



LAWS AND DRUG ABUSE

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Preface

Laws and drug abuse are intricately connected, with legal frameworks playing a crucial role in addressing substance misuse and its associated societal impacts. The first aspect to explore is the establishment of regulations governing the production, distribution, and use of controlled substances. These laws categorize drugs based on their potential for abuse and medical value, with strict controls in place for substances deemed to pose significant risks to public health.

Enforcement strategies form another key component of laws related to drug abuse. This includes efforts by law enforcement agencies to combat drug trafficking, smuggling, and illicit manufacturing operations. Through investigations, surveillance, and interdiction efforts, these agencies work to disrupt drug supply chains and apprehend individuals involved in illegal drug activities.

Treatment and rehabilitation programmes are essential components of drug abuse laws, focusing on addressing the root causes of substance misuse and supporting individuals in their journey towards recovery. These programmes often involve a combination of medical interventions, counseling, and behavioural therapies tailored to meet the unique needs of individuals with substance use disorders.

Furthermore, laws pertaining to drug abuse frequently incorporate prevention measures aimed at reducing the demand for illicit drugs and promoting healthy behaviours. These initiatives may include educational campaigns, community outreach programmes, and youth-focused interventions designed to raise awareness about the risks of drug abuse and empower individuals to make informed decisions.

International cooperation plays a significant role in addressing drug abuse, as drug trafficking and organized crime often transcend national borders. Through

bilateral agreements, multilateral treaties, and collaborative initiatives, countries work together to share intelligence, coordinate enforcement efforts, and harmonize drug policies to combat the global drug trade effectively.

Additionally, laws related to drug abuse often encompass harm reduction strategies aimed at minimizing the adverse consequences of drug use on individuals and communities. These strategies may include needle exchange programmes, overdose prevention measures, and access to medication-assisted treatment to reduce the risk of infectious diseases and overdose deaths.

Laws and drug abuse are intertwined in a complex regulatory framework aimed at protecting public health, promoting safety, and reducing the societal harms associated with substance misuse. By addressing drug abuse through a multifaceted approach that incorporates prevention, enforcement, treatment, and harm reduction, policymakers and law enforcement agencies can work together to mitigate the impacts of drug abuse on individuals, families, and communities.

The book on *Laws and Drug Abuse* offers comprehensive insights into legal frameworks and measures aimed at addressing drug abuse, highlighting strategies for prevention, enforcement, and treatment within the context of various jurisdictions.

–Author

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Legal Aspects of Drug Abuse in India

CURRENT LEGISLATIVE CONTROL

Drug abuse is a major public health problem with extensive legal ramifications. *In India, legal aspects of drug abuse involves two main areas:*

- (1) Licensing laws regulating production and retail supply,
- (2) Legislation for offences committed under intoxication circumstances

THE DRUGS AND COSMETICS ACT, 1940

This enactment was legislated to regulate the import, manufacture, distribution and sale of drugs and cosmetics. The act contains two schedules. The first deals with Ayurvedic and Siddha systems of drugs and second schedule deals with standards to be complied with imported drugs and drugs manufactured for sale, sold and stocked and exhibited for sale or distributed.

The act improvised the constitution of:

- Drugs Technical Advisory Board, to advise the Central and State Government on technical matters arising out of administration of this act,
- Central Drugs Laboratory and its functions along with prescribing the procedure of submission of samples of drugs for analysis or test, forms of laboratory report and fees payable in respect of such reports and
- Drugs Consultative Committee to advise the Central and State Government and Drug Technical Advisory Board on any matter tending to secure uniformity throughout in the administration of this act.

The quality and purity of drugs are the main objectives of the act. Standard of quality of drug is to be maintained. This act prohibits import, manufacture

and sale of certain drugs which is not of standard quality, misbranded and spurious drugs, propriety medicines lacking list of ingredients including quantity or formula on label and drugs which claims to cure or mitigate any such disease or ailments. This act also empowers Central Government to prohibit import of drugs which are likely to involve any risk to human beings or animals and drugs which are of no therapeutic value in public interest. This act provides stringent punishment for contravention of provisions of act and rules made thereof.

THE NARCOTIC DRUGS AND PSYCHOTROPIC SUBSTANCES (NDPS) ACT, 1985

This act consolidates and amends the existing laws related to narcotic drugs. Stringent provisions are made for the control and regulation of operations relating to narcotic drugs and psychotropic substances and for matters connected therewith. The act empowers Central government to take measures for preventing and combating abuse of and illicit traffic of narcotic drugs, *etc.*

Salient features of this act are as under:

- Some of the important definitions under this act includes
 - “Addict” as a person who has dependence on any narcotic drugs or psychotropic substance.
 - “Narcotic drug” as coca leaf, cannabis (hemp), opium, poppy straw and includes all manufactured goods and
 - “Psychotropic substance” as any substance, natural or synthetic, or any natural material or any salt or preparation of such substance or material included in the list of psychotropic substances (n=110).
 - “*Cannabis (hemp)*” means:
 - (a) Charas, that is the separated resin, in whatever form, whether crude or purified, obtained from the cannabis plant and also includes concentrated preparation and resin known as Hashish oil or liquid Hashish
 - (b) Ganja, that is the flowering or fruiting top of the cannabis plant
 - ‘*Coca derivatives*’ means:
 - (a) Crude cocaine (Any extract of cocaine leaf)
 - (b) Ecgonine and all the derivatives of ecgonine from which it can be recovered.
 - (c) All preparations containing more than 0.1% of cocaine
 - ‘*Opium*’ means:
 - (a) The coagulated juice of opium poppy;
 - (b) Any mixture, with or without any neutral material, of the coagulated juice of the opium poppy. It does not include any preparation containing more than 0.2% of morphine.
 - ‘*Opium derivatives*’ means:
 - (a) Medicinal opium
 - (b) Prepared opium used for smoking

- (c) Diacetylmorphine or heroin
- (d) Any preparation containing more than 0.2% of morphine
- (e) Phenanthrene alkaloids- Morphine, codeine, thebaine and their salts
- Central Government may, constitute a fund to be called the National Fund for Control of Drug Abuse which shall be applied to meet the expenditure incurred in connection with the measures taken for-
- Combating illicit traffic in narcotic drugs, psychotropic substances or controlled substances,
 - Controlling the abuse of narcotic drugs and psychotropic substances,
 - Identifying, treating and rehabilitating addicts
 - Preventing drug abuse,
 - Educating public against drug abuse
 - Supplying drugs to addicts where such supply is medical necessity.
- This act prohibits cultivation of any coca plant, opium plant or any cannabis plant or gather any portion of coca plant or produce, manufacture, possess, sell, purchase, transport, warehouse, use, consume, import inter-State, export inter State, import into India, export from India or transship any narcotic drug or psychotropic substance except for medical or scientific purposes and in manner and to the extent provided by the provisions of this act
- *The act empowers Central Government to permit and regulate by rules:*
 - The cultivation, or gathering of any portion of coca plant, or the production, possession, sale, purchase, transport, import inter-State, export inter-State, use or consumption of coca leaves;
 - The cultivation of opium poppy;
 - The production and manufacture of opium and production of poppy straw;
 - The sale of opium and opium derivatives from the Central Government Factories for export from India or sale to State Government or manufacturing chemists;
 - The manufacture of manufactured drugs, not including manufacture of medicinal opium or any other preparation containing manufactured drug from materials which the maker is lawfully entitled to possess;
 - The manufacture, possession, transport, import inter-State, export inter-State, sale purchase, consumption or use of psychotropic substances;
 - The import into India and export from India and transshipment of narcotic drugs and psychotropic substances.
- The State Government may by rules permit and regulate
 - The possession, sale, warehousing, purchase, transport, import inter-State, export inter-State, use and consumption of poppy straw;

- The possession, transport, import inter-State, export inter-State, purchase and consumption of opium
- The cultivation of cannabis plant, production, manufacture, possession, transport, import inter-State, export inter- State, sale, purchase and consumption of cannabis (Except Charas);
- The manufacture of medicinal opium or any preparation containing the manufactured drug from materials which the maker is lawfully entitled to process;
- The production and manufacture of opium and production of poppy straw;
- The sale of opium and opium derivatives from the Central Government Factories for export from India or sale to State Government or manufacturing chemists
- The possession, transport, import inter-State, export inter-State, purchase, use or consumption of manufactured drugs other than prepared opium and of coca leaf and any preparation containing any manufactured drugs.
- The manufacture and possession, of prepared opium from opium lawfully possessed by an addict registered with the State Government on medical advice for his personal consumption.
- Punishment for contravention involving small quantity in relation to poppy straw, prepared opium, cannabis plant and cannabis, manufactured drugs and preparations, psychotropic substances, and for illegal import into India, export from India or transshipment of narcotic drugs and psychotropic substances, is rigorous imprisonment for a term up to six months or with fine up to 10,000 rupees or both. For contravention involving quantity lesser than commercial quantity but greater than small quantity, punishment is rigorous imprisonment for a term up to ten years and with fine up to 1,00,000 rupees. For contravention involving commercial quantity punishment is rigorous imprisonment for a term up to ten years, which may extend up to 20 years and fine up to 1,00,000 rupees, which can be extended up to 2,00,000 rupees. Court has to record reasons in the judgement, for imposing a fine exceeding 2,00,000 rupees. Punishment for cultivation of any cannabis plant is rigorous imprisonment up to ten years and also fine up to 1,00,000 rupees.
- Punishment for contravention in relation to coca plant and coca leaves is rigorous imprisonment for a term up to ten years or fine up to 1,00,000 rupees.
- Punishment for contravention in relation to opium poppy and poppy involving small quantity, is rigorous imprisonment for a term up to six months or with fine up to 10,000 rupees or both. For contravention involving commercial quantity punishment is rigorous imprisonment for a term up to ten years, which may extend up to 20 years and fine

up to 1,00,000 rupees, which can be extended up to 2,00,000 rupees. Court has to record reasons in the judgement, for imposing a fine exceeding 2,00,000 rupees. In any other case, the punishment is rigorous imprisonment up to ten years and fine up to 1,00,000 rupees

- Punishment for consumption of any narcotic drug or psychotropic substance like cocaine, morphine, diacetylmorphine or any other narcotic drug or any psychotropic substance specified by Central Government by Gazette Notification is rigorous imprisonment for a term up to one year or fine up to 20,000 rupees or both. Punishment for consumption of any narcotic drug or psychotropic substance other than mentioned is rigorous imprisonment for a term up to six months or fine up to 10,000 rupees or both. For second and each subsequent offence, punishment is rigorous imprisonment for a term, which may extend to one half of the maximum term of imprisonment and also fine up to one half of the maximum amount of fine. If person is liable to punished with a minimum term of imprisonment and minimum amount of fine, the minimum punishment for such a person will be one half of the minimum term of imprisonment and one half of the minimum amount of fine.
- Under section 31 A, Chapter IV of this act, (1) If any person who has been convicted for offences punishable under section 19 (punishment for embezzlement of opium cultivator), section 24 (Punishment for external dealings (outside India) of narcotic drugs and psychotropic substances), section 27 A (Punishment for financing illicit traffic and harbouring offenders) and for offences involving commercial quantity of any narcotic drugs or psychotropic substance, is subsequently convicted of the commission of, or attempt to commit, or abetment of, or criminal conspiracy to commit an offence relating to a) engaged in the production, manufacture, possession, transportation, import to India, export from India or transshipment, of the narcotic drugs or psychotropic substances and quantity exceeding to those specified in the clause b) financing directly or indirectly or any of the activities specified in clause (a), shall be punishable with death, (2) where any person convicted by a competent court of criminal jurisdiction outside India under any law corresponding to the provisions of subsection 1, such person in respect of such conviction shall be dealt with for the purpose of sub section 1 as if he has been convicted by a court in India.
- Under section 64 A, any addict, who is charged with an offence punishable under section 27 or with offences involving small quantity of narcotic drugs or psychotropic substances, who voluntarily seeks to undergo medical treatment for de-addiction from a hospital or an institution maintained or recognized by the Government or a local authority and undergoes such treatment shall not be liable to prosecution under section 27 or any other section for offences involving small

quantity of narcotic drugs and psychotropic substances. This immunity may be withdrawn if the addict does not undergo the complete treatment for deaddiction.

- Section 71 of this act, empowers government to establish centres for identification, treatment, education, after care, rehabilitation, social reintegration of addicts and for supply, of any narcotic drugs and psychotropic substance (as prescribed by concerned Government) to the addicts registered with government and to others where such supply is a medical necessity.
- Small quantity of drugs defined under this act are
 - Hashish or Charas- 5gm
 - Opium-5gm
 - Cocaine-125mg
 - Ganja-500gm
 - Heroin/Smack/Brown Sugar-250mg.

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Narcotics Drugs and Psychotropic Substances Act 1985

Prior to the present drug control legislation, the focus of Indian drug policies was control of the drug trade and the collection of revenues through licensed sales. The change in policy direction had much to do with India's international commitments. As a signatory to the UN 1961 Single Convention, India, like many other nations, was obliged to eradicate culturally ingrained patterns of drug use, including those involving cannabis and opium.

Indian delegations at the UN had long objected to a proposed policy of international cannabis prohibition, but had "made little headway against the massive," predominantly Western and US-led, "anti cannabis bloc." Yet, in order to gain widespread acceptance, the final draft of the Single Convention included transitional reservations allowing so-called grace periods for phasing out traditional drug use. This meant that the "quasi-medical use" of opium had to be abolished within 15 years of the Convention coming into force. Similarly, the non-medical or non-scientific use of cannabis was to be discontinued as soon as possible, "but in any case within 25 years" from the date the convention came into force. Referring to cannabis, one expert has commented that it was a rather optimistic timetable when "matched against three thousand years of use by untold millions".

In political terms, any moves to phase out cultural drug use within India were problematic, since it was difficult for any party in power to tamper with popular religious and cultural feelings concerning the use of opium and cannabis. Consequently, mindful of international obligations regarding the UN grace period

and the political sensitivity of the issue within the country, the NDPS Act was quietly put on to the statute books with little national debate. The only provision for non-medical cultural use within the 1985 Act was that drinks made from cannabis leaves were to be sanctioned. As such, the legislation made many traditional forms of drug use a criminal act that could be punishable by imprisonment.

Some of the significant measures taken under the NDPS Act include:

- For the consumption of substances such as narcotic drugs or psychotropic substances or any other substance specified by the Central Government, the punishment is imprisonment for a term, which may be extended to one year, or a fine, which may extend to twenty thousand rupees, or both.
- In the case of consumption of cannabis products other than bhang, imprisonment may be for a term of six months, or a fine which may extend to ten thousand rupees, or both.
- The quantity specified for various substances that could lead to arrest for trading in drugs was not very large. For example, 250 milligrams of heroin, five grams of opium, five grams of charas or hashish, 500 grams of *ganja* and 25 milligrams of cocaine.

Evidence suggests that, in largely ignoring the sociocultural context of traditional drug use, the NDPS Act led to a significant increase in the arrests of low-level drug users. Arrests under the Act in 2001 totalled 16,315, of which around 76 per cent (12,400) were prosecuted and 28 per cent (4,568) convicted. A study undertaken in the same year in Tihar jail provides an insight into the make-up of such figures. Interviews with 1,910 individuals arrested under the NDPS Act (1985) indicated that around 325 (17 per cent) were arrested under Section 27.

This refers to the possession of small quantities of drugs meant for personal consumption. While the law has provision for such arrests to seek treatment instead of serving a sentence, the provision is rarely utilised. Research also shows that many of those arrested on drug charges spent years in jail before their cases came up for hearing. This was a result of the notoriously slow pace of the Indian judicial system. In some instances, it has meant that those caught with small quantities of drugs were eventually acquitted after spending years behind bars. Beyond concerns about the obvious injustice of such cases, prolonged prison time for low level drug offenders also raises the issue of recruitment by criminal groups.

A recent study on organised crime in Mumbai suggests that prisons in India, as in many other parts of the world, are ideal places for orienting vulnerable individuals into the world of crime.

CHANGES IN PATTERNS OF DRUG USE

The convergence of a number of important structural changes, at both national and international levels, around the time of the NDPS Act, impacted on long-

standing patterns of drug use within India. Research suggests that tourism has contributed to a diversification of drug use patterns. In the mid and late 1970s, exposure to other cultures in both Nepal and India produced new forms of drug taking behaviour. Since the early 1980s, most major Indian cities have been introduced to new “foreign” drugs such as heroin.

The interaction of young Indians with tourists has also facilitated an alteration in the relationships they later form with those drugs traditionally consumed. This is seen in all parts of the country, although the process is more gradual in rural areas. Such a rural-urban split can be explained by the impact of urbanization upon traditional patterns of drug use and management. Put simply, urban communities do not tend to adhere to traditions to the same degree as those in rural areas.

Furthermore, the relatively easy availability of a “foreign” drug like heroin, in comparison to opium, within the urban setting contributed to a shift in the drug of choice. As such, data from 16,942 drug users as part of the Drug Abuse Monitoring System reveal that, other than alcohol, there is significant variation in drug use patterns between urban and rural areas. With regard to heroin, for example, 14.9 per cent of users were from urban areas with nearly half that figure (7.9 per cent) being from rural areas.

The shift to heroin is also more likely to take place in urban settings that fall along the illicit heroin trafficking routes from South West and South East Asia. Indeed, the illicit drug trade has a significant, although complex, impact on drug use patterns within many parts of India. Shifts from opium to heroin use can be seen to depend on a number of inter-related factors. These include proximity to areas of illegal cultivation and processing, traditional regional drug use patterns and geographic accessibility. For example, there is illicit poppy cultivation in the North Eastern state of Arunachal Pradesh. Nonetheless, in a state with a history of cultural opium use and, due to the densely forested nature of the terrain, limited connectivity with the surrounding areas, drug use is limited to opium. In other parts of North East India, circumstances are different, however.

The combination of the easy availability of heroin from Myanmar and absence of cultural use of opium in these regions resulted in the emergence of heroin use. In the states of Madhya Pradesh, Rajasthan and Uttar Pradesh there is a history of cultural opium use with the demand long supplied by diversion from licit cultivation.

A study in Rajasthan in 1989 indicated that drug use was largely limited to opium and cannabis. Nonetheless, recent research shows that in the mid-1990s there was a shift from traditional drugs to heroin. It is significant that this change took place at a time when there was an increase in the illicit heroin traffic to India from Afghanistan via Pakistan. Evidence suggests that the new legislation exacerbated the problems arising from such structural changes.

For example, far from reaching its goal of eradicating drug use, enforcement of the NDPS Act appears to have inadvertently facilitated a shift to harder forms of drugs and riskier modes of consumption. The impact of the legislative changes

was initially felt in urban areas in the 1990s, especially the major cities. Hard drugs seem to have found a niche in many cities. An official study showed that of those drug users seeking treatment, significant numbers were using heroin, opium and the narcotic analgesic, propoxyphene. Another study among opiate users in fourteen sites across India indicated the primary substance of abuse was heroin followed by buprenorphine, a synthetic opiate. From the total sample of 4,648 drug users, around 43 per cent had injected drugs at some time. In many cases, the drug of choice was buprenorphine followed by heroin and propoxyphene. Among the injectors around 51 per cent in Amritsar were found to have shared needles at some time, with 15 per cent from Hyderabad, New Delhi, Dimapur, Trivandrum and Chennai reporting the same practice.

The conditions for widespread transmission of HIV and other infections through drug use are therefore increasingly present in India. It is possible to see that the shift in patterns of use is not only from traditional drugs to derivative drugs but also to synthetic products as well. A 2004 study on the illicit Indian drug trade indicated that increasing controls over poppy straw used in the preparation of opium drinks is creating a shift towards synthetic opiates.

This is a dangerous trend considering that the morphine content in poppy straw is very low. Given the cultural acceptance of cannabis and opium, monitoring of the drug of initiation among users can be a useful process in identifying changing patterns of drug use across the country. For example, the 2002 Ministry of Social Justice and Empowerment Rapid Assessment Study revealed that within the majority of fourteen study sites respondents cited cannabis (40 per cent) followed by alcohol (33 per cent) to be dominant drugs of initiation. However, in Dimapur, a city from North Eastern region, for around 34 per cent of the sample the first drug of abuse was propoxyphene, followed by heroin for 30 per cent.

The profile of drugs users is another area that has undergone significant changes. Traditional users were predominantly from the male adult population. Data collected from fourteen study sites in the Rapid Assessment Study indicate that after legislative measures were put in place to criminalise drug use, the age of initiation to drug use fell. The Study showed the mean age to be nineteen with around 52 per cent of the users in the sample starting to use drugs between the ages of 16 and 20 years. Socio-cultural mechanisms also traditionally ensured that drug use by women within India was limited. There now appears to be a shift in this pattern.

Drug use among women is often hidden with available data being based on random sampling of identified drug users. Nonetheless, data collected from 75 drug users in Mumbai, Delhi and Aizwal indicated the main substances of abuse to be heroin, propoxyphene, alcohol, minor tranquilisers and cough syrup. Around 40 per cent were injecting drug users with 49.3 per cent of the sample aged between 21 and 30 years old. In Aizwal, a larger proportion of the drug users were between 15 and 20 years old.

The consequences of an erosion of the traditional gender based restrictions on drug use also include negative secondary impacts. Of the seventy-five women

within Pratima Murthy's 2002 study, 45.3 per cent derived their main source of income from sex work and drug dealing. In combination with the high incidence of injecting drug use, this reality clearly has serious implications for the management of HIV/AIDS and other blood borne infections.

LAW AND POLICY

LEGAL FRAMEWORK

The laws and legislations do not seem to be adequate or comprehensive in dealing with the various forms of trafficking and often frees the culprit and penalises the victim. India is a signatory to several international covenants, conventions and treaties dealing with exploitation of women and children. The most important amongst these, in the case of children is the UN Convention on the Rights of the Child, 1989, ratified by India in 1992.

The CRC provides a platform for NGOs to bring their child rights concerns to notice in the form of alternate reports that can be sent to the UN Committee on the Rights of the Child for consideration. Besides, it also clearly provides for the State Parties to consult NGOs in the preparation of the Country Report to be presented before the Committee so that issues concerning children get adequately addressed.

As regards the national scene, it must be pointed out that we have a Constitution that is applauded all over the world, but, while Article 51 A in the Constitution of India makes it a fundamental obligation on all citizens to renounce practices derogatory to the dignity of women, it does not lay down the same in the case of children. Neither has one known of any trafficking case coming up before the court of law on grounds of violation of the fundamental duty laid down in the Constitution. As women and children are considered a weaker part of the society, the Constitution, following the principle of protective discrimination, allows for making and implementing laws specific to them, for their protection and well being.

The Immoral Traffic Act of 1956 is in line with this principle. Unfortunately, this Act deals only with trafficking of girls and women for prostitution. It does not cover trafficking of boys for sexual purposes. As the laws stand, the only legal provision that can be invoked to combat trafficking of boys is Section 377 of the IPC, which deals with "unnatural offences", and covers sodomy.

The Karnataka Devadasi Prohibition Act deals with trafficking of girls for religious purposes. Some of the other laws relating to trafficking are the Juvenile Justice Act, 1986, a number of Begging Prevention laws *e.g.*, the Bombay Begging Prevention Act, the Prevention of Illicit Traffic in Narcotic Drugs and Psychotropic Substances Act, 1989, the Bonded Labour Act and so on.

Besides the criminal law of India *i.e.*, the Indian Penal Code, the Criminal Procedure Code and the Indian Evidence Act provide for various forms of trafficking. However, there are enough loopholes in the laws and the legal system that result in the crime being perpetuated without fear.

GAPS IN THE EXISTING LEGAL FRAMEWORK

The existing legal framework is limited to defining trafficking only in terms of trafficking for prostitution. There is no comprehensive legal framework to cover trafficking of children for labour, begging, pornography, *etc.*

In trafficking, it is not just the "moving" of children from one place to another, it is also breach of trust and it is the pain and agony and trauma suffered by the victim both while being trafficked and thereafter. We need a law that addresses all these concerns. All other forms of trafficking other than prostitution is currently covered under the Indian Penal Code. The IPC has no specific provision on trafficking. IPC provisions that can be used to deal with a case of trafficking are the provisions relating to kidnapping and abduction, procurement and importation of minor girls for illicit intercourse, selling and buying of girls for prostitution, slavery and forced labour contained in sections 360, 361, 362, 363 A, 365, 366, 366 A, 366 B, 367, 369, 370, 371, 372, 373 and 374. The IPC does not contain any provision for abetment to trafficking or attempt to trafficking in any form whatsoever. In the case of Freddy Peats, the paedophile caught in Goa, the police initially brought the case under Section 377 of IPC dealing with unnatural offences as well as sections 291 and 293 of the IPC dealing with dissemination of obscene pictures, especially of minors.

In such cases a bail cannot be granted, but Freddy Peats managed to get released on bail. After much struggle Peat was sentenced to life. There is a need for a comprehensive legislation on child trafficking, which goes beyond child prostitution and addresses other grave forms and purposes of trafficking of children.

POLICIES AND PLANS

There is a need for a comprehensive policy on child trafficking. Unlike the National Policy on Child Labour, 1986, or the National Policies on Health, Education and Nutrition, there is no National Policy to Combat Child Trafficking or Trafficking as such. India however, does have an old National Policy for Children of 1974, which has not been changed in all these years.

This policy does not contain anything specifically for child victims of trafficking though it does talk about protection of children against neglect, cruelty and exploitation. One of the major goals of the National of Action is Improved protection of children in especially difficult circumstances, which includes tackling the root causes leading to such situations. This category of children is comprised of physically handicapped; mentally handicapped; drug addicts, victims of natural and man-made disasters, refugee children, street children, slum and migrant children, orphans and destitutes; children suffering from AIDS, children of parents with AIDS and AIDS orphans, children of prostitutes and child prostitutes and juvenile delinquents and child labour.

Although the National Plan of Action, 1992 deals with children in prostitution and children of prostitutes in its part concerning children in especially difficult circumstances, like most other government documents it does not recognise child trafficking *per se* as an issue for action.

3

Drug Abuse and Addiction

Intake of drugs for reasons other than medical in a manner that affects physical or mental functioning is termed drug abuse. Any abuse can lead to addiction. Tolerance refers to a condition where the user needs more and more of the drug to experience the same effect. Smaller quantities, which were sufficient earlier, are no longer effective and the user is forced to increase the amount of drug intake. Dependence – This can be physical and psychological. The person becomes dependent and starts feeling uncomfortable in the absence of the drug.

Withdrawal symptoms – When the drug intake is stopped, withdrawal symptoms are experienced. Physical dependence gives rise to withdrawals such as tremors and vomiting. Psychological dependence causes withdrawal symptoms like restlessness or depression. The intensity of withdrawal symptoms depends on the physical condition of the user, type of drug abused, the amount of drug intake and the duration of abuse.

Classification of Addictive Drugs:

- Narcotic Analgesics
- Stimulants
- Depressants
- Hallucinogens
- Cannabis
- Volatile Solvents
- Other drugs of abuse

Mode of intake:

- Opium – oral, inhalation
- Morphine – injection

- Codeine – oral
- Heroin – injection, inhalation, chasing
- Buprenorphine – oral, injection

Short – term effects:

- Euphoria
- Thought process impairment, drowsiness, apathy
- Feelings of hunger and pain are not felt
- Overdose of heroin can cause convulsions, coma and death

Long – term effects:

- Mood instability
- Reduced libido
- Constipation
- Respiratory impairments
- Physical deterioration

Infections like serum hepatitis and HIV can occur among IV users due to use of unsterile needles. In female abusers, menstrual irregularity and fetal addiction/ abnormality can occur.

TOLERANCE AND DEPENDENCE DEVELOP

Withdrawal symptoms:

- Feeling of unpleasantness
- Aches and pains all over the body
- Diarrhoea
- Dilation of pupils
- Insomnia

Stimulants:

- Drugs which excite or speed up the central nervous system

Type and mode of intake:

- Amphetamines – oral
- Cocaine – snorted

Short – term effects:

- A heightened feeling of well being, euphoria
- A sense of superabundant energy
- Increased motor and speech activity
- Suppression of appetite
- Increased wakefulness

Long-term effects:

- Chronic sleep problem
- Poor appetite
- Rapid and irregular heart beat
- Mood swings
- ‘Amphetamine psychosis’ may occur

TOLERANCE AND DEPENDENCE DEVELOP

Withdrawal symptoms – No major physiological disruptions:

- Extreme fatigue
- Disturbed sleep
- Voracious appetite
- Moderate to severe depression

Depressants:

- Drugs which depress or slow down the functions of the central nervous system

Type and mode of intake:

- Sedative-hypnotics –
- Barbiturates,
- Benzodiazepines
- Alcohol

Short – term effects:

- Relief from anxiety and tension
- Euphoria
- Lowering of inhibitions
- Poor motor coordination
- Impaired concentration and judgement
- Slurred speech and blurred vision
- Sedation, sleep with larger doses

Long – term effects:

- Depression
- Chronic fatigue
- Respiratory impairments
- Impaired sexual function
- Decreased attention span
- Poor memory and judgement
- Chronic sleep problems

Tolerance and dependence:

- Tolerance does not develop uniformly
- Cross tolerance can develop
- Physical and psychological dependence develop

Withdrawal symptoms:

- Tremors
- Insomnia
- Irritability and restlessness
- Hallucinations
- Convulsions
- Delirium tremens

HALLUCINOGENS

Hallucinogens are drugs which affect perception, emotions and mental processes

Type and mode of intake:

- *LSD*: Lysergic acid diethylamide
- *PCP*: Phencyclidine
- Mescaline
- Psilocybin

Short – term effects:

- Alterations of mood
- Distortion of the sense of direction, distance and time
- ‘Pseudo’ hallucinations
- Synesthesia – melding of two sensory modalities
- Feelings of depersonalization

Long-term effects:

- Flash back or spontaneous recurrence of on LSD experience can occur
- Amotivational syndrome
- LSD precipitated psychosis

Tolerance and dependence:

- Tolerance develops rapidly
- Withdrawal symptoms are not reported

CANNABIS

Drugs from cannabis plant come under this category:

- Ganja/Marijuana
- Hashish/Charas
- Hashish oil
- Bhang

Mode of intake:

- Smoking

Short – term effects:

- Mild euphoria
- Lowering of inhibitions
- Reddening of eyes
- Sense of smell, touch and taste are often enhanced
- Altered sense of time perception
- Impaired short-term memory
- Impairment of ability to perform complex motor tasks

Long-term effects:

- Decreased cognitive ability
- Amotivational syndrome
- Psychosis

- Respiratory problems
- Sterility/impotence
- In women abusers, fetal damage can occur

TOLERANCE AND PSYCHOLOGICAL DEPENDENCE DEVELOP

Withdrawal symptoms:

- Sleep disturbances
- Loss of appetite, irritability
- Tremors
- Depression or psychotic symptoms may become prominent

VOLATILE SOLVENTS

Drugs under this category are volatile hydrocarbons, Petroleum derivatives

Type and mode of intake:

- Glue and solvents like varnish and eraser fluids and petrol through sniffing.

Short – term effects:

- Euphoria
- Clouded thinking
- Slurred speech
- Staggering gait
- Hallucinations
- Sudden death

Long – term effects:

- Psychosis
- Permanent brain damage
- Liver, kidney and heart damage

OTHER DRUGS OF ABUSE

Medically used drugs that do not fall into any of the categories:

- Muscle relaxants
- Painkillers
- Anti-histamines, prescribed for allergies
- Anti-emetics
- Anti-depressants/anti-psychotics

These drugs are taken orally as tablets or used in the form of injections. The effects and subsequent dependence and withdrawal symptoms vary.

Damage Due to Addiction

Irrespective of the drug abused, addiction leads to:

- Physical deterioration
- Psychiatric problems
- Intellectual impairment

- Personality deterioration
- Increased risk of accidents and higher susceptibility to high risk behaviour in the form of unprotected sex or use of unsterile needles
- Legal risks

DRUG ABUSE PROBLEMS: LOSING GROUND

Over the last 30 years, awareness of illicit drugs, access to them and their abuse have dramatically increased. Despite major gaps in information, increases in the abuse of major dependence producing drugs are reflected in reports from official and unofficial sources. Reports from the United Nations, observations of experts, studies of crime, education, work and health—all point to serious problems in developing and industrialized countries. Although systematic quantification of problems is not available, there is general agreement that populations at highest risk are those in the age range most needed for productive work.

Other groups of people, however, are involved in substance abuse, such as street children in developing countries as well as youth elsewhere who misuse volatile solvents, thinners and marijuana. Reports from the United Nations and other sources indicate increases in drug abuse and harmful consequences in most parts of the world. Substance-related deaths have been estimated at nearly 5 million annually for alcohol and tobacco and 200,000 annually for injecting drug abusers.

Life years lost through disability related to drug dependence have been estimated for 1990 at 39.3 million years worldwide for males and 13.3 million years for females. Aggregate worldwide estimates of the burden of drug-related diseases, lost job time and the costs of other associated conditions are not available. Due to the fact that many drug-impacted conditions were not included in this brief compilation, it is clear that figures cited here for mortality, morbidity, disability or impairment are not only incomplete but are also underestimates of the real impact of addictive disorders.

Patterns of abuse in different countries show enormous variation, including different drugs abused, individuals who take drugs, various settings and a range of impacts. A problem of major concern is the consumption of drugs in areas producing opium/heroin, coca/cocaine and cannabis. Another way of expressing this problem is in terms of a shift in consumption from developed to developing countries.

To the extent that producers of these drugs are themselves regular users, they represent a permanent market: their own pattern of drug abuse ties them closely to future illicit production. This situation now exists in Pakistan, several Latin American countries and other parts of the world as well. Compulsive or regular consumption guarantees continued production. These producers become victims of their own “success”. Production and illicit traffic in opium/heroin, coca/cocaine or cannabis appear extremely high whether assessments are based on official estimates or the opinions of independent experts. Since 1989, estimates of opium production have been between 3,000 and 4,000 tonnes per year. Coca leaf, produced in fewer countries than opium, has increased since 1988, from just below 295,000 tonnes of leaf to slightly over 330,000 tonnes.

While these are not precise totals of world production, they do indicate the magnitude of world supply, a first step in understanding the supply-demand equation. The magnitude should be considered in the context of commodities that may not be very large in volume but have enormously high value and unit costs. Production of both opium and coca take place in the developing world where favourable growing conditions, remoteness from the law and cheap labour are available.

Control of precursors and chemicals essential for production of illicit drugs has become increasingly difficult with more movement of people, more porous national boundaries and, in many countries, reduced government authority.

Extremely high profit margins provide cash to hire new waves of couriers, finance insurgent movements, buy political protection and give financial support to terrorists. The world of illicit drug dealing is harsh and ruthlessly competitive, with marginal and incompetent dealers often eliminated by rival gangs or police action.

In sum, illicit supply and demand for drugs have surged with enormous profits for a few and modest incomes provided to others. Increased morbidity and mortality and associated family, educational and employment problems due to drug abuse are pervasive. Measures to prevent and control drug abuse are weak and the knowledge base on which these measures rest is even weaker. While it is possible that this dire picture may improve, further deterioration is more likely.

LACK OF PRODUCTIVE EMPLOYMENT AND IMPACT ON THE WORKPLACE

The workplace is part of the community, reflecting its strengths and weaknesses. With an estimated 30 per cent of the world's labour force not productively employed and young people seeking jobs faster than they are created, the ranks of the unemployed, and their problems, continue to increase. Drug abuse occurs frequently in the same age groups as those without productive work, increasing the vulnerability of this segment of the population to social problems. Drug abuse represents difficult problems for employers because they are under competitive pressure to increase output.

At the same time, these employers must respond to critical human resource issues to continue in business. Illicit drugs as well as alcohol and tobacco create significant problems in the workplace, according to recent studies and reports. Prescription drug problems, *i.e.*, legal drugs used in unwise fashion or with unexpected results, are a major concern to employers, workers and enterprise representatives. Work tasks that require higher level judgement, constant attention, immediate memory and fine motor skills are easily disrupted by drugs.

Safety-sensitive jobs with immediate responsibility for the welfare of others are particularly vulnerable to drug impairment. Illicit and licit drugs may increase response time, disrupt fine motor skills and cause mood changes. Cocaine and other stimulants have the potential to induce compulsive use, disrupting work

and family life. Drug abusers have more absenteeism, accidents on the job, medical claims and lost productivity than non-users. The high costs of drug abuse can be reduced by careful pre-employment appraisal, supervision on the job, periodic prevention efforts and occasional interventions as required.

IMPLICATIONS OF RURAL AND URBAN POVERTY

Although rural and urban poor are alike in that they must constantly seek the essentials of daily living, they have basically different kinds of involvement in drug problems. Rural poverty is more related to the supply of illicit drugs and urban poverty is more related to both dealing and demand. Illicit growth provides income for farmers willing to take risks for the higher gain than obtained from licit crops. Because of the size of the shadow economy created by illicit drug money, the absorption of drugs and drug money into the fabric of society and the degree of dependence of many social and economic sectors on this relatively new income, drugs have a social significance far beyond that reflected in statistics on production, consumption or impact.

Persons with marginal incomes often spend money on drugs, alcohol or tobacco instead of food, clothes and shelter. With dependence-producing drugs, sporadic use may deteriorate into regular or compulsive use, reinforcing consumption and guaranteeing a market for the supplier. When suppliers become compulsive or regular abusers, illicit growth and supply-demand patterns are more difficult to change. Poverty may change perspective so that immediate money with a risk is preferable to stable but delayed income with less risk.

Development programmes should examine the behaviour of farmers and peasants, however, to determine their economic motivations rather than make assumptions about their behaviour based on theory or impressions. Reasonable assurance of a modest income over a long timespan from licit crops may be sufficient to motivate farmers to participate in alternative development programmes.

The urban poor do not have the opportunities for crop production as do the poor in remote rural areas. Urban dwellers are, however, exposed to more varieties of abuse and are more vulnerable to taking up jobs in the illicit distribution system. More negative role models and opportunities to make illicit money are found among urban than rural poor.

MARGINALIZATION

Due to its highly varied nature in different sociocultural contexts, drug abuse may be seen as normative, marginal, deviant or criminal behaviour. Processes of marginalization apply to the behaviour of governments and communities as well as people. Large numbers of people are migrating from rural poverty to urban squalor, creating shanty towns where serious housing, health, and education problems are bred. Young people especially are vulnerable to drug abuse, especially abuse of cheap solvents, volatile substances and marijuana.

Drug subcultures rapidly develop, teaching young persons drug practices. Persons who are identified as drug abusers become more difficult to reintegrate

back into the larger community. Indifference or denial to the plight of those with substance abuse disorders, whether practised by individuals, communities or governments, are common. How to avoid stereotyping and stigmatizing persons with drug problems is problematic.

A start can be made by separating drug using behaviour from the person, rejecting the illegal behaviour but accepting the person for his or her human potential to follow a different path. In the remote areas of developing countries, no authority may be present to represent the rule of law. Tribal, religious, ethnic or other groups may control a region relatively independent of national policies. In many countries, social and political institutions appear weaker now than decades ago. In extreme cases, these institutions appear under siege, having lost legitimacy and stability.

When governments lose contact with people and control of the economic process, civil society is weakened. Civil frustration, violence, terrorism and corruption create conditions ripe for illicit drug growth, production and abuse and *vice versa*. Drugs, delinquency and crime are related in many ways.

In some cases, drug abuse may lead to crime; in others, criminal behaviour precedes drug abuse. The broader impact of drug abuse and crime may increase tension and other deviance, placing additional burdens on institutions such as the family. Drug-related crimes and terrorism cause instability and overload police, courts and prisons. Given sufficient size, drug problems may marginalize governments and institutions as well as people. In extreme cases, these problems may lead to parallel governments, where drug czars exercise enormous personal and financial power.

FUTURE CHALLENGES

With neither a single cause nor a simple cure, drug abuse and its many related problems continue to increase in many regions of the world. Problems related to the abuse of drugs are severe in some parts of both the developing and the industrialized world: disease, accidents, deaths, crime, lowered productivity and many other problems are frequently reported.

Not adequately monitored, drug abuse acts as a brake on human and social development and cannot be separated from endemic problems of disease, poverty, joblessness and violence. Varying widely between countries, illicit drug use and related problems reflect several characteristics: sales of drugs are usually highly profitable and they are easily marketed commodities. Also, they have powerful effects on the brain and behaviour, influencing a wide range of human activities. Progress in the field of drug abuse prevention depends on several factors.

- First, our strategies to response to drug problems should begin with the people, communities and institutions involved. People should be considered as the heart of the problem and the beginning of any solution. This principle will obviously take different forms in rural and urban areas and also be influenced by class distinctions.

- Secondly, alternative development strategies for rural areas should respond to the conditions found in target areas, which will differ according to the communities involved.
- Thirdly, as in rural settings, urban drug problems also need an individualized assessment and response, building on the strengths found on site.

To succeed, urban and rural interventions need a series of support mechanisms and long-term planning. To be effective, both need the support of the local community and a base in public policy. The concentration of drug money in the hands of a small number of persons is as important as its size. Further, people who become rich from illicit drugs, however they spend money, are not publicly accountable. The accumulation of huge sums outside the official governmental and economic structures threatens the stability of government, economic institutions and civil society.

