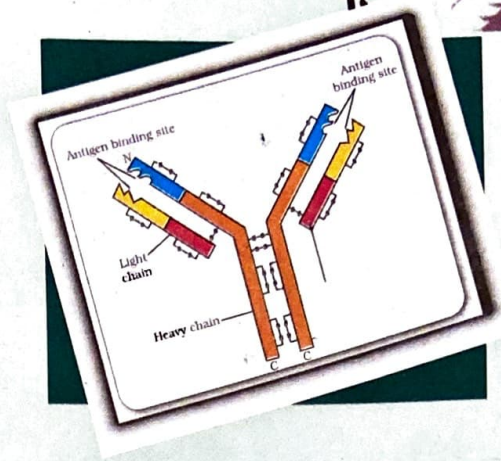


CHAPTER 8

HUMAN HEALTH AND DISEASE



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- 8.1 Common Diseases in Humans
- 8.2 Immunity
- 8.3 AIDS
- 8.4 Cancer
- 8.5 Drugs and Alcohol Abuse

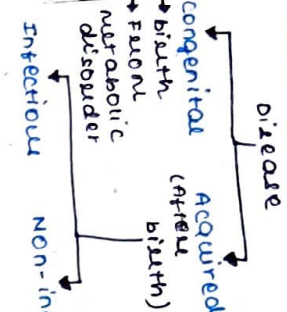
good humor
Hypoth

Father of Medicine

Health, for a long time, was considered as a state of body and mind where there was a balance of certain 'humors'. This is what early Greeks like Hippocrates as well as Indian Ayurveda system of medicine asserted. It was thought that persons with 'black bile' belonged to hot personality and would have fevers. This idea was arrived at by pure reflective thought. The discovery of blood circulation by William Harvey using experimental method and the demonstration of normal body temperature in persons with black bile using thermometer disproved the good humor hypothesis of health. In later years, biology stated that mind influences, through neural system and endocrine system, our immune system and that our immune system maintains our health. Hence, mind and mental state can affect our health. Of course, health is affected by -

Father of B.C.

- (i) genetic disorders - deficiencies with which a child is born and deficiencies/defects which the child inherits from parents from birth;
- (ii) infections and
- (iii) life style including food and water we take, rest and exercise we give to our bodies, habits that we have or lack etc.



The term **health** is very frequently used by everybody. How do we define it? Health does not simply mean 'absence of disease' or 'physical fitness'. It could be defined as a state of complete physical, mental and social well-being. When people are healthy, they are more efficient at work. This increases productivity and brings economic prosperity. Health also increases longevity of people and reduces infant and adult mortality.

Balanced diet, personal hygiene and regular exercise are very important to maintain good health. Yoga has been practised since time immemorial to achieve physical and mental health. Awareness about diseases and their effect on different bodily functions, vaccination (immunisation) against infectious diseases, proper disposal of wastes, control of vectors and maintenance of hygienic food and water resources are necessary for achieving good health.

When the functioning of one or more organs or systems of the body is adversely affected, characterised by various signs and symptoms, we say that we are not healthy, i.e. we have a **disease**. Diseases can be broadly grouped into **infectious** and **non-infectious**. Diseases which are easily transmitted from one person to another, are called **infectious diseases**. Infectious diseases are very common and every one of us suffers from these at sometime or other. Some of the infectious diseases like AIDS and malaria are non-infectious diseases. Cancer is the major cause of death. Drug and alcohol abuse also affect our health adversely.

8.1 COMMON DISEASES IN HUMANS

A wide range of organisms belonging to bacteria, viruses, fungi, protozoans, helminths, etc., could cause diseases in man. Such diseases causing organisms are called **pathogens**. Most parasites are therefore pathogens as they cause harm to the host by living in (or on) them. The pathogens can enter our body by various means, multiply and interfere with normal vital activities, resulting in morphological and functional damage. Pathogens have to adapt to life within the environment of the host. For example, the pathogens that enter the gut must know a way of surviving in the stomach at low pH and resisting the various digestive enzymes. A few representative members from different groups of pathogenic organisms are discussed here along with the diseases caused by them. Preventive and control measures against these diseases are also briefly described.