Further, the illicit activity that produces these sums generates enormous social costs in governance, health care, crime control and integrity of public institutions and officials. Whether the resulting social costs of drug abuse and its problems are greater than any benefits of illicit funds, basic principles of social justice require that these funds not be considered the same as legitimately earned money. By any reasoning, such illicit funds cannot be considered simply another example of the redistribution of wealth by an unsanctioned, alternate market.

AIDS has changed the nature and impact of drug abuse. In the illicit drug scene, the HIV virus is spread in two primary ways: first, contaminated needles or syringes are shared; secondly, infected injecting drug abusers may travel widely. Although heterosexual transmission is the major cause of AIDS in many countries, drug injection is widely practised and high concentrations of seropositive drug injectors exist in Africa, Asia and Latin America.

Recent evidence shows that “in cities such as Bangkok and Edinburgh and in the Indian state of Manipur, HIV seroprevalence among drug users has risen from 0 to 40 per cent within two years or less”. Persons between 15 and 45 are frequently the victims of AIDS, with most deaths occurring so far, at least in Africa, among skilled workers. A growing population of young orphans and dependent, older family members will be severely affected socially and economically.

SUBSTANCE ABUSE IN INDIA

The epidemic of substance abuse in young generation has assumed alarming dimensions in India. Changing cultural values, increasing economic stress and dwindling supportive bonds are leading to initiation into substance use. According to the World Health Organization substance abuse is persistent or sporadic drug use inconsistent with or unrelated to acceptable medical practice. The picture is grim if the world statistics on the drugs scenario is taken into account. With a turnover of around \$500 billions, it is the third largest business in the world, next to petroleum and arms trade.

About 190 million people all over the world consume one drug or the other. Drug addiction causes immense human distress and the illegal production and distribution of drugs have spawned crime and violence worldwide. June 26 is celebrated as International Day against Drug Abuse and Illicit Trafficking every year. It is an exercise undertaken by the world community to sensitize the people in general and the youth in particular, to the menace of drugs.

Today, there is no part of the world that is free from the curse of drug trafficking and drug addiction. Millions of drug addicts, all over the world, are leading miserable lives, between life and death. India too is caught in this vicious circle of drug abuse, and the numbers of drug addicts are increasing day by day. According to a UN report, One million heroin addicts are registered in India, and unofficially there are as many as five million. What started off as casual use among a minuscule population of high-income group youth in the metro has permeated to all sections of society. Inhalation of heroin alone has given way to intravenous drug use, that too in combination with other sedatives and painkillers. This has increased the intensity of the effect, hastened the process of addiction and complicated the process of recovery. Cannabis, heroin, and Indian-produced pharmaceutical drugs are the most frequently abused drugs in India. Cannabis products, often called charas, bhang, or ganja, are abused throughout the country because it has attained some amount of religious sanctity because of its association with some Hindu deities.

The International Narcotics Control Board in its 2002 report released in Vienna pointed out that in India persons addicted to opiates are shifting their drug of choice from opium to heroin. The pharmaceutical products containing narcotic drugs are also increasingly being abused. The intravenous injections of analgesics like dextropropoxyphene, *etc.*, are also reported from many states, as it is easily available at 1/10th the cost of heroin. The codeine-based cough syrups continue to be diverted from the domestic market for abuse. Drug abuse is a complex phenomenon, which has various social, cultural, biological, geographical, historical and economic aspects.

The disintegration of the old joint family system, absence of parental love and care in modern families where both parents are working, decline of old religious and moral values, *etc.* lead to a rise in the number of drug addicts who take drugs to escape hard realities of life. Drug use, misuse or abuse is also primarily due to the nature of the drug abused, the personality of the individual and the addict's immediate environment.

The processes of industrialization, urbanization and migration have led to loosening of the traditional methods of social control rendering an individual vulnerable to the stresses and strains of modern life. The introduction of synthetic drugs and intravenous drug use leading to HIV/AIDS has added a new dimension to the problem, especially in the Northeast states of the country. Drug abuse has led to a detrimental impact on the society. It has led to increase in the crime rate. Addicts resort to crime to pay for their drugs. Drugs remove inhibition and impair judgment egging one on to commit offences. Incidences of teasing, group

clashes, assault and impulsive murders increase with drug abuse. Apart from affecting the financial stability, addiction increases conflicts and causes untold emotional pain for every member of the family. With most drug users being in the productive age group of 18-35 years, the loss in terms of human potential is incalculable.

The damage to the physical, psychological, moral and intellectual growth of the youth is very high. Adolescent drug abuse is one of the major areas of concern in adolescent and young people's behaviour. It is estimated that, in India, by the time most boys reach the ninth grade, about 50 per cent of them have tried at least one of the substance of abuse nature. In last three decades, many epidemiological surveys have been carried out in India to assess the prevalence of substance abuse. In Uttar Pradesh, Dube and Handa reported that 22.8 per 1000 were dependent on alcohol and drugs while Thacore from Lucknow gave a figure of 18.55 per 1000.

The Important finding of these studies is that alcohol was the commonest substance used (60-98%) followed by cannabis use (4-20%). Epidemiological surveys also revealed that 20-40% of subjects above 15 years are current users of alcohol and 10% of them are regular or excessive users. In a rural population of Uttar Pradesh alcohol was found to be the commonest substance abused (82.5%) followed by cannabis (16.1%). Varma *et al* found that rates of current use of alcohol in Punjab were 45.9% in Jalandhar and 27.7% in Chandigarh whereas it was 28.1% in rural areas of Punjab. Shukla reported that 38.3% of the rural population in Uttar Pradesh was habitual substance users.

In a study conducted in rural community in Bihar prevalence of alcohol/drug use was found to be 28.8% of the study population. Increase in incidences of HIV, hepatitis B and C and tuberculosis due to addiction adds the reservoir of infection in the community burdening the health care system further. Women in India face greater problems from drug abuse. The consequences include domestic violence and infection with HIV, as well as the financial burden. India has braced itself to face the menace of drug trafficking both at the national and international levels. Several measures involving innovative changes in enforcement, legal and judicial systems have been brought into effect.

The introduction of death penalty for drug-related offences has been a major deterrent. The Narcotic Drugs and Psychotropic Substances Act, 1985, were enacted with stringent provisions to curb this menace. The Act envisages a minimum term of 10 years imprisonment extendable to 20 years and fine of ₹1 lakh extendable up to ₹2 lakhs for the offenders. Comprehensive strategy involving specific programmes to bring about an overall reduction in use of drugs has been evolved by the various government agencies and NGOs and is further supplemented by measures like education, counseling, treatment and rehabilitation programmes. Substance abuse can be addressed at the individual level, at the local level and at the cross-national level.

At the individual level, there has to be a synthesis of biological understanding with the exploration of background sociocultural factors. At the national and

cross-national level, there has to be a concerted effort of all the countries in managing the issue of substance abuse, taking into account the local socio-cultural and political scenarios.

DRUG POLICY IN INDIA

INTRODUCTION

Contemporary international drug policy seeks to control both the demand and supply of drugs through the criminalisation of production, trafficking and use. Furthermore, adherence to the United Nations drug control conventions ensures that most nation states adopt a similar prohibition-oriented approach when formulating national drug control legislation. Recent research suggests that this can be problematic in some Asian countries where long-standing cultural sanctions already existed for drug use; particularly those involving psychoactive plant products such as cannabis and opium. With its focus on India, this briefing document examines the impact of the punitive approach towards drugs in those societies and communities that have traditionally exerted socio-cultural controls over the use of mind-altering substances.

The discussion highlights the unintentional but often harmful consequences of such drug control policies. In framing the discussion of this topic, it is important to note that the socio-cultural context of traditional drug use within many Asian countries means that experiencing an altered state of consciousness is only a part of the drug taking experience and not the ultimate goal of users. Indeed, norms controlling excessive and regular drug use have customarily governed socially and culturally accepted consumption of native mind-altering substances. While such traditional use management strategies vary across Asian countries, it is possible to identify similarities that exist between these approaches to drug use and contemporary interventions that collectively fall within the so-called harm reduction paradigm. The defining feature of harm reduction programmes is their focus on the prevention of harm rather than the prevention of drug use itself. It can be argued, therefore, that as signatories to the 1961 UN Single Convention on Narcotic Drugs, many Asian countries have been required to move away from long-standing approaches to control customary drug use. In many respects, there has been a subsequent shift from traditional drug use management to an emphasis on eradicating all drug use and trade.

The implementation of law-enforcement-dominated policies has generated a tense relationship between contemporary legislation and culturally ingrained drug use patterns and associated management strategies. This situation is compounded by changing patterns of drug use within India. This is the result of a number of interrelated factors; the rising popularity of new non-traditional forms of drug use introduced via tourism; urbanization; and leakage from illicit drug production in the region. Indeed, evidence suggests that changes in policy may have contributed to increases in the use of harder forms of drugs and more harmful modes of consumption, notably drug injecting. Such a change in user

behaviour is particularly significant given the role played by injecting drug use in the transmission of HIV/AIDS and other blood borne infections. The management of this issue has become a cause for concern within the field of drug demand reduction and has serious implications for the development realities of many Asian countries.

HISTORY

The use of the cannabis plant for a variety of purposes has long existed in India, a fact also noted for many other countries of Asia. Its use for medicinal reasons, as well as its mind altering capacity, is significant. Cannabis has been used along with other ingredients to treat rheumatism, migraine, malaria and cholera; to relieve fluxes; facilitate surgical operations; to relax nerves; restore appetite; for general well-being; and it is also considered beneficial for the functioning of the heart and liver. Additionally, the cannabis plant provides food grain, oil seed and fibre for manufacture of fibrous products in select parts of India.

The practice of using cannabis to alter consciousness and as part of religious and shamanistic rituals has also existed in India for centuries. For example, the drug has a strong religious association as a gift from Lord Shiva to his followers. Opium has also been used for socio-cultural reasons in different parts of the country with medicinal use being more prevalent than cultural use, like that seen among the Rajputs in Rajasthan and Gujarat. Prior to the introduction of contemporary drug control legislation, a system for procuring opium and cannabis through legal outlets existed.

However, drug control initiatives put in place procedures that made it difficult to obtain these substances. Legislation in 1985 and 2001 include provisions for medical use, but there has been a trend not only to reduce the quantity released by the government, but also to tighten up procedural regulations for obtaining the drugs by traditional medicinal practitioners. The resulting inability to source sufficient licit opium and cannabis for traditional use has forced such practitioners to make purchases from the expanding illegal market.

SOCIO-CULTURAL CONTROLS

Until the 1980s cannabis consumption does not appear to have been regarded as an issue of major social concern in India, with little or no official mention of excessive use. Prevalent socio-cultural regulations with regard to the form of use, mode of consumption, context of use and profile of users, ensured a system of use management that limited drug use within the country. For instance, norms restricted the use of cannabis and opium to the adult male population.

In the case of cannabis, this is a pattern documented in a number of countries including Cambodia, Vietnam, Thailand, Laos, China, Nepal and Pakistan. Even among the male adult population, there were restrictions on the context for consumption, with sanctioned use often linked or limited to specific religious and social occasions. In India and Nepal, the use of cannabis appears to be linked to religious festivals like Shivaratri, Krishna Ashtami and participation

in *bhajan* sessions. Indeed, occasions like *Holi*, ‘the festival of colours,’ are not complete without the sharing of *bhāng*—a drink made with cannabis.

At such select occasions, women and youngsters were permitted to use *bhāng* and other items made from cannabis, including snacks, sweets and curry. Opium is also offered at the harvest festival in a ceremony called *akhateej*, intended to strengthen family marital clan bonds and put aside old feuds. It is this specification regarding the profile of users and a desire for cultural confirmation that ensured the existence of mechanisms to control drug use. The provision made for women and children to consume cannabis products in select cultural contexts and in specified forms indicates a strong cultural acceptance for cannabis within India. Norms reaffirmed the cultural dimension of cannabis use and probably prevented excessive non-cultural use of cannabis. As noted earlier, the adherence to cultural norms on sanctioned use emerged from a strong association of cannabis with Lord Shiva. For example, *Sadhus* of various sects who primarily worship Lord Shiva make use of the drug for strengthening their concentration and spiritual search. Prior to smoking cannabis, the *sadhus* praise their Lord and take it in his name, a pattern of consumption seen also among lay followers. During Shivaratri, the distribution of cannabis drink and other products is perceived as a way to strengthen the association with the Lord. It is likely that such a relationship played a major role in restricting its use within India and Nepal, despite easy availability and local cultivation.

The drug’s connection to Shivaratri almost certainly limited its use beyond the ceremonial context. Unlike cannabis, opium does not appear to have any significant religious associations, but even here the link between cultural identity and the consumption of opium acted as a strong mechanism to restrict consumption of the drug in excess. Studies conducted into opium use in Rajasthan and Gujarat indicate strong links between cultural and caste membership, and use of the drug. An opium drink can be used to greet guests to social functions that include marriage celebrations, sealing a business deal or mourning the demise of a relative. In this case, culture permits opium consumption in the male adult population but, unlike with cannabis, there is no specific cultural sanction for women and youngsters to use the substance except for medicinal purposes. Such sanctioned cultural use, and its occasion or context, produces a situation within which a drug’s mind-altering properties are not the sole focus of the practice.

For example, in consumption during a celebration or get together, songs and social interaction form the binding force for consuming the substance. Consumption of *bhāng* during *Holi* calls for community participation from the decision to prepare the drink, through to making it, and finally its consumption in a group setting. The pattern of consumption for smoking cannabis and opium also restricts drug use, because as a group activity the users only inhale a few times from the pipe. Moreover, smoking the pipe is but a part of social interaction and not the sole activity of the group. Sharing the drug is also not the result of any economic consideration as is sometimes seen in the case of heroin.

4

Attitudes towards Drugs in Sport

The overwhelming majority of athletes I know would do anything, and take anything, short of killing themselves to improve athletic performance. There are many reasons why an athlete may take a drug, other than for legitimate therapeutic purposes.

Previous experiences, at school or college, may prompt further experimentation with drugs within a sporting context. This approach may easily be fuelled by an athlete reading about drugs and their effects in popular magazines or even in serious scientific journals. Unfortunately, too many people involved in sport, at all levels, are prepared to speculate through television, newspapers or other media on the problem of drug abuse in sport.

Too often these unsubstantiated reports lead to accusations and counter-accusations between those involved in the practice and administration of sport. Such activities do little to enhance the reputation of sport and inevitably lead to confusion in the minds of the majority of sportsmen and women who do not take 'performance-enhancing' drugs. This uncertainty presents the greatest danger to those younger athletes who either become disenchanted with their chosen sport or are misled into believing that drug taking has become a necessary part of the route to sporting success.

Other athletes may experience pressure from peer groups, particularly fellow athletes from their own or other sports. This pressure may result from a desire to conform with the 'in-crowd'.

Alternatively, it may be a fear of competing, on unequal terms, with athletes who are suspected of taking drugs. Peer pressure may also be exerted through fellow athletes encouraging an individual to participate in drug taking. Certainly

drugs have become readily available and black market prices ensure that drug peddlers can make a handsome profit at the expense of athletes. A different type of psychological pressure may be involved in another group of athletes. For these athletes, drug taking may be the last resort for the improvement of performance, having reached their apparent limit of capability by conventional methods of training.

The motivating factors for drug misuse do not necessarily lie in the hands of the athlete. It is an unfortunate fact that certain athletes are coerced into taking drugs by someone in authority. This person may be their coach, trainer or team doctor. The directive may even have originated from a country's governing body. Such pressures are obviously extremely difficult to resist, particularly where team selection is at stake. Evidence of the direct involvement of the government in the German Democratic Republic demonstrated not only the complicity of those in positions of trust but also the way the athletes themselves, in particular females, unknowingly took substances and have suffered the consequences.

Many studies have been carried out using questionnaires to ascertain attitudes towards drugs in sport. From these studies, the majority of athletes, coaches, medical practitioners and others involved in sport do not favour the use of performance-enhancing drugs. However, these results may reflect the respondent's ethical and moral attitudes to the problem, but in practice the pressures of competition may compel them to take a more pragmatic approach to drug taking. This denial of drug taking is a common feature among alcohol and drug abusers and further hinders any attempt at tackling the problem. Potentially more damaging is the type of athlete who openly admits to taking drugs and by so doing provides a model for the younger, more impressionable athletes to follow.

The blame for taking drugs does not, of course, always lie entirely with the athlete. There is often a body of so-called 'enablers' such as friends, family, and coaches who either actively encourage the athlete to participate in drug taking or vehemently shield the user from the need to deal with the problem. The reasons for this attitude are not always clear but in most cases involve self-interest.

Conversely, those closely associated with the athlete may be unaware of their drug-abusing habits. This may, to a large extent, be due to a lack of knowledge and understanding of the drugs used and of their pharmacological effects.

It is clear that the majority of those involved in sport, both administrators and participants, are against the misuse of drugs in sport. It is equally clear that there is too little understanding of both the motivating factors that lead an athlete to take drugs and also the effects that those drugs can induce. It is vital that a wider knowledge of drugs and their adverse effects is achieved so that the current problem of drug abuse in sport can be contained and that future generations can be educated and persuaded against such misuse.

ATTITUDES TO SPORT

The social psychologist Elliott Aronson has defined an attitude as ‘an enduring evaluation – positive or negative – of people, objects and ideas’. We can pick out two important features of attitudes from this definition. First, attitudes are longlasting. Once we have established a firm attitude to sport, we are likely to stick with it. Second, attitudes involve making judgements. Our attitudes to sport are likely to emerge as either distinctly positive or distinctly negative. Understanding attitudes is important to sport psychologists for a number of reasons. If parents and teachers, can understand how children acquire attitudes, they can use this understanding to try to ensure that as many young people as possible develop positive attitudes to sport. By understanding the link between attitudes and behaviour, we can try to help more people enjoy the medical and psychological benefits of both participation and spectatorship in sport. An understanding of the ways in which attitudes can be changed is valuable in helping us to increase sporting participation and motivate athletes.

THE NATURE OF ATTITUDES

Pennington *et al* distinguished between two approaches to understanding attitudes. The functional approach looks at *why* we have attitudes, and how adopting particular attitudes can be helpful to us. The structural approach looks at what different factors make up attitudes.

Functions of Attitudes

Smith *et al* suggested that having attitudes serves three main psychological purposes: the adaptive function, the knowledge function and the ego-defensive function. The adaptive function of attitudes involves the usefulness of certain attitudes in helping us achieve our goals. For example, one way in which we might ‘get in’ with a desirable crowd is to share their interest in sport in general or in a particular sport. This is not to say that people regularly and cynically change their attitudes in order to gain favour. It is more likely that, without being aware of it, we are influenced in our attitudes by our awareness of how much good or harm certain attitudes can do us. The knowledge function of attitudes refers to the fact that having attitudes makes the world a simpler and more predictable place. It also means we can save ourselves ‘mental energy’ that would otherwise have to be spent analysing every person and situation we come across. For example, we might have a universally positive view of sport, regardless of the nature of different sports and the contexts in which sport takes place. Such an attitude then frees us from the complex business of making moral judgements about details such as safety and politics.

The ego-defensive (or *self*-defensive) function of attitudes concerns the fact that we can adopt attitudes to help protect ourselves from difficult or painful feelings. For example, one way children might defend themselves against the feelings of humiliation they have experienced in PE lessons is to adopt a strongly negative attitude to all sport. People whose pride has suffered by a defeat in

sport might similarly adopt a defensive attitude: 'I'm not bothered – I'm sick of basketball anyway.' Teachers, coaches and parents must recognise how people use attitudes to make themselves feel better. We should not take people too seriously if they say they are giving up their sport after one bad game. If, on the other hand, a player adopts an enduring negative attitude after a bad experience, we may wish to intervene to alter this attitude. Of course, the defensive function of attitudes does not always lead to negative attitudes to sport and sport psychology. In a study amusingly entitled 'Death can be good for your health', Arndt *et al* examined the relationship between encountering reminders of one's own mortality and attitudes to exercise. Regardless of their current fitness or sporting participation, participants reminded of their mortality experienced a shift in attitudes in favour of regular exercise. Presumably, this was defensive, a pro-sport attitude being used to deny the reality of death.

Structure of Attitudes

The structural approach to attitudes looks at the different components that make up our attitudes. It is generally agreed that there are three aspects to our attitudes, the cognitive dimension, the affective dimension and the behavioural dimension.

- The cognitive dimension of attitudes concerns our *beliefs*.
- The affective dimension of attitudes concerns our *feelings* (the term 'affective' means emotional).
- The behavioural dimension of attitudes concerns our *actions*.

Our beliefs are often stereotyped. We might, for example, hold stereotypical views about those who favour particular sports. Stereotypes are beliefs that exaggerate the similarities of all members in a group and minimise the differences between members of the group. Thus, we might believe that all rugby players drink too much or that all football fans are violent. We also hold beliefs about the benefits of exercise and sport. Such beliefs are likely to have a strong effect on our sport and exercise behaviour. It seems likely that our feelings about sport result at least in part from our beliefs. For example, if we believe that rugby players are always drunk or that football fans are all violent, we are likely to feel repulsed or frightened by them. We are also likely to have strong feelings about exercise and sport in general and about particular sports. Research has shown that the amount and type of information about a sport that are given to students can affect their feelings about that sport. In general, the more we know about a sport, the more positive we feel about it. Theodorakis found that by increasing the level of technical information given to students on a skiing course, it was possible to make them feel more positive about skiing.

MEASURING ATTITUDES

We can measure attitudes directly by asking people questions or asking them to respond to statements that describe beliefs, feeling or behaviours associated with the topic we are interested in.

There are other, indirect ways of measuring attitudes (such as measuring physiological change or responses to ambiguous pictures), but sport psychologists tend to rely more on direct measures. Direct measurement of attitudes is done in three main ways: Likert scales, semantic differential scales and Thurstone scales.

Likert Scales

Likert developed the simplest and what has become the most common way of measuring attitudes. We start by producing an equal number of positive and negative statements concerning whatever we are measuring attitudes to. These statements can concern beliefs, feelings and behaviours. Then people are asked to respond to the statements, usually on a 5-point scale, ranging from (SA) 'strongly agree' to 'strongly disagree' (SD).

Liked scale items measuring attitudes to boxing

	SA	A	?	D	SD
1. Boxing causes brain damage.	[]	[]	[]	[]	[]
2. I watch boxing matches on TV.	[]	[]	[]	[]	[]
3. I find boxing exciting.	[]	[]	[]	[]	[]

Item 1 refers to a belief, item 2 to a behaviour and item 3 to an emotion. Thus, cognitive, affective and behavioural dimensions are all included. This is worth considering in designing one's own Likert scales.

Note also that item 1 is a negative statement whilst the other two are positive statements. This is important because some people have a tendency to agree with most items (the yea-sayer effect) or generally to disagree (the nay-sayer effect).

In order to score this type of test, we need to give all the positive statements values of 1–5 or 0–4, 5 being the most positive. For the negative statements, we must reverse this, giving them values of 5–1 (or 4–0).

Each person who fills in the test can then be given a score for each item and finally an overall score, which shows how positive or negative his or her attitude is overall.

Semantic Differential Scales

Osgood *et al* developed an alternative procedure for direct measurement of attitudes, the semantic differential scale. To prepare such a scale, we first think of a number of words with opposite meanings that are applicable to describing the subject of the test.

There are seven points between each pair of words. The respondents' task is to select a point between the two extremes that best describes how they feel. Kenyon developed a semantic differential scale called the Attitudes Towards Physical Activity to measure how positively people feel about sport and exercise. The ATPA uses eight pairs of words opposite in meaning, referring to various types of physical activity and various functions of physical activity.

 Semantic differential items from the ATPA

(a) Sport as a social experience

Good 1234567 Bad

Pleasant 1234567 Unpleasant

Wise 1234567 Foolish

For example, in the three items above, someone with a positive attitude to sport as a social experience would be expected to select numbers nearer 1 than 7 for each word pair. The ATPA has been commonly used as a measure of attitudes to sport in sport psychology research.

Thurstone Scales

Thurstone & Chave developed a complex system of attitude measurement. Thurstone scales resemble Likert scales in that they appear as a series of statements to which respondents choose a response based on how closely they agree with the statement. However, Thurstone believed that it was important that we should know just *how* positive or negative each statement in a scale is, not just whether it is positive or negative. This is achieved by having a panel of at least 50–100 judges rate each statement for positivity or negativity. The advantage of this is that when we add up someone's scores, we can weight very positive and very negative statements more heavily than only mildly positive statements.

Thus, to return to the example of boxing, if someone replied 'strongly agree' to the statement, *There should be an immediate world ban on boxing*, it would represent a more negative view than the same response to the statement, *Boxing can be dangerous*.

Although, in principle, Thurstone scales should be more valid than Likert scales because of the weighting of items, in practice, few researchers are willing to go to the extra effort needed to compile this type of scale. As Oppenheim pointed out, Likert scales generally produce much the same results as Thurstone scales with a fraction of the preparation time.

THE FORMATION OF ATTITUDES TO SPORT

How do we form the attitudes we hold to sport? Think about your own sporting attitudes for a moment. You may remember early positive or negative experiences that shaped your attitudes. You might be able to point to family members or teachers that were a strong influence on you. Did you take up a sport to impress someone attractive or get into the in-crowd, and then find you liked the sport? You may feel that you are just the type of person that is naturally attracted to sport, or you may not. Actually, research has linked all these factors to the development of attitudes.

Personality, Genes and Attitudes

Eysenck proposed that people high in extroversion and psychoticism tend to have pro-sport attitudes. To trait theorists such as Eysenck, personality is

primarily determined by genetic factors. It is certainly conceivable that genes may influence sporting attitudes. This is not to say that there is a gene for liking sport, but, if some aspects of personality are inherited, it may be that we can inherit a *predisposition* to developing certain kinds of attitude. There is indeed some evidence that our genetic make-up may predispose us to generally positive or negative attitudes to sport.

Waller *et al* found that separated identical twins (who are genetically identical) have more similar views on a variety of topics than separated fraternal twins (who share 50 per cent of their genes). This study implies that genes play some role in affecting our attitudes.

However, we should remember that there are serious difficulties in conducting studies with separated twins – we never know for sure whether similarities between separated twins are due to similarities in genetics or environment. Actually, it is probable that our childhood environment is more important than our genes in influencing the development of our attitudes.

Social Learning of Attitudes

Children tend to observe and imitate the behaviour of their role models. Thus, children are likely to adopt the attitudes to sport they see in their parents. Children also receive powerful reinforcers in response to the attitudes they express from a very early age. Social learning can help explain attitudes to both participation and spectating. We can easily imagine a scenario where a boy observes his father intently watching a football match and cheering when one team scores.

The boy would be likely to copy the father's behaviour. It is also extremely likely that the father would respond to this by praising the boy and explaining the finer points of the match – thus reinforcing the behaviour. Bandura's four-stage model of this process is shown in Figure. You may be thinking that this is a shamefully politically incorrect example – what about girls' attitudes to sport? Actually, this was a deliberate ruse to make you think about how boys and girls might be exposed to different learning experiences. Imagine that in the above scenario, instead of the son, the young daughter of a football fan cheered at the football.

It is unlikely that she would receive the same positive reinforcers as her male counterpart. She might well be ignored – or, worse, punished. In our culture, there are fewer opportunities for girls than boys to learn the pleasure of sport spectatorship.

The problem of gender differences in attitudes to sport spectatorship was highlighted during the 1998 World Cup, when the disparity between some men's and women's attitudes to watching football became so polarised that the term 'World Cup widows' was coined, and Relate Marriage Guidance had to issue advice on how to maintain a relationship between two partners with different attitudes to watching football!

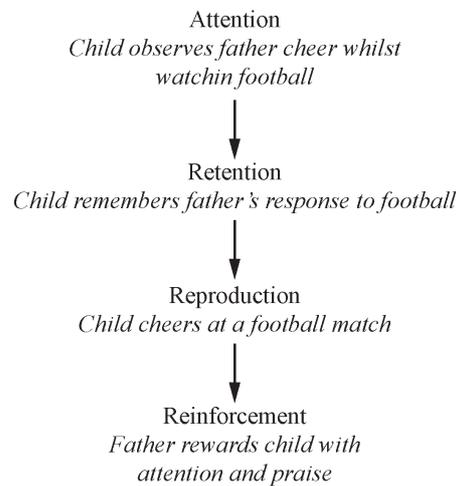


Fig. Social learning of a child's attitude to football.

Parental Involvement

The extent to which parents actively get involved in children's sporting activities can affect their attitudes to sport. At one extreme, parents who do not acknowledge children's achievements are clearly not giving them appropriate reinforcement. At the other extreme, it may be possible for parents to become overinvolved. This was supported by a study by Stein *et al*, who surveyed 42 13–14-year-olds who played soccer, volleyball or American football. Most respondents said that their parents were moderately involved and that this was appropriate. Both very low and very high levels of involvement were associated with reduced satisfaction with sport and increased stress levels.

Desire For Health and Physique Enhancement

Currently, there is increasing social pressure on people of all ages and both sexes to maintain a particular body type that is characterised by low fat mass and high muscle mass. This is a paradoxical situation for psychologists. On the one hand, there is genuine concern about the rapidly rising rates of child and adult obesity and the accompanying health problems. Thus, we may argue that society is right to pressure people to use sport and exercise to manage their weight and fitness. On the other hand, the evidence of rising rates of eating problems suggests that too much emphasis on the importance of sport in weight management can have serious, negative psychological consequences. This was underlined by a study in which 371 children aged 10–15 were assessed for their exercise and sporting activity, attitudes to their weight and other weight-control strategies. Nearly half believed they were too fat. A significant minority used extreme weight-control strategies, such as fasting, vomiting and taking slimming pills, as well as exercise.

ATTITUDES TO COMPETITION

Social learning theory is useful in understanding how we acquire our attitudes to competition. There has been much discussion in the last few years of British attitudes to competition. On the one hand, it has been pointed out that the British may be less motivated to win than other cultures because of the philosophy, 'it's not the winning that counts, but the taking part'. On the other hand, concern has also been expressed that too much emphasis on competition prevents many children from learning to enjoy sport. One of the most comprehensive surveys of attitudes to sport, the Miller Lite Report, found that 86 per cent of American parents surveyed thought that PE teachers place too much emphasis on competition.

Gervis pointed out that problems can arise when early training overemphasises the importance of winning. This can be at least partially understood in terms of social learning theory. If reinforcement is provided only for winners, then, by definition, it is provided for half the participants in team games, and much fewer in individual sports. With most participants failing to receive positive reinforcement, it is unlikely that they will maintain their interest in sport.

There appear to be differences between athletes and non-athletes in attitudes to competition. Finkenbergh & Moode surveyed 164 university students on their attitudes to sport, half of these being participants in sport at university level. Athletes placed more emphasis on the importance of competition in sport than did the control group, along with opportunities for social status and career enhancement. Non-participants in sport were positive about sport but saw its purpose more in terms of enhanced self-esteem and character development.

ATTITUDES TO SPORT AND SPORTING BEHAVIOUR

As Gill says, we are interested in attitudes in sport psychology, not so much for their own sake, as for their influence on sporting behaviour. Therefore, a very important issue concerns the extent to which attitudes can be used to predict behaviour. Early psychological research seemed to show that there was little relationship between attitudes and behaviour, but our current thinking is that attitudes *can* effectively predict behaviour, but only if we also have access to certain other information.

The Theory of Reasoned Action

Ajzen & Fishbein have produced a model of the link between attitudes and behaviour that has proved popular in sport psychology. This is called the theory of reasoned action (TRA). A simple version of the TRA is shown in Figure, as used to explain participation in the TRA, two factors determine individuals' *intention* to take part in sport: their general attitude to sport and how socially desirable they consider sport to be. Therefore, before we even intend to participate in sport, we need to have positive feelings and beliefs about sport *and* we need to see sport as a socially desirable activity. Of course, the intention

to participate does not necessarily lead to the behaviour. Other circumstances may still interfere. For example, we might be particularly busy or plagued by a recurring injury.

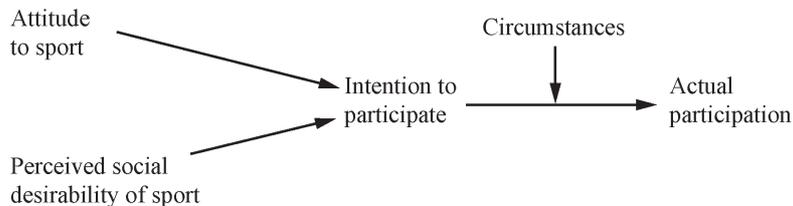


Fig. Applying the theory of reasoned action to explaining participation in sport.

The Theory of Planned Behaviour

Ajzen introduced a modification to the theory of reasoned action, creating an offshoot known as the *theory of planned behaviour* (TPB). The idea was that, although the TRA is effective in predicting how people would behave in situations where they have full control over their actions and can behave entirely voluntarily, it is less useful in situations where behaviour is highly constrained by circumstances. The theory of planned behaviour gets around this by introducing a further variable, *perceived behavioural control*, which influences intentions. As in the TRA, there is a strong link between intention and action; however, we formulate the intention to act in a certain way only when we perceive that we have control over our behaviour.

Discussion

Sport psychologists widely support the TRA and TPB as explanations of the relationship between attitudes to sport and sporting behaviour. Gill had students survey 68 people on their attitudes to jogging. They then asked the participants how many times per week they jogged (as a measure of behaviour). A moderate relationship ($r = 0.44$) was found between attitude to jogging and frequency of jogging. However, as the TRA would predict, a much stronger correlation ($r = 0.81$) emerged between *intention to jog* and frequency of jogging. A study by Wankel *et al* suggested that the TPB predicts participation more accurately than the TRA. Data from over 3000 Canadians taken from a national survey of well-being were analysed, looking at measures of exercise, perceived behavioural control and social norms. Attitudes to sport and perceived behavioural control were more predictive of taking part in sport than social desirability, supporting the TPB as opposed to the TRA. In another study by the same research group, Mummery & Wankel found that both perceived behavioural control and social desirability affected attitudes to participation in adolescent swimmers. Both a recent meta-analysis and a qualitative review of studies on the TRA and TPB have confirmed that research has supported the idea that the TPB is a superior explanation. There are important lessons to be learned from the body of research on the link between attitudes and behaviour in sport. To understand what factors

affect the decision to take part in sport, we need to know subjects' perception of its social desirability and their beliefs about their own opportunity to participate. Both of these perceptions may be inaccurate, and one way to persuade more people to take part in sport may be to tackle these inaccurate beliefs.

The Transtheoretical Model (TTM)

The TTM was originally produced by Prochaska & DiClemente in order to understand better why some smokers succeeded in giving up without professional help. Marcus & Simkin applied it to understanding the process whereby people take up and maintain sport/exercise behaviour. The term 'transtheoretical' refers to the fact that the model comprises elements from several psychological theories. According to the TTM, people go through five stages before they regularly participate in sport. Each stage is defined by a different relationship between intentionality and behaviour. This makes the model dynamic and gives it an advantage over the TRA and TPB, which assume a static relationship between intentions and action. Of course, people do not simply pass through the five stages and end up with maintenance.

They may relapse a number of times at different points for a number of reasons, ranging from injury to the seasonal nature of their chosen sport. A simple example is the person who takes up jogging in the summer but relapses to preparation or even contemplation when the nights draw in and jogging becomes a considerably colder and wetter experience! The model explains why some people undergo such relapses in terms of *self-efficacy*. Briefly, self-efficacy is our perception of our own competence in an activity. The more competent we perceive ourselves to be, the more likely we are to maintain the physical activity. This has an important practical application; we can encourage people who have recently taken up a sport to maintain it in the face of new barriers, such as injury, weather or a change in working or family patterns that makes training less convenient, by building their confidence in their ability. During the progress through the five stages, an individual may use a variety of strategies to encourage the continued shift from inactivity to activity.

These include making use of social support, as in cultivating friendships with athletes who tend to socialise in sporting contexts. Another approach is *stimulus control*. This involves removing oneself from situations that encourage inactivity and instead planning events such as skiing or cycling holidays that will inevitably mean taking part in sport and that will provide incentives to training. Individuals may also deliberately expose themselves to information on the health benefits of sporting participation (this is called *consciousness raising*) or the risks of inactivity (this is called *dramatic relief*). On any occasion, influenced by their self-efficacy beliefs and activity strategies, individuals are faced with a choice of whether to proceed with sporting activity. This involves a cost-benefit analysis in which they weigh the advantages of training this evening against the cons. The influence of the pro arguments should increase as the individual progresses through the five stages.

ETHICAL ISSUES ASSOCIATED WITH DRUG USE IN SPORT

the use of doping agents in sport is both unhealthy and contrary to the ethics of sport, ...it is necessary to protect the physical and spiritual health of athletes, the values of fair play and of competition, the integrity and unity of sport, and the rights of those who take part in it at whatever level.

Drug use in sport is contrary to the very principles upon which sport is based. Sport is considered as character building, teaching 'the virtues of dedication, perseverance, endurance and self-discipline'. If, as Justice Dubin observes: 'sport helps us to learn from defeat as much as from victory, and team sports foster a spirit of co-operation and interdependence ...import(ing) something of moral and social values and...integrating us as individuals, to bring about a healthy, integrated society' drug abuse would have no place in sport. Justice Dubin goes on to ask 'how has it come about, then, that many athletes have resorted to cheating. Why are the rules that govern sport often regarded as obstacles to be overcome or circumvented rather than as regulations designed to create equality of competitive opportunity and to define the parameters of the sport?'

Using drugs in sport for the purpose of gaining an unfair advantage presents an ethical dilemma for athletes, coaches, doctors and officials. It is clearly cheating, moreover it may put the health of the athlete at risk. Furthermore it may also be calculated cheating, when quantities and substances are carefully monitored in an attempt to cheat the rules on drug testing.

It has been argued that the ethical dilemma has emerged for many reasons:

- Media pressure to win;
- The prevalent attitude that doping is necessary to be successful;
- Public expectations about national competitiveness;
- Huge financial rewards of winning;
- The desire to be the best in the world;
- Performance-linked payments to athletes from Governments and sponsors;
- Coaching which emphasizes winning as the only goal;
- Unethical practices condoned by national and international sports federations;
- Competitive character of the athlete;
- Infallibility of the 'medical' profession to cure and improve performance;
- Psychological belief in aids to performance-the magic pill;
- The development of spectator sport; and
- A crowded competition calendar.

The majority of these reasons were cited in the Dubin Inquiry itself, as explanations were sought for the context in which five Canadian athletes (four weightlifters and one track and field athlete) came to be disqualified for anabolic steroid use at the Seoul Olympics. René Maheu has noted that development of spectator sport has turned attention away from the moral value of sport for the

individual towards its entertainment potential. 'The success of spectator sport and the importance it has come to assume in everyday life are unfortunately too often exploited for purposes alien to or even opposed to sport-commercialism, chauvinism and politics-which corrupt and deform it.'

Dubin, however, whilst acknowledging the existence of all the influences and their undoubted effects which might lead to drug misuse in sport, argued first that there can be no justification for athletes to cheat in order to win, and second that the pressures and temptations are the same for all athletes yet most show greater character and do not succumb. He concluded the problem is not educational, economic or social but, essentially, a moral problem.

The sporting contest is seen to have been replaced by a competition between doctors and biochemists on the one side and the regulating authorities on the other. The athlete becomes the puppet of this technology, health risks are simply ignored and other competitors cannot participate in the competition unless they, too, are prepared to use substances to improve performance. In an era where genetic and chemical manipulation has become commonplace it is hardly surprising that some athletes no longer rely on their natural abilities and skills.

In 1892 at a conference at the Sorbonne, Baron de Coubertin, founder of the modern Olympics said: 'Before all things it is necessary that we should preserve in sport these characteristics of nobility and chivalry which have distinguished it in the past, so that it may continue to play the same part in the education of the peoples of today as it played so admirably in the days of ancient Greece.'

This may have been so at the turn of the twentieth century and the emergence of the modern day Olympic Games, yet in present day sport, the pressures on all concerned are immense. An athlete is faced with the pressures of winning, of competing, of meeting the expectations of the coach, team-mates, family and friends. Coaches are under pressure to produce the winning combination, of coping with fitness levels and of making demands on individual competitors, which may give the wrong signals in respect of drug misuse. Doctors may be faced with the dilemma of prescribing drugs for athletes and monitoring their effects as a safe way of containing drug misuse rather than know an athlete will seek black market sources and advice. The doping regulations may also apply to others who assist or incite an athlete to commit a doping offence.

Occasionally, criticisms of the drug-testing procedure itself are made: in particular the suggestion of invasion of privacy and impropriety in observing a person urinating. Athletes are looking forward to the advent of blood testing as a sophisticated progression towards comprehensive doping control. However, it is likely to be some time before scientists are willing to move from urine analysis because of the range of substances which can be detected. Blood testing offers a limited opportunity for detection of prohibited substances at present.

There is also another perspective, that of 'what constitutes drug misuse?'. Some banned substances actually originate in the body and it is an excessive level which has been deemed to be a doping offence. Critics would argue this level has been arbitrarily set. Other substances, such as ephedrine and caffeine,

commonly occur in over-the-counter medications, herbal preparations and even in social drinks. Do they actually improve performance? There is no doubt that athletes are prepared to make use of these substances to assist their performance. In terms of drugs with a therapeutic purpose there is also considerable abuse of medications by athletes who have no therapeutic indication. Given this array of drug misuse by sportsmen and women, it is hardly surprising that anti-doping rules have been introduced.

The definition of doping has to begin somewhere. The time may have come for the critics and the sports regulators to work together to achieve a practical set of rules, a realistic competitive calendar, an efficient support system and greater controls on the commercialization of sport. Elite athletes have become the focus of a considerable amount of media attention, with stories about their injuries and illnesses filling column inches.

Moreover, speculation and reporting about the lifestyle of professional athletes has given rise to an image totally out of step with the dedication, training and motivation required to survive the sporting calendar. In many sports, increasing commercialism has seen a price put on an athlete's head; some cope better with this than others.

THE MECHANISM OF ACTION OF ANTI-INFLAMMATORY DRUGS

Despite the relative paucity of convincing trials that demonstrate the effectiveness of these anti-inflammatory drugs, their use in the treatment of sports injuries is very widespread. The commencement of a course of NSAIDs immediately after the injury occurs appears to be an effective way to reduce the recovery time. The most commonly used drugs in this class are aspirin, diclofenac, ibuprofen, indomethacin, naproxen and piroxicam.

The use of these drugs, though widespread, remains largely empirical, as there is no universally accepted explanation of how they reduce inflammation. Indeed our understanding of the processes involved in soft tissue injury is far from complete. Several suggestions have been made, however, to explain the antiinflammatory activity of the aspirin-like drugs. Considerable attention has been focused on the possible interaction of these drugs with various factors involved in this inflammatory process.

For example, many early attempts to explain the anti-inflammatory activity of these drugs considered their ability to interfere with proteolytic enzymes. These enzymes are involved both in the early stages of inflammation and in the later stages when the process is well established. An inhibition of proteolytic enzyme activity either at the start of the reaction, preventing the activation of the complement, kinin, fibrin or plasmin systems, or during the later, autocatabolic stage of inflammation could be the mechanism of action. Certainly many antiinflammatory drugs have been shown to have some measure of anti-protease activity, but the general correlation between enzyme inhibition and antiinflammatory activity is not impressive.

Aspirin derivatives are known to inhibit a large number of enzyme systems, but inhibition is generally seen only at drug concentrations that exceed the normal therapeutic level. Another explanation that has been proposed which is closely related to this idea is that the anti-inflammatory drugs reduce inflammation by preventing the release of enzymes from lysosomes during the more established phase of the reaction. Again, whilst there is some experimental evidence available to support this idea, overall, it is not a convincing explanation.

With an improved understanding of the mediation of inflammation came the idea that the action of anti-inflammatory drugs might be due to an interference with the activities of one or more of the proposed chemical mediators of inflammation. It was not, however, until 1971 that any major headway was made in this area of our understanding. In a series of three papers published in *Nature*.

John Vane and his colleagues outlined the hypothesis that the action of the aspirin-like drugs could be attributed to their ability to suppress the synthesis of prostaglandins. Virtually all NSAIDs have been shown to inhibit the synthesis of prostaglandins and they generally exhibit this property at concentrations that are low enough to be achieved with normal therapeutic doses of the drugs.

The predictable consequences of the inhibition of prostaglandin synthesis on an inflammatory process (based on the known pro-inflammatory activities of the prostaglandins) easily lead us to the conclusion that this property of NSAIDs provides an explanation for their mechanisms of action.

A reduction in the level of prostaglandins at an inflammatory site should result in a reduction in the symptoms of heat and redness since prostaglandins would normally promote an increased blood flow to the area by virtue of their ability to cause profound erythema. A reduction in the pain associated with the reaction could also be anticipated, since, in the absence of prostaglandins, there would be no state of hyperalgesia. In other words the tissue would not exhibit a greater sensitivity to painful stimuli than normal. Oedema would also be reduced in severity as the permeability-increasing effect of chemical agents on blood vessel walls would not be subject to the normal exaggerating action of the prostaglandins.

Thus we can see that the reduction in synthesis of the prostaglandins that can be demonstrated when using NSAIDs could account for the reduction of all the cardinal signs of inflammation. As additional support for this idea of a single, common mechanism of action for NSAIDs, other properties exhibited by this group of drugs can also be explained by an inhibition of prostaglandin synthesis. For example, as well as being analgesic, anti-inflammatory drugs, these compounds are invariably anti-pyretic agents as well, that is they have the ability to reduce elevated body temperature.

During fever prostaglandins are detectable in increased quantities in the cerebrospinal fluid which fills the cavities of the brain, and it has been shown in animals that the injection of prostaglandins into the anterior hypothalamus evokes a pyrexia response. The inhibition of prostaglandin synthesis, therefore,

offers an explanation for this property of these drugs, in addition to their anti-inflammatory action. Another property, which is common to most of these agents, is that they inhibit platelet aggregation. To repair damaged blood vessels, platelets come together to form a plug to fill the gap and prevent bleeding. This activity is in part mediated via the synthesis of thromboxanes by the platelets. Drugs such as aspirin, which inhibits the cyclo-oxygenase enzyme, will prevent the synthesis, not only of prostaglandins but of thromboxanes as well, preventing normal platelet function. In some circumstances, notably when there is already some impairment to normal platelet function, this activity of these drugs may represent a hazard. There is, however, much interest in the use of this anti-platelet activity to prevent the development of thrombosis. Small blood clot fragments may lodge in the vascular beds of the brain or heart and a very small regular dose of aspirin may protect a subject from a stroke or a heart attack.

Another common feature of NSAIDs is their tendency to cause gastric irritation and this, too, can be explained by a mechanism of prostaglandin synthesis inhibition. Prostaglandins normally limit the amount of hydrochloric acid secreted by the parietal cells in the main gastric glands, probably by an action on the enzyme adenylate cyclase. In addition, prostaglandins may promote the functional vasodilatation necessary for the parietal cells in their secretory mode. If the levels of prostaglandins in the stomach are reduced then a greater amount of acid will be secreted and this acid will be produced by cells that have been forced into this synthetic activity without the usual increased provision of oxygen. This situation may thus result in a gastritis in which some mucosal tissue may be damaged by the ischaemia that can result from the increased metabolic activity occurring without increased blood flow.

We do, therefore, have a proposed mechanism of action for NSAIDs that can be invoked to explain not only their anti-inflammatory activity, but also their anti-pyretic and anti-platelet activities. The proposition even serves to explain their most common side-effect. This brief account of mechanism would be less than complete, however, if it did not at least indicate one or two of the many observations that have been reported which do not easily fit within this explanation.

First, sodium salicylate is some 100 times less effective than acetylsalicylate (aspirin) as an inhibitor of prostaglandin synthesis whereas they are of similar anti-inflammatory activity. Secondly, in experiments in which inflammation has been induced in essential fatty acid-deficient animals (*i.e.*, animals rendered incapable of generating prostaglandins) aspirin has been shown to be as effective at reducing inflammation as it is in normal animals. As a final example of the type of observation that is not compatible with this theory it has been shown that even small sub-anti-inflammatory doses of aspirin render the inflamed synovial tissue of arthritic joints incapable of producing prostaglandins for several days. Clearly, however compelling the idea that inhibition of prostaglandin synthesis is the explanation for the mechanism of action of aspirin, an explanation is required as to why regular high doses of the drug are needed

to achieve an anti-inflammatory action when two or three tablets, two or three times a week would seem to be all that is necessary to induce effective inhibition of prostaglandin synthesis.

The relationship between prostaglandin synthesis and the NSAIDs is, thus, confused. On the one hand we have a convincing and attractive hypothesis which explains the many and varied activities and even side-effects of this group of drugs by one, simple and elegant mechanism. On the other hand we have evidence that not all anti-inflammatory drugs are good inhibitors of prostaglandin synthesis, that aspirin can exert an anti-inflammatory effect in the absence of any prostaglandin synthesis and that it is too good at inhibiting prostaglandin synthesis in rheumatic patients to explain why such large amounts of the drug are needed in clinical practice.

NSAIDS IN SPORTS INJURY

Whatever the mechanism by which these drugs exert their effect, their use in the treatment of chronic inflammatory disease is well established and their efficacy beyond question. Similarly in the treatment of acute traumatic injury their use has become commonplace and although far too many clinical trials have failed to furnish proof of their efficacy, clear evidence that these drugs are of benefit in sports injury has been produced. These drugs represent a simple and relatively safe means of reducing the inflammatory response to an injury. They may also help to return an injured sports participant to competitive fitness more rapidly. Many clinical trials compare the use of two different anti-inflammatory drugs but the most common finding is that there is no significant difference between the two. Where differences are reported they are not consistent. It would therefore be difficult to indicate a rank order of efficacy for these drugs.

Sprains strains (partial tearing of muscles) and bruises are all painful examples of sports injuries. Commonly they may warrant the use of painkilling (analgesic) drugs such as paracetamol or even in severe cases a narcotic analgesic compound such as dihydrocodeine. Since, however, these conditions are generally associated with an inflammatory component the use of an analgesic drug with antiinflammatory activity would seem to be a more logical choice. About twenty different NSAIDs are available which could be used to treat sports injuries and some details are given here of a small selection of them.

Aspirin

Aspirin is a very effective analgesic drug at a dose of 2-3 g per day. At higher doses, that is in excess of 4 g per day, aspirin will reduce the swelling of an inflamed joint, a property not shown at the lower, analgesic level. Whilst anti-inflammatory activity is seen only at higher doses it is inadvisable to exceed the normal recommended doses without qualified medical supervision.

Despite the antiquity of this preparation, unequivocal evidence that any of the newer challengers offers an all-round superior performance is lacking. The

general availability, and low cost of aspirin make it an ideal candidate for self-treatment following sports injury. Aspirin use is, however, not devoid of side-effects, although the risks involved with the use of the drug are probably generally overstated. Given that the injured athlete is an otherwise normal, healthy adult, the major problem liable to be encountered following the use of aspirin (or indeed, for that matter, any of the NSAIDs) is gastric irritation which may be experienced as a form of dyspepsia.

Attempts to reduce this problem by modifying the tablets in a variety of ways have not been particularly successful. It is now generally recognized that the effect of these drugs on the stomach is due not so much to the unabsorbed drug in contact with the gastric mucosa as to the effect of the drug after its absorption. The most effective way to minimize this problem is to avoid the use of these drugs when the stomach is empty. If the drugs are taken following a meal then any increased acid production that ensues can be utilized in the digestive process rather than being free to attack the lining of the stomach itself.

In 1984 Anderson and Gotzsche compared the use of aspirin and another NSAID, naproxen, in patients with sports injuries. Perhaps not surprisingly, they found no significant differences between the two drugs. Whilst this type of trial is common and the finding typical, the authors did highlight a phenomenon very relevant to the treatment of this type of traumatic injury. They demonstrated that significantly better results were obtained when the interval between injury and the start of treatment was shorter. This effect is widely appreciated now and is exactly what would be predicted from experimental inflammation studies in animals. In laboratory tests of the type used to screen for anti-inflammatory activity of new drugs for the treatment of arthritis it can be shown clearly that NSAIDs are much more effective against developing inflammation than they are against established inflammation.

The implications of this are clear. If it is deemed necessary to use an anti-inflammatory drug to treat a sports injury, it should be given as early as possible after the damage is sustained and certainly before the inflammation becomes established. The principal reason for this probably lies in the realm of the intravascular/extravascular fluid equilibrium. The role of permeability changes has already been highlighted. Protein moves through the blood vessel wall during the development of the inflammatory reaction and draws water with it resulting in the oedematous swelling. Once this oedema is formed, its resolution is dependent on the removal of the extravascular protein. NSAIDs do not appear to have any effect on the extravascular protein. It is an inevitable conclusion, therefore, that preventing oedema development is easier than resolving established oedema as there is no mechanism for the rapid removal of this protein for the resolution of an established reaction.

Naproxen

Naproxen is one of the mainstays of treatment for chronic inflammatory conditions. Its efficacy and safety record are excellent and it is one of the most

frequently prescribed drugs for the treatment of arthritis. Since its introduction in the early 1970s naproxen has been the subject of a large number of trials in the treatment of soft tissue injuries. Whilst many of these compare naproxen with another NSAID and find no difference in activity, several trials have shown naproxen to be better than the other drug in some respects and naproxen has been shown to be superior to placebo.

In view of the popularity of this drug and the generally good reports of its efficacy in the literature, naproxen must rank high amongst the most suitable drugs for the treatment of sporting injuries. The drug is given at a dose of 0.75-1.25 g per day in 3 or 4 divided doses. Initially a high loading dose of 500 mg may be given to aid the rapid attainment of suitable plasma levels of the drug (750 µg/ml).

The drug may be taken at meal times to help combat any gastric discomfort felt, although in the presence of food the drug is absorbed more slowly. More rapid absorption occurs with the use of naproxen sodium. A 500 mg naproxen suppository preparation is available, principally for use at night.

Ibuprofen

Ibuprofen is another NSAID with a similar structure to naproxen. It is the oldest propionic acid derivative anti-inflammatory agent in use and considerable experience has, therefore, been obtained with it. This drug is also one of the few drugs of this class available in the UK without prescription. It has a reputation for being well tolerated.

In other words, it is widely felt that this particular anti-inflammatory agent does not induce the same degree of dyspepsia as many of its rivals. In the UK, the Committee on Safety of Medicines (CSM) advises that ibuprofen is associated with the lowest risk of serious upper gastrointestinal side-effects of seven oral NSAIDs reviewed. The other NSAIDs considered by the CSM were piroxicam, ketoprofen, indomethacin, naproxen and diclofenac which were considered to be associated with intermediate risk and azapropazone which was considered to be associated with the highest risk.

Ibuprofen has always been perceived to be a well-tolerated drug. It is possible, however, that much of its reputation is based on early experiences with the drug when it was used at relatively low dose levels. To improve the often disappointing activity of ibuprofen the doses used have been increased and whilst the drug is still generally well tolerated it is certainly not without gastric irritant activity at these higher levels. Trials using ibuprofen at doses as low as 1200 mg per day have been shown to reduce pain and recovery time of soft-tissue sports injuries. Trials have, however, tended to use higher doses than this. Hutson found no significant differences between the activity of ibuprofen given at doses of 1.8 or 2.4 g daily amongst 46 patients with sporting injuries to the knee. The normal recommended dose range for ibuprofen for musculoskeletal disorders is 1.2-1.8 g daily in 3 or 4 divided doses, preferably after food. This may be increased if necessary to the maximum recommended daily dose of 2.4 g.

Indomethacin

Indomethacin has been used for treating inflammatory conditions since the mid-1960s and remains a very frequently prescribed drug. Whilst being an effective anti-inflammatory drug it does suffer, apart from the gastric irritant activity somewhat typical of this type of drug, from a number of central nervous system side-effects such as headaches, dizziness and light-headedness. Generally, indomethacin is found to be of similar efficacy to other NSAIDs, such as naproxen, in the treatment of soft-tissue sports injuries.

As might be expected, the drop-out rate due to side-effects of this drug is generally higher than for other members of this group of drugs with normal therapeutic doses of indomethacin (50-200 mg daily). The drug is normally initiated as 25 mg 2 or 3 times daily and gradually increased if necessary. Edwards et al. found it necessary to withdraw only one patient from a group of 53 who were receiving 75 mg of indomethacin daily for acute soft-tissue sports injuries. It is possible that at this low starting dose toxicity is less of a problem.

Indomethacin is also available in 100 mg suppositories for night-time use and these may be of benefit in some individuals. It should be remembered that the combined rectal and oral doses should not amount to more than 200 mg in a 24-hour period.

Piroxicam

Piroxicam appears to be comparable with indomethacin or naproxen in treating acute musculoskeletal injuries and it is generally well tolerated. One particular advantage of piroxicam is that it has a long half-life, which permits its use as a single daily dose, usually of 20 mg. An initial, loading dose of 40 mg on each of the first 2 days of treatment, reducing to 20 mg for subsequent days may be used for acute musculoskeletal disorders.

In a large study of acute sports injuries in Norway the authors concluded that piroxicam at 40 mg daily for the first 2 days and 20 mg daily for a further 5 days resulted in significant improvements in mobility and reductions in pain when compared with placebo (Lereim and Gabor, 1988). This treatment gave a marginally superior response when compared with naproxen at 500 mg twice daily, and both drugs were well tolerated.

Piroxicam may also be given as a deep intramuscular injection for the initial dose. Effective concentrations of drugs are usually achieved earlier in this way than when they are administered orally.

Diclofenac

Diclofenac is another useful drug of this class. Available in both 75 and 100 mg tablets, daily doses of 75-150 mg are recommended. In a trial involving subjects with severely sprained ankles, diclofenac at 150 mg daily was shown to be superior to both placebo and piroxicam at 20 mg daily. Both drugs were well tolerated. One possible advantage of this drug is that it is available in a

slow-release form that is administered once daily, although this may be less of an advantage in the acute situation. In general, therapeutic levels are not achieved as rapidly with drugs that have a long half-life. Drugs with a short duration of action will normally give therapeutic levels in a very short period of time.

Phenylbutazone

Phenylbutazone was introduced into clinical medicine in 1949 to take its place alongside the salicylates for the treatment of arthritic conditions. It is a powerful anti-inflammatory drug and is capable of treating acute exacerbations of rheumatoid arthritis and severe ankylosing spondylitis (an inflammatory condition of the spine). Compared with the many, newer antiinflammatory agents now available it is subject to a large number of toxic side-effects, some of which have led to fatal outcomes. Whilst many physicians believe this to be an extraordinarily useful anti-inflammatory agent, others have argued that it is too dangerous to use.

The most serious side-effects are undoubtedly the retention of fluid which in predisposed individuals may precipitate cardiac failure, and the interference with normal blood cell production, most commonly resulting in aplastic anaemia and agranulocytosis which can occur within the first few days of treatment. Its use, therefore, in self-limiting musculoskeletal disorders is difficult to justify. In the UK phenylbutazone is now only indicated for the treatment of ankylosing spondylitis in hospital situations. In the past it has been somewhat abused, particularly in the United States. A report by Marshall indicates that in the National Football League, for example, an average of 24-40 unit doses of phenylbutazone was used per player per season. Whatever the role of phenylbutazone in injuries in sportsmen and women, there is no doubt that this drug has been used considerably in the field of equestrian sports. In show jumping the horses' feet are subjected to constant concussion. By the age of 10 many show-jumping horses will have suffered pathological changes in their feet but in many cases will be at their peak. Similarly 3-day event horses are subject to considerable physical stress, with strain of a tendon or the suspensory ligament being common injuries. Even without jumping-related competition, the regular galloping activity, as in for example, flat racing or polo, may result in substantial changes in bones, joints and ligaments of a horse. When pushed too hard or for too long lameness may develop due to the pain and inflammation caused. The time-honoured remedy for reducing the pain and inflammation of these injuries in horses is to administer an anti-inflammatory drug, the most frequently used example being phenylbutazone.

Horses generally tolerate phenylbutazone very well and may be treated with the drug to improve their comfort. Whilst there are many indications for the use of phenylbutazone in horses, dilemmas do arise as to whether their use may mask an injury and lead to a complete breakdown of an affected limb. The governing bodies of equestrian sports generally recognize the usefulness of this drug but exclude the use of the drug on, or immediately

before, competition days in order that no unfair advantage may be gained by improving performance and also to protect unfit horses from being used competitively.

Rofecoxib and Celecoxib

These new NSAIDs are notable for their selective inhibition of the inducible cyclo-oxygenase 2. They are not currently licensed for the treatment of acute musculoskeletal disorders. If the ability to inhibit the cyclo-oxygenase enzyme selectively is advantageous for the treatment of acute inflammatory problems then these drugs may prove to be valuable in the future.

DURATION OF NSAID TREATMENT

There are obvious advantages to the early treatment of inflammatory responses to injury. How long treatment should continue is less clear. Studies of NSAID treatment of soft tissue injuries in animals have generally demonstrated the advantage of treatment in the early, post-injury stage. The effectiveness of treatment over longer periods is less apparent. Some sports injuries studies have also reported no differences between treated and untreated groups at later stages of the inflammatory and healing processes.

In self-limiting injuries healing will generally occur without treatment. It is perhaps inevitable that differences between treated and non-treated groups will diminish with time. Whilst treatment may result in earlier return to normality, untreated subjects are likely to 'catch up'. There is, however, an alternative interpretation, which is that NSAIDs may actually slow down the healing process.

Inhibiting the influx of inflammatory cells, particularly polymorphonuclear leucocytes, may limit the amount of local tissue injury that occurs following trauma. It is possible that this may lead to the slower removal of damaged tissue and a consequent delay in the resolution of the injury. The production of scar tissue may be impaired if fibroblast activity is reduced and this could, indeed, reduce the speed at which fully functional tissues are reformed.

There is no consistent evidence that NSAIDs delay healing and, in consequence, explanations of possible mechanisms are largely speculative. Whilst sports injuries studies with NSAIDs do not universally demonstrate efficacy, the majority do. It would, therefore, seem to be a reasonable approach to treat acute traumatic sporting injuries immediately with NSAIDs but to discontinue treatment as soon as it is apparent that the acute inflammatory problem is resolving.

Table. Commonly Available Topical Preparations.

Piroxicam	Feldene
Ibuprofen	Fenbid Forte Gel, Ibugel, Ibumousse, Ibuspray, Proflex
Ketoprofen	Oruvail, Powegel
Felbinac	Traxam
Diclofenac	Voltarol

TOPICAL NSAIDS IN SPORTS INJURY

Several pharmaceutical companies produce topical preparations of NSAIDs for the relief of musculoskeletal pain. Topical preparations of salicylates, piroxicam, ibuprofen, ketoprofen, felbinac (the active metabolite of fenbufen) and diclofenac are currently available in the UK. The concept of applying a NSAID locally in an effort to maximize the level of the drug at the site of injury whilst minimizing the systemic level of the drug is an interesting one. In theory this technique may achieve a good therapeutic effect without the troublesome gastrointestinal side-effects sometimes encountered with systemic therapy.

There is good evidence that these preparations afford good penetration of the drug through the skin and that high levels of the active drug are achieved in the underlying tissues. Clinical trials with these preparations generally demonstrate that active drug formulations are more effective than placebo, but the differences are generally slight. In one celebrated double-blind study patients suffering bilateral inflammatory knee joint effusions were treated with diclofenac gel to one knee and a placebo gel to the other. It was found that there were small reductions in swelling in both knees and no significant difference between the drug-treated and placebo-treated knees could be detected. In other words it did not seem to matter which knee the NSAID was applied to!

It has been suggested that the massage of an affected area with a gel or cream may in itself be beneficial irrespective of the presence of a NSAID. A significant point which should be considered here is whether these compounds actually exert their anti-inflammatory action at the inflamed site or elsewhere. If, for example, the reality of the situation is that the drugs reduce inflammation by interacting in some way with components in the bloodstream, then the concept of local application would be flawed.

Proteolytic Enzymes as Anti-inflammatory Agents

Several reports have been published suggesting that proteolytic enzyme preparations are useful for the treatment of soft-tissue sports injuries. Hyaluronidase, which splits the glucosaminidase bonds of hyaluronic acid, reduces the viscosity of the cellular cement.

Local injections of this enzyme have been shown to reduce healing time of sprained ankles. Chymotrypsin preparations, which are available in tablet form, have also been found to be useful in sporting injuries. Whilst these enzymes are obviously vulnerable to gastrointestinal breakdown, there is evidence that some active enzyme is absorbed. A number of clinical trials have been conducted amongst professional soccer players and whilst not all have shown favourable results, some trials have found significant reductions in the recovery time to match fitness.

This is particularly the case when a haematoma or sprain is the major feature of the injury. In one notable trial an enzyme preparation was compared with placebo in injured footballers of a London club. The physicians monitoring the trial were so impressed by the apparent efficacy of the enzyme that the trial was

abandoned since it was considered unjustifiable to withhold the enzyme from the placebo group. This was deemed especially so since the club was in the running for major honours in that season! Here though we have an enigma. On the one hand we have apparently convincing reports that proteolytic enzyme preparations aid recovery from sports injury. On the other hand we are faced with the fact that the bulk of these reports are over 30 years old.

If these preparations could significantly reduce recovery time and return players to match fitness in perhaps only 70 per cent of the normal time it should take, why are they not in use? Perhaps the optimistic initial findings have not been reproducible on subsequent occasions or perhaps toxicity has limited their use; it is true that occasionally serious hypersensitivity reactions do occur when administering high molecular weight substances such as enzymes. Whilst they are not used now for treating mechanically induced trauma, these preparations are regularly used in a variety of post-surgical situations to reduce oedema.

Anti-inflammatory Steroids

Many of the body's natural hormones are based on the four-ring steroid structure. The precise activity of a steroid depends on which of a small number of substitutions are made to the structure. Some steroids (oestrogens, progesterones and testosterone) have powerful effects on sex-related attributes and activities. Others, such as the glucocorticoids or mineralocorticoids, influence the metabolic activities or fluid balance of the body.

The activities of steroids are seldom completely specific and often overlap each other. Of interest here are the most powerful anti-inflammatory agents known to humankind, the glucocorticoids. These are drugs that are based on the chemical structure of the steroids produced by the cortex of the adrenal gland and are generally referred to as corticosteroids. These corticosteroids were first used to treat inflammatory conditions in the late 1940s.

They represented an exciting and, possibly, fundamental new approach to the treatment of inflammatory disease. Initial optimism waned rapidly, however, as it quickly became apparent that these substances were not curative and that they were subject to considerable numbers of side-effects. The anti-inflammatory activity of these steroid hormones appears to be secondary to their glucocorticoid function, as despite the severe metabolic derangement which accompanies adrenal gland insufficiency there is no general precipitation of inflammatory reactions. Many attempts have been made to increase the anti-inflammatory activity of these steroids. A large number of anti-inflammatory steroids are now available, many of which are an order of magnitude more potent than cortisol. All of these steroids have significant glucocorticoid activity.

Inevitably, long-term use of these drugs will affect the general metabolic activity of the body and is likely to provoke symptoms similar to those seen when the adrenal cortex is hyperactive (Cushing's syndrome). It is, therefore, important that a distinction is made between the long-term use of anti-inflammatory steroids and their use in acute situations. The long-term use

of these drugs may lead to a number of side-effects, some of which may be particularly unfortunate for an athlete. Osteoporosis is frequently encountered during corticosteroid therapy. This serious weakening of the skeletal structure affects principally those bones with the most trabecular structure such as the ribs and vertebrae and vertebral compression fractures are a frequent complication of steroid therapy.

Long-term use of a drug which may weaken the bone structure of an individual (whose sporting activities may subject that structure to greater than normal stress) should not be contemplated lightly. Perhaps an even more significant problem, however, is the catabolic effect of glucocorticoids on skeletal muscle. Weakness of muscles in the arms and legs can occur soon after treatment is started, even with quite modest doses of these anti-inflammatory drugs. Experiments with rats have shown that very significant reductions in muscle weight can occur within 7 days of treatment. If long-term systemic steroid treatment is initiated, it must be realized that as well as the anti-inflammatory effect which will be achieved, the administered drug will largely take over the glucocorticoid role of the natural adrenal hormone.

Due to negative feedback mechanisms operating in both the hypothalamus and the anterior pituitary, the release of corticotrophin-releasing factor and adrenocorticotrophic hormone is inhibited and so the adrenal cortex is not stimulated to produce its own glucocorticoids normally. Over a period of time the adrenal cortex regresses to a state such that the adrenal gland can no longer produce sufficient quantities of glucocorticoid to support the body if the drug treatment is stopped suddenly. It is important, therefore, that following long-term treatment with a steroid, the drug must be withdrawn gradually by progressively lowering the daily dose.

Steroids are double-edged weapons in the armoury of anti-inflammatory therapy. They are powerful, anti-inflammatory drugs but they are, unfortunately, subject to a great many side-effects. The direct application of these drugs to an affected site such that a high concentration of the steroid is achieved locally but without the attainment of significant systemic levels offers the possibility of gaining the maximum usefulness of steroids with minimal toxicity. Direct application of steroids to the skin is not an entirely satisfactory method as, although they are generally well absorbed, large proportions of the active drug will be transported away by the blood and, therefore, accumulation in affected muscle or connective tissue is limited. Additionally, topical application of steroids tends to cause thinning of the skin and a slowing down of wound healing.

The local injection of a corticosteroid preparation does offer considerable advantages in the treatment of an inflammatory condition restricted to a small area of the body. Early attempts to inject steroids locally were not particularly successful as these highly soluble drugs were rapidly redistributed from the site. The development of less soluble esters of hydrocortisone and prednisolone to give fairly insoluble microcrystalline preparations which are injected as suspensions has markedly improved the successfulness of this particular

technique. A single dose of an insoluble steroid preparation will provide relief for several days or even several weeks. If necessary, these local injections can be repeated to extend the period of effectiveness. Great care must be taken when injections of steroids are given that aseptic precautions are taken to minimize the risk of the introduction of infective agents. This is especially the case where injections have to be administered intra-articularly to improve mobility and restrict damage of an affected joint. In the case of intra-articular injection, the use of a long-acting preparation such as triamcinolone hexacetonide is indicated so that repeated injections are less necessary, or at least, less frequent. Local injection of steroids is also valuable for the treatment of soft tissue injuries. They may be injected into the interior of a bursa (the fibrous sac, filled with synovial fluid which may be found between muscles or between a tendon and bone, and which facilitates frictionless movement between the surfaces that it separates), into a tendon sheath to reduce the inflammation of an affected tendon or infiltrated around the area of an inflamed ligament. Tendinitis of the elbow (tennis elbow) is a classic example of the type of injury that responds well to local corticosteroid injection.

Steroids do have the property of delaying the wound healing process. Particular care should be taken when using them in situations where extensive new tissue will have to be produced (as may be the case, for example, where a collision on the sports field has led to an open wound). In this instance the use of steroids to reduce inflammation may not be appropriate. Glucocorticoids are included in the list of prohibited classes of substances if administered orally, rectally or by intravenous or intramuscular injection. Local administration, including intra-articular injections of these antiinflammatory steroids is permissible when medically necessary but may, in some cases, require appropriate notification. The means by which these steroids exert their anti-inflammatory effects is not clear. It is probable that they have a number of activities, all of which contribute to their anti-inflammatory effects.

They have been shown to reduce the output of chemical mediators of inflammation and to inhibit the effects of mediators on the vascular endothelium, resulting in a reduction of oedema formation. They have also been shown to have a number of inhibitory actions on the responsiveness of white blood cells. They are, for example, particularly effective in reducing the activity of thymocytes, which are involved with delayed hyper sensitivity reactions. Whatever their mechanism of action, and despite the potential hazards of long-term, high-dose therapy, glucocorticoids are profoundly effective in the reduction of inflammatory reactions and their place in the treatment of sporting injuries is assured.

5

Drugs and Illicit Substances: Understanding the Impact

Studies of the effects of illegal drugs on human fertility have been scarce due to ethical considerations, as well as subject to under-reporting and bias due to the characteristics of the population being studied, such as low socioeconomic status or improper prenatal care. Use of illicit drugs appear to have a negative impact on fertility, though more in-depth research in this area is required to make a clear link.

Marijuana is one of the most commonly used drugs around the world, and it acts both centrally and peripherally to cause abnormal reproductive function. Marijuana contains cannabinoids which bind to receptors located on reproductive structures such as the uterus or the ductus deferens. In males, cannabinoids have been reported to reduce testosterone released from Leydig cells, modulate apoptosis of Sertoli cells, decrease spermatogenesis, decrease sperm motility, decrease sperm capacitation and decrease acrosome reaction. Females who use marijuana are at an increased risk of primary infertility in comparison to non-users (RR 1.7; 95 per cent CI 1.0-3.0). In women, use of marijuana can negatively impact hormonal regulation; over short periods of time, marijuana may cause a drop in the levels of luteinizing hormone, but over long periods of time, the hormone levels may remain constant due to developed tolerance. Marijuana and its cannabinoids have been reported to negatively impact movement through the oviducts, placental and fetal development, and may even cause stillbirth.

Another commonly used recreational drug is cocaine, a stimulant for both peripheral and central nervous systems which causes vasoconstriction and

anesthetic effects. It is thought to prevent the reuptake of neurotransmitters, possibly affecting behaviour and mood. Long term users of cocaine claim that it can decrease sexual stimulation; men found it harder to achieve and maintain erection and to ejaculate. Cocaine has been demonstrated to adversely affect spermatogenesis, which may be due to serum increases in prolactin, as well as serum decreases in total and free testosterone.



Fig. Illicit Drugs.

Peugh and Belenko suggest that the effects of cocaine in men depend on dosage, duration of usage, and interactions with other drugs. While less is known about cocaine's effects on females, impaired ovarian responsiveness to gonadotropins and placental abruption have both been reported. Opiates comprise another large group of illicit drugs. Opiates, such as methadone and heroin, are depressants that cause both sedation and decreased pain perception by influencing neurotransmitters. In men taking heroin, sexual function became abnormal and remained so even after cessation. Sperm parameters, most noticeably motility, also decrease with the use of heroin and methadone. In women, placental abruption with the use of heroin may also be a cause of infertility.

PRESCRIPTION DRUGS

In general, there are more studies reviewing the effects of medication on male than female fertility. It is necessary to first determine which medications cause fertility issues, and to then determine if these effects are permanent. A study headed by Hayashi, Miyata, and Yamada investigated the effects of antibiotics, antidepressants, antiepileptics, β stimulators, H1 and H2 receptor antagonists, mast cell blockers, and sulfonylurea compounds (n =201). Male participants were divided so one group had medication switched or stopped and the other served as the control. The intervention group improved 93 per cent in semen quality and 85 per cent of the group conceived in 12.5 months \pm .64 months; and the control group improved 12 per cent in semen quality and only 10 per cent conceived. The authors suggested that this study may link certain tested medications with impaired semen qualities.

Table. Medications and their Respective Effects on Both Male and Female Reproductive Function.

Medication	Effect on Reproductive Function
Anabolic Steroids	Impairment of spermatogenesis (up to one year recovery); may cause hypogonadism through pituitary-gonadal axis
	Reversible
Antiandrogens:	Impairment of spermatogenesis; erectile dysfunction
Cyproterone acetate, danazol, finasteride, ketoconazole, spironolactone	Reversible
Antibiotics:	Impairment of spermatogenesis
Ampicillin, cephalotin, cotrimoxazole, gentamycin, neomycin, nitrofurantoin, Penicillin G, spiramycin	Reversible
Antibiotics:	Impairment of sperm motility
Cotrimoxazole, dicloxacillin, erythromycin, lincomycin, neomycin, nitrofurantoin, quinolones, tetracycline, tylosin	Reversible
Antiepiletics:	Impairment of sperm motility
Phenytoin	Reversible
Antihypertensives:	Fertilization failure
Calcium channel blockers (nifedipine)	
Antihypertensives:	Erectile dysfunction
Alpha agonists (clonidine), alpha blockers (prazosin), beta blockers, hydralazine, methyl dopa, thiazide diuretics	
Anti-inflammatory 5-ASA and derivatives:	Impairment of spermatogenesis and sperm motility
Mesalazine, sulfasalazine	Reversible
Antimalarials:	Impairment of sperm motility
Quinine and its derivatives	Reversible
Antimetabolites / Antimitotics:	Arrest of spermatogenesis; azoospermia
	Irreversible
Colchicines, cyclophosphamide	
Anti-oestrogens	Impairment of endometrial development
Clomiphene citrate	reversible
Anti-progestins:	Impairment of both implantation and tubal function
Emergency contraceptive pills, progesterone-only pills	
Antipsychotics:	Increase prolactin concentrations that can lead to sexual dysfunction
Alpha blockers, phenothiazine, antidepressants (particularly SSRIs)	
Antipsychotics:	Impairment of spermatogenesis and sperm motility
Butyrophenones	Reversible
Antischistozomal:	Impairment of spermatogenesis and sperm motility
Niridazole	Reversible
Corticosteroids	Impairment of sperm concentration and motility
	Reversible
Exogenous testosterone, GnRH analogues	Impairment of spermatogenesis
	Reversible
H2 blockers:	Increase prolactin concentrations that can lead to impairment of luteal function, loss of libido, and erectile dysfunction
Cimetidine, ranitidine	
Local anaesthetics, halothane	Impair sperm motility
Metoclopramide	Erectile dysfunction
Methadone	Suppress spermatogenesis and sperm motility
Non-steroidal anti-inflammatory drugs, Cox-2 inhibitors	Impairment of follicle rupture, ovulation, and tubal function
	Reversible

ALCOHOL

Many studies have been conducted on the effects of alcohol and aspects of health, including fertility. While there are studies that demonstrate the link between alcohol and infertility, it is not entirely clear what amount relates to an increased risk. In men, alcohol consumption has been linked with many negative side effects such as testicular atrophy, decreased libido, and decreased sperm count. One meta-analysis including 57 studies and 29,914 subjects found a significant association between alcohol and semen volume ($P=.0007$; I squared statistics (I^2) $n = 35$). A link between alcohol and sperm morphology has also been found. Very few men who are classified as alcoholics were normozoospermic with only 12 per cent of men in one study being designated as such; most alcoholics were found to be teratozoospermic, with 73 per cent of heavy drinkers and 63 per cent moderate drinkers falling in this category ($n=100$; $P =.0009$). In addition, oligozoospermia was another common classification for heavy drinkers (64 per cent) in this study ($P=0.0312$). Alcohol seems to have a large impact on both sperm morphology and sperm motility. While alcohol may have effects on sperm morphology, there is little conclusive evidence linking alcohol with oxidative stress, and infertility. Oxidative stress has been found to systemically increase with alcohol consumption, but there is not yet a clear link between sperm oxidative stress and alcohol. Women who drink large amounts of alcohol have a higher chance of experiencing an infertility examination than moderate drinkers ($RR=1.59$, $CI 1.09 -2.31$) in comparison to those who consumed low amounts, who had a decreased chance of experiencing an infertility examination ($RR 0.64$; $CI 0.46-0.90$) ($n=7,393$). A common result of drinking is a hangover. Women who experienced hangovers were more likely to be infertile than women who did not experience hangovers, suggesting that the amount of alcohol consumed does matter. While it is clear alcohol can have an impact, the amount it takes to negatively influence reproductive function is not clear as there is no standard "drink". Amounts of alcohol ranging from one drink a week to 5 units a day can have various effects including increasing the time to pregnancy ($P=.04$; 95 per cent $CI.85-1.10$), decreasing probability of conception rate by over 50 per cent and decreasing implantation rate, increasing both the risk of spontaneous abortion ($OR 4.84$) and of fetal death, and causing anovulation, luteal phase dysfunction, and abnormal blastocyst development. Researchers believe that these effects may be due to hormonal fluctuations including increases in estrogen levels, which reduce FSH and suppress both folliculogenesis and ovulation, but many mechanisms are still unknown.

CAFFEINE

Caffeine has become an integral part of society with consumption varying from 50 mg in a 16 oz. bottle of Pepsi to 330 mg in a 16 oz. cup of Pikes Place Roast from Starbucks. However, caffeine has been reported to have negative effects on female fertility. Caffeine has been associated with an increase in the time to pregnancy of over 9.5 months, particularly if the amount is over 500 mg

per day (OR 1.45; 95 per cent CI 1.03-2.04). The negative effects that are emphasized in recent research are miscarriage, spontaneous abortion, fetal death and still birth. Women who consumed more than 100 mg of caffeine a day were more likely to experience a miscarriage (151 mg-300 mg: OR 3.045; 95 per cent CI: 1.237-7.287, $p=0.012$; over 300 mg; OR 16.106; 95 per cent CI 6.547-39.619, $p<0.00$; $n=312$) or spontaneous abortion. The karyotypes of those spontaneously aborted fetuses in women who consumed more than 500 mg of caffeine a day were also more likely to be normal ($n=1,515$; OR 1.4; 95 per cent CI 1.5-3.7), indicating that spontaneous abortions may not be due to genetic defects, but perhaps an unknown mechanism triggered by caffeine. Greenwood et al. demonstrated that caffeine consumption during the first trimester is related to both miscarriage and still birth ($n=2,643$).

The women who miscarried or had a still birth in their study had an average of 145 mg of caffeine per day (95 per cent CI 85-249); and women who had live births consumed an average of 103 mg per day (95 per cent CI 98-108), indicating that there may be a narrow window for caffeine to impact fertility. Women who consumed more than 375 mg of caffeine a day had an odds ratio for spontaneous abortion higher than women who had fewer than 200 mg a day (330 subjects, 1168 controls; OR 2.21; CI 2.53-3.18).

In 2003, Wisborg et al. found that after adjusting for smoking and drinking, women who drank four to seven cups of coffee had nearly an 80 per cent increase in chance of still birth, and those who consumed more than 8 cups of coffee a day had nearly a 300 per cent increase (OR 3.0; 95 per cent CI 1.5-5.9; $n=18,478$). Another study including over 88,000 women demonstrated that if over 8 cups of coffee were consumed, the risk for fetal death increased.