- 1) **Acute febrile disease** - **Salmonella typhi** is a pathogenic bacterium which causes typhoid fever in human beings. These pathogens generally enter the small intestine through food and water contaminated with them and migrate to other organs like spleen, liver, etc. Symptoms include high fever (39° to 40°C), weakness, constipation, headache and loss of appetite are some of the common symptoms of this disease. Intestinal perforation and delirium may occur in severe cases. Typhoid fever could be confirmed by Widal test.
- 2) **Acute febrile disease** - **Enteric fever** - **Shigella** causes dysentery. Symptoms include blood and mucus in stool.
- 3) **Acute febrile disease** - **Cholera** - **Vibrio cholerae** causes cholera. Symptoms include profuse watery stool, dehydration, muscle cramps, etc.
- 4) **Acute febrile disease** - **Typhoid fever** - **Salmonella typhi** causes typhoid fever. Symptoms include high fever, weakness, constipation, headache, etc.
- 5) **Acute febrile disease** - **Enteric fever** - **Shigella** causes dysentery. Symptoms include blood and mucus in stool.

Childhood diseases - **measles, mumps, rubella, diphtheria, pertussis, tetanus, polio, etc.**

Classic case in medicine - **Mary Mallon** (nicknamed **Typhoid Mary**) is worth mentioning here. She was a cook by profession and was a typhoid carrier who continued to spread typhoid for several years through the food she prepared.

Streptococcus pneumoniae and **Hemophilus influenzae** are bacteria like **Streptococcus pneumoniae** in humans which infects the lungs (air-filled sacs) of the lungs. As a result of the infection, the alveoli get filled with fluid leading to severe problems in respiration. The symptoms include fever, chills, cough and headache. In severe cases, the lips and finger nails may turn gray to bluish in colour. A healthy person acquires the infection by inhaling the droplets/aerosols released by an infected person or even by sharing glasses and utensils with an infected person. **Diphtheria, plague, diptheria, etc.** are some of the other bacterial diseases in man.

Many viruses also cause diseases in human beings. **Rhino viruses** represent one such group of viruses which cause one of the most infectious human ailments - the **common cold**. They infect the nose and respiratory passage but not the lungs. The common cold is characterised by nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc., which usually last for 3-7 days. Droplets resulting from cough or sneezes of an infected person are either inhaled directly or transmitted through contaminated objects such as pens, books, cups, doorknobs, computer keyboard or mouse, etc., and cause infection in a healthy person.

Some of the human diseases are caused by protozoans too. You might have heard about **malaria**, a disease man has been fighting since many years. **Plasmodium** is the protozoan responsible for this disease. Different species of **Plasmodium** (*P. vivax*, *P. malariae* and *P. falciparum*) are responsible for different types of malaria. Of these, **malignant malaria** caused by **Plasmodium falciparum** is the most serious one and can even be fatal.

Let us take a glance at the life cycle of **Plasmodium** (Figure 8.1). **Plasmodium** enters the human body as **sporozoites** (infectious form) through the bite of infected female **Anopheles** mosquito. The parasites initially multiply within the liver cells and then attack the red blood cells (RBCs) resulting in their rupture. The rupture of RBCs is associated with release of a toxic substance (haemozoin) which is responsible for the chill and high fever recurring every three to four days. When a female **Anopheles** mosquito bites an infected person, these parasites enter the mosquito's body and undergo further development. The parasites multiply within them to form sporozoites that are stored in their salivary glands. When these mosquitoes bite a human, the sporozoites are introduced into his/her body, thereby initiating the events mentioned above. It is interesting to note that the malarial parasite requires two hosts - human and mosquitoes - to complete its life cycle (Figure 8.1); the female **Anopheles** mosquito is the vector (transmitting agent).