ENVIRONMENTAL AND OCCUPATIONAL EXPOSURES

Many potential threats to reproductive health are encountered in every-day life through biological (viruses), physical (radiation), and toxic (chemicals) sources. While the human body has defences to protect itself, these threats can still influence one's health through inhalation, ocular and dermal contact, ingestion, and vertical and horizontal transfer. These hazards may also have negative ramifications for fertility.

Air Pollution

Air pollution is the release of pollutants such as sulfur dioxides, carbon monoxide, nitrogen dioxide, particulate matter, and ozone into the atmosphere from motor vehicle exhaust, industrial emissions, the burning of coal and wood, and other sources. While air pollution has received a tremendous amount of attention in the past few decades for many health reasons, its effects on fertility are less well-known. There have been reports of air pollution and its impacts on male fertility. Several studies have been conducted in the Czech Republic regarding men living in two different locations, one more polluted than the other. Men who are exposed to higher levels of air pollution were more likely to experience

abnormal sperm morphology, decreased motility, and an increased chance of DNA fragmentation (n=48 or 408 respectively). There was also a significant negative correlation found between sperm concentration and the amount of ozone to which a man was exposed (n=5134). Negative reproductive side effects of air pollution on women can include preterm delivery, miscarriage, stillbirth, spontaneous abortion, and fetal loss. Many times when fetal loss occurred, there were malformations within the fetal reproductive tract.

Heavy Metals

Heavy metals include metals such as lead, mercury, boron, aluminum, cadmium, arsenic, antimony, cobalt, and lithium. Only a few such heavy metals have been researched in connection to reproductive function. Lead, which is commonly found in batteries, metal products, paints, ceramics, and pipes, is one of the most prominent heavy metals. Lead interrupts the hypothalamic-pituitary axis and has been reported to alter hormone levels, alter the onset of puberty, and decrease overall fertility. Lead may alter sperm quality in men, and cause irregular menstruation, induce preterm delivery, and cause miscarriage, stillbirth, and spontaneous abortion in women. Mercury is commonly found in thermometers, batteries, and industrial emissions. Mercury concentrations increase in the food chain, resulting in bioaccumulation that can negatively impact reproduction in humans who consume food, usually tainted seafood. Ultimately, mercury can disrupt spermatogenesis and disrupt fetal development. Boron is another heavy metal that is used in the manufacturing of glass, cement, soap, carpet, and leather; its effects on the hypothalamic-pituitary axis are comparable to lead. While there is not much research on cadmium, it has been shown experimentally to cause testicular necrosis in mice, as well as marked changes in libido and infertility.

Pesticides, Endocrine Disruptors, and other Chemicals

Table. Chemicals and their Respective Effects on Both Male and Female Reproductive Function.

Chemical	Possible Reproductive Effects
BPA	Inhibits binding to androgen receptor, decreased semen quality, erectile dysfunction, chromosomal abnormalities in oocyte, recurrent miscarriage,
Disinfection by-products	
Organochemicals and Pesticides e.g. DDT, DDE, Methoxychlor	Change in hormone levels, irregular menstruation, decreased fertility, decreased semen quality, chromosomal abnormalities in sperm, altered histology of testes, decreased libido, fetal loss, miscarriage
Dioxins	Changes in hormone levels, altered puberty, altered start of menarche, endometriosis, decreased fertility, fetal loss
Phthalates	Decreased semen quality, oligozoospermia, earlier menarche, altered menstrual cycle, infertility
Solvents	Change in hormone levels, decreased semen quality, irregular menstruation, decreased fertility, miscarriage, fetal loss

Many of the chemicals used world-wide in today's society, including pesticides and endocrine disruptors, among others, may have various damaging effects on the reproductive health of both men and women. Mimicking natural hormones, impeding normal hormone activity, and varying regulation and function of the endocrine system are a few of the many ways that endocrine disruptors influence one's body. Numerous studies have reported negative effects of a variety of chemicals on reproductive health.

Occupation and Hobbies

Both men and women can be exposed to chemicals and other materials that may be detrimental to their reproductive health while on the job. Heavy metals and pesticides, have many negative side effects, particularly for those who work around them. Men working in agricultural regions and greenhouses which use pesticides have higher concentrations of common pesticides in their urine, overall reduced semen parameters, oligozoospermia, lower sperm counts, and sperm concentrations decreased by as much as 60 per cent.

Organic solvents may also prove detrimental. Men who work with these substances often experience indirect consequences with their female partner having decreased implantation rates (n=726). Welding is another possible source of occupational exposure, and plays a role in reduced reproductive health. There are also consequences for working in factories that manufacture chemicals and heavy metals.

Factories that produce batteries where workers are exposed to lead may have negative impacts on reproductive capabilities, including asthenospermia and teratospermia (n=150). Hobbies, while not often associated with excessive amounts of exposure, may be just as damaging as manufacturing.

Gardeners may be in contact with pesticides; crafters making jewelry, ceramics, and even stained glass may come in contact with lead; painters may also come in contact with lead-based paints. Whether it is manufacture or hobby, using any kind of heavy metal or pesticide likely will result in some exposure, and possibly reduce fertility.

Radiation

Exposure to various kinds and amounts of radiation can have lasting effects in humans. Radiation that is in the form of x-rays and gamma rays can be devastating to the sensitive cells of the human body, including germ and Leydig cells. The damage done depends on the age of the patient and dose, and ultimately can result in permanent sterility.

The incredible convenience of the cell phone has dramatically increased its usage in the last decade. However, it does not come without negative effects. There have been an increasing number of studies demonstrating negative effects of the radiofrequency electromagnetic waves (RFEMW) utilised by cell phones on fertility.

Cell phone usage has been linked with decreases in progressive motility of sperm, decreases in sperm viability, increases in ROS, increases in abnormal

sperm morphology, and decreases in sperm counts: One study evaluating 52 men demonstrated that men who carried a cell phone around the belt line or hip region were more likely to have decreased sperm motility (49.3 ± 8.2 per cent) compared to men who carried their cell phones elsewhere or who did not carry one at all (55.4 ± 7.4 per cent; $P < .0001$).

Link between cell phones and fertilization capacity. Falzone et al. reported that when exposed to RFEMW, sperm head area significantly decreased from $18.8 \pm 1.4 \mu\text{m}^2$ to $9.2 \pm 7.7 \mu\text{m}^2$ and acrosomal area significantly decreases from 21.5 ± 4 per cent to 35.5 ± 11.4 per cent ($P < .05$). In addition, Falzone et al. found the mean number of sperm binding to the zona was significantly less in the exposed group (22.8 and 31.8 respectively). While amount of research demonstrating negative effects of cell phone usage and fertility grows, there can be no clear conclusion as no standard for analyzing cell phone effects is available and many studies have limitations. Another aspect to consider is the effect of text-messaging on the body, as it is becoming more prevalent in respect to making phone calls. While technology quickly advances, research lags behind, providing the opportunity for unforeseen damage to occur.

PREVENTATIVE CARE

Contraceptive use

While contraceptives are often associated with preventing pregnancy, several studies have demonstrated that both condom usage and oral contraceptives can preserve fertility in women. In 2010, Revonta et al. concluded that infertile women used less oral contraception; women who considered themselves infertile might be less inclined to use contraceptives. Contraceptives are believed to reduce the chances of contracting a sexually transmitted infection, thus reducing infertility.

Contraceptives also may decrease time to conception. In one study, condom users had shorter time to conception compared to oral contraceptive users; oral contraceptive users in turn had shorter time to conception than those women not using any contraceptives.

In addition, oral contraceptives were demonstrated to have positive effects on the prevention and management of endometriosis and pelvic inflammatory disease. This evidence suggests that contraceptives may increase a woman's fertility, lending to the overall fertility of the couple.

Doctor Visits

Scheduling regular doctor appointments may be beneficial for fertility. Males tend to not seek medical treatment for sexual dysfunctions or infections. It was reported that when men experience sexual problems, only 10.5 per cent seek help ($n=11,161$). When the problems become on-going, 20.5 per cent of men turn to health care professionals. Mercer et al. concluded that the low amount of males seeking treatment is most likely due to lack of awareness of treatment and guidance.

For women, visiting the gynecologist to receive an annual pap smear has been associated with being protective of fertility (n=10,847). Kelly-Weeder and Cox also concluded from their study that when a woman reports her health status as good, she is more likely to be fertile. Both pap smears and self-reported health status may be related to better screening for disease, STI detection, more available information, and overall better access to care.

OTHER FACTORS

Clothing

The type of clothing a man chooses to wear, may have effects on reproductive health. Many studies have been conducted hoping to find an answer to the question of what type of clothing is best for fertility. The view that elevation of scrotal temperature negatively impacts spermatogenesis and sperm parameters is universally acknowledged. But the question of whether tight-fitting underwear actually has an effect on scrotal temperature and therefore semen quality has long been debated. There have been studies that have found significantly higher temperatures with tight-fitting clothing versus loose-fitting or no clothing. Increases in scrotal temperatures could be due to an increase in temperature of about 3.5°C of the air between the clothing and the skin in comparison the ambient air.

One study followed 20 participants who wore tight-fitting underwear for 6 months then switched to loose-fitting underwear for 6 months. Semen samples were taken every 2 weeks for the duration of the study. While half of the participants dropped out, there was a significant 50 per cent decrease in sperm parameters in the tight-fitting versus loose-fitting underwear, demonstrating that the effects of tight-fitting underwear reversible. In another study, men who wore tight-fitting underwear and pants had a relative risk of 2.5 of having impaired semen quality. They also noted that only wearing one or the other caused an insignificant decrease in semen quality. While there are studies that conclude that the type of underwear influences scrotal temperature, there are also some that did not find significant temperature differences.

Hot Water

Literature providing evidence that wet heat is tied to infertility is scarce. Many fertility authorities rely on the data provided from research of the effects of temperature on sperm function and then apply the idea to hot baths, jacuzzis, or saunas. One study conducted by Shefi et al. actually studied the effects of wet heat on 11 male subjects who were exposed to wet heat for greater than 30 minutes every week for at least 3 months prior to any experimentation. These 11 men were then told to avoid wet heat exposure for 3 months. Three different semen samples were assessed: one from the onset of the study representing the exposed, one before 3 months into the experiment, and another at 3 to 6 months. Nearly half of the participants saw an increase in semen quality. Sperm motility

saw a significant 22 per cent increase for responders, and the improvement appeared to continue longer than 3 months ($P=.02$). When reviewing the non-responders, Shefi et al. found that other lifestyle factors could have accounted for the lack of semen quality increase, such as tobacco use.

Lubricants

Many sexually active couples choose to utilise vaginal lubricants to treat vaginal dryness and pain during intercourse. While attempting to conceive, nearly 75 per cent of participating couples reported to an internet study that they used lubricants to ease the female partner's vaginal dryness, and 26 per cent had claimed that they almost always used a lubricant. Some non-commercial products used as lubricants include olive oil, vegetable oil, and saliva, and they have been demonstrated to negatively impact sperm function. Several products available to the public have been researched for possible effects on sperm function. A study conducted by Agarwal et al. compared Replens, Astroglide, FemGlide, K-Y Jelly, and Pre~Seed against a control medium. In relation to the control, Astroglide, FemGlide, and Replens all significantly decreased sperm motility after 30 minutes of contact with semen ($P<.01$). Astroglide and Replens had a greater impact on motility in comparison to FemGlide's. They also found that FemGlide and K-Y Jelly significantly increased sperm chromatin damage in comparison to the control medium ($P<.05$). While Pre~Seed caused an increase in chromatin damage, it was not significant.

6

The Impact of Drug Abuse

FAMILY AND COMMUNITY

Fast-paced social, economic and technological changes present a challenge to the stability and influence of the family. The family is often viewed as the basic source of strength, providing nurturance and support for its individual members as well as ensuring stability and generational continuity for the community and culture. In reality, the family is far more complex.

At least four conceptual views of the family have been identified:

- (1) First, it may be seen as protecting and sustaining both strong and weak members, helping them to deal with stress and pathology while nurturing younger and more vulnerable members.
- (2) Secondly, the family may be a source of tension, problems and pathology, influencing weaker members in harmful ways, including destructive drug or alcohol use.
- (3) Thirdly, it may be viewed as a mechanism for family members to interact with broader social and community groups, such as peer groups, schools, work colleagues and supervisors and persons associated with religious institutions.
- (4) Fourthly, the family may be seen as an important point of intervention—a natural organizational unit for transferring and building social and community values.

Rapid social, economic and technological change may, under certain circumstances, weaken the sense of family and reduce the sense of belonging to other people, groups and places. Stability of relationships, environment and

expectations is a powerful force in helping people manage their lives, especially important for children and young adults. In some societies, the classical problem of balancing discipline and control of children with nurturing support to encourage their exploration, understanding of the world and self-realisation may be complicated by substance abuse problems as well as a wide range of other conditions.

Families can have a powerful influence on shaping the attitudes, values and behaviour of children, but how do they compare with peers in terms of influence on drug taking? The influence of peer groups, which is usually strong during formative years of youth, may be stronger than that of parents in some cases. One researcher has found that friends are more similar in their use of marijuana than in any other activity or attitude. In this situation, drug use by peers may exert a greater influence than the attitudes of parents. This researcher observed that peer and parental influences are synergistic, with the highest rates of marijuana use being observed among adolescents whose parents and friends were drug users. Other investigators, however, have found that peers have a high degree of influence only when the parents have abdicated their traditional supervisory roles.

Hence, parents exercising traditional family roles may be able to limit the influence of peer groups on children's attitudes towards drug use and therefore have a crucial influence on children's behaviour. Prevention of drug problems can employ knowledge about family dynamics to address personal and social concerns of family members that otherwise would lead to drug abuse, both with respect to dysfunctional as well as intact families.

In this regard, it is important to avoid assuming "... either that parents are invariably responsible for the problems experienced by their children or that substance users can be blamed for all the problems experienced by the families in which they live". Family factors that may lead to or intensify drug use are thought to include prolonged or traumatic parental absence, harsh discipline, failure to communicate on an emotional level, chaotic or disturbed members and parental use of drugs, which provides a negative role model for children. Lack of household stability, income or employment for a parent may increase stress on the family and its vulnerability, pushing marginal individuals to find "solutions" or solace in alcohol or drugs. Single-parent families may have increased difficulties, with the single parent being forced to function beyond his or her ability. Alcohol abuse, other substance abuse and psychopathology have been studied among family members. It is well known that having biological relatives with alcoholism increases the risk in unaffected individuals.

Also, families with histories of psychological and social pathology may be at increased risk for alcohol problems. The degree to which similar processes apply to other drugs is not as well established. Persons who are heavy users of alcohol or other drugs may show psychiatric symptoms such as depression. Dysfunctional drug or alcohol use may mask an underlying emotional illness. A frequent finding from clinical assessment of users is a "dual diagnosis", where

two or more clinical conditions exist at the same time in an individual. Multiple problems in the family are also very common. The existence of an addictive personality type does not appear to have been scientifically validated, but the obvious signs of troubled persons-often exhibiting multiple symptoms-are easily recognized by expert and layman alike. Reports of disturbed family life related to drugs are frequent in the literature. In Ireland, it was found that disrupted family life appears to be a major risk factor for drug abuse among some young persons, and that as many as 10 per cent of the young people between 15 and 20 years of age in the northern part of Dublin were addicted to heroin.

In India, an increased number of heroin addicts seeking assistance at treatment centres has been reported. It has been estimated that between a half million and a million persons became addicts in the 1980s, challenging cultural traditions and services. While the family group can, under certain circumstances, be the origin of drug problems, it can also be a potent force for treatment. Family therapy has gained increased acceptance, with the defining characteristic being the simultaneous involvement of more than one member of the family in therapeutic sessions.

Many families are supported and cared for by women. They frequently have the key role in teaching the young, ensuring that health care is provided and maintaining links with and mobilizing community support when necessary. Recognition and effective utilization of women as resources for drug prevention and treatment can improve efforts to reduce both the supply and demand for drugs. Women who are not drug abusers may be affected by problems related to drug abusing men.

The problems of male partners may affect women in the form of difficulties in interpersonal relationships, instability, violence, child abuse, economic insecurity, deprivation of schooling and risk of sexually transmitted disease, including HIV infection. Limited data on the relationship between substance abuse and the health and social conditions of children are available. A report on health problems and substance use in Honduras, one of the poorest countries in the western hemisphere, with a GNP per capita of \$580 in 1992.

HEALTH

Health problems impair family life and productive employment, diminish the quality of life and may threaten survival. A comprehensive picture of worldwide health implications of drug abuse is not available. Significant country and international data, however, are available and the impact of addictive substances on health in both industrialized. The broader context of addictive substances includes tobacco, alcohol and solvents. All of these substances have several important characteristics in common.

They alter the function of the human brain and have an impact on behaviour; they are widely used throughout the world; and they burden society by increasing social and economic costs for productive enterprises and by drawing upon limited government services. The most widely used addictive substances, alcohol and

tobacco, are harmful with extensive damage to the individual, family and the community. Disease, disability and dysfunction were obviously not included in the estimate in the box but would certainly increase significantly any estimate of human costs due to substance abuse. Deaths as a result of drug abuse are a major source of concern. Recent informal estimates are that perhaps 200,000 drug-injecting-related deaths may occur per annum based on the estimated size of the current world population of injecting drug abusers of approximately 5.3 million. WHO has reported as follows: "Existing data indicated a several-fold increase in drug-related deaths over the past decade.... The yearly mortality rates among intravenous drug users or drug addicts on treatment programmes ranged between one and two per cent in Europe and the United States".

WHO's examination found that, during the period of 1980 to 1988, mortality related to drugs increased in some countries and decreased in others. It decreased in Japan and Thailand and showed little change in Austria, New Zealand and former Yugoslavia. Slight increases were seen in the former Czechoslovakia, the predecessor States of Germany, the Netherlands and Spain. Steeper increases in mortality were noted in Australia, Canada, France, Italy, Poland, the United Kingdom of Great Britain and Northern Ireland and the United States.

High variability in mortality rates, however, was found within countries and from year to year. Substances commonly associated with drug abuse-related deaths are cocaine, heroin, barbiturates and amphetamines. Benzodiazepines, hallucinogens, cannabis and other substances are less frequently implicated. Combinations of drugs and alcohol were frequently noted. Although commonly used, the term "overdose" is misleading since different reactions, such as hypersensitivity, may be the real mechanism of death in some cases rather than an acute intoxication effect due to excessive amounts of the drugs.

Availability, cost, chemical contents of the drugs, preexisting and potentially life-threatening health problems and patterns of use are all factors that may play key roles in determining whether harmful effects occur in any individual case. The most widely used controlled drug, cannabis, could be associated with some fatal accidents despite its low acute toxicity. Concerning chronic use, there may be greater risks of damaging the lungs by smoking cannabis than tobacco. Commenting on the public implications of the use of addictive substances, a major health report states: "Decisions about the control of tobacco and other addictive substances are among the most important health-related choices that societies can make collectively.

In many populations, prolonged cigarette smoking is already the greatest single cause of premature death. Alcohol and other drugs also contribute to disease and disability. The damage from substance abuse is not limited to the individuals involved; others also suffer indirectly because of drunk driving, fires, passive smoking, and drug related crime and violence".

The proportion of all drug users and abusers who end up with serious health and social problems is not known. Whatever that proportion, illicit drug use more frequently results in problems or disease rather than death. Since substance

abuse is not evenly spread throughout the population, it is advisable to determine the characteristics of the specific groups involved in order to plan interventions. Drug abuse may be influenced by the social-cultural milieu, the degree to which a person is part of a structured environment, his or her personal characteristics, the specific drugs involved and the circumstances of use. The earliest stages of life are a particularly vulnerable time.

Reporting on the effects of alcohol and drug abuse on fetuses in a study carried out in four Danish cities, one researcher has found that the extent of maternal drug abuse is correlated with obstetric complications and developmental characteristics of the foetus. The effects of an unstable foetal life carry over into childhood. However, with care, many of these effects can be overcome. One of the most visible impacts of harmful drug use is seen in the consequences of cocaine use on newborn infants. Experts have found that cocaine-using pregnant women have a higher rate of spontaneous abortion. Also, mothers who carried their foetus to full gestational term had infants with depressed behaviour and poor responses to stimuli. Other studies indicate that infants exposed to sedatives, stimulants or pentachlorophenol may have marked deficits. PCP and cocaine used by mothers also may interfere with the essential bonding that occurs between mother and child at birth. Other investigators have findings supporting these views.

In discussing the victims of drug abuse, a commentator notes that "maternal drug use is a substantial and apparently growing part of the problems of unhealthy newborns. The direct victim of such passive drug taking is the child, but there are indirect victims too. Drug-damaged children put burdens on already strained systems of pediatric health care and public education.

Some of the forms of damage, particularly to cognitive function and impulse control, will tend to increase crime rates when the children become adolescents and young adults. The damaged child's future schoolmates, workmates, and neighbours will all bear some of the cost". Quite apart from the direct consequences, the care of children abandoned by, or taken away from, addicted parents again implies a considerable social cost.

Probably the most widely occurring substance abuse pattern in this context is the foetal alcohol syndrome, which involves both physical and mental deficiencies that are costly to treat, often requiring both intensive initial and long-term care. The human immunodeficiency virus causes the clinical disease acquired immunodeficiency syndrome. Unknown before the 1980s, it now is an epidemic for which there is no known cure and no vaccine.

The virus is spread by sexual intercourse, contaminated blood, mother-to-child transmission during the perinatal period and use of contaminated syringes and injection equipment. The importance of each of these means of spread varies from one region of the world to another. The devastating effects of AIDS are seen most clearly in the developing world. Two-thirds of the AIDS cases, adults and children, are in Africa, where the primary means of spread is heterosexual contact. Males may acquire the virus through use of dirty injection

equipment and then transmit it to female or male sex partners. Primary prevention is the only known means of slowing the spread of this virus. Early attempts to prevent transmission of the virus between addicts sharing dirty needles focused on information programmes that advised "Don't share needles or at least clean the syringe with bleach before reusing it". Recently, however, bleach baths for injection equipment have been found to be less than fully effective. Results from some of the needle exchange programmes, although less widely accepted, have been found to be positive, according to some health officials.

Peer outreach models have been used in India, the United States and elsewhere. In addition to increasing mortality, the rapid spread of AIDS, particularly in Africa, is producing a whole new class of poor, including orphans under 10 years of age who are expected to number 10 million or more by the turn of the century. Serious effects are expected not only in mortality but also in reduced life expectancy, sexually transmitted diseases and endemic diseases such as tuberculosis. Impaired immune systems increase vulnerability to other diseases as well. O has projected that in 2000, 2.5 million people will be newly infected with HIV, HIV prevalence will have reached 26 million, and AIDS deaths will total 1.8 million.

The impact of AIDS will depend also on fertility, mortality and other conditions. For example, in areas such as Thailand, where fertility and mortality rates are much lower than in sub-Saharan Africa, AIDS may well contribute to actual population declines over a period of 30 years or more. According to one expert, drug injecting has been identified in 80 countries and HIV infection in 52 of them.

He states: "HIV prevention must... consider interventions which help discourage drug injecting. Particularly at risk are countries in drug producing and along drug transshipment routes in South East and South West Asia, Africa, and South America. The diffusion of injecting can occur far more rapidly than the time it takes to introduce HIV prevention activities". According to this expert, drug injecting is a relatively recent phenomenon in many countries and the new diffusion of injecting is "occurring in countries which are mostly poor, and are either in drug producing areas or along drug transshipment routes. In many countries the recent rapid diffusion of injecting has been followed by major outbreaks of HIV infection, for example throughout urban, rural and hilltribe areas in Thailand, in Manipur in northeast India, Ruili in southern China, and Myanmar".

Manipur, which shares a long border with Myanmar, and Madras, India, are examples of places where rapid increases of heroin injection have taken place. Among persons who administer drugs by injection, the proportion estimated to be infected with the virus varies widely from a low range of 1-5 per cent in the United Kingdom to 20 per cent in Germany, 30 per cent in the Netherlands, 30-80 per cent in Italy, 40-60 per cent in Spain and 58 per cent in France.

As the proportion of injecting drug users who are HIV positive increases and increased numbers of them travel, the rate of spread of the virus may also

increase. As one expert notes, the "most conservative predictions by public health institutions foresee increased use of illegal drugs via injection in many countries and increased transmission of HIV among people who take drugs in this way".

The relationship between the injection of drugs and HIV transmission has become a major concern in many parts of the world. But, according to a WHO report, less well "recognized, but statistically and medically more significant in terms of its overall societal impact, is the relationship between substance abuse and hepatitis, tuberculosis, cardiovascular diseases, cirrhosis and neuropsychiatric disorders; disinhibition and sexually transmitted diseases; unwanted pregnancy and complications in pregnancy including fetal distress; and violence and suicide". Treatment and rehabilitation are essential components of demand reduction. They should be seen as a means to help persons overcome addiction and not a form of punishment. Research has indicated that treatment, carried out under proper conditions, does change behaviour. Treatment provides a necessary foundation for rehabilitation and community reintegration. The setting in which it occurs may be less important than the skills of persons involved, the processes used and the type of treatment. In planning to prevent relapse, many services are needed, including rehabilitation, community services and active follow-up. Successful programmes require qualified staff, constant management, adequate resources and the flexibility to adapt to changing circumstances.

Since resources for specialized assistance for persons with drug problems are often not available in many countries, existing primary health care settings and networks may have to be adapted to care for drug abusers. The majority of persons in rural areas have no easy access to specialized health care but primary health care networks can provide a contact point and a means of intervention. One expert has concluded that general health workers should receive training to deal with alcohol and drug problems, especially in such subjects as rapid assessment, counselling and crisis management of early phases of cases of substance abuse disorders.

Aggregate multicountry information on the costs of drug abuse is not available. In the United States, however, where this issue has been examined, drug abuse was found to impose a \$44.1 billion dollar burden on the economy in 1985, with the projection of \$58.3 billion for 1988. Calculations were based on the human capital approach, which is based on the value of productivity in terms of market earnings and imputed value for housekeeping services.

Drug abuse, compared to alcohol abuse and mental illness, was comparatively low in direct and indirect costs and high in other related costs, such as crime, motor vehicle crashes, administrative costs of related social welfare programmes and costs associated with the destruction of property by fire. This study's calculation of cost also included the value of productivity losses for victims of crime. Costs for men were twice that for women. The significantly higher costs for men reflect their higher prevalence as drug users, their greater labour force

participation rates and their higher earnings relative to women. Estimates do not include costs of crack cocaine addiction and its devastating consequences because that problem emerged after this research was carried out in 1985. In the United Kingdom, the total identifiable costs associated, directly or indirectly, with drug abuse in 1988 were conservatively estimated at £1,821 million, with 80 per cent of this being the replacement value of stolen goods.

Investigation, legal and sentencing costs were other categories and preventive and medical costs were relatively minor. In Australia, researchers have examined alternative models to estimate costs, pointing out that any estimate may be misinterpreted. The researchers estimate that the annual avoidable tangible drug abuse costs for Australia for 1994 will be \$AI 38 million.

This amount is interpreted as indicating the potential benefit which could result from effective intervention programmes. Clearly, the preparation of social and economic cost estimates is becoming a priority. No comparative national estimates for the cost of care and treatment of substance abuse problems have been prepared. Most policy officials have little idea what the addictive disorders cost their countries or what they are spending on this group of problems.

In the United States, a study of hospital records shows a surprisingly high number of admissions and costs for substance-abuse-related treatment. This study found that in 1991, "there were 2.2 million tobacco, alcohol or drug-related Medicare admissions, which accounted for 20 per cent of all Medicare hospitalizations. Because these substance abuse related cases tend to be more expensive to treat than the average hospital case, the amount actually paid by Medicare for substance abuse-related care was even higher, accounting for 23 per cent or nearly one-fourth of the total Medicare payments for hospital care.

Substance abuse-related cases cost more to treat because they required almost 26 per cent more hospital staff and other resources than Medicare discharges that are unrelated to substance abuse". Furthermore, "Medicare spent over \$13 billion of its \$57 billion inpatient short-stay hospital expenditures on substance-abuse-related care. These amounts exceed the 1 out of 5 dollars spent in the Medicaid programme for substance abuse-related conditions". Although the magnitude of these figures is not typical of other countries, this same study found that "relying solely on diagnoses that explicitly mention alcohol or drugs on the medical record in order to measure the prevalence and cost of drugs and/or alcohol problems in hospitals grossly underestimates the full impact of substance abuse".

Cases where alcohol and drug treatment were the primary diagnoses represented less than 3 per cent of the substance-abuse total costs. The conclusion is that substance-abuse-related costs may be a serious but unrecognized drain on national income; it is often unrecognized because drugs or alcohol may not appear directly in diagnoses and classifications but may be major risk factors contributing to other diseases and costly social disorders. Paying for the costs of assistance to persons with drug problems raises many questions, including that of the role of the public and private sectors.

Many drug abusers are unable to pay the costs of care by themselves and have no insurance or other means to pay when health care is primarily provided by the private sector. Public policy should take into consideration two points. First, priority should be given to the most important aspects of the drug abuse problem, such as compulsive heroin or cocaine users' inability to pay for treatment. Involving them in public treatment programmes would reduce the demand for these drugs and allow supply reduction efforts to be more successful since the compulsive drug users consume far more drugs than experimenters.

Secondly, the issue of preventive care needs to be addressed. If preventive care systematically loses out to market forces, which are politically or commercially stronger, a government may need to intervene to ensure adequate support for prevention. The cost picture is made more complex by the nature of the existing health care system. Does a national or comprehensive health care system exist? If it does, are drug treatment services covered? A major policy issue is whether information on costs of the problem is sufficient to draw conclusions about resource allocation. In addition, estimates are needed about the costs of various alternative policy responses, including what the consequences would be if limited or no intervention takes place by authorities.

Allocation of scarce resources may be determined not only by costs associated with morbidity, mortality and associated social problems but also by other factors such as public perceptions of safety and security. Although this discussion concerns the impact of illicit drugs, it should be borne in mind that many parts of the world lack adequate supplies of licit drugs, with neither essential medications nor access to basic health care.

Highlighting the abuse of dependence-producing drugs does not, however, diminish the magnitude of problems related to the unavailability of licit narcotics or psychotropics needed for treatment of health problems. Programmes to control the illicit use of drugs may be designed which support pharmaceutical control measures essential for distribution of licit drugs.

EDUCATION

Education is the principal means of preventing drug abuse. In addition to educational institutions, other settings are important for the contributions they make to learning and socialization. Home, workplace and religious institutions, to name three examples, are settings for the education of young and old alike. Most officials support the full integration of drug abuse education into mainstream institutions, whether public and private, religious or secular.

An issue, often unstated, is whether, to have real impact on the drug problem, society or the individual should be the initial target for change. Seeking the root causes focuses on the social conditions that lead persons to engage in drug abuse. Slow and indirect, education is often seen as producing its results only over the long run, involving parents and making gradual social changes to reduce experimentation, occasional or regular drug use. The short-term approach and the long-term demand reduction approach by education are two ends of a

continuum which are often placed in opposition to each other. In reality, both are essential parts of a comprehensive view of prevention of drug abuse. To clarify and assess human progress, a yardstick termed the Human Development Index has been prepared by UNDP.

HDI uses real purchasing power, health and education indicators to provide a broader picture of human progress than was previously available on comparative income bases. Generally measuring the ability of people to live a long and healthy life, HDI reflects the importance of education to human and social development and provides a focus for health planning. By focusing on specific target groups, preventive health education has the dual goals of forestalling the abusive use of drugs and promoting human development. Adolescence is a time when enormous changes take place in the process of normal development.

In many cultures it is, according to one observer, "a time for developing a person's sense of self-identity, a process that involves separating from parental attachments and values and establishing new social ties, values and ideals. In separating from parents, youth need to form other meaningful relationships. Sometimes the peers with whom the growing youth associates influence him or her to adopt drugs as part of their social behaviour. However, the effect of drugs may not be to enhance social relationships and self-identity. Rather, the drugs may cause the growing girl or boy to become apathetic and emotionally detached and, consequently, to face problems of establishing social bonds, with the result that the youth becomes increasingly isolated emotionally and socially". Although many officials show concern about drug abuse, some also minimize the risks.

The word "drugs" often causes associations with illness, even shameful illness, although less so for alcohol and tobacco than other drugs. This may be the reason why some officials minimize the risks involved in drug use. Cultures vary enormously with respect to their degree of stigmatizing persons with health or social problems. In some countries, only a minority of the children go to school, and those in school may stay there for only a few years. In these situations, methods need to be adapted when preparing health education approaches for drug abuse prevention, particularly for rural youth. Flexible methods include innovative out-of-school approaches to health promotion activities consistent with community values and standards. When fewer children go to school or when families are less integrated, adaptive changes in educational interventions are needed for both formal and informal approaches.

The effects of cannabis, the most widely used illicit drug, have been reviewed by many authors. One study which has summarized this work indicates that chronic or acute use of cannabis may result in preoccupation with the immediate present, an impairment of short-term memory and other mental functions, impaired tracking ability in sensory and perceptual functions, adverse emotional and social development of children and adolescents, and impaired classroom performance.

The degree of impairment follows the dosage amounts used, everything else being equal. Summarizing the potential impact of several kinds of drugs, another

commentator has concluded that "drugs can decrease cognitive operations, making it difficult for the youth to develop a functional set of values and ideals. Reduced cognitive efficiency also leads to poor academic performance and a resulting decrease in self-esteem, contributing to instability of the individual's sense of identity".

Drugs may preoccupy and come to dominate the person's thinking as providing a solution to problems that need, in reality, non-drug solutions. Youth, as well as adults, may take drugs to deal with problems which cannot be resolved by such substances. Approaches to education about drugs may be grouped conceptually into a threefold typology: the chosen educational strategy or approach; the target group and the type of activity and teaching materials used. Depending on the target group, a direct substance-centred approach may be used. It is possible to make the environment of the individuals involved the target, although this is not frequently done. Also, educational activities may be carried out by adults, teachers, specialist educators, youth leaders, parents or peers. Spending for the general education of youth, frequently relatively small, is often allowed to fall behind other areas. According to UNESCO, "public expenditure in education has continued to stagnate in most countries, accounting for about 3 per cent of GNP for the developing countries of Asia as a whole".

Where drug abuse education fits into overall national funding priorities is not clear. Nor is information available about the relation of amounts spent on drug abuse education compared to other educational activities. Programmes for educating various target groups vary enormously in cost, from practically nothing for activities using donated time or free resources from sponsors to very expensive for high technology mass media programmes. The cost-effectiveness approach is a means to determine the most suitable responses to drug abuse.

Unfortunately, information about the costs and outcomes of various intervention measures for drug abuse education is not usually available. In the absence of this kind of information, alternative educational measures may be compared on the basis of costs and other factors to determine their suitability for use in programmes.

The mass media have been used in many different types of campaigns and programmes. However, the objectives of mass communication efforts have often been unclear and lacking in specific outcome goals. They are based on the assumption that peoples' knowledge, attitudes and behaviour can be influenced in a desired direction. Television, radio, newspapers, posters, brochures—all of these may reach a large number of persons.

The overall effect of their use on various target groups in many different countries has not been evaluated. There are examples of inquiries into the success of mass media efforts. Specialized communication techniques have recently been examined from the standpoint of the potential for reducing drug demand and promoting alternative development. The dramatic success of child immunization campaigns in developing countries may provide useful ideas for

the drug abuse field. Applicability of similar techniques to drug abuse education has been the subject of some speculation. Qualitative audience research and focus groups have been proposed as a means of obtaining a better understanding of the common underlying causes of drug abuse in various groups. Further study of the impact of the mass media on attitudes and behaviour in a variety of social and cultural contexts is needed.

CRIME

Countries vary in the way they define crime. In the drug abuse field, however, a common conceptual structure is provided by international drug treaties. Several of the treaties have obligations which require penal provisions in national law for illicit traffic offences. Requirements concerning illicit demand are more complicated. Countries implement both supply and demand obligations in enormously varied ways. Crime and drugs may be related in several ways, none of them simple.

- Illicit production, manufacture, distribution or possession of drugs may constitute a crime.
- Secondly, drugs may increase the likelihood of other, non-drug crimes occurring.
- Thirdly, drugs may be used to make money, with subsequent money-laundering.
- Fourthly, drugs may be closely linked to other major problems, such as the illegal use of guns, various forms of violence and terrorism.

Whether illicit drug use should be considered a crime, a disease, a social disorder or some mixture of these is debated in many countries. Often, public policy is ambivalent about the nature of addiction, with social attitudes towards drug abuse reflecting uncertainty about what causes abuse and who is ultimately responsible. A continuum exists in relation to accepted social status and crime. At one end is law-abiding behaviour and at the other, criminal activity. Between these two extremes are found deviant behaviour and delinquency. Many marginal persons who use drugs do not go on to become delinquents or criminals. If progression along this continuum does not take place within a country, the concept of progression is even less applicable across cultures. What is marginal or deviant in one culture may be tolerated or even considered to be part of the mainstream in another. Information collected by police or other authorities varies from country to country.

The amount of unreported crime depends on many variables. States parties to the international drug control treaties have an obligation to report on drug abuse to the United Nations. Reports on the illicit traffic and drug abuse are presented to sessions of the Commission on Narcotic Drugs, which meets regularly in Vienna. Whatever the limitations are of reports to the United Nations as estimates of the illicit traffic, these reports do shed light on how serious the situation is. Using these various sources of information, UNDCP has recently reported the spread of illicit opium poppy cultivation in Latin America, increased

heroin abuse in parts of Africa and Asia and increased cocaine abuse in Latin America and the Caribbean. These increases, along with other information about current trends, reflect a bleak picture. The United Nations conducts and publishes a series of surveys of crime trends, operations of criminal justice systems and crime prevention strategies in Member States. Reports on crime-related matters, including the impact of organized criminal activities on society at large and control of the proceeds of crime, are presented to the Commission on Crime Prevention and Criminal Justice. The sharpest increase in crime recorded in both the 1980-1985 period and the 1975-1989 period was in drug related crime and robbery.

The rate of increase in drug crimes was greater than for all other types of crime, except kidnapping, for which the base figures were low. The complex connection between drug use, delinquency and crime has been discussed by experts for decades. Substance use and delinquent behaviour are often related, especially as either drug use or delinquency become more serious. Early sexual activity is strongly related to delinquency and drug abuse. Girls who have been pregnant report increased prior use of alcohol and other drugs. Youth who do not feel a strong attachment to their parents are more likely than others to use drugs and become delinquent, consistent with the findings cited earlier in the part on the family.

One aspect of this connection between drugs and crime is temporal causation: which is cause and which is effect? In the case of individual addicts, drug use may precede crime or the reverse. After examination of groups, researchers in the United States have concluded that many variations exist but that some delinquency or crime often precedes addiction. They have found that involvement in property crime generally precedes the addiction career. After addiction occurs, property crime increases and narcotic use is further increased. One expert found that during "... periods of curtailed narcotics use produced by treatment, property crime levels are significantly reduced and become extremely low after termination of the addiction career".

Researchers have found a close connection between drug abuse, criminal behaviour and social attitudes. Review of the crime/drugs literature supports three notions: heroin addicts are usually deeply involved in crime; daily opiate use increases criminality several fold; and many heroin abusers are not interested in obtaining treatment although drug treatment programmes do reduce the criminality of addicts while they are in treatment. Whether causality is involved in these relationships is not clear. Illicit drug use, delinquency and crime are best seen as closely interrelated behaviours, especially when they occur in contact with the supply of illicit drugs. Drugs and crime cannot be considered separately, in isolation from each other, especially if they emerge from a common set of circumstances.

The close connection between drug use and criminal behaviour is supported by many studies. A national survey in the United States examined the relationship between drug use and criminal behaviour. Results show that "drug use is a

strong correlate of being booked for a criminal offence, but age is the more important correlate of criminal involvement. There were few differences in models predicting violent as opposed to property crime, although minority status was a more important predictor of violent crime, and poverty was a more important predictor of property crime".

The close connection between crime and drug use is seen in studies of arrests. The Drug Use Forecasting Programme of the United States National Institute of Justice monitors drug use among recently arrested persons in selected cities. Periodically, examinations are conducted on a sample of arrests in booking facilities. A study of findings on males in 14 United States cities in 1989 used urine screening and selective confirmation tests for 10 drugs.

Preference for selection into the testing programme was given to persons charged with serious non-drug-related offences. With a total of nearly 3,000 tests, results were drug positive for cocaine for a high percentage of persons in New York (76%), Philadelphia (74%) and the District of Columbia (65%). Smaller cities had lower percentages of positive test results: Indianapolis (26%) and San Antonio (24%).

The test method used detects only drugs used 2-3 days prior to arrest so that actual drug use by arrests was probably higher than the results obtained. Upon interview, arrests revealed a surprisingly high percentage of needle sharing, with the lowest percentages found in Detroit (10%) and San Antonio (48%). In sum, from one-fourth to three-fourths of the serious non-drug offenders tested positive for cocaine, many tested positive for other drugs, and a substantial portion of these arrests are at significant risk of acquiring HIV and other blood-borne infections.