Cholera - **Vibrio cholerae** causes cholera. Symptoms include profuse watery stool, dehydration, muscle cramps, etc.

Enteric fever - **Shigella** causes dysentery. Symptoms include blood and mucus in stool.

Common cold - **Rhino viruses** cause common cold. Symptoms include nasal congestion, sore throat, cough, headache, etc.

Malaria - **Plasmodium** causes malaria. Symptoms include high fever, chills, sweating, etc.

Dysentery - **Shigella** causes dysentery. Symptoms include blood and mucus in stool.

Cholera - **Vibrio cholerae** causes cholera. Symptoms include profuse watery stool, dehydration, muscle cramps, etc.

- Personal hygiene
- Public Hygiene
- Avoid contact with person
- Destroying
- breeding places
- Dogs and coon dogs with flea.

Living around and...

contact with the infected persons or their belongings should be avoided. For diseases such as malaria and filariasis that are transmitted through insect vectors, the most important measure is to control or eliminate insect vectors and their breeding places. This can be achieved by avoiding stagnation of water in and around residential areas, regular cleaning of household coolers, use of mosquito nets, introducing fishes like Gambusia in ponds that feed on mosquito larvae, spraying of insecticides in drains, drainage areas and swamps, etc. In addition, doors and windows should be provided with wire mesh to prevent the entry of mosquitoes. Such precautions have become more important especially in the light of recent widespread incidences of the vector-borne *Aedes* mosquito-borne diseases like dengue and chikungunya in many parts of India. The advancements made in biological science have armed us to effectively deal with many infectious diseases. The use of vaccines and immunisation programmes have enabled us to completely eradicate a deadly disease like smallpox. A large number of other infectious diseases and deadly disease like diphtheria, pneumonia and tetanus have been controlled to a large extent by the use of vaccines. Biotechnology (about which you will read more in Chapter 12) is at the verge of making available newer and safer vaccines. Discovery of antibiotics and various other drugs has also enabled us to effectively treat infectious diseases.

2 IMMUNITY

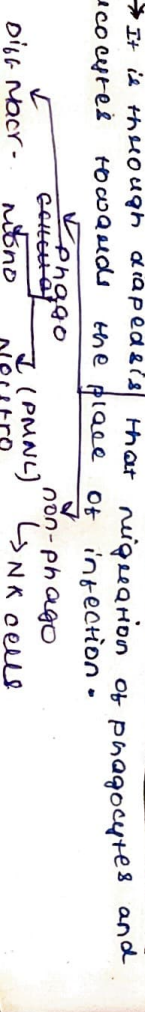
- acq. and exp. immunity
- large no. in P.M of B-cell
- antibodies
- IgE allergic & parasitic
- antibodies
- IgG
- antibody
- antigen

Innate Immunity → By Birth

Innate immunity is non-specific type of defence, that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Innate immunity consists of two types: (i) Innate immunity and (ii) Acquired immunity.

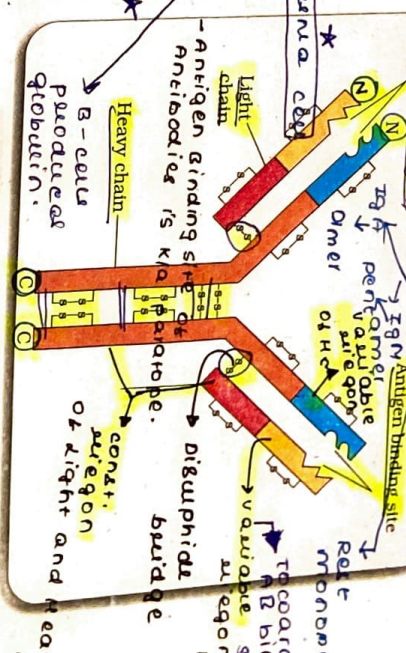
- Physical barriers: Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.
- Physiological barriers: Acid in the stomach, saliva in the mouth, tears from eyes—all prevent microbial growth.
- Cellular barriers: Certain types of leukocytes (WBC) of our body like phagocytes-nuclear leukocytes (PMNL-neutrophils) and

It is through antibodies that recognition of phagocytes and reocurred towards the place of infection.



Phagocytic cells - and...
Erythrocytes are...
macrophages in tissues can phagocytose and destroy...
cytokine barriers: Virus-infected cells secrete proteins called...
Acquired Immunity: on the other hand is pathogen specific...
The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood, i.e. B-lymphocytes and T-lymphocytes. The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies. The T-cells themselves do not secrete antibodies but help B-cells to produce them. Each antibody molecule has four peptide chains, two small called light chains and two longer called heavy chains. Hence, an antibody is represented as H₂L₂. Different types of antibodies are produced in our body. IGA, IGM, IGE, IGG are some of them. A cartoon of an antibody is given in Figure 8.4. Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two-types of our acquired immune response - antibody mediated immunity (AMI). The T-lymphocytes mediate cell-mediated immunity (CMI). Very often, when some human organs like heart, eye, liver, kidney fail to function satisfactorily, transplantation is the only remedy to enable the patient to live a normal life. Then a search begins - to find a suitable donor. Why is it that the organs cannot be taken from just anybody? What is it that the doctors

Suppressed function of cytotoxic and helper T cells.
Autoimmunity disorder.
151
Killer T cell destroys non-self cell.
Cytotoxic killer T cell.
Rec. performing cells lysis.



antigen binding site, antigen binding site, heavy chain, light chain, disulphide bridge, B-cell produced, peptide chains, two small called light chains and two longer called heavy chains.

antigen binding site, antigen binding site, heavy chain, light chain, disulphide bridge, B-cell produced, peptide chains, two small called light chains and two longer called heavy chains. Hence, an antibody is represented as H₂L₂. Different types of antibodies are produced in our body. IGA, IGM, IGE, IGG are some of them. A cartoon of an antibody is given in Figure 8.4. Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two-types of our acquired immune response - antibody mediated immunity (AMI). The T-lymphocytes mediate cell-mediated immunity (CMI). Very often, when some human organs like heart, eye, liver, kidney fail to function satisfactorily, transplantation is the only remedy to enable the patient to live a normal life. Then a search begins - to find a suitable donor. Why is it that the organs cannot be taken from just anybody? What is it that the doctors



ACTIVE

Artificial Resistance through vaccine. eg: Covid.

Natural when antigen gained into body through natural life. eg: measles

Smallpox - mumps - A female except 2 cannot be given to pregnant Active fault

Passive immunity

Natural Fluid clost - Abundant Anti-tetanus Ig-A Passive immunity

Also Ig-G in milk through mother fetus placenta

Classification of vaccine:

1st gen: - whole org. vaccine either live or attenuated. eg: smallpox, BCG, influenza.

2nd gen: - subunit vaccines. containing definite protein antigen such as tetrad vaccine Hepatitis - B surface antigen from yeast.

3rd gen: - (Syn. vaccines) DNA vaccine, made of plasmid, genetically eng. through biotech. eg: Hepatitis - B vaccine - Malaria

When a host is exposed to antigens, which may be in the form of living or dead microbes or other proteins, antibodies are produced in the host body. This type of immunity is called **active immunity**. Active immunity is slow and takes time to give its full effective response. Injecting the microbes deliberately during immunisation or infectious organisms induce active immunity. When ready-made antibodies are directly given to protect the body against foreign agents, it is called **passive immunity**. Do you know why mother's milk is considered very essential for the newborn infant? The yellowish fluid **colostrum** secreted by mother during the initial days of lactation has abundant antibodies (IgA) to protect the infant. The foetus also receives some antibodies from their mother through the placenta during pregnancy. These are some examples of passive immunity for active immunity. **Positive + Active**

8.2.3 Active and Passive Immunity and Immunisation

The principle of immunisation or vaccination is based on the property of memory of the immune system. In vaccination, a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen (vaccine) are introduced into the body. The antibodies produced in the body against these antigens would neutralise the pathogenic agents during actual infection. The vaccines also generate memory - B and T-cells that recognise and kill the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies. If a person is infected with some deadly microbes to which quick immune response is required with some deadly microbes to which quick immune response is required, we need to directly inject the **preformed antibodies**, or **antitoxin** (a preparation containing antibodies to the toxin). Even in cases of snakebites, the injection which is given to the patients, contain preformed antibodies against the **snake venom**. This type of immunisation is called **passive immunisation**.