When drug problems in a community are perceived as serious, people must face unpleasant alternatives. They can accept the reality of drugs in their neighbourhood, adapting to a situation that they cannot hope to change immediately; they can change their life-style to reduce the threat of drug dealing and violence in their streets and buildings; they can change the environment by some form of community action either with or without the support of the police; or they can flee to safer housing if possible. Many of these alternatives are not available to persons living in poverty or with limited means. Thus, with fewer choices, the poor pay a greater personal price for drug problems than others. Another implication of crime is that the political agenda becomes filled with drug abuse issues and related problems, such as fear of violent crime, vulnerability of youth and increased prostitution.

Reactions in communities vary from resignation to indifference to active mobilization and resistance. Some citizens' groups organize themselves and have found ways to disrupt traffickers, from the use of telephone call-in on hot lines to boarding up vacant buildings previously occupied by drug users. A number of terrorists and organized criminal gangs are involved in or have close ties to the illicit drug trade. The link between the two is often money and power. One commentator cites an example of terrorists and drug dealers joining forces

as follows: "Colombian political terrorists... financial much of their operations through the drug trade, which has caused some "conventional" drug barons to explode in retribution". Colombia has emerged as a centre of trafficking in cocaine, blending highly organized social and economic interests with an underground specializing in drug crime. Organized crime is not restricted to one area of the world.

In Italy, faced with a socially entrenched, long-standing criminal element, authorities have enacted laws against the Mafia to seize and confiscate property illegally acquired. Aimed at depriving organized crime of their supply of money, these laws are reported to have had a positive impact. Political changes may affect smuggling patterns, organized crime and drug abuse. A study of the effects of opening the borders within the European Union has raised the issues of drug trafficking, terrorism and computer crime. In the past, close links existed between terrorist groups in several European countries. Fewer control points between member countries of the European Union may make it more difficult to maintain adequate security. In the countries of the former Soviet Union and with the opening of eastern Europe, major changes are taking place in social controls, rules and laws. New frontiers tempt smugglers of drugs and other merchandise. Illicit traffic in drugs generates enormous profits. Funds are obtained in or converted into an international currency and then moved into financial centres which can electronically transfer the money around the world.

The process of moving the money makes its origins indistinguishable from those of legitimately obtained currency. Shell, ghost or front operations are used in this process, as are businesses which handle large amounts of cash. Financial flows from drug trafficking may be estimated directly or indirectly. The direct approach involves analysis of international banking and capital account statistics for the balance of payments. Indirect methods use estimates of world drug production, the consumption needs of drug abusers or the actual seizures of illicit drugs.

Reviewing the situation with respect to opium, coca and cannabis, an OECD Financial Action Task Force has found that "although a large part of heroin, cocaine and cannabis production is consumed in industrialized countries, important quantities are also consumed in producing countries, especially heroin, where they also generate profits.... Psychotropic substances such as amphetamines/methamphetamine and LSD are produced in clandestine laboratories, including some within Task Force countries.

Large amounts of cash are derived, although not on the same scale as for cocaine and heroin". It was estimated in this report that sales of cocaine, heroin and cannabis amount to approximately \$122 billion per year in the United States and Europe, of which 50- 70 per cent or as much as \$85 billion per year, could be available for laundering and investment. Given the magnitude of these estimates, the economies of the countries involved are likely to be overwhelmed by drug money. In the case of countries whose economy is dependent on commodities, such as is the case with Colombia and its coffee exports, sharp

falls in the world price of the commodity may increase the importance of drug money to the national economy. At a different level, medications, which play an important role in the relation between physicians and patients, may also give rise to unlawful activity. Patients may pressure doctors for drugs when they are not indicated. The number of patients who misuse medications or seek psychoactive drugs for nonmedical use or for resale is sizeable.

As cited by an official of a large medical association, one estimate is that 3 per cent of patients somehow misuse prescriptions for controlled drugs. This report on the abuse of prescription drugs in the United States says that "in surveys by the National Institute on Drug Abuse, more than half of patients who sought treatment for or died of drug related medical problems were abusing prescription drugs". Physicians and pharmacists occasionally contribute to this problem for several possible reasons: for profit, or because they follow out of date professional practices, are duped by patients or do not recognize forged prescriptions.

In addition to physicians' or pharmacists' lack of professional management of drugs, counterfeit or other illegally manufactured drugs are widely available in some countries. Whether illicitly made in clandestine laboratories or diverted from stocks of legitimate drug manufacturers, the profits gained from selling such drugs are extremely high. With pharmaceutical production controls providing reliable quality, these drugs are stolen and then marketed along paths of least resistance and most profit. Stimulants, depressants, hallucinogenics and sedative-hypnotics are major types of drugs sold illicitly.

A common pattern is for psychotropic drugs to be made in industrialized countries and then shipped to markets around the world. With legitimate pharmaceutical companies having long lines of distribution and high potential profits, theft may occur anywhere along the chain of intended distribution. Dealers may buy or steal equipment to make pills or capsules, setting up businesses which appear to be involved in legitimate manufacture of drugs. The impact of drug abuse on law enforcement is extensive. At each step along the way of production, distribution and consumption, drugs have an impact because they divert time, energy and resources away from other responsibilities. Intelligence, surveillance, interdiction and seizure, prosecution and adjudication, sentencing, prisons, probation and parole—all of these measures may need to become specialized to deal with the complexity and volume of drug cases. Special drug courts are needed in some countries to process the load of drug cases. The overall costs of drug abuse to society are a subject of growing interest in the process of making national and international policy.

The illicit trafficker, the crop grower, the petty dealer in the neighbourhood, the money launderer and those who support them—all may make immediate profits. The proportion of persons that gets caught is not known and it is also unknown how long they stay in business. The profits of small-time dealers may be exaggerated, however. A study of 186 drug dealers reported a median net earning of \$721 per month from drug sales and \$2,000 per month for the 37 per cent of dealers who reported selling drugs on a daily basis. "Street-level drug

dealing appears to be a complement to, rather than a substitute for, legitimate employment, and it appears to be less profitable than media reports would suggest".

As for the careers of most dealers, it is likely that more dealers decide to quit on their own than are detected and stopped. The aim of the criminal justice system is not to catch all dealers but to be effective enough to dissuade most people from this illegal activity in the first place.

WORK AND EMPLOYMENT

Work status includes more than being either employed or unemployed. Also to be considered are the rate of underemployment and the extent of work in the informal sector. What is perceived as an employment problem also varies according to the views of society. For example, if youth have low status in a particular culture, the fact that they are disproportionately unemployed, not to mention under-employed, may be of little interest to decision makers. If a society places youth in a marginal status until some distant adulthood, it is even more difficult for young people who have been associated with drugs to obtain productive employment. These adverse effects on youth may also appear for female youth, who in some cultures do not normally have prospects for occupational roles outside the home. According to "an estimated 30 per cent of the world's labour force are not productively employed. More than 120 million people are registered as unemployed; some 700 million are underemployed".

Further, the disparity between the income levels of people in rich and poor countries is growing larger, and even when there has been a drop in poverty levels in some countries, the distribution of income has not correspondingly improved. Employment has constantly lagged behind economic growth for both developing and industrialized countries. The situation in both is similar in one respect: substantial increases in capital investment or productivity have not always created a corresponding number of jobs. One study terms this phenomenon "jobless growth".

Policy makers are searching for ways to increase the number of jobs along with economic growth. The number of young people is expanding faster than available jobs. The disparity between the size of the labour force and the number of persons employed is projected to worsen throughout the 1990s. ILO estimates, for example, that "the labour force for sub-Saharan Africa will grow 3.3% a year in the 1990s, while productive employment will increase by only 2.4% a year. Even this employment growth assumes an acceleration of GDP growth from 3.7% to around 5%.

This situation is unlikely to be any better in Latin America or South Asia". Increased rates of unemployment are projected to occur in the same age group as those persons most likely to use drugs and have drug problems. Add to this the fact that many of the jobs that are available are separated from the community and the family support network necessary to sustain workers, and the ingredients for intensification of social problems are clear. Education and training, often

mentioned as solutions to unemployment, may be part of the problem rather than the solution since the existing supply of educated and trained persons frequently exceeds the demand in many countries. Competition for jobs will likely increase and employers may become even more selective in hiring young people. Drug abuse occurs more frequently in young people than in other age groups.

The risk factors for drug use often occur before entry into the workforce. The drug abuse problems of the community are, therefore, brought into the workplace. The age group with the highest frequency of drug use is often 18-35 years, although wide variation exists between countries. Thus the point of maximum benefit of prevention programmes may occur before or at the point of entry into the labour market. Employers can make major contributions to the prevention of drug abuse, helping themselves and the community in the process. Effective workplace initiatives to prevent drug abuse should begin in the community and be directed at young persons who are potential workers.

In many parts of the world, the workplace and living areas are not separate. Even if property lines set these two areas apart, people pass back and forth frequently between the two. The close connection between the family and the work setting make it more difficult to use formally organized welfare services or assistance programmes to assist with workers' problems. Moreover, community or government agencies, such as occupational safety and health departments, are less able to assist workers in informal or in home work settings.

The relationship between drug and alcohol abuse and the workplace is significantly influenced by national, social, cultural, ethnic, religious and gender issues. Cultural or group practices may also facilitate drug or alcohol abuse. Drinking or drug abuse cultures exist in some workplaces and some of them set a standard that may be imposed on the non-user. In addition, conditions in some workplaces involve exposure to harmful or dependence-producing substances, such as glue in shoe factories. Employees may follow fads or local customs and accept substance abuse, holding views that are clearly inconsistent with known facts about their physical effects. A recent study in Portugal found that there are "still some workers who believe they can work with more precision if they drink a certain amount of wine and there are some employers, both in the building and agricultural sector, who offer free wine to get some work done".

While the consequences of unemployment vary, it usually reduces the ability of the person to participate in the social, economic and political life of the community. Unemployment is itself a marginal status so long as employment is the norm. With increased migration from rural areas to cities, more competition exists for jobs. Without training and employment, young people may find themselves on the fringes of an urban society.

Since the expectation exists for most people to engage in productive work of some kind, unemployment may become a state of idleness. When employment means separation from the family and friends, social relationships may deteriorate. If living at home, the unemployed person may feel that the lack of

work places an undue burden on the family that may already have difficulty meeting the needs of its members. The workplace reflects the strengths and weaknesses of the community. To assess the scope of drug and alcohol problems, a Canadian study carried out three surveys of more than 2,000 persons in the Alberta workforce, including both the current workforce and those actively seeking work.

Less than 1 in 16 persons reported using illicit drugs, mainly marijuana, in the past 12 months. Among current drug users, 18 per cent reported at least two personal problems associated with their drug use. Alcohol was the most frequently used substance. In research carried out more than 10 years ago, disruptive drug use was examined in an extensive study of 468 young adults in Los Angeles, one-third of whom were minorities. Thirty-one per cent admitted to being drunk, stoned or high on at least one psychoactive substance while at work or school during the past six months. Less than 13 per cent of these young adults had sold any illicit drug during the past six months. Disruptive drug use was not limited to a single substance and characteristically involved multiple substances. Alcohol was the most prevalent class of substance used, and marijuana was the most prevalent individual substance used at work or school.

The magnitude of the relationship of disruptive drug use and work-related variables was small to moderate. However, “disruptive use of all drugs was significantly correlated with the more times that one lost a job during the past four years, losing a job in the past six months, increased trouble with job, increased vandalism at work, and increased seeking of support and advice from family and friends for a work problem”.

A recent study carried out by ILO and the Commission of the European Communities examined drugs and alcohol in the European workplace. A total of 237 respondents from employers’, enterprises’ and workers’ organizations provided information on drug and alcohol uses of nearly 1.5 million workers in Europe.

The frequency of drug- and alcohol-related problems during the last three years was obtained for 13 different problems. More than half of the sample reported specific performance impairments and absences from work as a result of drug-related problems. In about two out of five cases, organizations had dismissed employees for drug-related reasons. This study also compared the five most frequent problems related to drug and alcohol for the same 237 respondents. The results indicated that drug and alcohol use were associated with the same types of problems, but those associated with alcohol occur more frequently than those with drugs. More respondents thought drug and alcohol problems in combination are increasing rather than decreasing. Also, 87 per cent of the respondents thought an increase in the number of workers with prescription drug problems had taken place over the last three years.

The percentages of respondents concerned about alcohol and drugs as potential causes of work-related problems were as follows: alcohol (87%), prescription drugs (64%), cannabis (54%), opiates (53%) and stimulants (50%).

Alcohol was clearly the priority concern, with prescription drugs second. Twenty-three enterprise respondents reported that 1-5 problem drug users had been identified in their enterprises and 15 said 6-50 persons had been identified as having problems.

**Table. Most Frequent Problems
Related to Drugs and Alcohol (N-237)**

Alcohol	%	Drugs	%
Impaired Performance	87.5	Impaired performance	55
Intoxication at Work	81.4	Absence from Work	54.5
Lateness	81.4	Disciplinary Problems	47
Absence from Work	78	Dismissal	41.8

A recurrent issue concerning workplace substance use and abuse is whether workers' substance use should be a concern of employers. Some employers saw productive employment as incompatible with any illicit drug use, whether it takes place at the work site or elsewhere. Others indicated that the employer's concern should be only with job performance and that the private lives of workers were not their business. This complicated issue is related to the nature of the job, the degree of responsibility employees have for the safety and welfare of others and the social and cultural values of the family and community.

The setting in which drugs are taken influences the effects they have. Since the work setting is, by definition, designed to produce goods or services, the effects of drugs are influenced by the expectations of job behaviour and those of co-workers and supervisors. Similar to the situation at home or in the community, there appears to be no sure way to assess drug taking or drug-related behaviour in the workplace.

A recent review stated that "alcohol and other drug use by work force members cannot be reliably inferred from performance assessments, since performance decrements may have many causes.

Conversely, performance decrements are often not obvious despite alcohol and other drug uses. More direct measures of the quality of worker performance hold promise for determining workers' fitness to perform specific jobs at specific times, regardless of the potential cause of impairment". Drug effects seen in the workplace depend partly on the Performance requirements of the job. Tasks that require higher level judgement, constant attention, immediate memory and fine motor skills are more easily disrupted by drugs than physical labour. Marijuana, for example, may disrupt cognitive functions, increase response time and lower psychomotor accuracy.

Opiates, even in low doses, may bring about mood changes, decrease activity and impair psychomotor skills related to driving and related tasks. Cocaine, at low doses, may enhance performance on simple tasks as long as the takers do not overestimate what they can do and do not take risks beyond their capacity to perform. Repeated use of cocaine, crack or related substances quickly leads to compulsive use, dependence and problems on and off the job.

In spite of all these qualifications, it is clear that drug problems reduce job attendance and impair performance. Do alcohol and drug abusers cost the workplace more than non-users? The ILO study referred to found that two-thirds of all participants agreed that alcohol and drug abuse resulted in significant costs in European workplaces. Enterprises, workers and employers did not significantly differ on this question when statistical tests were carried out on questionnaire responses.

Costs were primarily absenteeism, reduced motivation and accidents or injuries at work. In a study of the relationship between drug use and subsequent job performance at the United States Postal Service, pre-employment tests of applicants were correlated with later behaviour on the job at several intervals. Positive pre-employment drug test results were correlated with absenteeism and involuntary separation. It was found that differences between those who tested positive and those who tested negative increased with time. In this study, “updated absenteeism and turnover data were collected for inclusion into the utility analysis follow-up. The most recent update indicated that the absenteeism and turnover differences between the positives and negatives have further increased but the rate of increase appears to be levelling off. Estimates based on employees who had an average of 3.3 years of tenure suggest that the Postal Service, by screening out applicants who test positive for drugs, can expect to save approximately \$105 million dollars in absenteeism and turnover cost over the tenure of one cohort of employees”. The cost-effectiveness of the screening technique depends, in part, on the base rate of the behaviour involved.

If a workplace or other setting has a very low rate of drug use to begin with, fewer applicants will test positive and the programme cost to find an employee who tests positive will increase. The implications of this point were stressed in a meeting on drug and alcohol testing in the workplace at which it was stressed that “any economic analysis of workplace drug screening is likely to be greatly influenced by the prevalence of drug use in the population screened”. In sum, drug problems have a costly impact on the workplace as well as the community.

Employers and workers alike are concerned about the consequences of drug and alcohol abuse. According to one expert, “alcohol and drug involvement in accidents, and the impact on such employment indicators as absenteeism, turnover, medical claims, safety risk and lost productivity, confirm that there are direct costs involved with drug or alcohol use in the workplace”.

7

Development of New Drugs

Over the centuries, herbalists and apothecaries have experimented with potions derived from plant and animal sources. Indeed, some drugs are still derived from natural sources. For example, the morphine group of drugs is extracted from the fruiting head of the opium poppy and digoxin is derived from the foxglove plant. However, the majority of drugs are produced through chemical synthesis. The pharmaceutical industry is one of the largest and most successful international organizations. Companies are continually striving, through research and development, to produce new drugs. Current research into gene technology is likely to revolutionize the development of new drugs in the future.

The development of new drugs is monitored by government agencies who evaluate data on the activity and safety of new drugs before the company is awarded a product licence. In the USA the agency is the Food and Drug Administration (FDA), in the UK it is the Medicines Control Agency (MCA).

Agencies do not always agree, therefore a drug may have a product licence in one country but not in another. The product licence states the therapeutic purpose for which the drug may be used. This, again, may vary from one country to another. The development of new drugs can take between 10 and 12 years and cost several hundred million dollars.

Dosage forms for Drug Delivery to the Body

There are many different dosage forms through which drugs can be delivered to particular sites in the body. Examples of dosage forms for drugs subject to restrictions in sport. The selection of the most appropriate dosage form depends on a number of factors:

- Speed of action
- Oral preparations are slow to be absorbed from the gastrointestinal tract. Modified release tablets can slow this process even more, to give a longer duration of action.
- Injections, particularly intravenous, are very rapid.
- Aerosol inhalers provide rapid effects on the airways.
- Transdermal patches provide a slow sustained delivery by absorption through the skin.
- Site of action
- Oral and most injection preparations lead to extensive distribution of the drug around the body.
- Creams/ointments/ear drops/eye drops/aerosol inhalers are each delivered to the site where they are specifically needed.
- Reduction of side-effects
- Generally, the more widely distributed the drug is in the body, the greater the chance of side-effects. Therefore, topical administration has advantages over systemic delivery by mouth or by injection.

Table. Major routes of administration for drugs.

Route	Examples of dosage forms
Oral	Tablets, capsules, syrups
Buccal	Lozenges, sublingual (dissolved under the tongue) tablets, buccal sprays
Injections	Intravenous, intramuscular, subcutaneous, intra-articular (into a joint such as the knee)
Topical	Dermatological (creams, ointments, lotions, sprays) Drops (ear, eye, nose)
Inhalation	Aerosols, dry powders
Rectal	Suppositories
Vaginal	Pessaries

THE ABSORPTION, DISTRIBUTION, METABOLISM AND ELIMINATION OF DRUGS

For a drug to exert its effect it must reach its site of action. This will involve its passage from the site of administration to the cells of the target tissue or organ. The principal factors which can influence this process are absorption, distribution, metabolism and elimination. Consideration of these factors is known as the pharmacokinetics of drug action.

Absorption

The absorption of a drug is, in part, dependent upon its route of administration. Most drugs must enter the bloodstream in order to reach their site of action and the most common route of administration for this purpose is orally, in either liquid or tablet form. Absorption from the gut can be affected by:

- Lipid solubility of the drug
- Gastrointestinal motility

- Gastrointestinal pH (acidity)
- Physicochemical interaction with the contents of the gut (enzymes, food, other drugs)

Where a drug is required to act more rapidly, or is susceptible to breakdown in the gastrointestinal tract, the preferred route of administration is by injection. There are a number of routes through which drugs are injected and the main ones are subcutaneous (under the skin), intramuscular (into a muscle) and intravenous (directly into the bloodstream via a vein).

Many drugs can be applied topically for a localized response. This may take the form of applying a cream, ointment or lotion to an area of skin. IOC regulations regarding the route of administration for drugs which are subject to restrictions treatment of abrasions, lesions, infections or other such dermatological conditions. Topical applications may also involve applying drops to the eye, the ear or the nose. Drugs administered by a topical route are not normally absorbed into the body to the same extent as drugs administered orally. Consequently, the IOC regulations regarding certain drugs are complex.

Distribution

Apart from topical administration, a significant proportion of a drug will reach the bloodstream. Most drugs are then dissolved in the water phase of the blood plasma. Within this phase some of the drug molecules may be bound to proteins and thus may not be freely diffusible out of the plasma. This will affect the amount of drug reaching its target receptors. Plasma protein binding is but one factor in the complicated equation of drug distribution. As a general rule the amount of drug reaching its target tissue is a small proportion of the total drug in the body. Most of the drug remains in solution within the various fluid compartments of the body.

The principal fluid compartments are: the plasma, the interstitial spaces between the cells and the fluid within the cells of the body (intracellular). These compartments are separated by capillary walls and cell membranes, respectively. Therefore, drugs which can pass through the capillary wall but are unable to cross cell membranes are distributed in the extracellular space and those drugs which permeate all membranes are found within the total body water.

Very few molecules, with the exception of proteins, are unable to cross capillary walls; hence, most drugs, except those which extensively bind to plasma protein, can be found outside the plasma. For a drug to be able to penetrate cell membranes it must be lipid soluble as well as water soluble. The majority of drugs are lipid soluble and are therefore widely distributed throughout the total body water.

Drugs which are not lipid soluble are unable to penetrate the cells of the gastrointestinal tract and are therefore poorly absorbed orally. Such drugs must be administered by injection. An additional obstruction to the passage of drugs occurs at the 'blood-brain barrier' which comprises a layer of cells which covers the capillary walls of the vessels supplying the brain. This barrier effectively excludes molecules which are poorly lipid soluble. The blood-brain barrier is

an important factor to be considered in drug design since a drug's ability to cross this barrier can influence its potential for centrally mediated side-effects.

Metabolism

The body has a very efficient system for transforming chemicals into safer molecules which can then be excreted by the various routes of elimination. This process is known as metabolism and many drugs which enter the body undergo metabolic change. There are several enzyme systems which are responsible for producing metabolic transformations. These enzymes are principally located in the cells of the liver but may also be found in other cells. They produce simple chemical alteration of the drug molecules by processes such as oxidation, reduction, hydrolysis, acetylation and alkylation. The consequences of drug metabolism may be seen in a number of ways:

- An active drug is changed into an inactive compound. This is a common metabolic process and is largely responsible for the termination of the activity of a drug.
- An active drug can be metabolized into another active compound. The metabolite may have the same pharmacological action as the parent drug or it may differ in terms of higher or lower potency or a different pharmacological effect.
- An active drug can be changed into a toxic metabolite.
- An inactive drug can be converted into pharmacologically active metabolites. This mechanism can occasionally be used for beneficial purposes where a drug is susceptible to rapid breakdown before it reaches its site of action. In this case a 'prodrug' can be synthesized which is resistant to breakdown, but which will be metabolized to the active drug on arrival at its target tissue.

Generally speaking, the metabolism of drugs results in the conversion of lipid-soluble drugs into more water-soluble metabolites. This change affects distribution, in that less lipid-soluble compounds are unable to penetrate cell membranes. The kidneys are able to excrete water-soluble compounds more readily than lipid-soluble molecules since the latter can be reabsorbed in the kidney tubules and therefore re-enter the plasma.

Metabolism is a very important factor in determining a drug's activity since it can alter the drug's intrinsic activity, its ability to reach its site of action, and its rate of elimination from the body. Many drugs are completely metabolized before being excreted in the urine.

THE IOC TESTING PROCEDURES IN DOPING CONTROL DETECT

Elimination

There are many routes through which drugs can be eliminated from the body:

- Kidneys (urine)
- Salivary glands (saliva)
- Sweat glands (sweat)

- Pulmonary epithelium (exhaled gases)
- Mammary glands (mammary milk)
- Rectum (faeces)

Excretion via the rectum in the faeces may take place either by passage from the blood into the colon or through secretion with the bile.

The most important route for drug excretion, however, is through the kidneys into the urine. Most drugs and their metabolites are small molecules which are water soluble and as such can be easily filtered through the capillaries within the glomeruli of the kidneys. Having been filtered out from the plasma, the molecules may be reabsorbed, to a greater or lesser extent, from the renal tubules. This will depend on their lipid/water partition coefficients, and on whether there is a specific membrane carrier transport system for the particular molecule.

The net effect, in all cases, is that a constant fraction of the drug is eliminated at each passage of the blood through the kidney filtration system. The drug and/or its metabolites are then voided with the urine. It is for this reason that urine sampling is the principal method used in dope testing. The methods available for detecting drugs and their metabolites are extremely sensitive and capable of determining both the nature and the concentration of the drug/metabolite present.

Peptide hormones, which are synthesized in the body, have produced difficulties with regard to dope testing. At the time of writing, a suitable test for human growth hormone, acceptable to the IOC, had not been implemented, despite significant resources having been invested in developmental research.

On the other hand, an accredited testing system for erythropoietin (EPO) was introduced for the first time at the Sydney 2000 Olympic Games. The test comprised both a urine-based and a blood-based test and relied on the fact that EPO, used by athletes, is derived from recombinant DNA technology. This instils subtle differences in the properties of recombinant EPO (rEPO) compared with endogenous EPO, produced by the body. The urine test used electrophoretic techniques to distinguish between rEPO and EPO. The blood test identified characteristic changes in blood cell morphology, induced by rEPO.

Pharmacological means have been used in an attempt to mask drug-taking activities. These have included the concomitant use of drugs such as probenecid, whose therapeutic use is in the treatment of gout. Probenecid has also been used for many years in combination with certain antibiotics, as it will delay the excretion of these antibiotics and therefore prolong their antibacterial effect within the body. This property of probenecid has been used by competitors to try to delay the excretion of banned drugs such as anabolic steroids and thereby avoid detection. However, this effect is not absolute and the testing procedures are sophisticated enough to detect minute quantities of drugs in the urine. Probenecid itself has been on the IOC list of banned substances since 1987.

EFFECT OF EXERCISE ON PHARMACOKINETICS

Under most circumstances exercise does not affect the pharmacokinetics of drug action. During severe or prolonged exercise, blood flow within the body

will be altered, with a decrease in blood supply to the gastrointestinal tract and to the kidneys. However, there is little documentary evidence to suggest that such changes significantly affect the pharmacokinetics of the majority of drugs.

Drugs and their Targets

Ideally, a drug should interact with a single target to produce the desired effect within the body. However, all drugs possess varying degrees of side-effects, largely dependent on the extent to which they interact with sites other than their primary target.

During their development, drugs undergo a rigorous evaluation in an endeavour to achieve maximum selectivity. The aim of selectivity is to increase the drug's ability to interact with those sites responsible for inducing the desired therapeutic effect whilst reducing the drug's tendency to interact with secondary target sites which are responsible for producing its side-effects.

Drugs can interact with enzymes, carrier molecules and ion channels in cell walls to produce their pharmacological effect. However, the sites through which most drug molecules interact are known as receptors.

These receptors are normally specific areas within the structure of cells. They may be located intracellularly but most receptor sites are found on cell membranes. Receptors are present within cells to enable naturally occurring substances, such as neurotransmitters, to induce their biochemical and physiological functions within the body. We exploit the fact that receptors exist, by designing drugs to stimulate (agonists) or block (antagonists) these receptors and thereby intensify or reduce biochemical processes within the body.

The interaction between a drug (ligand) and a receptor is the first step in a series of events which eventually leads to a biological effect. The drug receptor interaction can therefore be thought of as a trigger mechanism.

There are many different receptor sites within the body, each of which possesses its own specific arrangement of recognition sites. Drugs are designed to interact with the recognition sites of particular receptors thereby inducing an effect in the tissue within which the receptors lie. The more closely a drug can fit into its recognition site the greater the triggering response and therefore the greater the potency of the drug on that tissue.

In designing drugs it is sometimes necessary to sacrifice some degree of potency on the target receptor site in order to decrease the drug's ability to interact on other receptors. A tendency towards the therapeutic effect and away from side-effects is thereby achieved, thus producing a greater degree of selectivity.

LEGITIMATE THERAPEUTIC USE OF DRUGS

Like any other person, an athlete is liable to suffer from a major or minor illness that requires treatment with drugs. A typical example might involve a bacterial or fungal infection necessitating the use of an antibiotic or antifungal agent. How many sportsmen or women have experienced athlete's foot? Apart from the slight risk of side-effects due to the drug's action, it is difficult to perceive how such a

treatment would affect an athlete's performance. A less common but more serious medical condition would be epilepsy or diabetes. Under these circumstances it would be inconceivable for an athlete to consider participating in sport without regular treatment with drugs. For many minor illnesses, from which we all suffer from time to time, such as coughs, colds, gastrointestinal upsets and hay fever, it is possible to obtain medications without visiting the doctor.

There is a wide range of preparations available for the treatment of minor illnesses which can be purchased from a pharmacy without the need for a doctor's prescription. The drugs contained in these over-the-counter (OTC) medications are relatively less potent than those available on prescription. Athletes should carefully scrutinize the label on any medication or substance which is being taken to ensure that a banned substance is not included in the medicine.

Examples of such substances include the psychomotor stimulant, caffeine and the sympathomimetic amines, ephedrine, pseudoephedrine, phenylpropanolamine and phenylephrine. Though dose levels are low in OTC medications, the sophisticated methods used for the analysis of urine are perfectly capable of detecting these drugs or their metabolites. The IOC introduced urinary cut-off levels for these OTC drugs in the late 1990s. If these drugs are detected in urine samples, at concentrations below the cut-off levels, the athlete will not be sanctioned.

It is also in the athlete's interest, in the event of visiting a medical practitioner, the nature of any drug treatment, to avoid the prescribing of prohibited substances wherever possible. As with any medical condition requiring treatment, a decision needs to be taken as to whether the athlete is fit to compete at all.

Performance Continuation

Permitted drug treatments to alleviate the symptoms of minor ailments such as sore throats, colds and stomach upsets can be seen as simply allowing the athlete to continue performing during a temporary period of minor ill-health. Athletes frequently experience injuries involving muscles, ligaments and tendons. Provided that the injury is not too serious, it is common for the athlete to take palliative treatment in the form of analgesic and anti-inflammatory drugs. This enables the athlete to continue to train and even compete during the period of recovery from the injury. The wisdom of such action is perhaps open to question but the use of analgesics under these circumstances is unlikely to confer an unfair advantage.

The doping regulations restrict the type of analgesics which can be used and control the methods of administration for drugs such as corticosteroids. In weighing up the consequences of giving a pain-killing injection, a doctor would probably take into account: the time available before the athlete is in competition and the extent of the injury. In contrast an athlete is more likely to be thinking about the effort which has been expended in reaching this stage, the remaining opportunities, the rewards from sponsors, the acclaim from family and friends, and often the risks of treatment are inadequately reviewed.

Table: Drugs used socially or recreationally that are subject to IOC regulations.

Drug	IOC regulation
Amphetamines	Prohibited class IA (stimulants)
Cocaine	Prohibited class IA (stimulants)
Caffeine	Prohibited class IA (stimulants) (if urine level above 12 µg/ml)
Narcotic analgesics	Prohibited class IB (narcotics)
Alcohol	Prohibited in certain circumstances, class IIIA
Marijuana	Prohibited in certain circumstances, class IIIB

Certainly, the inappropriate injection of corticosteroids could have deleterious effects on joints systemic complications are not uncommon. Even non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin, though widely used, are liable to produce adverse effects such as gastrointestinal bleeding and ulceration has suggested that NSAIDs may not hasten the return of injured athletes back to competition.

Recreation/social Use

Many cultures, throughout the ages, have used the drugs for social and recreational purposes. These substances range from caffeine, a constituent of beverages frequently consumed in many societies, through the generally socially tolerated drugs, such as alcohol and marijuana, to the hard, addictive drugs such as the narcotic analgesics related to heroin and morphine and the psychomotor stimulants such as cocaine. The use of these drugs, particularly in Western cultures, has grown in recent years. This has been reflected in the increasing numbers of positive test results, particularly for marijuana, from IOC accredited laboratories. Although these drugs may be taken in a social or recreational setting, they are all potential performance-enhancing drugs, hence their subjection to IOC regulations. Amphetamines, cocaine and narcotic analgesics are banned completely. Caffeine is banned but only if urine concentrations rise above 12 micrograms per millilitre, thus allowing for 'normal' consumption of caffeine-containing beverages. Alcohol and marijuana are prohibited only in certain sports.

Amphetamines

In the UK, it has been estimated that 10 per cent of 16- to 59-year-olds, rising to 20 per cent of 16- to 29-year-olds have tried amphetamine. Amphetamines are used socially to produce alertness and energy. However, they also impair judgement and concentration and heavy use leads to depression and anxiety. There is a risk of addiction with regular use of amphetamine.

Cocaine

Cocaine is a powerful stimulant. It is usually inhaled as a powder but a crystalline ('crack') form of cocaine is smoked as a vapour. The complex

pharmacology of cocaine leads to a wide spectrum of adverse effects, including a negative effect on glycogenolysis, paranoid psychosis, seizures, hypertension and myocardial toxicity, which could lead to ischaemia, arrhythmias and sudden death, especially following intense exercise. Smoked 'crack' cocaine is more dangerous as the rate of absorption is greater, leading to a more intense effect on the cardiovascular system. After regular use, addictive cravings for cocaine can persist for a period of months.

Some bizarre fatalities have been linked to concomitant use of cocaine with alcohol and anabolic steroids, which may have resulted from the production of a novel, cardiotoxic metabolite, norcocaine.

Caffeine

Perhaps the most widely used social drug is caffeine, which is present in many of the beverages that we consume daily. These include tea, coffee and many soft drinks. At the levels at which caffeine is normally consumed its pharmacological effects are minimal. However, attempts have been made to use caffeine as a doping agent by taking supplements in the form of tablets or injections. This has necessitated the introduction into the doping control regulations of an upper limit for caffeine present in urine samples (12 micrograms per millilitre).

NARCOTIC ANALGESICS

The narcotic analgesics are readily absorbed when taken orally, by injection or by inhalation. They are potent drugs whose effects are primarily on the central nervous system. The discovery of opiate receptors within the brain has helped in the understanding of the mode of action of morphine, heroin and other related narcotic analgesics. They appear to be mimicking the effect of certain endogenous opiates, known as endorphins and enkephalin.

They depress certain centres of the brain resulting in reduced powers of concentration, fear and anxiety. Prolonged pain, more so than acute pain, is reduced. Some centres of the brain, such as the vomiting centre and those associated with salivation, sweating and bronchial secretion, are initially stimulated, though they become depressed on continued use of the drugs. The respiratory and cough centres are depressed. Respiration becomes slow, it deepens and may be periodic in nature. Death as a result of overdose of narcotic analgesics normally occurs through respiratory depression. Characteristic side-effects of narcotic analgesics include constricted pupil size, dry mouth, heaviness of the limbs, skin itchiness, suppression of hunger and constipation. Athletes are in danger of addiction to analgesics as they attempt to mask injury to train or to compete.

Narcotic analgesics are renowned for their ability to cause tolerance and dependence in the regular user. Tolerance to the drugs occurs over a period of time and increasing dose levels are needed to produce the same pharmacological effect. Dependence on narcotic analgesics leads to physical withdrawal symptoms.

Symptoms normally begin with sweating, yawning and running of the eyes and nose. These are followed by a period of restlessness which leads to insomnia, nausea, vomiting and diarrhoea. This is accompanied by dilation of the pupils, muscular cramp and a 'goose flesh' feeling of the skin commonly referred to as 'cold turkey'. Relief from the physical withdrawal symptoms of narcotic analgesics can be achieved by the readministration of these drugs, hence the difficulty that addicts experience in trying to terminate their dependence on narcotic analgesics. Methadone, a synthetic opiate, is used to treat heroin addiction. Methadone itself has addictive properties and accounts for many deaths through overdose.

Alcohol

Alcohol is the most commonly used drug in Britain, with only 7 per cent of males and 13 per cent of females describing themselves as non-drinkers. Though taken for recreational purposes, the effects of alcohol may well be manifested in the field of sport. Some sporting events even take place in an environment where alcohol is freely available both to the spectator and the performer. Alcohol suppresses inhibitions but also impairs judgement and reflexes. Alcoholics risk premature death through cirrhosis of the liver, accidents and suicide.

Marijuana

Marijuana is a drug derived from the hemp plant and which is normally taken by inhalation in the form of a cigarette but can be taken orally. The precise mode of action of cannabis is not fully understood but the effects produced are principally euphoria and elation accompanied by a loss of perception of time and space. A single 'joint' can slow reactions for up to 24 hours.

Conflicting opinions exist on the dangers associated with prolonged use of cannabis. There is evidence that short-term recall memory can be impaired and that permanent brain damage may be induced. Marijuana can adversely affect psychomotor functions; these effects may last up to 24 hours following its use. Although unlikely to be used as a performance-enhancing substance in sport, events in recent years have shown that marijuana is used as part of the lifestyle of many athletes.

This was illustrated in the landmark case of the Canadian snowboarder, Ross Rebagliati, who tested positive for marijuana and was stripped of his gold medal at the 1998 Winter Olympic Games in Nagano, only to be re-instated when the IOC and the International Ski Federation realized that they were each operating different rules regarding the banning of marijuana. Apart from the validity of the test result, Ross Rebagliati claimed that the marijuana was present in his body through secondary, passive smoking, not as an attempt at performance enhancement.

Controls have been introduced in motorized sports and a number of professional sports such as association football and rugby league have regulated against its use in order to preserve the reputation of the sport and the health of

players. The IOC have recently introduced a clause that states that a urine concentration of the metabolite, carboxy-THC, less than 15 nanograms per millilitre, does not constitute doping at Olympic Games.

PERFORMANCE ENHANCEMENT

This particular area of drug use is potentially the most serious threat to the credibility of competitive sport and has become subject to doping control regulations. It concerns the deliberate, illegitimate use of drugs in an attempt to gain an unfair advantage over fellow competitors. It would be appropriate, at this point, to provide a definition of a performance-enhancing drug. Unfortunately a precise definition is extremely difficult to formulate for a number of reasons.

- A particular drug which may be considered performance enhancing in one sport may well be deleterious to performance in another sport. Drugs with a sedative action, such as alcohol and beta blockers, would be considered useful in events such as rifle shooting where a reduced heart rate and steady stance are important. However, these drugs would be counterproductive, if not dangerous, in most other sports.
- Should performance-enhancing drugs be defined by the fact that they are 'synthetic' or 'unnatural' substances to the body? This type of definition would exclude testosterone and other naturally occurring peptide hormones which are used for illicit purposes. 'Blood doping', the method by which competitors store quantities of their own or other blood in a frozen state and re-infuse it prior to competing in an attempt to increase oxygen carrying capacity, would also be excluded by such a definition.
- Should substances used in special diets, such as vitamin supplements, be classed as performance-enhancing drugs? Certainly other naturally occurring substances, such as creatine and L-carnitine, have been widely used in the expectation that they would enhance performance.
- Perhaps the greatest difficulty in precisely defining performance-enhancing drugs concerns the prescribing and use of drugs which can be perceived as possessing performance-enhancing properties but which are used for legitimate therapeutic purposes. This problem is readily illustrated when considering athletes who suffer from asthma. One of the most important classes of drugs used for their treatment is the group of bronchodilators, many of which are sympathomimetics and therefore the subject of doping control. Since asthmatic attacks are frequently associated with stress, of which competitive exercise is an extreme case, then this obviously produces severe problems for the asthmatic if they are to avoid transgressing the doping control regulations. Selected bronchodilator sympathomimetics are allowed under doping control regulations.

The issue of performance enhancement is one which will retain media attention at major sporting events. Definitions may actually obscure the

fundamental principle as explained by Sir Arthur Porritt, first Chairman of the IOC Medical Commission: 'to define doping is, if not impossible, at best extremely difficult, and yet everyone who takes part in competitive sport or who administers it knows exactly what it means.

The definition lies not in words but in integrity of character'. In essence, it encompasses the principle of cheating, defined in the antidoping regulations of individual sports.

ANTI-ANXIETY DRUGS AND SPORT

Throughout civilization and up to the present day human ingenuity has found various ways of coping with the stresses that life brings. Sometimes these entail a form of escapism into a drug-induced illusory world to eschew temporary troubles. A resort to alcohol, for example, can bring a transient euphoric uplift from pressing matters of the day. These strategies are perhaps truer today than they were in Dionysian cultures, exceptions being those countries where alcohol is taboo for religious reasons. It is generally believed that stress-induced illness is a phenomenon of contemporary urban civilization. The widespread prescription of tranquillizers and the high incidence of alcohol addiction support this view. Their impact on fitness and well-being has received scant attention.

Amongst athletes, participation in sports brings its own unique form of stress, usually before the more important contests. Though a certain amount of pre-competition anxiety is inevitable, the anxiety response varies enormously between individuals, with some people coping extremely poorly. Many find their own solutions to attenuate anxiety levels, albeit sometimes with exogenous aids. Anxiety may adversely affect performance, especially in activities highly demanding of mental concentration and steadiness of limbs. This has prompted the use of anti-anxiety drugs, although some are not permitted in many sports.

The relationship between anxiety and sport performance is first explored. The concentrates on alcohol, its metabolism in the body and its effect on the central nervous system. The interactions between alcohol and health are then considered. Its impact on physiological responses to exercise and the uses in sport are examined next. The main 'minor' tranquillizers, the benzodiazepines and melatonin, finally, the uses and abuses of other anti-anxiety drugs are described.

ANXIETY AND PERFORMANCE

The psychological reaction to impending sports competition is variously referred to as anxiety, arousal, stress or activation. Though these concepts are not synonymous, their relationships to performance have sufficient similarities to group them together for the present purposes. Anxiety denotes worry or emotional tension, arousal denotes a continuum from sleep to high excitement, stress implies an agent that induces strain in the organism and activation refers to the metabolic state in the 'flight or fight' reaction. Irrespective of which concept is adopted, the effects of the biological responses on performance are

generally assumed to fit an inverted-U curve. A moderate level of 'anxiety' about the forthcoming activity is deemed desirable to induce the right levels of harnessed motivation for action. The simpler the task the higher will be the level of anxiety that can be tolerated before performance efficiency begins to fall.

Although the inverted-U model is somewhat simplistic, it does illustrate that over-anxiety has a detrimental effect on the physical and psychomotor elements that comprise sports performance. In such instances anxiety-reducing strategies will have an ergogenic effect. The athlete or mentor may have to choose between mental relaxation techniques or drugs to alleviate anxiety.

There are various indices which the behavioural scientist employs in measuring anxiety in field conditions, such as sport, especially prior to competition. These include hand tremor, restlessness or other subjective estimates of 'tension', paper and pencil tests and so on. Linked to these are physiological indices which demonstrate increased sympathetic tone. These measures include muscular tension as indicated by electromyography, galvanic skin response or skin conductance and elevated concentrations of stress hormones or their metabolites in blood or in urine. These variables may be important to consider if the mechanisms by which the ergogenic or adverse effects of anxiety-reducing drugs operate are to be understood.

High levels of anxiety generally militate against performance and so favour attempts to reduce anxiety. Anxiety level depends very much on the nature of the sport as well as on the individual concerned. Generally, high anxiety is associated with brief and high-risk activities. A league table of anxiety responses pre-start as reflected in emotional tachycardia, shows motor-racing and downhill skiing to be top of the list. Activities like para-chuting and high acceleration rides in leisure parks induce strong anxiety reactions albeit mingled with a feeling of exhilaration. In these cases heart rates have been found to correlate highly with adrenaline levels in blood and in urine. Possibly because of the practice of relaxation techniques in this group and the long duration of such games.

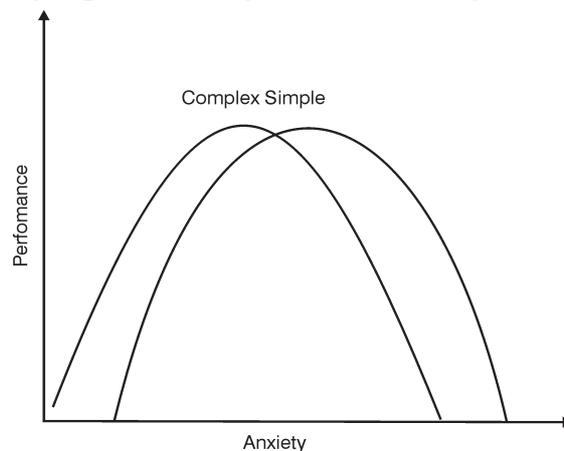


Fig. The Relationship between level of Anxiety and Performance Efficiency for Simple and Complex Tasks.

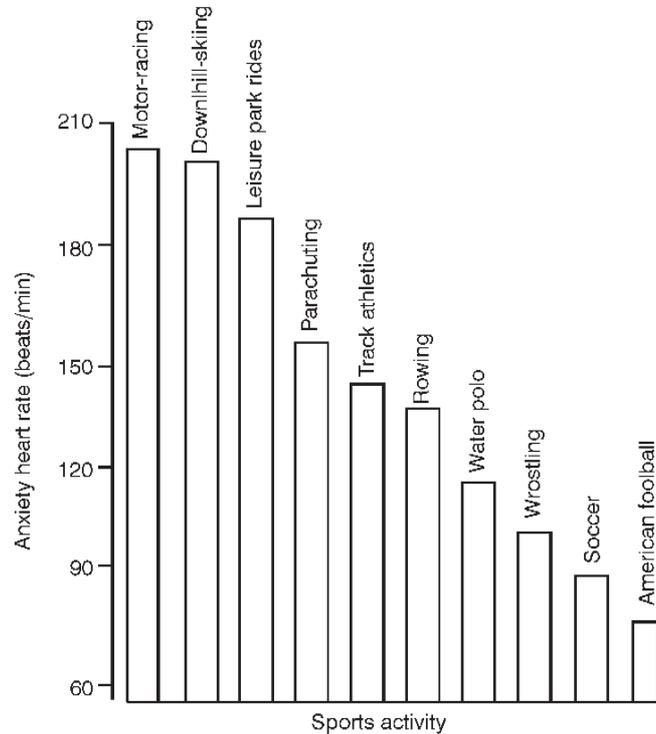


Fig. Pre-activity Heart rate for Various Sports and Recreations.

Professional athletes regularly subjected to situations of high psychological stress tend to adapt. At this elite level highly anxious personalities are rare. The anxiety reaction of professional soccer players, for example, is highly reproducible although there are noticeable trends. Resting heart rates in the dressing-room tend to be higher when playing at home rather than away, because players are subject to more critical scrutiny by a home audience.

Anxiety is highest in goalkeepers, for whose mistakes the team is usually punished. Players returning to the team after a spell of injury or making an initial appearance in the premier team show higher heart rates than their normal pre-match values. It is hardly surprising to find that goalkeepers are the most vulnerable members of the team to stress-related illnesses such as stomach ulcers.

Avoiding over-anxiety may be important in game players for reasons of safety. Anxiety has been found to correlate with joint and muscle injuries in soccer, the more anxious players tending to get injured most often. This supports the notion of injury proneness: the mechanism is probably lack of commitment or hesitancy in critical events that might promote injury. Traditionally, some soccer players used to take a nip of whisky immediately prior to going on to the pitch, the communal bottle being euphemistically referred to as 'team spirit'. The inhibiting effects of alcohol used to be exploited by tournament rugby players, who were not averse to drinking beer in between rounds of 'rugby sevens' competitions for example.

Obviously there is a thin line to tread between, on the one hand, reducing anxiety to enhance well-being and mental states prior to competing in sport and, on the other hand, impairing performance because of a disruption in motor co-ordination accompanying the treatment. The outcome depends on the concentrations of the drug, the timing of ingestion and the individual susceptibility to it. There are also possibilities of tolerance to the drug with chronic use or of drug dependence developing. Residual effects may carry over to the following day, affecting training or subsequent competitive performance. These aspects are now considered in the context of alcohol in sports and exercise.

ALCOHOL

Metabolism of Alcohol

The alcohols are a group of chemicals, most of which are toxic. The most common is ethanol or ethyl alcohol which is obtained by the fermentation of sugar. It is non-toxic, except in large and chronic doses, and has been enjoyed as a beverage for many centuries.

Ethyl alcohol is both a drug and a food, accounting for about 100 kcal (420 kJ) of energy per adult of the UK population each day. Its energy value per unit weight (kcal/g), the Atwater factor, is 7 compared with a value of 9 for fat, but this is higher than the value of 4 for both carbohydrate and protein. Wine contains about 12 per cent alcohol, and so a litre bottle will contain about 120 g with a calorific content of 840 kcal (3516 kJ). The value of alcohol as a food stuff is limited, as it is metabolized mainly in the liver and at a fixed rate of about 100 mg/kg body weight per hour. For a 70-kg individual this amounts to 7 g of alcohol hourly.

The energy is not available to active skeletal muscle and consequently it is not possible to exercise oneself to sobriety. Beer contains some electrolytes but its subsequent diuretic effect makes it less than the ideal agent of rehydration after hard physical training.

Alcohol is a polar substance which is freely miscible in water. This is due to the fact that alcohol molecules are held together by the same sort of intermolecular forces as water, namely hydrogen bonds. The alcohol molecule is also soluble in fat, it is small and has a weak charge. (As the lipophilic alkyl group becomes larger and the hydrophilic group smaller, the alcohol molecules associate preferentially with other alcohol, hydrocarbon or lipid molecules rather than water.) It easily penetrates biological membranes and can be absorbed unaltered from the stomach and more quickly from the small intestine.

The rate of absorption is influenced by the amount of food in the stomach, whether there are gas molecules in the drink and the concentration of alcohol in the drink. Absorption is quickest if alcohol is drunk on an empty stomach, if gas molecules are present in the drink and the alcohol content is high. Intense mental concentration, lowered body temperature or physical exercise tend to slow the rate of absorption.

From the gastrointestinal tract the alcohol is transported to the liver by means of the hepatic circulation. The activity of the enzyme alcohol dehydrogenase, present chiefly in the liver, governs the disappearance of alcohol from the body. In the liver, alcohol dehydrogenase converts the alcohol to acetaldehyde; it is then converted to acetic acid or acetate by aldehyde dehydrogenase. About 75 per cent of the alcohol taken up by the blood is released as acetate into the circulation. The acetate is then oxidized to carbon dioxide and water within the Krebs (or citric acid) cycle. An alternative metabolic route for acetate is its activation to acetyl co-enzyme A and further reactions to form fatty acids, ketone bodies, amino acids and steroids. Ethyl alcohol is distributed throughout the body by means of the circulatory system and enters all the body water pools and tissues, including the central nervous system. Its distribution amongst the body fluids and tissues depends on several factors, such as blood flow, mass and permeability of the tissue.

Organs such as the brain, lungs, liver and kidneys reach equilibrium quickly, whilst skeletal muscle with its relatively poorer blood supply attains its peak alcohol concentration more slowly. Initially, alcohol moves rapidly from blood into the tissues. When absorption is complete, arterial alcohol concentration falls and alcohol diffuses from the tissues into the capillary bed. This means that alcohol concentrations remain high in the peripheral venous blood due to the slower rates of metabolism and excretion.

The metabolism of alcohol in the liver is unaffected by its concentration in the blood. Some alcohol is eliminated in the breath, but this is usually less than 5 per cent of the total amount metabolized. This route is utilized in assessing safe levels for driving, forming the basis of the breathalyser tests. Small amounts of alcohol are excreted in urine and also in sweat if exercise is performed whilst drunk. Higher excretion rates through the lungs, urine and sweat are produced at high environmental temperatures and at high blood alcohol levels.

With a single drink the blood alcohol level usually peaks about 45 minutes after ingestion. This is the point where any influence on performance will be most evident. Effects on performance will generally be greater on the ascending limb than for a corresponding value on the descending limb of the blood alcohol curve; the rate of change and the direction of change of the blood alcohol concentration are more crucial factors than is the length of time alcohol is in the bloodstream. The peak is delayed about 15 minutes if strenuous exercise precedes the ingestion. This delay may be due to the reduction in blood flow to the gut that accompanies exercise, the increased blood flow to skeletal muscle and the needs of the thermoregulatory system post-exercise.

Besides the exogenous ethanol in body fluids, trace amounts of ethanol are synthesized endogenously. This endogenous ethanol is thought to arise both from bacterial fermentation in the gut and from the action of alcohol dehydrogenase on acetaldehyde derived from pyruvate. Blood levels of endogenous alcohol in the human are very low, ranging only up to about 7.5 mg in total.

Studies on alcohol and exercise are notoriously difficult to control, as most subjects will recognize the taste of the experimental treatment. Most experimenters use vodka in orange juice as the alcohol beverage: the placebo can include enough vodka to taste but not enough to produce a measurable blood alcohol concentration. Another strategy is to put a nose clip on the subject, who is then given anaesthetic throat lozenges. Subjects vary in their responses to alcohol, as does the same subject from day to day, making inferences from laboratory studies difficult.

As the effects of alcohol differ with body size, dosage is usually administered according to body weight. Effects also vary with the level of blood alcohol induced, but there is not general international agreement on acceptable maximum levels for day-to-day activities such as driving. Alcohol doses that render subjects intoxicated or drunk have little practical relevance in exercise studies and so experimental levels are usually low to moderate.

Additionally, experiments that entail alcohol ingestion should be approved by the local human ethics committee, and high alcohol dosages are unlikely to gain acceptance in experimental protocols.

Action of Alcohol on the Nervous System

The effects of ethanol administration on central nervous tissue are due to direct action rather than to acetaldehyde, its first breakdown product. Following ethanol ingestion, very little acetaldehyde crosses the blood-brain barrier, despite elevated levels in the blood. Alcohol has a general effect on neural transmission by influencing axonal membranes and slowing nerve conductance.

The permeability of the axonal membrane to potassium and sodium is altered by the lowering of central calcium levels that results from ingesting alcohol. Alcohol has differential effects on the central neurotransmitters, acetylcholine, serotonin, noradrenaline and dopamine.

Alcohol blocks the release of acetylcholine and disrupts its synthesis. As a result, transmission in the central cholinergic pathways will be lowered. The ascending reticular cholinergic pathway determines the level of cortical arousal and the flow of sensory information to be evaluated by the cortex. The lowering of electro-cortical arousal reduces the awareness of stressful information and the ability of the individual to attend to specific stimuli. These de-arousing changes are reflected in alterations in the electroencephalogram with moderate to large doses of alcohol. The obvious results are impairments in concentration, attention, simple and complex reaction times, skilled performance and, eventually, short-term memory.

Alcohol decreases serotonin turnover in the central nervous system by inhibiting tryptophan hydroxylase, the enzyme essential for serotonin's biosynthesis. Activity in the neurones of serotonergic pathways is important for the experience of anxiety; output of corticosteroid hormones from the adrenal cortex increases the activity in these neurones. Alcohol has an opposing action and so may reduce the tension that is felt by the individual in a stressful situation.

An effect of alcohol is to increase activity in central noradrenergic pathways. This is transient and is followed, some hours later, by a decrease in activity. Catecholaminergic pathways are implicated in the control of mood states, activation of these pathways promoting happy and merry states. The fall in noradrenaline turnover as the blood alcohol concentration drops ties in with the reversal of mood that follows the initial drunken euphoric state. This is exacerbated by large doses of alcohol as these tend to give rise to depression.

The small alcohol molecules penetrating the blood-brain barrier stimulate the brain to release dopamine. Dopamine is regarded as a 'pleasure-related' hormone and its release is triggered in the limbic system. Stimulation of sweat glands also affects the limbic system whilst cerebral cortical activity is depressed. Pain sensors are numbed and later the cerebellum is affected, causing difficulty with balance.

Alcohol also has an effect on cerebral energy metabolism: the drug increases glucose utilization in the brain. As glucose is the main substrate furnishing energy for nerve cells, the result is that the lowered glucose level may induce mental fatigue. This will be reflected in failing cognitive functions, a decline in mental concentration and in information processing. It is unlikely that exercise, per se, will offset these effects.

The disruption of acetylcholine synthesis and release means that alcohol acts as a depressant, exerting its effect on the reticular activating system, whose activity represents the level of physiological arousal. It also has a depressant effect on the cortex: it first affects the frontal centres of the cortex before affecting the cerebellum. In large quantities it will interfere with speech and muscular co-ordination, eventually inducing sedation. In smaller doses it inhibits cerebral control mechanisms, freeing the brain from its normal inhibition. This release of inhibition has been blamed for aggressive and violent conduct of individuals behaving out of character when under the influence of alcohol.

Undoubtedly, alcohol has been a factor in crowd violence and football hooliganism on the terraces. The belief led to the banning of alcohol at football and cricket grounds in Britain in the mid-1980s. These restrictions were extended to other sporting events in the years that followed.

Clearly, alcohol will have deleterious effects on performance in sports that require fast reactions, complex decision making and highly skilled actions. It will also have an impact on hand-eye co-ordination, on tracking tasks, such as driving, and on vigilance tasks such as long-distance sailing. An effect on tracking tasks is that control movements lose their normal smoothness and precision and become more abrupt or jerky.

In vigilance tasks, some studies have shown a deterioration in performance with time on task. At high doses of alcohol, meaningful sport becomes impractical or even dangerous. Progressive effects of alcohol at different blood alcohol concentrations. An important effect of alcohol, not listed, is that it diminishes the ability to process appreciable amounts of information arriving simultaneously from two different sources.

Table. Demonstrable effects of alcohol at different blood alcohol concentrations.

<i>Concentration level (mg/100 ml blood)</i>	<i>Effects</i>
30	Enhanced sense of well-being; retarded simple reaction time; impaired hand-eye co-ordination
60	Mild loss of social inhibition; impaired judgement
90	Marked loss of social inhibition; co-ordination reduced; noticeably 'under the influence'
120	Apparent clumsiness; loss of physical control; tendency towards extreme responses; definite drunkenness is noted
150	Erratic behaviour; slurred speech; staggering gait
180	Loss of control of voluntary activity; impaired vision

The most frequently cited study that reported facilitatory effects of alcohol on human performance was the classic experiment of Ikai and Steinhaus. They showed that in some cases moderate alcohol doses could improve isometric muscular strength. This result was similar to that obtained by cheering and loud vocal encouragement. They explained the effect on the basis of central inhibition of the impulse traffic in the nerve fibres of the skeletal muscles during maximal effort. This depression of the inhibitory effect of certain centres in the central nervous system may allow routine practices to proceed normally without any disturbing effects. This finding has not generally been replicated when other aspects of muscular performance are considered.

Alcohol and Health

The effects of alcohol on health are usually viewed in terms of chronic alcoholism. Persistent drinking leads to a dependence on alcohol so that it becomes addictive. Most physicians emphasize that alcoholism is a disease rather than a vice and devise therapy accordingly. The result of excessive drinking is ultimately manifested in liver disease: cirrhosis, a serious hardening and degeneration of liver tissue, is fatal for many heavy drinkers.

Cancer is also more likely to develop in a cirrhotic liver. There is evidence of increased susceptibility to breast cancer in women who drink alcohol regularly. Cardiomyopathy or damage to the heart muscle can result from years of heavy drinking. Other pathological conditions associated with alcohol abuse include

generalized skeletal myopathy, pancreatitis and cancers of the pharynx and larynx. Impairment of brain function also occurs, alcoholic psychoses being a common cause of hospitalization in psychiatric wards.

Alcohol was formerly used as an anaesthetic until it was realized that it was too dangerous to supply in large quantities for that purpose. The result of applying alcohol to living cells is that the protoplasm of the cells precipitates as a consequence of dehydration. Long-term damage to tissue in the central nervous system may be an unwanted outcome of habitual heavy drinking.

Heavy drinking is not compatible with serious athletics. For the athlete, drinking is usually done only in moderation, an infrequent respite from the ascetic regimens of physical training, though the odd end of season binge is customary. Nevertheless, drinking is a social convention in many sports, such as rugby, squash and water-polo, where there may be peer-group pressure to take alcohol following training or competition or at club functions. Indeed, a few high-profile footballers in the English Premier league in the late 1990s admitted to an alcohol addiction and to referral to a rehabilitation clinic for alcoholics.

The sensible athlete drinks moderately and occasionally, avoiding alcohol for at least 24 hours before competing. Hangovers may persist for a day and disturb concentration in sports involving complex skills. The attitude of the retired athlete may be very different. If his active career is terminated abruptly and the free time that retirement releases is taken up by social drinking, the result may well be a gradual deterioration in physical condition, with body weight increasing and fitness declining. In this context, the effect of alcohol on the ex-athlete may be quite harmful.

Various institutions within sports medicine have addressed the problems of alcohol and exercise. In 1982 the American College of Sports Medicine set out a position statement on alcohol which was unequivocally against any indulgence. It underlined the adverse effects of alcohol on health and condemned the resort to alcohol by athletes. Its estimate was that there were 10 million adult problem drinkers in the United States and an additional 3.3 million in the 14-17 year age range. No evidence for any of the beneficial aspects of alcohol was mentioned.

There is a belief that moderate drinking has some positive benefits for health. Small amounts increase the flow of gastric juices and thereby stimulate digestion: in large doses, alcohol irritates the stomach lining, causing gastritis and even vomiting of blood. A national survey of lifestyles in England and Wales provided support for the view that healthy people tended to drink a little. Amongst men under 60, the likelihood of high blood pressure was found to increase with the amount of alcohol consumed. For older men and for women, light drinking was associated with lower blood pressure, even when effects due to body weight were taken into account.

It is thought also that moderate drinking provides a degree of protection against coronary heart disease. This belief may have been nurtured originally in the vineyards of France where a habitually modest consumption of wine is

associated with a low incidence of heart disease. One report claimed that myocardial infarction rates were lower in moderate drinkers than in non-drinkers. A possible mechanism is the reduction in hypertension and the relaxation from business cares that drinking can bring. Moderate alcohol consumption may help haemostasis, in balancing the processes of coagulation and fibrinolysis. A link has also been shown by an increase in high-density lipoprotein cholesterol levels with moderate levels of drinking alcohol. High-density lipoprotein particles remove cholesterol from the tissues and transfer it into other particles in the blood; low-density lipoprotein, on the other hand, obtains its cholesterol from these other particles and transfers it to the tissues.

A high ratio of high-density to low-density lipoprotein fractions is generally found in well-trained endurance athletes, a low ratio being indicative of poor cardiovascular health. The effect is apparent in autopsies of alcoholics whose blood vessels are in good condition despite pathological changes in other tissues. The mechanism by which alcohol would raise the high-density lipoprotein cholesterol has not been fully explained.

It seems that for a healthy athlete in a good state of training, occasional drinking of alcohol in moderation will have little adverse effect. It is important to emphasize that any such occasional bouts of drinking should be restrained and should follow rather than precede training sessions, whose training stimulus is likely to be lowered by the soporific influence of drinking alcohol before strenuous exercise.

AN INTERNATIONAL POLICY PERSPECTIVE/ GOVERNMENT ACTION AND POLICY

Drug use and abuse by athletes has now become a frequent feature of sport. It is clear that if drug use and abuse in sport is to be treated seriously it will require consolidated action, a joint commitment by sport, governments and others. In the words of Justice Dubin 'The resolution of this problem cannot simply be left to those who govern sport nationally and internationally.'

Initially, sport attempted to put its own house in order, and it was the international sports federations and the IOC who were the first bodies to introduce testing. Concern that the commitment required to achieve effective controls was lacking led to the involvement of governments. Testing had been limited to major competitions such as the Olympic Games and world championships; the regulations of the international sports federations introduced testing in a limited way. The IOC created a reference list of prohibited substances and proceeded to amend it to reflect doping practices. Testing programmes rested on accurate analysis.

The IAAF and the IOC undertook the accreditation of laboratories for the analysis of urine samples. In many ways the progress being made to control drug misuse was not sufficient to demonstrate a real commitment to resolving the problem. The limitations and potential conflicts of interest which developed in the way testing programmes were delivered did nothing to reassure

governments that action taken was sufficient and others began to take a close interest in the control of drugs in sport. Governments became the other key players in the fight against doping. Sport is played on a national level throughout the world and governments were concerned about the ineffectiveness of the inconsistent actions of sports bodies, some had regulations-some did not. In 1967, prior to the first testing at an Olympic Games, the Committee of Ministers of the Council of Europe adopted a resolution on doping in sport, the first international text of its kind. The resolution stressed the moral and ethical principles at stake for sport, and the health dangers for athletes.

The resolution explicitly referred to doping as cheating and included a broad definition of doping, including doping methods as well as the misuse of drugs. Governments were recommended to persuade sports organizations to take the necessary steps to have proper and adequate regulations and to penalize offenders. Finally the resolution recommended governments to take action themselves if the sports organization did not act sufficiently within 3 years. Anti-doping legislation was introduced in several European countries in response to this resolution.

Having continued to monitor the situation for 11 years, sports ministers adopted a further resolution in 1978, which called for governments to provide a co-ordinated policy and an overall framework in which the doping controls of sports organizations could take place. A European Charter, a statement of principles, anti-doping strategies and policies was adopted in 1984.

It is significant that the chairman of the drafting group was the Chairman of the IOC Medical Commission, Prince Alexandre de Merode and that the Charter received the support from international sports organizations. It was obvious that sport alone would be unable to contain the problem; the Charter provided the first opportunity for governments to drive the agenda with the sports bodies, many of whom appeared to be above the law in the way they dealt with doping matters.

Although the Charter received support from international sports organizations it was not binding upon governments, but would have 'moral, political and practical impact'.

Anxious to keep up the momentum, the Council of Europe Committee of Ministers pressed for testing out of competition without prior warning to the athlete. Ministers also sought to secure a commitment to international harmonization, not only among sports but also among countries. Ministers agreed to the drafting of an anti-doping convention in 1989 that would be binding on governments.

The key significance of this document was the recognition of political will to address the problem of doping. The Convention also provides a number of common standards-legislative, financial, technical and education, for implementation by all the bodies concerned with the state, by governments themselves and by government in support of sports organizations. Governments have embraced the standards being agreed through the Convention, although

not wholeheartedly supported by the international sports organizations. In some countries the Convention has been adopted as the national legislation.

Progress towards a uniform international anti-doping policy took a further step forward when the IOC, international sports organizations and national governments came together at the First Permanent World Conference on Anti-Doping in 1988. The outcome of this conference was the development of the International Olympic Charter against Doping in Sport. This important document identified the policies and practices required to counter doping and was relevant mainly to national policies and practice. Its adoption as an IOC Charter was crucial to its success and influence, although the full support of the sports movement was not evidenced in the anti-doping programmes of that time.

A second world conference the following year in Moscow helped to take forward some practical issues such as the operating standards for out-of-competition testing. However, a third world conference in London in 1993 focusing on the planning of testing programmes, national organization of anti-doping programmes, ethics and education showed the broader agenda still in need of attention. After that conference the sport/government partnership appeared to falter.

Whilst recognition of the need for a symbiotic relationship between sports organizations and governments was noted in the IOC/IF Agreement against Doping in Sport in June 1993, the identification of roles may be illustrative of underlying tensions. In seeking ways to 'intensify the prevention of, education and fight against doping in sport', the IOC and International Sports Federations agreed to 'develop the co-operation between the IOC, The International Sports Federations, the National Olympic Committees, the National Federations and the governmental or other organizations concerned in order to combat the trafficking of doping substances'.

Interestingly, International Sports Federations were invited 'to adopt each year as a basic minimum document, the list of banned classes and methods established by the IOC Medical Commission and to undertake the appropriate controls for each sport'. Sport was clearly indicating the role for governments in the regulation of supply and availability of drugs, whilst reserving the actual controls in sport for the sports movement.

In the 1990s actions to control drug misuse in sport were numerous. Initially the IOC took control of the doping in sport agenda. Harmonization was the theme of a conference called in Lausanne in 1994 for the IOC Associations of Summer and Winter Olympic Federations, National Olympic Committees and athlete representatives and led to the publication of more unified rules and procedures in the document Preventing and fighting against doping in sport.

The very next year the IOC published the IOC Medical Code, bringing together the IOC anti-doping rules and regulations in one document for the first time in 1995. However, the sports federations were slow to adopt the IOC standards, and differences in the lists of prohibited substances, the sanctions to be applied, and waiver in respect of minor procedural irregularities were evident.

The compilation of directories of international sports federations' anti-doping regulations by UK Sport demonstrated that essential differences between sports remained, notably in the definition of doping itself.

Governments have continued to be critical of the lack of action by sports organizations themselves to address the problem seriously from within. In 1987 the then UK Sports Minister Colin Moynihan and former Olympic athlete Sebastian Coe co-authored a report that noted 'Within the present arrangements there appear to be too many loopholes, and perhaps insufficient security for satisfactory levels of effectiveness and confidence to be achieved ...there is too much potential for evasion, leading to public concern and also to frustration among administrators and sportsmen and women.'

Similarly the Commission of Inquiry into the Use of Drugs and Banned Practices intended to Increase Athletic Performance in Canada in 1990 pointed to the failure of leadership among sports organizations and to the involvement and compliance of officials in drug use. The evidence of those witnesses at this inquiry who admitted their use of banned substances was in large part instrumental in uncovering the scandalous and pervasive practice of doping in sport that until then has hidden from public view, although not from the view of national and international sports federations.'

The action taken by sport itself, whilst an important contribution, can only be strengthened by a concerted world-wide effort supported by governments. Regrettably there have also been incidents of testing programmes actually being used to cover-up drug misuse.

Testing of athletes prior to a major event to determine whether they would pass the competition test has been admitted in several former Eastern bloc countries. Covering-up results from major competitions has also been revealed. Robert Voy, formerly Chief Medical Officer to the United States Olympic Committee explained how problematic this is: 'Allowing National Governing Bodies (NGBs), International Federations (IFs) and National Olympic Committees (NOCs) such as the United States Olympic Committee to govern the testing process to ensure fair play in sport is terribly ineffective. In a sense it is like having the fox guard the hen house'. Independence of the testing programmes and an openness of information would seem to be the only way forward, if public confidence and in particular the confidence of athletes is to be restored.

It is significant that the IOC's own role at that time indirectly extended outside the Olympic Games through the accreditation of laboratories, the establishment of the list of doping classes, a financial assistance programme for IFs who need help to intensify their anti-doping controls and encouragement to Olympic sports to comply with the principles of the agreement. Yet their role was dogged with suggestions and innuendos about conflicts of interest, even direct actions to cover-up doping issues within the Olympic family.

Co-operation between international and national sports federations and the newly created national anti-doping organizations has the potential to provide

one of the strongest practical deterrents to drug misuse. However, the authority of international sports federations and of national policies and legislation can sometimes lie uneasily together. Some sports have interpreted the intervention of governments in anti-doping matters as threatening their independence and challenging their abilities to undertake urine sampling. As the majority of testing and especially laboratory expertise is government funded, a mutually supportive relationship between sports organizations and governments is crucial to the ongoing success of anti-doping activities.

The response of governments and international organizations to the whole issue of doping in sport has been significant and interesting. Government-initiated enquiries in Australia, Canada, New Zealand and the UK have acted as a catalyst for progress in anti-doping activities, creating the International Anti-Doping Arrangement (IADA), in 1990, an intergovernmental agreement on consolidated actions in the fight against drug misuse. Originally founded by the countries of Australia, Canada and the UK, this alliance was soon joined by the countries of Norway, New Zealand, Sweden, Netherlands, Denmark and Finland.

At about the same time the Nordic Convention between the Scandinavian countries opened up the borders to reciprocal testing and mutual recognition of results, working directly with their sports federations, sometimes adopting a stronger position than the international federation. The strong alliance of the IADA countries has led to the achievement of the most significant development in standardization of anti-doping procedures, the International Standard for Doping Control, a quality assured standard for the planning, implementation and monitoring of results of testing. Several international forums have now endorsed this standard as the accepted standard for anti-doping programmes and the International Standards Organization are presently considering its transfer to an ISO certified standard.

In an article published in 1992, the Chairman of the IOC Medical Commission acknowledged the strategy of a common policy to be the most effective, he stated: 'A commonly accepted international policy is necessary for the elimination of doping in sport. Such a policy would lead to an improved and more consistent approach and would contribute to equality and equity in the international sporting community. Both public authorities and the independent sports organizations have separate but complimentary responsibilities and should work together for this purpose at all levels.'

Legislation has become a major problem for sport as athletes turned to the law to address perceived inconsistencies in the rules of sport, Katrin Krabbe, Harry Reynolds and Diane Modahl were only some of the high profile cases that challenged the reliability of testing procedures and resulted in significant financial pressure upon the national federations. Governments also added to the pressures by making funding of sport conditional upon minimum anti-doping programmes, as required by the 1989 Anti-Doping Convention, which was gathering speed as more countries adopted its articles into their national policies

and laws. In some countries the requirements for an effective anti-doping response were enforced through legislation. The direct action taken by the French Government to intervene during the 1998 Tour de France and reveal evidence of blood doping and drug misuse shocked the sporting world but won the admiration of athletes.

The International Cycling Federation, previously considered one of the more responsible federations in anti-doping procedures, was exposed as failing to address the extensive drug misuse in this premier event. These events were undoubtedly the catalyst for the IOC response in February the following year.

The ongoing tensions surrounding the allegations of cover-ups in the testing at the 1996 Atlanta Games, the scandals of corruption and bribery over Olympic bidding and increasing interest of the European Union to intervene more directly culminated in the most significant opportunity for drug-free sport finally to become a possibility. In 1999 the IOC called a World Conference on Anti-Doping in Sport in Lausanne. This conference attended by sports federations and the IOC also attracted a number of government ministers. In particular the Director of the United States Office on National Drug Control Policy Barry McCaffrey and UK Sports Minister Tony Banks were vociferous in their criticism of the IOC. Support for a new independent world agency spread and was evident among many of the athletes and sports federations present.

The debate demonstrated the strength of feeling among the governments to require the sports movement to clean up their sports or face government intervention. Initial suggestions to form an international anti-doping agency, 'headquartered in Lausanne, governed by a council presided over by the IOC President' were rejected. The conference culminated in an agreement to form the World Anti-Doping Agency, 'to be fully operational in time for the XXVII Olympiad in Sydney in 2000' as an equal partnership between sport and governments.

In the years following there has been an uneasy struggle to find a basis for the formal establishment and operation of the World Anti-Doping Agency (WADA) in a way that would ensure mutual ownership but not surrender control to either sport or government. The IOC originally offered funding with an expectation that governments would pay their share and the bidding process for a permanent home began in earnest. The government side has developed regional co-ordination across the world under the umbrella of the 'International Intergovernmental Consultative Group on Anti-Doping'. Meetings have been held in Montreal, Oslo, Cape Town and Kuala Lumpur involving an increasing number of governments in the fight against doping.

WADA has sought greater legitimacy in promoting drug-free sport. Among its responsibilities are 'expanding out of competition testing, co-ordinating research, promoting preventive and educational actions and harmonizing scientific and technical standards and procedures for analyses and equipment'. WADA programme of testing out of competition has been initiated through a contracted arrangement with a consortium of government-sponsored national

anti-doping agencies. Debate about the additional testing in countries where there are strong independent national programmes has led to some criticism of WADA's ability to meet its principal objectives. Duplication of testing by international federations and national agencies as well as the Australian government prior to the Sydney Olympics demonstrated the need for greater co-ordination, although the question of who would give up the authority to test remains a vexed question. The Sydney Olympics marked a turning point in the accountability for testing under the control of the IOC, when the WADA observer programme was introduced.

Unexpectedly, the voting of the Foundation Board led to the WADA headquarters being located in Montreal. The offices opened in April 2002. Further work is continuing on the development of a WADA Framework and Code. If agreed, this should provide the basis for a symbiotic relationship between sport and government. Early indications are that compliance could be linked to eligibility to participate in Olympic Games and to host world championships.

8

Neurological Disorders Associated with Drug use

DRUG DISORDERS

A synthetic disorder is a disease caused by a different form of a gene called a variation, or an alteration of a gene called a mutation. Many diseases have a genetic aspect. Some, including many cancers, are caused by a mutation in a gene or group of genes in a person's cells. These mutations can occur randomly or because of an environmental exposure such as cigarette smoke. Other synthetic disorders are inherited. A mutated gene is passed down through a family and each generation of children can inherit the gene that causes the disease. Still other genetic disorders are due to problems with the number of packages of genes called chromosomes. In Down syndrome, for example, there is an extra copy of chromosome 21. Both environmental and genetic factors have roles in the development of any disease. A genetic disorder is a disease caused by abnormalities in an individual's genetic material (genome).

The four different types of genetic disorders are:

1. Single-gene,
 2. Multifactorial,
 3. Chromosomal,
 4. Mitochondrial.
1. *Single-gene (also called Mendelian or monogenic)*: This type is caused by changes or mutations that occur in the DNA sequence of one gene. Genes code for proteins, the molecules that carry out most of the work,

perform most life functions, and even make up the majority of cellular structures. When a gene is mutated so that its protein product can no longer carry out its normal function, a disorder can result. There are more than 6,000 known single-gene disorders, which occur in about 1 out of every 200 births. Some examples are cystic fibrosis, sickle cell anemia, Marfan syndrome, Huntington's disease, and hereditary hemochromatosis.

Single-gene disorders are inherited in recognizable patterns: autosomal dominant, autosomal recessive, and X-linked.

2. *Multifactorial (also called complex or polygenic)*: This type is caused by a combination of environmental factors and mutations in multiple genes. For example, different genes that influence breast cancer susceptibility have been found on chromosomes 6, 11, 13, 14, 15, 17, and 22. Its more complicated nature makes it much more difficult to analyse than single-gene or chromosomal disorders. Some of the most common chronic disorders are multifactorial. Examples include heart disease, high blood pressure, Alzheimer's disease, arthritis, diabetes, cancer, and obesity. Multifactorial inheritance also is associated with heritable traits such as fingerprint patterns, height, eye colour, and skin colour.
3. *Chromosomal*: Chromosomes, distinct structures made up of DNA and protein, are located in the nucleus of each cell. Because chromosomes are carriers of genetic material, such abnormalities in chromosome structure as missing or extra copies or gross breaks and rejoinings (translocations) can result in disease. Some types of major chromosomal abnormalities can be detected by microscopic examination. Down syndrome or trisomy 21 is a common disorder that occurs when a person has three copies of chromosome 21.
4. *Mitochondrial*: This relatively rare type of genetic disorder is caused by mutations in the nonchromosomal DNA of mitochondria. Mitochondria are small round or rod-like organelles involved in cellular respiration and found in the cytoplasm of plant and animal cells. Each mitochondrion may contain 5 to 10 circular pieces of DNA.

SYNTHETIC DISORDERS IN HUMANS

INTRODUCTION

Within their coiled strands, chromosomes hide a world of information about how a person should look, how tall he should be, what should be his skin colour and also the diseases that he may be prone to (which are referred to as genetic disorders in human). They have this information coded in the form of nucleotide sequences that form DNA (deoxyribonucleic acid) molecules. A single molecule of DNA is coiled to form a single chromosome. These chromosomes are present in pairs. Human beings have 23 pairs of chromosomes or 46 chromosomes in all. Of them, 1 pair forms the sex chromosomes. The rest 22 pairs are the

autosomes. Sex chromosomes are of two types - X and Y. A man has one X and one Y chromosome (XY) while a woman has two X chromosomes (XX). It is just the difference of one sex chromosome that decides an individual's gender.

The chemical information of every organism is specifically coded in the nucleotide sequences of genes - the unit of heredity. Each gene codes for an enzyme that plays an important role in various biochemical reactions. In other words, a gene contains a specific sequence of nucleotide bases that are responsible for the organization of amino acids in the correct order to form an enzyme. Any disruption in this sequence, causes genetic disorders in humans.

CAUSES OF DISORDERS IN HUMANS

Genetic diseases in humans are caused due to abnormalities in genes or chromosomes.

Such defects can be caused by the following mechanisms:

- *Mutations:* These are sudden inheritable changes in the nucleotide sequence of a gene.
- *Aneuploidy:* Aneuploidy is caused when there are abnormal number of chromosomes in an organism. This could be due to loss of a chromosome (monosomy) or presence of extra copy of a chromosome (trisomy, tetrasomy, etc.)
- *Deletions:* Loss of a part of chromosome as in the case of Jacobsen syndrome.
- *Duplications:* Duplication of a portion of chromosome that results in extra amount of genetic material.
- *Inversions:* Inversion of the nucleotide sequence because a portion of chromosome has broken off, got inverted and reattached at the original location of the chromosome.
- *Translocations:* When a portion of chromosome has got transferred on to some other chromosome. Sometimes translocation can take place between two chromosomes, in which case they interchange chromosome segments. However, in some cases a portion of a chromosome may simply get attached to another chromosome.

TYPES OF DISORDERS IN HUMANS

- *Autosomal Dominant Genetic Disorders:* These disorders are caused when an individual has inherited the defective gene from a single parent. This defective gene belongs to an autosome. Such an inheritance is also known as autosomal dominant pattern of inheritance.
- *Autosomal Recessive Genetic Disorders:* Such disorders manifest only when an individual has got two defective alleles of the same gene, one from each parent. These genetic disorders are inherited via the autosomal recessive pattern of inheritance.
- *Sex-Linked Disorders:* These are disorders related to sex chromosomes or genes in them.
- *Multi-factorial Genetic Disorders:* Such disorders are the result of genetic as well as environmental factors.

COMMON DISORDERS IN HUMANS

Achondroplasia

It is an autosomal dominant genetic disorder which is the most common genetic cause of dwarfism. Individuals suffering from achondroplasia vary from 4 feet to 4 feet 4 inches in height. They have disproportionately short limbs. However, there is no intellectual disability. In this disorder, the cartilage, specially in the long bones, fail to convert into bones. It is caused due to mutation in the FGFR3 gene (located on chromosome 4. which codes for a protein that regulates transformation of cartilage to bone). Although, an individual may inherit the disorder from an affected parent, the disorder is usually the result of a mutation in the sperm or egg of a healthy parent. Achondroplasia can be detected before birth with the help of prenatal ultrasound. There is no treatment for this disorder. However, limb extending surgeries can be done, although this is a controversial issue.