8.2.4 Vaccination and Immunisation

Recombinant DNA technology has allowed the production of antigenic polypeptides of pathogen in bacteria or yeast. Vaccines produced using this approach allow large scale production and hence greater availability for immunisation, e.g. **hepatitis B vaccine produced from yeast**.

Types of Allergies:

Hay fever: - swollen, red, itchy eyes and nose. Sneezing, watery eyes, runny nose, itching throat, etc. - allergic rhinitis.

Genetic (atopy) - asthma, eczema, hay fever, etc. - allergic diseases.

When you have gone to a new place and suddenly you started sneezing, itching for no explained reason, and when you went away, your symptoms disappeared. Did this happen to you? Some of us are sensitive to some particles in the environment. The above-mentioned reaction could be because of allergy to pollen, mites, etc., which are different in different places.

The exaggerated response of the immune system to certain antigens present in the environment is called **allergy**. The substances to which such an immune response is produced are called allergens. The antibodies produced to these are of **IgE type**. Common examples of allergens are mites in dust, pollens, animal dander, etc. Symptoms of allergic reactions include sneezing, watery eyes, running nose and difficulty in breathing.

Allergy is due to the release of chemicals like **histamine and serotonin** from the mast cells. For determining the cause of allergy, the patient is exposed to or injected with very small doses of possible allergens, and the reactions studied. The use of drugs like **anti-histamine, adrenaline and steroids** quickly reduce the symptoms of allergy. Somehow, **rodent-bite** like style has resulted in lowering of immunity and more sensitivity to allergens - more and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the environment. This could be because of the protected environment provided early in life.

8.2.5 Allergies

8.2.6 Auto Immunity - genetic factor. quick and adrenergic. Memory-based acquired immunity evolved in higher vertebrates based on the ability to differentiate foreign organisms (e.g. pathogens) from self-cells. While we still do not understand the basis of this, two corollaries of this ability have to be understood. One, higher vertebrates can distinguish foreign molecules as well as foreign organisms. Most of the experimental immunology deals with this aspect. Two, sometimes, due to genetic and other unknown reasons, the body attacks self-cells. This results in damage to the body and is called **auto-immune disease**. Rheumatoid arthritis, which affects many people in our society, is an auto-immune disease. **Diabetes** is another auto-immune disease. **Thyroid gland** is affected in **Graves' disease** and **Hashimoto's thyroiditis**. **Insulin** is secreted by **beta cells** in the **pancreas**. In **diabetes**, the body attacks these cells, leading to **diabetes mellitus**.

8.2.7 Immune System in the Body

The human immune system consists of lymphoid organs, tissues, cells and soluble molecules like antibodies. As you have read, immune system is unique in the sense that it recognises foreign antigens, responds to these and remembers them. The immune system also plays an important role in allergic reactions, auto-immune diseases and organ transplantation.

Lymphoid organs: These are the organs where origin and/or maturation and proliferation of lymphocytes occur. The **primary lymphoid organs** are **bone marrow** and **thymus** where immature lymphocytes differentiate.

Secondary lymphoid organs: These are the organs where mature lymphocytes interact and proliferate. Examples include **spleen, lymph nodes, tonsils, adenoids, appendix, Peyer's patches, and the mucosal lining of the gut.**

Primary lymphoid organs: Bone marrow, Thymus.

Secondary lymphoid organs: Spleen, Lymph nodes, Tonsils, Adenoids, Appendix, Peyer's patches, Mucosal lining of the gut.



→ test for diagnosis of AIDS call ELISA + Western blot.

* AIDS -

- organism causing it.
- caused of AIDS (S)
- mechanism of effect on lymphocyte
- Effect of AIDS on G-cells
- felt for AIDS
- prevention

→ Treatment: - no cure but some drugs can prevent.

→ Zidovudine (AZT)

→ Didanosine

→ Zalcitabine

→ Nevirapine

→ Didanosine

→ Zalcitabine

→ Zidovudine

→ AZT

→ Didanosine

→ Zalcitabine

→ Nevirapine

→ Didanosine

→ Zalcitabine

→ Zidovudine

After getting into the body of the person the virus enters into macrophages where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase. This viral DNA gets incorporated into host cell's DNA and directs the infected cells to produce virus and in this way acts like a factory.

The macrophages continue to produce virus and in this way acts like a factory. Simultaneously HIV enters into helper T-lymphocytes (T_H) replicates and produce progeny viruses. The progeny viruses released in the blood attack other helper T-lymphocytes. This is repeated leading to a progressive decrease in the number of helper T-lymphocytes in the body of the infected person. During this period the person suffers from (points of fever, diarrhoea and weight loss). Due to decrease in the number of helper T-lymphocytes, the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially *Mycobacterium* viruses, fungi and even parasites like *Toxoplasma*. The patient becomes so immunodeficient that he/she is unable to protect himself/herself against these infections. A widely used diagnostic test for AIDS is enzyme linked immunosorbent assay (ELISA). Treatment of AIDS with anti-retroviral drugs is only partially effective. They can only prolong the life of the patient but cannot prevent death, which is inevitable.

Prevention of AIDS - As AIDS has no cure prevention is the best option. Moreover, HIV infection, more often, spreads due to conscious behaviour patterns and is not something that happens inadvertently, like pneumonia or typhoid. Of course, infection in blood transfusion patients, new-borns (from mother) etc., may take place due to poor monitoring. The only excuse may be ignorance and it has been rightly said - "don't die of ignorance". In our country, the National AIDS Control Organisation (NACO) and other non-governmental organisations (NGOs) are doing a lot to educate people about AIDS. WHO has started a number of programmes to prevent the spreading of HIV infection. Making blood (from blood banks) safe from HIV, ensuring the use of only disposable needles and syringes in public and private hospitals and clinics, free distribution of condoms, controlling drug abuse, advocating safe sex and promoting regular check-ups for HIV in susceptible populations, are some such steps taken up.

Infection with HIV or having AIDS is something that should not be hidden - since then, the infection may spread to many more people. HIV/AIDS-infected people need help and sympathy instead of being shunned by society. Unless society recognises it as a problem to be dealt with in a collective manner - the chances of wider spread of the disease increase manifold. It is a malady that can only be tackled, by the society and medical fraternity acting together, to prevent the spread of the disease.

8.4 CANCER

Cancer is one of the most dreaded diseases of human beings and is a major cause of death all over the globe. More than a million Indians suffer from

HUMAN HEALTH AND DISEASE

NEOPLASIA

- Mortality = ↑↑↑
- Telomerase acc. ved.