Achromatopsia

It is an autosomal congenital recessive disorder which is characterized by visual acuity loss, colourblindness, light sensitivity and nystagmus. It is also known as rod monochromatism. The symptoms are first noticed in children at the age of six months when they exhibit nystagmus and photophobic activities. Achromatopsia is of two forms. The more severe form is known as complete achromatopsia. Those who exhibit milder symptoms are known to suffer from partial achromatopsia. Using optical and visual aids are useful in improving vision of those suffering from achromatopsia.

Acid Maltase Deficiency

It is an autosomal recessive disorder, in which the defect is in the gene for the acid maltase enzyme, which leads to accumulation of glycogen stored in muscles. Glycogen build up, weakens the muscles of a patient suffering from this disorder. This may affect respiratory muscles resulting in respiratory failure. It is also known as the *Pompe Disease*. Although, in childhood and adolescence the symptoms show slow progress and are less severe, infantile forms cause death within first year, if not treated on time.

Albinism: Albinism is a congenital disorder in which there is little or completely no production of melanin in hair, skin and iris of the eyes. Hence albinos (people suffering from albinism) have light coloured skin, hair and eyes. It is caused due to inheritance of recessive alleles from parents. This disorder can't be cured. However, the symptoms can be alleviated with the help of surgical treatment, vision aids and using device that provide protection from sun.

Alzheimer's Disease: Alzheimer's disease is the most common form of dementia which is characterized by gradual memory loss, irritability, mood swings, confusion and language breakdown. Although, scientists are not

unequivocal about the cause of this disease, the most widely accepted reason is the amyloid cascade hypothesis, that suggests excess production of a small protein fragment called ABeta (A β). Also known as Senile Dementia of the Alzheimer Type (SDAT) or simply Alzheimer's, this is a degenerative disease and scientists are yet to find its cure. However, balanced diet, mental exercises and stimulation are often suggested for prevention and managing of the disease.

Angelman Syndrome

It is a neurological disorder that was first described by a British pediatrician, Dr. Harry Angelman, in 1965. This disorder is marked by intellectual and developmental delays, severe speech impairment and problems in movement and balance, recurrent seizures and small heads. Children with Angelman syndrome typically have a happy demeanor. They are hyperactive with short attention span and show jerky hand movements. These children appear normal at birth.

This genetic disorder in human is a classical case of genetic imprinting, in which the disorder is caused due to deletion or activation of the maternally inherited chromosome 15. Its sister syndrome is the Prader-Willi syndrome in which there is a similar loss or inactivation of the paternally inherited chromosome 15.

Bardet-Biedl Syndrome

It is a pleiotropic recessive genetic disorder that is characterized by obesity, polydactyly, deterioration of rod and cone cells, mental retardation and defect in the gonads and kidney disease. It is difficult to diagnose Bardet-Biedl Syndrome, specially in the young. As no cure is yet known for the disorder, treatment is concentrated on specific organs and systems.

Barth Syndrome

A rare but serious sex linked genetic disorder, the Barth syndrome is caused due to mutations or alterations in the BTHS gene. The gene is located on the long arm of X chromosome. This disorder primarily affects the heart. Besides heart defects, Barth syndrome results in poor skeletal musculature, short stature, mitochondrial abnormalities and deficiency of white blood cells. There is no cure for this disorder. Treatment focuses on managing the symptoms and preventing infections.

Bipolar Disorder

Also known as manic depressive disorder or bipolar affective disorder, individuals suffering from bipolar disorder suffer from highly elevated moods, referred to as mania or episodes of severe depression. Research shows that both genetic as well as environmental factors are responsible for this disorder. Medicines as well as psychotherapy is found to be useful in dealing with the severe mood swings associated with the disorder.

Bloom Syndrome

Bloom syndrome is an autosomal recessive genetic disorder, which is characterized by a high frequency of breaks and rearrangements in the chromosomes of an affected person. Symptoms include short stature, butterfly shaped facial rash, high pitched voice, increased susceptibility to cancer, leukemia, respiratory illnesses and infections. Some may even show mental retardation.

Like other genetic disorders in human, there is no treatment for Bloom's syndrome. All treatment is preventive in nature. This disease is more common in Ashkenazi Jews with a frequency of 1/100 individuals suffering from this disorder.

Colour Blindness

Colour blindness refers to the inability of differentiating among certain colours. This can be genetically inherited and can also be caused due to a damage to the eye, nerve or brain. As far as genetics is concerned, colour blindness is most commonly the result of mutations in the X chromosome. However, research has shown that mutation in 19 different chromosomes can cause colour blindness. There is no treatment to cure colour blindness. However, certain types of tinted filters and contact lenses may enable an individual to differentiate colours.

Cri-du-Chat Syndrome

Cri du Chat syndrome is caused due to deletion of short (p) arm of chromosome 5. Most cases of this disorder are not inherited. In such cases, they are caused due to spontaneous deletion of a segment of chromosome 5 during formation of egg or sperm or during early stages of fetal development. The syndrome gets the name from the characteristic high pitched cry of an infant that resembles the cry of a cat. Other symptoms are intellectual disabilities, delayed development, microcephaly (small head), low birth weight, typical facial features and weak muscle tones during infancy. No specific treatment is available for this disorder.

Cystic Fibrosis

Cystic fibrosis is an inherited disease of the glands that secrete mucus and sweat. Cystic fibrosis causes the mucus to become thick and sticky that clogs various organs of the body, that results in other complications. It mostly affects lungs, liver, pancreas, sinuses, intestines and sex organs. Cystic fibrosis also causes excess loss of salts through sweat that results in dehydration, tiredness, weakness and elevated heart rate. This is an autosomal recessive disorder in which the mutation is caused in the CFTR gene. At present, there is no cure for cystic fibrosis. However, doctors treat the symptoms using antibiotic therapy along with other treatments that would clear the mucus that accumulates in different organs.

Down Syndrome

Also called *Trisomy 21* it is a genetic disorder in human that is the result of extra copy of chromosome 21, that a child inherits from his/her parent. This extra genetic material causes delays in mental as well as physical development of a child. Physical peculiarities caused due to this syndrome include a narrow chin, a prominently round face, protruding tongue, short limbs, the Simian crease and poor muscle tone. Almost 1 in every 800 to 1000 births may have genetic abnormality. The incidence of this disorder increases with maternal age. Amniocentesis during pregnancy or birth can detect this abnormality. Karyotyping test of a child confirms this syndrome, if done after birth. No specific cure is available. However, treatment of the health problems and training and special education of such individuals is of great help.

Duchenne Muscular Dystrophy

It is an X linked recessive trait which is characterized by progressive degeneration of muscles that results in loss of ambulation and finally leading to death. It is one of the most prevalent muscular dystrophies that affect only males. Females are just the carriers and hence don't show the symptoms. The disorder is caused due to mutation in the gene DMD (located on X chromosome) that codes for protein dystrophin which is an important component of muscle tissue. Physical therapy is effective in lessening physical disabilities of children suffering from this disorder. Besides this, recent advancements in medicines are helping in extending lives of those affected. Stem cell research also shows promising developments in dealing with this form of muscular dystrophy.

Fragile X Syndrome

Also known as the *Martin-Bell syndrome* or *marker X syndrome*, the Fragile X syndrome is the most common cause of inherited form of mental retardation. It is the result of trinucleotide repeat disorder, in which, the trinucleotide gene sequence CGG in the X chromosome is repeated several times. The result is intellectual disabilities, high levels of anxiety and hyperactivity like fidgeting, autistic behaviour like hand flapping, avoiding eye contact, shyness, mental retardation and attention deficit disorder and other symptoms. It is an X-linked dominant disorder that has no cure. Medicines, educational, behavioural and physical therapy are the only help available to individuals suffering from this disorder.

Galactosemia

A rare metabolic genetic disorder in human, galactosemia impairs body's ability to break down galactose. Alternately, it is also known as *Galactose-1-phosphate uridyl transferase deficiency (Galactosemia type I)*, *Galactokinase deficiency (Galactosemia type II)*, *Galactose-6-phosphate epimerase deficiency (Galactosemia type III)*. Infants suffering from galactosemia show

symptoms within a few days after birth or soon after they start nursing. The symptoms include yellowing of skin, eyes, diarrhea, vomiting, refusal to drink milk, malnourishment and also mental retardation. If milk or milk products are given to infants suffering from galactosemia, then accumulation of galactose in their system damages brain, eyes, liver and kidneys. Eliminating lactose and galactose from diet of an individual is the only way to treat classic galactosemia (galactosemia type I) which is the most common and most severe form of galactosemia. Although very different, galactosemia is often confused with lactose intolerance.

Hemophilia

This is a recessive X-linked genetic disorder in which the bodies of individuals lose the ability to coagulate blood or blood clotting. As the mutation is caused in X chromosome and the condition is recessive, the females are carriers and males suffer from the symptoms of hemophilia.

However, under rare occasions, females may also suffer from hemophilia. There are two variations of the disorder. Hemophilia A which is more common than the other variation, Hemophilia B. Regular infusion of the coagulating factor that lacks in an individual, helps one control blood loss caused due to excessive bleeding.

Huntington's Disease

It is an autosomal dominant genetic disorder in the huntingtin gene, that produces a faulty protein instead of the normal "huntingtin" protein. The faulty protein causes damage to specific areas of the brain, that initially manifests as abnormal involuntary movements that become increasingly uncoordinated jerky movements. As the disease progresses, decline on mental abilities (marked with dementia), behavioural and psychiatric problems become prominent. Although physical symptoms of Huntington's disease may manifest at any age, it most commonly occurs in individuals between 35 to 45 years old. In rare cases, when onset of the disease takes place as early as 20 years, the condition is referred to as *juvenile*, *akinetic-rigid* or *Westphal variant HD*. Although there is no cure, medicines help individuals to cope with emotional disabilities. Speech therapy, occupational and behavioural therapy also help individuals deal with the disabilities due to Huntington's disease.

Jackson-Weiss Syndrome

It is an autosomal dominant genetic disorder in which there are foot abnormalities, and premature fusion of bones in the skull lead to deformations of the facial features (widely spaced eyes, bulging forehead) and the skull. In this syndrome, the great toes are short and wide and turn away from the rest of the toes. Some toes may be fused or have some other abnormalities. The mutation is caused in the FGFR2 gene which is located in chromosome 10. Treatment involves corrective surgery for deformed bones in face and foot.

Klinefelter Syndrome

It is the most common sex linked genetic disorder. In which males have an extra X chromosome. Hence, this disorder is also known as *47, XXY* or *XXY syndrome*. The most common symptom is infertility. Besides this, males with the XXY syndrome have impaired physical, language and social developments. As these individuals produce less testosterone than other males, such teenagers may be less muscular and have less facial hair than their peers. The presence of the extra X chromosome can't be undone. However, testosterone replacement therapy, a variety of therapeutic options like behavioural, speech and occupational therapy and educational treatments are the options available for those suffering from Klinefelter's syndrome.

Krabbe Disease

Krabbe disease is a rare degenerative disorder of the nervous system. It occurs due to mutation in the GALC gene which results in deficiency of enzyme galactosylceramidase. Deficiency of this enzyme affects the development of the myelin sheath of nerve cells. This disorder is inherited in autosomal recessive pattern and manifests itself in babies of 6 months of age. However, it can occur during adolescence or adulthood as well. Bone marrow transplant has helped some who suffer from mild form of this disorder. Treatment is usually symptomatic and supportive.

Langer-Giedion Syndrome

Langer-Giedion syndrome is a genetic disorder in human that is caused due to deletion or mutation of at least two genes on chromosome 8. This is not an inherited disorder. It is caused due to random events during formation of reproductive cells (sperms and eggs) in individuals. This is a rare disorder that causes bone abnormalities and typical facial features. Individuals suffering from Langer-Giedion syndrome have multiple non-cancerous tumors in their bones that cause pain, restrict joint movement and exerts pressure on nerves, blood vessels, spinal cord and the tissues surrounding the tumors. Some intellectual disability may be associated with this disorder. External fixators can be used for facial and limbic reconstructions.

Lesch-Nyhan Syndrome

It is an X-linked recessive disorder which causes deficiency of the enzyme hypoxanthine-guanine phosphoribosyltransferase (HPRT). Lack of HPRT leads to accumulation of uric acid in body, which leads to gout and kidney problems, poor muscle control and mental retardation of moderate degree. A striking feature of this disorder is a child biting his lips and fingers. This self mutilating behaviour appears in second year of a child's life. Other than these features, an individual suffering from this disorder shows facial grimacing, involuntary writhing and repetitive movement of limbs that is characteristic of Huntington's disease.

This disorder is alternatively also known as *Nyhan's syndrome*, *Juvenile gout* and *Kelley-Seegmiller syndrome*. Treatment for the Lesch-Nyhan syndrome is symptomatic.

Marfan Syndrome

Marfan syndrome is an inherited genetic disorder of the connective tissue, in which mutation is caused in the FBN1 gene that codes for the protein fibrillin-1. Marfan syndrome can be mild or severe. There is great variability in the features of this disorder that are associated with skeleton, skin and joints. However, confirmatory symptoms of the disorder are long limbs, dislocated lenses and dilation of the aortic root. Individuals suffering from Marfan syndrome or *Marfan's syndrome* usually have heart problems. They typically are tall and thin with slender, tapering fingers. Once diagnosed with Marfan's syndrome, regular visit to the cardiologist is required. Treatment depends upon the organ system that is affected. Regular check ups, medicines and surgery may be required to treat the symptoms of this disorder that is alternately also known as *leodosis*.

Muscular Dystrophy

Muscular dystrophy (MD) refers to a group of genetically inherited disorders of progressive degeneration of skeletal muscles. It also causes defects in muscle proteins and death of muscle cells and tissues. These disorders vary in severity and the extent and distribution of muscle weakness. Although the skeletal muscles are primarily affected, muscular dystrophy may impair functions of other systems of the body as well. While in some cases the symptoms appear in infancy of childhood, in certain instances muscular degeneration sets in during adulthood. *Duchenne MD* is the most common form of MD. Other common disorders are *Becker MD*, *Facioscapulohumeral MD* and *Myotonic MD*. There is no specific treatment to cure or reverse MD. However, therapeutic options like speech therapy, respiratory therapy, speech therapy and corrective orthopedic surgery and orthopedic appliances are used to treat disabilities due to MD.

Myotonic Dystrophy

Myotonic dystrophy, also known as *dystrophia myotonica (DM)* is an autosomal recessive genetic disorder that is caused due to repetition of a trinucleotide sequence. It affects the muscles of the body and is a multi-system disorder. Other than progressive muscle wasting, there is formation of cataracts in the eye, cardiac conduction defects and hormonal imbalances. There are two variations of this disorder – DM 1 and DM 2. DM 1 is more severe than DM 2. In DM 1 the trinucleotide sequence repeat is located on chromosome 9 whereas in case of DM 2 the trinucleotide sequence repeat occurs in chromosome 3. Although this disorder can manifest at any stage of one's life, variability with respect to age on onset of the symptoms reduces within successive generation. Hence it is a good example of *anticipation*. There is no cure for this disorder. Nevertheless the affected organs can be treated to manage the symptoms.

Nail-Patella Syndrome

Nail-patella syndrome (NPS) is inherited via autosomal dominant pattern. It is a disorder that affects the joints, bones, fingernails and kidneys. It is most commonly characterized by lack of nail and knee caps. Bone deformations manifest in elbow and abnormally shaped hip bone. Research shows that individuals suffering from the NPS are susceptible to developing glaucoma and scoliosis. Other names for NPS are *hereditary onychoostedysplasia*, *iliac horn syndrome*, *Fong disease* or *Turner-Kiser syndrome*.

Neurofibromatosis

An autosomal dominant condition, neurofibromatosis (abbreviated NF) is a genetically inherited condition in which nerve tissue grow tumors, that may be benign or may cause medical complications by compressing nerves and tissues around them. Hence, in this disorder the bones, nervous system, the spine and the skin are affected. Tumors under the skin may appear as bumps and are associated with skin discoloration. Learning disabilities are also associated with this disorder. There are two types of this disorder. Neurofibromatosis type 1 is more common than neurofibromatosis type 2. While type 1 is caused due to mutation in chromosome 17, neurofibromatosis type 2 is the result of a mutation in chromosome 22. Due to lack of any cure, treatment is aimed at managing symptoms and complications. In case, the tumor becomes cancerous (as happens with 10% of the cases), chemotherapy may be required. Surgery is resorted to, when the tumor compresses any organ or specific tissue of the body.

Noonan Syndrome

It is an autosomal dominant genetic disorder that may be inherited or arise due to spontaneous mutation in genes KRAS, PTPN11, RAF1, and SOS1. Individuals suffer from developmental disabilities that result in heart malformations, short stature, characteristic facial features, impaired blood clotting and indentation of the chest. Speech, language and learning disabilities are also common.

Triple X Syndrome

As the name suggests, trisomy refers to the genetic disorder which results in an extra copy of the X chromosome in females. This disorder is variably known as the *XXX syndrome*, *triplo-X*, *trisomy X*, and *47,XXX aneuploidy*. This genetic disorder is not inherited. It is caused due to non-disjunction during cell division, that results in an extra copy of chromosome in reproductive cells. In some cases, the extra copy of X chromosome may be caused during cell division in early embryonic development. Women with this disorder.

Osteogenesis Imperfecta

This is an autosomal dominant disorder of the connective tissue in which bones break easily and sometimes due to no apparent reason. Hence, it is also

known as *brittle bone syndrome* or *Lobstein disorder*. Genetic mutation impairs synthesis of collagen - a protein that makes bones strong. Osteogenesis Imperfecta may also weaken muscles, cause brittle bones, curved spine and a impaired hearing. Exercise, physical therapy, medicines and orthopedic devices are the only treatment available for people suffering from this disorder, as cure hasn't yet been found.

Patau Syndrome

Also known as *trisomy D* or *trisomy 13*, Patau syndrome is caused due to non-disjunction of chromosome 13 during meiosis, due to which, an affected individual inherits an extra copy of the chromosome. Robertsonian translocation can be another cause of this disorder. Like other genetic disorders in human that originate due to non-disjunction of chromosomes, the incidence of Patau syndrome increases with maternal age.

The extra copy of chromosome results in kidney and heart defects, neurological problems, facial defects, polydactyly (having extra fingers) and deformed feet. Features of this disorder are present from birth and may be confused with Edward's syndrome. Hence, genetic testing is important to confirm diagnosis. While certain infants may be able to survive only for a couple of days, depending upon the severity of the conditions, those who survive with milder symptoms undergo treatment, focusing the particular disability that each individual suffers from.

Phenylketonuria

Phenylketonuria (abbreviated as PKU) is an autosomal recessive disorder that causes deficiency in the enzyme phenylalanine hydroxylase. The result of this deficiency is that instead of being metabolized to tyrosine, the amino acid phenylalanine gets converted into phenylketone (also known as phenylpyruvate). This compound is detected in urine.

If left untreated, excess phenylketone can impair development of the brain. This will manifest as mental retardation, seizures or brain damage. A diet low in phenylalanine or other means that lowers amount of the compound helps in dealing with the disorder.

Porphyria

Porphyria is an inherited genetic disorder in which, synthesis of any one of the 8 enzymes involved in the process of synthesis of heme, is disrupted. Heme is linked to a chemical called protoporphyrin. Disruption in the heme biosynthetic pathway results in accumulation of porphyrin or its precursors in the body, that cause neurological or dermal problems. Acute porphyria affects the nervous system, whereas cutaneous porphyria or erythropoietic porphyria primarily affects the skin. This disorder is inherited in autosomal dominant pattern. Taking heme externally through a vein and medicines can alleviate the symptoms of this disorder.

Retinoblastoma

Retinoblastoma is a cancer of the retina, that affects children younger than 5 years. It can be genetic as well as non genetic. The genetic form, which is the cause in almost half of the cases of retinoblastoma, is the result of mutation in chromosome 13. Retinoblastoma usually affects one eye. Characteristic physical feature is whiteness of the retina, which is referred to as “cat’s eye reflex” or leukocoria. Other symptoms include, deterioration in vision, eye pain, redness and irritation in the eye. Retinoblastoma is curable if treated at an early stage. However, if not treated on time, cancer may spread out from the eye to other parts of the body.

Rett Syndrome

Rett syndrome is a neurological and developmental disorder that is inherited through X-linked dominant pattern. It occurs almost exclusively in females. For about a year of normal growth, girls with Rett’s syndrome show clinical features that include decreased rate of head growth, small hands and feet, disabilities related to learning communication, coordination and speech. Affected girls lose control over purposeful use of hands and show repetitive movements like wringing of the hands and clapping.

TYPES OF SYNTHETIC DISORDERS

Genetic disorders may be caused by problems with either genes or chromosomes. An inherited disorder is caused by a gene that is passed from parent to child. These disorders can be dominant, recessive, or X-linked. Chromosomal disorders can occur even when the parents do not have any risk factors. Some are caused by a mix of factors (multifactorial).

DOMINANT DISORDERS

Just one gene from either parent can cause a dominant gene disorder. If one parent has the gene, each child of the couple has a 1-in-2 chance of inheriting the disorder.

Examples of dominant disorders are:

- *Huntington’s disease:* An inherited nerve disorder that causes loss of control of movements and mental function, usually starting between 35–50 years of age.
- *Polydactyly:* A condition in which a person has extra fingers or toes.

RECESSIVE DISORDERS

For recessive disorders, both parents must carry the gene before the problem can occur in their child. If you have a recessive gene for a certain disorder, you are a carrier for that disorder. Although you may show no signs of the disorder yourself, you can still pass it on to your children. If both parents are carriers of the same recessive disorder, each of their children has a 1-in-4 chance of having the disorder.

Some recessive disorders are more common in certain ethnic groups, such as:

- *Sickle cell disease:* An inherited disorder in which red blood cells have a crescent shape, causing chronic anemia and episodes of pain. It occurs most often in African Americans.
- *Tay–Sachs disease:* An inherited birth defect that causes mental retardation, blindness, seizures, and death, usually by age 5 years. It occurs mostly in people of eastern European Jewish descent (Ashkenazi Jews) and among French Canadians and Cajuns.
- *Cystic fibrosis:* An inherited disorder that causes problems in digestion and breathing that occurs mostly in people of Northern European descent.

X-LINKED DISORDERS

Disorders that are caused by genes on the X chromosome are called X-linked or sex-linked disorders. In most X-linked disorders, the abnormal gene is recessive.

A woman can carry the gene for an X-linked disorder caused by a recessive gene but not have that disorder. This is because even though one of her X chromosomes has the recessive disorder, her other X chromosome has the normal gene, which is dominant.

A male baby inherits one X chromosome from his mother. If the X chromosome he inherits has the disorder, he will get the disorder because he doesn't have another X chromosome with a normal gene to cancel out the abnormal one. Colour blindness is a common X-linked trait.

If you are a carrier for an X-linked disorder, there is a 1-in-2 chance a son will have the disorder and a daughter will be a carrier. Very rarely, a daughter has an X-linked recessive disorder. In this case, her father has the disease and her mother is a carrier. If you have a family history of a disorder, carrier testing may be used to show if you are a carrier of an X-linked disorder.

Examples of X-linked disorders are:

- *Hemophilia:* An inherited sex-linked disorder in which the blood lacks a substance that helps it clot.
- *Duchenne muscular dystrophy:* An inherited, sex-linked disease most often affecting males. Symptoms are weakness and muscle wasting, first of the limbs and trunk, but slowly affecting all voluntary muscles, with death usually occurring around age 30 years.
- *Fragile X syndrome:* A disorder of the X chromosome that is the most common inherited cause of mental retardation.

CHROMOSOMAL DISORDERS

Genetic disorders also may be caused by a missing, damaged, or extra chromosome. Such problems often are caused by an error that occurred when the egg or sperm was forming. Most children with chromosomal disorders have physical defects, and some have mental defects.

Two examples of chromosomal disorders are:

1. *Down syndrome:* A genetic disorder resulting from an extra copy of the 21st chromosome in which mental retardation, abnormal features of the face, and medical problems such as heart defects occur.
2. *Trisomy 18:* A genetic disorder resulting from an extra copy of the 18th chromosome that causes serious problems with physical and mental development. Most infants with trisomy 18 die within the first year of life. The risk of having a child with a chromosomal disorder increases as a woman ages. For instance, a 35-year-old woman has a 1-in-192 (less than 1%) chance of having a baby with a chromosomal disorder. The chance increases to 1 in 66 (about 1.5%) in a woman aged 40 years.

MULTIFACTORIAL DISORDERS

Disorders thought to come from a mix of factors are called multifactorial disorders. This means the actual cause is unknown. A few of these disorders can be detected during pregnancy.

Sometimes they can be corrected with surgery. Some examples of multifactorial disorders are:

- *Abdominal wall defect:* The muscle and skin that cover the wall of the abdomen are missing and the bowel is either enclosed in a clear sac (omphalocele) or sticks out through a hole in the abdominal wall (gastroschisis).
- *Cleft palate:* A gap or space occurs in the roof of the mouth.
- *Clubfoot:* The foot is misshaped and twisted out of position.

RISK FACTORS

When you have your prepregnancy checkup or start prenatal care, your doctor may give you a list of questions like the ones in the box. Your answers to these questions will help your doctor advise you on your risk of having a baby with a genetic defect. He or she also may suggest genetic counseling or testing. If you answer “yes” to any of them, you may be at increased risk for having a baby with a genetic disorder. In most cases, even couples at risk can have healthy children with no genetic disorders. However, genetic disorders can occur even when there is no history of problems in the family. For that reason, some tests to detect genetic disorders are offered to all women.

TESTING

Whether you want to be tested to see if you are at increased risk for birth defects or genetic disorders is a personal choice. Some couples would rather not know if they are at risk for a problem, but others benefit from knowing in advance. Some tests can be done before a woman is pregnant and others are done at various times during pregnancy. Some may need to be done in a special center equipped to perform them.

Carrier Testing

Carrier testing of both parents will detect if either parent is a carrier of a certain genetic defect. Carrier testing can be done before, during, or after pregnancy.

RISK FACTORS FOR DISORDERS

- Will you be 35 years or older when your baby is due?
- Will the baby's father be 50 years or older when your baby is due?
- If you or your partner are of Mediterranean, Asian, or African descent, do either of you or anyone in your families have thalassemia (an inherited disorder that causes anemia)?
- Is there a family history of neural tube defects?
- Have you or the baby's father ever had a child with a neural tube defect?
- Is there a family history of congenital heart defects?
- Is there a family history of Down syndrome?
- Have you or the baby's father ever had a child with Down syndrome?
- If you or the baby's father are of eastern European Jewish, French Canadian, or Cajun descent, is there a family history of Tay-Sachs disease?
- If you or the baby's father are of eastern European Jewish descent, is there a family history of Canavan disease?
- If you or the baby's father are African American, is there a family history of sickle cell anemia or sickle cell trait?
- Is there a family history of hemophilia?
- Is there a family history of muscular dystrophy?
- Is there a family history of cystic fibrosis?
- Is there a family history of Huntington's disease?
- Does anyone in your family or the family of the baby's father have cystic fibrosis?
- Is anyone in your or the baby's father's family mentally retarded?
- If so, was that person tested for fragile X syndrome?
- Do you, the baby's father, anyone in your families, or any of your children have any other genetic diseases, chromosomal disorders, or birth defects?
- Do you have a metabolic disorder such as type 1 or type 2 diabetes or phenylketonuria?
- Do you have a history of pregnancy issues (miscarriages or a stillborn baby)?

For a carrier test, a sample of blood or saliva is studied in a lab to detect a defective gene for a certain inherited disorder. All women may be offered or informed about carrier testing for cystic fibrosis. Other tests can be done if your family history, ethnic origin, or some other factor raises your risk of being a carrier. Unfortunately, there are no carrier tests for most inherited birth defects.

Your doctor or genetic counselor will help you understand the chances that the defect could be passed on to your baby. If the carrier testing is done before you are pregnant, you can use the results to decide if you want to get pregnant. If you are already pregnant, you may be offered testing to see if the baby has the defect.

SCREENING TESTS

Screening tests are available to detect some birth defects during pregnancy. However, a screening test only shows if there is an increased risk that a defect will occur.

The following screening tests may be offered:

- *Maternal serum screening:* These tests measure the level of three or four substances in the mother's blood. This test is used to find out if a woman is at increased risk for having a baby with a neural tube defect, abdominal wall defect, Down syndrome, or trisomy 18. These tests usually are done between 15 and 20 weeks of pregnancy.
- *First trimester screening:* This screening test combines the results of a special *ultrasound* test called *nuchal translucency screening* and blood (serum) tests (PAPP-A and hCG). It is done between 10 and 14 weeks of pregnancy. This test can be done to look for signs of Down syndrome, trisomy 18, and heart defects.

A test result could be positive (showing there is a risk of a problem) even though the baby is healthy. Likewise, a birth defect can occur even if testing doesn't show a problem. Most tests focus on a certain problem, and not all disorders can be found by testing. If the results of a screening test show an increased risk, further tests may be done to diagnose the problem.

DIAGNOSTIC TESTS

If a screening test or other factors raise concerns, diagnostic tests often can show whether certain birth defects are present.

The following diagnostic tests may be offered:

- *Detailed ultrasound exam:* A type of ultrasound exam that can help explain abnormal screening test results and provide more detailed information. An ultrasound exam can be performed anytime during pregnancy, although a detailed exam is best performed after 18 weeks of pregnancy.
- *Amniocentesis:* A procedure in which a needle is used to withdraw a small amount of amniotic fluid and cells from the sac surrounding the fetus. The amniotic fluid and cells can be tested to detect certain chromosomal problems in the fetus. Amniocentesis usually is done at 15–20 weeks of pregnancy.
- *Chorionic villus sampling (CVS):* A procedure in which a small sample of cells is taken from the placenta and tested. CVS detects some of the same chromosomal problems as amniocentesis does. This test can be performed earlier than amniocentesis—often at 10–12 weeks of pregnancy.

- *Fetal blood sampling*: Also known as cordocentesis, this procedure tests for chromosomal defects and other problems. For this test, blood is taken from a vein in the umbilical cord. Fetal blood sampling usually is used when the results of amniocentesis, chorionic villus sampling, or ultrasound are unclear. The test results may take a week or more to complete.

THE NEXT STEPS

The results of these tests and what they mean to the mother and baby can be explained by a genetic counselor. These counselors have special skills in genetic disorders. They are trained to assess risks and help couples in looking at their options. Most babies are born healthy, but for some there is an increased risk of a birth defect. Testing can help detect the risk of a genetic disorder, but no test is 100% accurate. If you are at risk for having a baby with a genetic disorder, talk to your doctor about counseling and testing. A counselor can give a couple information that can help them decide how to proceed.

GLOSSARY

- *Anencephaly*: A type of neural tube defect that occurs when the fetus's head and brain do not develop normally.
- *Chromosomes*: Structures that are located inside each cell in the body and contain the genes that determine a person's physical makeup.
- *Fetus*: A baby growing in the woman's uterus.
- *Genes*: DNA "blueprints" that code for specific traits, such as hair and eye colour.
- *Nuchal Translucency Screening*: A special ultrasound test of the fetus to screen for the risk of Down syndrome and other birth defects.
- *Spina Bifida*: A neural tube defect that results from incomplete closure of the fetal spine.
- *Ultrasound*: A test in which sound waves are changed to images to examine internal structures. During pregnancy, it can be used to examine the fetus.

DRUG REVERSES

UCLA mouse study offers hope for correcting how autism disrupts brain

UCLA researchers discovered that an FDA-approved drug reverses the brain dysfunction inflicted by a genetic disease called tuberous sclerosis complex (TSC). Because half of TSC patients also suffer from autism, the findings offer new hope for addressing learning disorders due to autism. *Nature Medicine* publishes the findings in its online June 22 edition.

Using a mouse model for TSC, the scientists tested rapamycin, a drug approved by the FDA to fight tissue rejection following organ transplants. Rapamycin is well-known for targeting an enzyme involved in making proteins needed for memory. The UCLA team chose it because the same enzyme is also regulated by TSC proteins.

“This is the first study to demonstrate that the drug rapamycin can repair learning deficits related to a genetic mutation that causes autism in humans. The same mutation in animals produces learning disorders, which we were able to eliminate in adult mice,” explained principal investigator Dr. Alcino Silva, professor of neurobiology and psychiatry at the David Geffen School of Medicine at UCLA. “Our work and other recent studies suggest that some forms of mental retardation can be reversed, even in the adult brain.”

“These findings challenge the theory that abnormal brain development is to blame for mental impairment in tuberous sclerosis,” added first author Dan Ehninger, postgraduate researcher in neurobiology. “Our research shows that the disease’s learning problems are caused by reversible changes in brain function — not by permanent damage to the developing brain.”

TSC is a devastating genetic disorder that disrupts how the brain works, often causing severe mental retardation. Even in mild cases, learning disabilities and short-term memory problems are common. Half of all TSC patients also suffer from autism and epilepsy. The disorder strikes one in 6,000 people, making it twice as common as Huntington’s or Lou Gehrig’s disease.

Silva and Ehninger studied mice bred with TSC and verified that the animals suffered from the same severe learning difficulties as human patients. Next, the UCLA team traced the source of the learning problems to biochemical changes sparking abnormal function of the hippocampus, a brain structure that plays a key role in memory.

“Memory is as much about discarding trivial details as it is about storing useful information,” said Silva, a member of the UCLA Department of Psychology and UCLA Brain Research Institute. “Our findings suggest that mice with the mutation cannot distinguish between important and unimportant data. We suspect that their brains are filled with meaningless noise that interferes with learning.”

“After only three days of treatment, the TSC mice learned as quickly as the healthy mice,” said Ehninger. “The rapamycin corrected the biochemistry, reversed the learning deficits and restored normal hippocampal function, allowing the mice’s brains to store memories properly.”

In January, Silva presented his study at the National Institute of Neurological Disorders and Stroke meeting, where he was approached by Dr. Petrus de Vries, who studies TSC patients and leads rapamycin clinical trials at the University of Cambridge.

After discussing their respective findings, the two researchers began collaborating on a clinical trial currently taking place at Cambridge to examine whether rapamycin can restore short-term memory in TSC patients.

“The United States spends roughly \$90 billion a year on remedial programmes to address learning disorders,” noted Silva. “Our research offers hope to patients affected by tuberous sclerosis and to their families. The new findings suggest that rapamycin could provide therapeutic value in treating similar symptoms in people affected by the disorder.”

THE 2001 AMENDMENTS OF NDPS ACT (1985) AND UNADDRESSED CONCERNS

The criminalisation of drug use and the increasing rates of arrest for possessing small quantities of drugs led to officials, social scientists, members of the judiciary and others to question the suitability of such harsh legislation. According to one observer, the Act failed because of delay in trials, a weak bail law that left the poor languishing in prisons, the failure of investigating agencies to follow the procedural requirements of NDPS Act and a poor understanding of the addiction problem.

As a consequence of such criticisms, including those from the National Addiction Research Centre, a reassessment of the Act in 2001 resulted in amendments relating to the length of imprisonment and the quantity and type of drug seized. This ensured that, where traditional drugs are concerned, only individuals with large quantities of cannabis can be arrested for drug trafficking and face imprisonment. Further changes in the law in 2002 created two categories that are based on quantity seized. These are defined as small quantities and commercial quantities. For trafficking in commercial quantities, the sentence is imprisonment for more than twenty years and a fine varying between 100,000 and 200,000 Rupees. The categorisation of quantity varies according to the substance seized; for hashish, a small quantity is classified as below 100 grams and commercial quantity as 1 Kilogram and above; for heroin, a small quantity is below 5 grams and commercial quantity above 250 grams.

This is arguably a more realistic figure than the former law that classified those possessing more than a quarter gram as drug traffickers. Nonetheless, despite the efforts made to revise the Act, one contradiction persists. This is that any form of use remains a criminal offence, which can result in imprisonment for a period of six months. Such an offence appears to be unrealistic in a country where the use of cannabis and opium retains widespread cultural acceptance in many states across the country. The National Drug Policy follows the lines drawn by legislation and the focus has been on demand reduction through prevention and treatment, and supply reduction through enforcement activities.

However, there has been a clear emphasis of political support and resource allocation to supply reduction. One example of this relates to one of the 2001 amendments to the act, which created a National Fund for Control of Drug Abuse. This was designed to support the expansion of demand reduction programmes, but has yet to become active. At present, efforts on the demand side focus on prevention, treatment, rehabilitation and after care services undertaken within institutional and community settings. There are currently 450 centres funded across the country for deaddiction and counselling services. National level Drug Abuse Monitoring Systems have also been established in an effort to understand trends in drug use and its implications for drug abuse management. Most efforts in the area of demand reduction are funded by Ministry of Social Justice and Empowerment and United Nations Office on Drugs and Crime.

ONGOING ISSUES OF CONCERN IN THE AREA OF DRUG DEMAND CONTROL IN INDIA

As described here, the authorities have clearly made efforts to alter provisions of the NDPS to take more account of the indigenous drug use culture within the country. That said, evidence suggests that Indian drug policy could be made far more effective and appropriate to national realities.

This is crucial at a time when overall, “the drug situation is still in a benign stage in India, though moving in dangerous directions”. While cultural norms in rural areas effectively restrict drug use to traditional forms and drug-related HIV is still relatively low within the national context of drug use, current trends suggest increasing levels of problematic non-traditional use and addiction.

We suggest that in any assessment of contemporary Indian drug control policies, there are a number of key issues of concern:

- Most prevention efforts within India are, within the international framework laid down by the United Nations, currently based on experiences in predominantly Western countries. As such, they start from a position that considers all forms of drug use criminal and deviant. Thus, this leaves no scope for strengthening cultural mechanisms of use management or integrating them into contemporary legislation. For example, where institutional care appears unsustainable, practitioners could consider traditional forms of control such as the use of *doda pani* to wean users away from excessive opium or heroin consumption. Research suggests that cultural norms in India are far more efficient means of drug control, and have fewer negative side-effects than legislation inspired by global norms.
- Limited government funding means that the treatment of drug abuse is not widely available.
 - Centres tend to provide services on a fee paying basis and the marginalised street level drug user consequently has limited options. In the city of Mumbai, for example, there are no treatment centres that cater to street level users with complications. Furthermore, the government hospital catering to the general population dislikes dealing with drug users because they are considered to be ‘difficult’ patients. Treatment for drug addiction is consequently not widely available and this sometimes results in users dying without receiving any care.
 - There is a systematic reduction of government grants to drug treatment centres and the remuneration for the services of professionals is so minimal there are few takers. Under such conditions, there appears to be limited scope for an appropriate approach to care.
- Attempts at cost management by users, in combination with the deteriorating quality of street drugs, have produced more risky forms of use; that is to say, injecting behaviour. This has serious consequences

for public health in some parts of India. A recent study found that the purity of heroin sold on the street varies from 3 per cent to 12 per cent. The Narcotics Drugs Control Board of India places the purity of street level heroin at 5 per cent. In the northeastern part of the country it seems that a shift to injecting drug use is also a result of time management issues. The behaviour of a drug user in these areas of political instability is more dangerous than in other parts of the country.

- The approach of the Indian government is law enforcement led, with limited resources provided for treatment. This is unfortunate, since studies in other cultural settings show that efforts dominated by the law enforcement are not particularly effective. A high rate of drug incarceration as a strategy to control drug use has at best a marginal impact and does not lead to a significant undermining of the drug market. Indeed, experience from around the world reveals the cost effectiveness of appropriate treatment and harm reduction programmes and interventions.

Mindful of these issues, and within the context of current research, we therefore urge Indian authorities to:

- Strengthen efforts to understand patterns and trends of drug use within the country, especially in rural areas falling along the drug trading routes and those close to cultivating areas.
- Develop methods for supporting socio-cultural controls on drug use.
- Urgently assess the demand for drug treatment, particularly amongst the urban poor engaging in the most dangerous forms of drug use, and increase the coverage of a range of treatment interventions.

By concentrating predominantly on the punitive aspects of UN legislation, the Indian authorities are currently failing to address adequately the issue of drug use within their own borders.

Without an urgent change in approach, involving not only the refocusing of resources but also the recognition of traditional attitudes to the use and management of mind-altering substances, the nation may in the future face similar drug-related problems to those recently experienced in other countries in the region.

Within the Islamic Republic of Iran, there is currently a high incidence of drug-related deaths and HIV/AIDS infection among injecting drug users while increasing problems surrounding the use of “amphetamine type stimulants” are to be found in Thailand.

Specific national circumstances mean that no two countries experience identical patterns of problematic drug use. Yet the timely implementation of pragmatic and culturally appropriate policies within India would surely do much to prevent a repeat of such crises.

DRUG NEUROLOGICAL DISORDER

Neurological disorders are health conditions involving the nervous system. A neurological disorder is a disease or injury of the central nervous system that causes paralysis of any part of the body. Sometimes physical injury to the brain, spinal cord, or nerves can be the cause of neurological disorders. Sometimes they can result from biochemical causes. Other times, the cause may be unknown and only the effects are seen. Neurological disorders can be a sign that there is an imbalance in your system. When you have an imbalance, you are also susceptible to various diseases, which can settle in weak areas of your body.

Neurological disorders are a group of disorders that involve the central nervous system (brain, brainstem and cerebellum), the peripheral nervous system (including cranial nerves), and the autonomic nervous system (parts of which are located in both central and peripheral nervous system). Major branches are headache, stupor and coma, dementia, seizure, sleep disorders, trauma, infections, neoplasm's, neuroophthalmology, movement disorders, demyelinating diseases, spinal cord disorders, and disorders of peripheral nerves, muscle and neuromuscular junctions. Neurological disabilities are associated with damage to the nervous system (including the brain and spinal cord) that results in the loss of some bodily or mental functions. Acquired Brain Injury (ABI), and Epilepsy are two of the most prevalent neurological disabilities. Heart attacks, infections, genetic disorders, and lack of oxygen to the brain may also result in a neurological disability.

Neurological disorders are quite diverse, chronic, challenging to treat, and often disabling. They can be caused by many different factors, including (but not limited to): inherited genetic abnormalities, problems in the immune system, injury to the brain or nervous system, or diabetes. Many mental illnesses are believed to be neurological disorders of the central nervous system, but they are classified separately. They are not traditionally listed as neurological diseases because their causes are not definitely determined as biological, although there are good reasons to suspect that bipolar disorder and schizophrenia have neurochemical causes. The human central nervous system consists of the brain and spinal cord. These lie in the midline of the body and are associated with the skull and vertebrae respectively. The central nervous system along with the peripheral nervous system comprises a primary division of controls that command all physical activities of a vertebrate. Neurons of the central nervous system affect consciousness and mental activity while spinal extensions of central nervous system neuron pathways affect skeletal muscles and organs in the body.

CONDITIONS

Multiple sclerosis is a demyelinating disease, a non-contagious chronic autoimmune disorder of the central nervous system which can present with a variety of neurological symptoms occurring in attacks or slowly progressing over time. It has no cure yet and the exact cause remains unknown. Due to its effects of the nervous system, it can lead to long-term impaired mobility and

disability in severe cases. Multiple sclerosis slowly progressive autoimmune disease in which the body's immune system attacks the protective myelin sheaths that surround the nerve cells of the brain and spinal cord (a process called demyelination), resulting in damaged areas that are unable to transmit nerve impulses.

Multiple sclerosis can be thought of as an inflammatory process involving different areas of the central nervous system (CNS) at various points in time. During an multiple sclerosis attack, inflammation occurs in areas of the white matter of the central nervous system (nerve fibers that are the site of multiple sclerosis lesions) in random patches called plaques. This process is followed by destruction of myelin, which insulates nerve cell fibers in the brain and spinal cord. Myelin facilitates the smooth, high-speed transmission of electrochemical messages between the brain, the spinal cord, and the rest of the body; when it is damaged, neurological transmission of messages may be slowed or blocked completely, leading to diminished or lost function.

Multiple sclerosis is a nerve disorder caused by destruction of the insulating layer surrounding neurons in the brain and spinal cord. This insulation, called myelin, helps electrical signals pass quickly and smoothly between the brain and the rest of the body. When the myelin is destroyed, nerve messages are sent more slowly and less efficiently. Patches of scar tissue, called plaques, form over the affected areas, further disrupting nerve communication. The symptoms of multiple sclerosis occur when the brain and spinal cord nerves no longer communicate properly with other parts of the body. multiple sclerosis causes a wide variety of symptoms and can affect vision, balance, strength, sensation, coordination, and bodily functions.

Multiple sclerosis affects more than a quarter of a million people in the United States. Most people have their first symptoms between the ages of 20 and 40; symptoms rarely begin before 15 or after 60. Women are almost twice as likely to get multiple sclerosis as men, especially in their early years. People of northern European heritage are more likely to be affected than people of other racial backgrounds, and multiple sclerosis rates are higher in the United States, Canada, and Northern Europe than in other parts of the world. multiple sclerosis is very rare among Asians, North and South American Indians, and Eskimos. The onset of multiple sclerosis is usually at age 20 to 40 years, and its many symptoms affect almost every system of the body. There may be visual difficulties, emotional disturbances, speech disorders, convulsions, paralysis or numbness of various regions of the body, bladder disturbances, and muscular weakness. The course of the disease varies greatly from person to person. In some patients, the symptoms remit and return, sometimes at frequent intervals and sometimes after several years. In others the disease progresses steadily. The disease is more common in women than men, and often appears between the ages of 20 and 45. It is more frequently seen in the temperate zones, such as northern Europe, than the subtropical and tropical areas of the World. In Europe and North America multiple sclerosis is the most common cause of neurological

disability in young adults, affecting 1 in 800 of the population. Multiple sclerosis is not strictly a hereditary disease. However, multiple sclerosis is a disease influenced by a variety of factors, one of which is the genetic background of an individual. There is no single gene known to be responsible for multiple sclerosis, though a few genes have been demonstrated to increase the risk of development. Although these genes are of scientific interest and continue to play a part in research, they are not enough to diagnose an individual with multiple sclerosis.

Cerebral Palsy

Cerebral palsy or CP is a group of disorders associated with developmental brain injuries that occur during fetal development, birth, or shortly after birth. It is characterized by a disruption of motor skills, with symptoms such as spasticity, paralysis, or seizures. Cerebral palsy is also known as static encephalopathy and Little's disease (which is strictly speaking only the "spastic diplegia" form of CP). It is no longer considered a disease, but rather it is a chronic nonprogressive neurological disorder. The incidence is about 1.5 to 4 per 1000 live births. There is no cure, but therapy may be helpful. It has one of the highest lifetime costs of any birth defect.

The disorder is marked by several important signs. All persons with cerebral palsy developed it while the brain was under development. This limits the age at which the disorder can develop to at most 5 years old, however 80% of all cases occur before the baby reaches 1 month old. Secondly, it is a nonprogressive disorder, that is, once the damage to the brain is done no additional damage occurs. Cerebral palsy never worsens, though its symptoms may change with time. The disorder also never improves. It is a permanent disability which stays with a person their entire life. Any temporary problems would suggest a disorder other than cerebral palsy, which is why a reliable diagnosis of it can't occur until the child is four or five years old. Additionally, the disorder is characterized by disruption of the motor skills of the person. The severity in the loss of motor skills varies greatly from case to case. Lastly, even though there is a loss of motor skills, the muscles themselves are not defective. The problem lies solely in the brain's ability to control those otherwise healthy muscles.

The affected muscles of a person with CP may become rigid or excessively loose, or the person may lose control of muscles, or have problems with balance and coordination. A combination of these is also possible. The person may be primarily affected in the legs (paraplegia or diplegia), or in the arm and leg of one side of the body (hemiplegia), or all four limbs may be involved (quadriplegia). A person with CP may also be affected by a number of other problems, including seizure disorder, visual deficits, hearing problems, mental retardation, learning disabilities, and attention-deficit/hyperactivity disorder. None of these is necessarily part of CP, however, and a person with CP may have no other impairments except for the movement disorder.

Cerebral palsy affects approximately 500,000 children and adults in the United States, and is diagnosed in more than 6,000 newborns and young children each

year. Cerebral palsy is not an inherited disorder, and as of yet there is no way to predict with certainty which children will develop it. It is not a disease, and is not communicable. CP is a nonprogressive disorder, which means that symptoms neither worsen nor improve over time. However manifestation of the symptoms may become more severe over time; for example, rigidity of muscles can lead to contractures and deformities that require a variety of interventions.

Headaches

A headache is a condition of mild to severe pain in the head; sometimes upper back or neck pain may also be interpreted as a headache. Most headaches are due to tension, migraine, or a combination of the two. Serious underlying causes of headaches, like a tumor or a stroke, are extremely rare, despite the fact that many people worry about these possibilities.

There are three types of primary headaches: tension-type (muscular contraction headache), migraine (vascular headaches), and cluster. Virtually everyone experiences a tension-type headache at some point. An estimated 18% of American women suffer migraines, compared to 6% of men. Cluster headaches affect fewer than 0.5% of the population, and men account for approximately 80% of all cases. Headaches caused by illness are secondary headaches and are not included in these numbers.

Headaches have a wide variety of causes, ranging from eyestrain to inflammation of the sinus cavities to life-threatening conditions such as encephalitis, brain cancer, and cerebral aneurysms. When the headache occurs in conjunction with a head injury the cause is usually quite evident; however, many causes of headaches are more elusive. The most common type of headache is a tension headache. Some people experience headaches when they are hungry or dehydrated.

In developed countries, Tension Type Headache (TTH) alone affects two-thirds of adult males and over 80% of females. Extrapolation from figures for migraine prevalence and attack incidence suggests that 3000 migraine attacks occur every day for each million of the general population. Less well recognized is the toll of chronic daily headache: up to one adult in 20 has headache every or nearly every day.

Not only is headache painful, but headache disorders are also disabling. Worldwide, according to the World Health Organization (WHO), migraine alone is 19th among all causes of years lived with disability (YLDs). Headache disorders impose recognizable burden on sufferers including sometimes substantial personal suffering, impaired quality of life and financial cost. Repeated headache attacks, and often the constant fear of the next one, damage family life, social life and employment. For example, social activity and work capacity are reduced in almost all migraine sufferers and in 60% of TTH sufferers.

The long-term effort of coping with a chronic headache disorder may also predispose the individual to other illnesses. For example, depression is three times more common in people with migraine or severe headaches than in healthy individuals.

Alzheimer's Disease

Alzheimer's disease (AD) is an irreversible, progressive disorder in which brain cells (neurons) deteriorate, resulting in the loss of cognitive functions, primarily memory, judgment and reasoning, movement coordination, and pattern recognition. In advanced stages of the disease, all memory and mental functioning may be lost. A person with Alzheimer's disease has problems with memory, judgment, and thinking, which makes it hard for the person to work or take part in day-to-day life. The death of the nerve cells occurs gradually over a period of years.

A person with Alzheimer's disease usually has a gradual decline in mental functions, often beginning with slight memory loss, followed by losses in the ability to maintain employment, to plan and execute familiar tasks, and to reason and exercise judgment. Communication ability, mood, and personality may also be affected. Most people who have Alzheimer's disease die within eight years of their diagnosis, although that interval may be as short as one year or as long as 20 years. Alzheimer's disease is the fourth leading cause of death in adults after heart disease, cancer, and stroke.

Between two and four million Americans have Alzheimer's disease; that number is expected to grow to as many as 14 million by the middle of the 21st century as the population as a whole ages. While a small number of people in their 40s and 50s develop the disease (called early-onset Alzheimer's disease), Alzheimer's disease predominantly affects the elderly. Alzheimer's disease affects about 3% of all people between ages 65 and 74, about 19% of those between 75 and 84, and about 47% of those over 85. Slightly more women than men are affected with Alzheimer's disease, but this may be because women tend to live longer, and so there is a higher proportion of women in the most affected age groups.

People with Alzheimer's disease can develop more and more problems as time goes by. Initially, memory loss is the most noticeable, although language difficulty (for example, trouble finding words) is also seen. Poor planning, poor judgement or becoming lost even in familiar settings are all symptoms of the problem. Personality changes can develop over time, along with agitation, depression, irritability, and, rarely, aggressivity. Finally, a person with severe Alzheimer's disease will be unable to talk, unable to sit up, and unable to control bowels or bladder. Understandably, many older people - and their children - fear the development of Alzheimer's disease.

Chronic Fatigue Syndrome

Chronic fatigue syndrome (CFS) is an illness characterized by prolonged, debilitating fatigue and multiple nonspecific symptoms such as headaches, recurrent sore throats, muscle and joint pains, memory and concentration difficulties. Profound fatigue, the hallmark of the disorder, can come on suddenly or gradually and persists or recurs throughout the period of illness. Unlike the

short-term disability of say, the flu, chronic fatigue syndrome symptoms linger for at least six months and often for years. The cause of chronic fatigue syndrome remains unknown.

Chronic fatigue syndrome is a debilitating and complex disorder characterized by profound fatigue of six months or longer duration that is not improved by bed rest and that may be worsened by physical or mental activity. Persons with chronic fatigue syndrome (CFS) most often function at a substantially lower level of activity than they were capable of before the onset of illness. In addition to these key defining characteristics, patients report various nonspecific symptoms, including weakness, muscle pain, impaired memory and/or mental concentration, insomnia and post-exertional fatigue lasting more than 24 hours. In some cases, chronic fatigue syndrome can persist for years.

Chronic fatigue syndrome may occur after an infection such as a cold, bronchitis, mononucleosis, hepatitis or intestinal illness. It can start during or shortly after a period of high stress or come on gradually without any clear starting point and any obvious cause. Chronic fatigue syndrome is a flu-like condition that can drain your energy and sometimes last for years. People previously healthy and full of energy may experience extreme fatigue, weakness and headaches as well as painful joints, muscles and lymph nodes.

Chronic fatigue syndrome is the most common name for this disorder, but it also has been called chronic fatigue and immune disorder (CFIDS), myalgic encephalomyelitis, low natural killer cell disease, post-viral syndrome, Epstein-Barr disease, and Yuppie flu. Chronic fatigue syndrome has so many names because researchers have been unable to find out exactly what causes it and because there are many similar, overlapping conditions. Reports of a CFS-like syndrome called neurasthenia date back to 1869. Later, people with similar symptoms were said to have fibromyalgia because one of the main symptoms is myalgia, or muscle pain. Because of the similarity of symptoms, fibromyalgia and chronic fatigue syndrome are considered to be overlapping syndromes.

In the early to mid-1980s, there were outbreaks of chronic fatigue syndrome in some areas of the United States. Doctors found that many people with chronic fatigue syndrome had high levels of antibodies to the Epstein-Barr virus (EBV), which causes mononucleosis, in their blood. For a while they thought they had found the culprit, but it turned out that many healthy people also had high EBV antibodies. Scientists have also found high levels of other viral antibodies in the blood of people with chronic fatigue syndrome. These findings have led many scientists to believe that a virus or combination of viruses may trigger chronic fatigue syndrome.

Chronic fatigue syndrome was sometimes referred to as Yuppie flu because it seemed to often affect young, middle-class professionals. In fact, chronic fatigue syndrome can affect people of any gender, age, race, or socioeconomic group. Although anyone can get chronic fatigue syndrome, most patients diagnosed with chronic fatigue syndrome are 25-45 years old, and about 80% of cases are in women. Estimates of how many people are afflicted with chronic fatigue syndrome vary due to the similarity of chronic fatigue syndrome

symptoms to other diseases and the difficulty in identifying it. The Centers for Disease Control and Prevention (CDC) has estimated that 4-10 people per 100,000 in the United States have chronic fatigue syndrome. According to the CFIDS Foundation, about 500,000 adults in the United States (0.3% of the population) have chronic fatigue syndrome. This probably is a low estimate since these figures do not include children and are based on the CDC definition of chronic fatigue syndrome, which is very strict for research purposes

Parkinson's Disease

Parkinson's disease is a neurodegenerative disease of the substantia nigra (an area in the basal ganglia). The disease was first discovered and its symptoms documented in 1817 (*Essay on the Shaking Palsy*) by the British physician Dr. James Parkinson; the associated biochemical changes in the brain of patients were identified in the 1960s. The disease is a progressive movement disorder of the extrapyramidal system, which controls and adjusts communication between neurons in the brain and muscles in the human body.

Parkinson's disease involves a breakdown of the nerve cells in the motor area of the brain. As the cells break down, there is a shortage of dopamine. Dopamine is a neurotransmitter, or chemical that carries messages to the body. When there is a shortage of dopamine, the messages that regulate movement aren't sent properly. Parkinson's disease happens when nerve cells (neurons) in a part of the brain called the substantia nigra gradually die. These cells normally produce dopamine, a chemical that helps to relay messages between areas of the brain that control body movement. The death of cells in this area of the brain leads to abnormally low levels of dopamine, which makes it difficult for a person with Parkinson's disease to control muscle tension and muscle movement, both at rest and during periods of activity.

Parkinson's disease is progressive, meaning the signs and symptoms become worse over time. But although Parkinson's may eventually be disabling, the disease often progresses gradually, and most people have many years of productive living after a diagnosis. Unlike other serious neurologic diseases, Parkinson's disease is treatable. For decades, the drug levodopa, commonly known as L-dopa, has been the mainstay of Parkinson's disease treatment. But L-dopa can cause side effects, and it may become less effective as the disease worsens, especially as new symptoms develop. In addition, responses to the drug may become more erratic over time. For that reason newer drugs are now also used, either alone or in combination with levodopa. It is estimated that 4 million people are suffering from the disease world-wide. Parkinson's disease affects all ethnic groups. Although Parkinson's disease occurs in every part of the world, because it is mainly an illness of later life, it is more common in developed countries where people live longer. The overall prevalence of Parkinson's disease in Europe is approximately 1.6 – 1.8 per 100 in persons over 65 years of age. Because of the ageing of the world population, the importance of Parkinson's disease as a public health issue is expected to increase.

Carpal Tunnel Syndrome

Carpal tunnel syndrome occurs when tendons in the wrist become inflamed after being aggravated. Tendons can become aggravated when the carpals (a tunnel of bones) and the ligaments in the wrist narrow, pinching nerves that reach the fingers and the muscle at the base of the thumb. Repetitive flexing and extension of the wrist may cause a thickening of the protective sheaths that surround each of the tendons, which narrows the tunnel. Women are three times more likely to develop CTS than men, and the risk increases with age. People between the ages of 40 and 60 are more commonly affected.

Carpal tunnel syndrome is a condition that may be caused by repeatedly performing stressful motions with your hand or holding your hand in the same position for long periods of time. CTS is classified as a cumulative trauma disorder, an ailment that attacks the body's musculoskeletal system. The musculoskeletal system is made up of muscles that pull on tendons and move the bones at joints. The joints are held together by ligaments. Carpal tunnel syndrome specifically affects the sensitive nerves of, and the blood supply that feeds, the hands and wrists.

Carpus is a word derived from the Greek word "karpos" which means "wrist." The wrist is surrounded by a band of fibrous tissue which normally functions as a support for the joint. The tight space between this fibrous band and the wrist bone is called the carpal tunnel. The median nerve passes through the carpal tunnel to receive sensations from the thumb, index, and middle fingers of the hand. Many conditions can cause increased pressure within the carpal tunnel and lead to carpal tunnel syndrome. Carpal tunnel syndrome was first described with broken wrists. A broken wrist can cause bleeding and swelling within the carpal tunnel leading to increased pressure within the carpal tunnel. Most people with carpal tunnel syndrome have no identifiable cause. It affects almost 5% of the population and is most common in middle-aged women. Carpal tunnel syndrome is diagnosed based on the complaints of the individual combined with physical tests and often electrical studies. No single test is definitive for diagnosis of carpal tunnel syndrome. Instead, the person's complaints and test findings together lead to its diagnosis.

Neuropathy

Neuropathy is the disease of the nervous system. Neuropathy is a disturbance in the function of a nerve or particular group of nerves. Many people who have had diabetes for a while have nerve damage. The three major forms of nerve damage are: peripheral neuropathy, autonomic neuropathy, and mononeuropathy. The most common form is peripheral neuropathy, which mainly affects the feet and legs.

Neuropathy can lead to disability, amputation, decreased ambulation as well as foot and leg ulceration because of loss or damage to nerves which feel sensation in the lower limbs. Another reason for the disability is due to the

changes that can occur in the biomechanics of feet and legs, leading to an increased risk of ulcers. A diabetic person that has neuropathy increases their risks of amputation of an extremity 2 fold.

Peripheral neuropathy is a general term referring to disorders of peripheral nerves. The peripheral nervous system is made up of the nerves that branch out of the spinal cord to all parts of the body. Peripheral nerve cells have three main parts: cell body, axons, and dendrites. Any part of the nerve can be affected, but damage to axons is most common. The axon transmits signals from nerve cell to nerve cell. Most axons are surrounded by a substance called myelin, which facilitates signal transmission. Peripheral neuropathy can be associated with poor nutrition, a number of diseases, and pressure or trauma. Many people suffer from the disorder without ever identifying the cause.

Mononeuropathy involves damage or destruction of an isolated nerve or nerve group. It is a type of peripheral neuropathy (damage to nerves outside the brain and spinal cord). Mononeuropathy is most often caused by damage to a local area resulting from injury or trauma, although occasionally systemic disorders may cause isolated nerve damage (as with mononeuritis multiplex). The usual causes are direct trauma, prolonged pressure on the nerve and compression of the nerve by swelling or injury to nearby body structures. The damage includes destruction of the myelin sheath (covering) of the nerve or of part of the nerve cell (the axon). This damage slows or prevents conduction of impulses through the nerve.

Autonomic neuropathy affects nerves of body parts that we cannot consciously control. The digestive system is most often affected, especially the intestine and stomach, blood vessels and heart, urinary system. It can affect the nerves that control your tiny muscles of the eyes and sex organs. It can also affect the return of normal blood sugars when an episode of hypoglycemia occurs. This type of nerve damage frequently results in damage that causes the inability to sense low blood sugars. To prevent autonomic neuropathy, you need to continuously keep your blood glucose levels well controlled.

In all neuropathy and neuropathic pain, there is abnormal conduction of nerve impulses from the input (usually peripheral in the extremities) to the spinal cord and brain. The pain of neuropathy is a result of the abnormal processing of nerve impulses that originate in these peripheral nerves. The terms neuropathy and peripheral neuropathy are often used interchangeably to describe the same process. Neuropathy can cause strange and extremely unpleasant sensations to arise in the affected area, including paresthesia (tingling or numbness), causalgia (burning sensations), and dysesthesia (unpleasant, burning, crawling, itchy, tingling or numb sensations)—or just plain pain.

Pain associated with neuropathy can be very intense and may be described as cutting, stabbing, crushing, burning, shooting, gnawing, or grinding. In some cases, a nonpainful stimulus (such as a feather drawn across the skin) may be perceived as excruciating, or pain may be felt even in the absence of a stimulus. If a problem with the motor nerve has continued over a length of time, muscle

shrinkage (atrophy), or lack of muscle tone, may be noticeable. Autonomic nerve damage can also occur and is most noticeable when an individual stands upright and experiences difficulties such as light-headedness or changes in blood pressure. Other indicators of autonomic nerve damage are lack of sweat, tears, and saliva; urinary retention; and impotence. In some cases, heart beat irregularities and respiratory problems can develop.

Neuropathy often results in numbness, abnormal sensations called dyesthesias and allodynias that occur either spontaneously or in reaction to external stimuli, and a characteristic form of pain, called neuropathic pain or neuralgia, that is qualitatively different from the ordinary nociceptive pain one might experience from stubbing a toe or hitting a finger with a hammer. Neuropathic pain is usually perceived as a steady burning and/or “pins and needles” and/or “electric shock” sensations. The difference is due to the fact that “ordinary” pain stimulates only pain nerves, while a neuropathy often results in the firing of both pain and non-pain (touch, warm, cool) sensory nerves in the same area, producing signals that the spinal cord and brain do not normally expect to receive.

9

Drug Abuse Prevention

INTRODUCTION

Misuse of alcohol and other drugs is a problem not only for the abuser but also for the caregiver, family, workplace, neighbourhood, and indeed, for the society at large. It can affect anybody regardless of age, sex and socio-occupational status.

No geographical location, race, or religion is exempt. The growing menace of alcohol and drug abuse at both international and national levels is of great concern today. It has been continuously challenging the existing resources to combat the problem. For such a multifaceted complex problem, the interventional strategies also need to be multidimensional in nature. Before considering the various ways in which a multi-level preventive approach can be taken up, it is first important to understand the common but often confusing terms such as 'drug' and 'abuse'.

BASIC CONCEPTS

Broadly speaking, a drug is defined as any chemical which, when administered, alters the functioning of one or more systems of the organism. However, this definition is too general and would include virtually all medicines ranging from antacids to vitamins and antibiotics. A more narrowly defined term is a 'psychotropic' drug, which induces change primarily in some aspect(s) of mental functioning; for example, an anti-depressant is meant to relieve mental depression.

When we refer to 'drugs' we mean agents such as alcohol, cannabis, heroin or morphine. Although they are all psychotropic agents, they are rarely taken for a particular illness. Rather, they are consumed voluntarily to alter one's mood, thinking, perception or other mental functions so as to induce pleasure in an artificial manner.

Further, these drugs can cause addiction when taken repeatedly so that, at a later stage, these are consumed not so much to induce pleasure as to avoid or reduce the discomfort resulting from their absence in the body (in other words, to avoid or decrease the 'withdrawal' of the drugs).

In this sense, alcohol is also a 'drug'. In order to differentiate them from other, more generally defined, medicinal drugs, these are now called 'psychoactive substances' or simply 'substances'.

Of course, there are several medicinal drugs that can also be misused as drugs of abuse, *e.g.*, codeine-containing cough syrups, several painkillers containing opium-like substances, *etc.* When used in this context (for non-medical uses such as inducing pleasure), these are also referred to as 'substances'.

The disorders resulting from pathological (excessive, compulsive, uncontrolled, or nonmedical) use of these substances are grouped as "Psychoactive substance use disorders". The common terms such as 'abuse' and 'dependence' come under this umbrella. 'Addiction' is a much older term than both 'abuse' and 'dependence'. It is now omitted from technical language because of its pejorative connotation. However, the term still is retained in popular usage. It denotes either abuse or dependence.

Also, the word 'abuse' when used non-specifically may cover both abuse and dependence phenomena. Thus, used loosely, a drug 'abuser' (earlier called 'addict') is a person who uses drug(s) in a pathological fashion and may meet the technical definition of either 'abuse' or 'dependence'. This clarification of terminology was felt necessary because often these various terms create confusion in our mind.

The World Health Organization in 1992 has enlisted the following categories of psychoactive substances:

- Alcohol
- Opioids (opium, heroin, morphine, pethidine, buprenorphine, codeine, *etc.*)
- Cannabis ('ganja', 'bhang', 'charas')
- Sedative-hypnotics ('tranquillisers')
- Cocaine
- Other stimulants, including amphetamines and caffeine
- Hallucinogens (*e.g.*, LSD, 'acid')
- Tobacco
- Volatile solvents (typewriter correction and dilution fluids, kerosene, gasoline, petrol, paint-thinner, nail-polish removers, *etc.*) and other organic hydrocarbons (*e.g.*, those in shoe-polish, Iodex, *etc.*)

Of these, the common and major substances used in India are alcohol, tobacco, opioids, cannabis, tranquillisers, and recently, volatile solvents.

LEVELS OF SUBSTANCE ABUSE PREVENTION

Traditionally, the two major strategies at the level of primary prevention are:

- Supply reduction (policies and activities aimed at minimizing the availability of alcohol and drugs to people);
- Demand reduction (aimed at decreasing the internal need or demand for the substances by the people).

A third strategy is harm reduction, which tends to minimize the harm resulting due to substance use, and thus acts at the levels of secondary and tertiary prevention. Both international and national-level active responses have been mounted to take the drug menace in its stride. International Treaties and various International Agencies or Drug Control Programmes (most notably the United Nations Office for Drugs and Crime, UNODC, formerly United Nations Drug Control Programme, UNDCP) are in force, trying to plan, implement and monitor many aspects of the drug control programme, in terms of both the reduction in supply of, and the demand for drugs.

India is a signatory to the following international conventions:

- Single convention on Narcotic Drugs, 1961, as amended by the 1972 Protocol;
- Convention on Psychotropic Substances, 1971;
- U.N. Convention against Illicit Trafficking in Narcotic Drugs and Psychotropic Substances, 1988.

In addition, India has enacted her own comprehensive legislation in this matter in the form of Narcotic Drugs and psychotropic Substance Act (NDPS) in 1985, amended in 1988. Various Ministries/Departments are given responsibility for tackling different aspects of the problem. The supply reduction aspects are largely the responsibility of the Ministry of Home Affairs (along with the Narcotics Control Bureau) and the Ministry of Finance (Department of Revenue). Prevention and rehabilitation are primarily responsibilities of the Ministry of Social Justice and Empowerment, formerly known as the Ministry of Welfare, and the Ministry of Health and Family Welfare (Department of Health, Drug De-addiction Programme).

Thus, a multi-pronged approach has been adopted. Section 4(d) of the NDPS Act provides for identification, treatment, education, aftercare, rehabilitation and social reintegration of drug abusers. For this purpose the Act also empowers the Government, under section 71(1), to establish as many centres as it thinks fit and frame appropriate rules for their functioning. Following this mandate, a number of de-addiction centres have been established at both Central and State levels with the assistance and under the auspices of Ministry of Health and Family Welfare.

Most of these are directly funded and monitored by the Ministry of Health and some are directly funded by the UNODC. There are a number of counselling and rehabilitation centres operating through the Ministry of Social Justice and Empowerment. Still other, voluntary, non-government organizations (NGOs)

are actively pursuing the common goal of drug abuse control. The focus of all these activities is threefold: the drug abuser, his family, and the society at large. The drug abuser is first motivated and engaged in treatment. He is then detoxified in an outpatient and/or inpatient setup depending upon the needs and priorities. This part of the treatment is essentially pharmacological (*i.e.*, through medicines given to counteract the withdrawals of drugs of abuse). Side by side, a comprehensive assessment is made of the patient's biological, psychological and socio-environmental aspects. Guided by the assessment, a longer-term treatment plan is formulated which may include both pharmacological aspects (*e.g.*, giving disulfiram, naltrexone or acamprosate to alcohol-dependent persons and naltrexone to opioid-dependent persons) and non-pharmacological aspects.

The latter may comprise of individual counselling, cognitive or behavioural therapies, Yoga therapy and meditation, and group work including participation in self-help groups like the Alcoholics or Narcotics Anonymous (AA and NA). The AA and NA groups are especially useful for maintenance of sobriety for many millions of former substance abusers all over the world. A final long-term plan is then drawn up for occupational rehabilitation and social reintegration. The family of the drug abuser similarly undergoes thorough assessment and counselling. The latter is aimed at providing emotional support, psycho-education, defusing family conflicts and guiding the family through the different phases of treatment and rehabilitation. At times a formal family therapy or couples therapy is undertaken. More usually, family groups are formed where various related and common issues are discussed and mutual support is generated. Various practical day-to-day tips for management of the patients at home are also given, often in the form of Dos and Don'ts for the family members. The family groups have especially been found to be helpful.

The society of the drug abuser is tapped in more indirect ways. It is at this focus that principles of demand reduction really come into action. One of the most vital components of demand reduction is raising awareness – awareness about both the evils of drug abuse as also about the availability of help for treatment should the need occur. The modalities of achieving this end are manifold: campaigns through the press, television and radio; public meetings, workshops, poster and painting competitions; disseminating information through books, pamphlets, posters and stickers; organizing and popularising 'drug free' music and other cultural events; networking with various NGOs, clubs, hotels and other areas of social intercourse; and promoting in general a healthy drug-free but full-of-fun life-style. Ex-abusers and their family members take an active part in this social focus on demand reduction.

SUPPLY REDUCTION

Supply reduction has to be conceptualised differently for licit (alcohol and tobacco) and illicit drugs. For illicit drugs, supply reduction strategies remain an important issue at international, national and local levels. However, alcohol and tobacco control pose dilemmatic questions for the policy makers, because

although they are responsible for immense harm at personal, familial and societal level, they generate handsome revenue for the government. Further, it has been seen repeatedly that a superimposed complete prohibition of supply for alcohol and tobacco does not work. All it does is to create an artificial illegal market for these substances and to encourage corrupt practices at various levels, causing further expenditure for an already impoverished state exchequer for law enforcement. On the other hand, unrestricted easy availability of alcohol and tobacco have been seen to correspond with increasing use, which in turn results in a commensurate increase in substance-related morbidity (lung cancer, cirrhosis of liver), mortality and social harm such as violence and accidents (especially for alcohol). An attempt to control supply is akin to tightrope walking.

The following measures have been suggested:

- Price controls.
- *Controls on availability:*
 - Minimum age limits for sale.
 - Limiting the hours and days of sale.
 - Licensing and restricting the number and location of outlets.
 - Prohibition on selling to intoxicated persons (for alcohol).
 - Public monopolies of retail sale.
 - Enforcement of retail controls.
 - G. Restrictions on import.
- *Controls on the use of alcohol and tobacco:*
 - At specified places (*e.g.*, public offices, schools, *etc.*).
 - At specified times.
 - During specified activities (*e.g.*, driving, operating heavy machinery).
- *Product safety standards:*
 - Alcohol and tar content specification and restriction.
 - Display of warning statements on health hazards on the packages.
- *Controls on marketing:*
 - Controls on advertisements of alcohol and tobacco in print or electronic media
 - Controls on ‘surrogate’ advertising (*e.g.*, advertising ‘apple juice’ or other innocuous products by a particular industry which also produces alcoholic drinks, and indirectly but clearly advertising the alcohol product under the garb of advertisement of the innocuous product).
 - Controls on sponsorship of cultural, sports or other events.
 - Taxing marketing costs.
 - Controls on the mass media of the portrayal of alcohol and tobacco use.

Combating the abuse of both licit and illicit substances is a tall order. Nonetheless, the current data suggests that some strategies are better than others. Though supply reduction measures for alcohol and tobacco have been shown to be modestly successful if implemented properly, interventions aimed at reducing the supply of illicit drugs rarely works effectively. These measures are expensive

both in terms of resources, infrastructure and manpower, and tend not to significantly curb the supply of illicit drugs, the number of users, or the amounts they consume. Governments must therefore develop stronger parallel strategies to reduce the demand for drugs if the problem is to be meaningfully addressed. This requires enhanced public education that includes messages on prevention that are meaningful to the youth and that note the dangers associated with the more casually accepted use of tobacco and apparently less potent liquors. The most successful educational campaigns tend to be locally administered, culturally meaningful, and relevant for all youths. Governments should also develop and support culturally relevant prevention efforts.

DEMAND REDUCTION

The major role of demand reduction activities in India lies with the Ministry of Social Justice and Empowerment and also with the Ministry of Health and Family Welfare. Other ministries involved in demand reduction activities in the country are the Ministry of Human Resource Development (Department of Youth Affairs and Education) and the Ministry of Broadcasting. In the federal system of India, health is an issue dealt with by individual states in which the federal (Central) Government has a policy making, coordinating, and assisting role. So the relevant Ministries of the states also deal with drug issues. NGOs too have played a key role in all aspects of drug demand reduction. Under the NDPS Act, several high level committees were formed in the past. Ministry of Health and Family Welfare appointed an expert committee in 1986. An advisory committee was constituted in 1988.

The Central Government directly constituted a Cabinet Subcommittee in April 1988 (upon whose recommendation the national-level Drug De-addiction Programme was launched) and also in August 1993. A Narcotics Coordination Committee of secretaries (from the Ministries of Health, Welfare, Home, Revenue and Director- General of Narcotics Control Bureau) was also constituted in March 1994. Since 1988, specific project documents were also developed in collaboration with UNODC (then UNDCP). In 1994, a national Master Plan for Drug Abuse Control (1994-2003) was submitted.

The Master Plan had proposals for both demand and supply reduction and had outlined overlapping responsibilities for the Ministry of Social Justice and Empowerment and the Ministry of Health and Family Welfare in demand reduction. The Ministry of Social Justice and Empowerment currently funds more than 400 counselling and rehabilitation centres throughout the country (December 2002: 462 centres; 318 are De-addiction-cum-rehabilitation centres and 144 are Counselling and Awareness centres). Funding for NGOs working in the field of drug abuse is also available from several bilateral agencies.

The strategy of this Ministry in demand reduction can be summarized as follows:

- Building awareness and educating people about ill effects of drug abuse.
- Dealing with the abusers through a well rounded-up programme of motivation, counselling, treatment, follow-up and social integration of cured persons.

- To impart drug abuse prevention and rehabilitation training to volunteers and generate an educated cadre of demand reduction workers.

The Ministry of Health and Family Welfare has funded more than 100 drug de-addiction centres in the country. These are located in the hospitals and medical institutes. Although mainly concerned with treatment and rehabilitation of alcohol and drug abusers (*i.e.*, working at the secondary and tertiary levels of prevention), these drug de-addiction centres are involved in several demand reduction (primary prevention) activities as well.

These include:

- Generating trained manpower by training doctors, nurses, social workers, counsellors, other health professionals.
- Development and dissemination of health education materials relevant to demand reduction themes as well as need for early detection and treatment.
- Community-based research in several areas related to substance abuse, including demand reduction.
- Information, Education and Communication (IEC) activities at the local levels (schools, colleges, public offices, factories and industries, *etc.*) as also via mass media.
- Establishing a data collection and monitoring system for drug abuse.
- Establishment of drug abuse screening services.

DEMAND REDUCTION AND OTHER PREVENTIVE ACTIVITIES

Governmental as well as non-governmental voluntary agencies (NGOs) are currently carrying out several activities in demand reduction and other preventive activities.

These include:

- *Primary Prevention:*
 - Audio-visual publicity
 - Development and distribution of print materials
 - Press advertisements
 - Out door publicity
 - Anti-drug awareness campaigns
 - Awareness programmes in schools and Colleges
 - Workplace prevention
 - Drug abuse prevention for street children.
- Drug Treatment and Rehabilitation:
 - Medical detoxification
 - Treatment with antagonists such as naltrexone
 - Treatment with pharmacological agents such as deterrents (disulfiram) or anticraving agents (acamprosate)
 - Pilot treatment programmes for opiate abusers
 - Utilizing twelve-step programmes

- Therapeutic communities
- Long-term rehabilitation programmes
- Drug treatment programmes in jails
- Detoxification camps in villages
- Community based case detection and treatment programmes.

In spite of this impressive array of activities and programmes, evaluation of these programmes has been minimal. An earlier evaluation of the national demand reduction activities in the country observed that the budgetary utilization was low, the pace of the implementation of the programmes have been slow, and the quality and range of services were limited.

The need for broadening of primary prevention services was also emphasized in the evaluation. The latest formal evaluation of the drug deaddiction centres funded by Ministry of Health and Family Welfare has depicted a rather dismal picture: about 60% of the centres were nonfunctional (though some of them have been maintaining a degree of low-key service), nearly one-fourth of the centres were not providing any de-addiction services at all, and only about 13% of the evaluated centres were optimally functional.

Almost all the functioning centres kept their activities limited to providing outpatient and/or inpatient services; only a minority of the centres were providing community-based services as well. There are numerous factors contributing to a lack of progress in these demand reduction programmes. These include a host of administrative factors including improper coordination between the various Ministries and agencies involved in this work.

This leads to a neglect of some areas and duplication of others. A withering political and administrative will is another factor. In spite of having been formulated a decade back, the National Master Plan for Drug Abuse Control was never published officially, let alone being put into action. This might have to do with yet another factor: the gradual drying up of funds. Since 1987-88, when UNDCP and other agencies were heavily funding the drug de-addiction and demand reduction programmes, that was the time when a lot of activities took place.

Since 1994-95, the activities and initiatives on the part of the government have tended to become halfhearted. A parallel decline of interest was evident at the level of the funded agencies as well. As mentioned in World Mental Health, it is an irony that "despite the inadequacy of supply reduction policies, efforts to decrease the demand for substances of abuse remain almost universally underfunded and under-supported. Although treatment and prevention services are offered, and sizable amounts of money are spent on demand-reduction programmes, the comparatively small amounts of resources allocated reflect a lack of priority given to demand reduction in almost countries, including India.

This relative imbalance speaks of a lack of knowledge about the potential effectiveness of demand-reduction strategies, the conflicting political forces that reign in the area of substance-abuse control, and the quasi-military approach that sees substance abuse as unrelated to health and human services.

LAWS AND DRUG ABUSE

Laws regarding drug abuse encompass a spectrum of legal measures aimed at preventing, controlling, and mitigating the negative consequences associated with illicit drug use. These laws vary across jurisdictions but commonly include regulations on the manufacturing, distribution, possession, and consumption of controlled substances. Additionally, laws often address issues such as drug trafficking, drug-related crime, and the treatment of individuals with substance use disorders. Drug abuse laws typically classify drugs into different categories based on their potential for abuse and medicinal value, with penalties varying depending on factors such as the type and quantity of drugs involved, the individual's criminal history, and the circumstances of the offense. Enforcement of drug laws involves collaboration among law enforcement agencies, judicial systems, healthcare providers, and community organizations to deter drug-related activities, prosecute offenders, and provide support and treatment for individuals affected by drug abuse. Moreover, efforts to address drug abuse often extend beyond legal measures to include prevention programs, education initiatives, harm reduction strategies, and substance abuse treatment services. Overall, laws concerning drug abuse aim to balance public health and safety concerns with respect for individual rights and liberties, seeking to minimize the social, economic, and health impacts of drug misuse within society. The book on Laws and Drug Abuse offers comprehensive insights into legal frameworks and measures aimed at addressing drug abuse, highlighting strategies for prevention, enforcement, and treatment within the context of various jurisdictions.



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