CANCER

- Non-mortal
- Telomerase enzyme = active

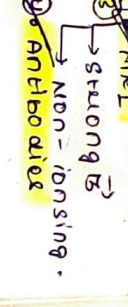
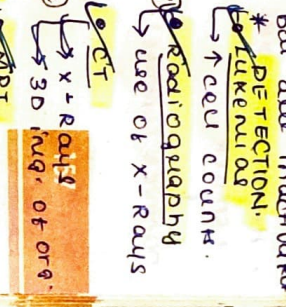
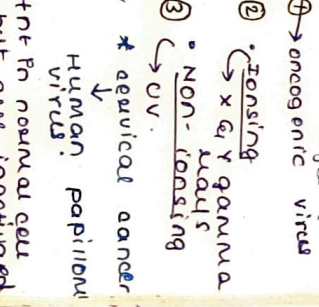
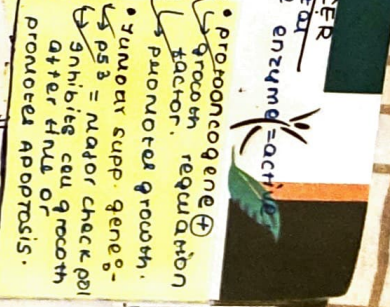
cancer and a large number of them die from it annually. The mechanisms that underlie development of cancer or oncogenic transformation of cells and their treatment and control have been some of the most intense areas of research in biology and medicine.

In our body, cell growth and differentiation is highly controlled and regulated. In cancer cells, there is breakdown of these regulatory mechanisms. Normal cells show a property called **contact inhibition** by virtue of which contact with other cells inhibits their uncontrolled growth. Cancer cells appear to have lost this property. As a result of this, cancerous cells just continue to divide giving rise to masses of cells called **tumors**. Tumors are of two types: **benign and malignant**. Benign tumors normally remain confined to their original location and do not spread to other parts of the body and cause little damage. The **malignant tumors**, on the other hand, are a mass of proliferating cells called **neoplastic of tumor cells**. These cells grow very rapidly, invading and damaging the surrounding normal tissues. As these cells actively divide and grow they also spare the normal cells by competing for vital nutrients. Cells sloughed from such tumors reach distant sites through blood and wherever they get lodged in the body, they start a new tumor here. This property called **metastasis** is the most feared property of malignant tumors.

Causes of cancer: Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents. These agents are called **carcinogens**. Ionising radiations like X-rays and gamma rays and non-ionizing radiations like UV cause DNA damage leading to neoplastic transformation. The chemical carcinogens present in tobacco smoke have been identified as a major cause of lung cancer. Cancer causing viruses called **oncogenic viruses** have genes called **viral oncogenes**. Furthermore, several genes called **cellular oncogenes** (or) **proto oncogenes** have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.

Cancer detection and diagnosis: Early detection of cancers is essential as it allows the disease to be treated successfully in many cases. Cancer detection is based on biopsy and histopathological studies of the tissue and blood and bone marrow tests for increased cell counts in the case of leukaemia. In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope (histopathological studies) by a pathologist. Techniques like radiography (use of X-rays), CT (computed tomography) and MRI (magnetic resonance imaging) are very useful to detect cancers of the internal organs. Computed tomography uses X-rays to generate a three-dimensional image of the internal of an object. MRI uses strong magnetic fields and non-ionising radiations to accurately detect biological and physiological changes in the living tissue.

Antibodies against cancer-specific antigens are also used for detection of certain cancers. Techniques of molecular biology can be



→ 400 years

Biology

Smoking effects
cancer of
lung
urinary bladder
throat
bronchitis
emphysema
coronary heart
disease
gastric ulcer

Smoking also pays the way to hard drugs. Tobacco has been used by human beings for more than 400 years. It is smoked, chewed or used as a snuff. Tobacco contains a large number of chemical substances including nicotine an alkaloid. Nicotine stimulates adrenal glands to release adrenaline and nor-adrenaline into blood circulation, both of which raise blood pressure and increase heart rate. Smoking is associated with increased incidence of cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer, etc. Tobacco chewing is associated with increased risk of cancer of the oral cavity. Smoking increases carbon monoxide (CO) content in blood and reduces the concentration of haemoglobin oxygen. This causes oxygen deficiency in the body.

When one buys packets of cigarettes one cannot miss the standing warning that is present on the packing which warns against smoking and says how it is injurious to health. Yet, smoking is very prevalent in society, both among young and old. Knowing the dangers of smoking and chewing tobacco, and its addictive nature, the youth and old need to avoid these habits. Any addict requires counselling and medical help to get rid of the habit.

8.5.1 Adolescence and Drug/Alcohol Abuse

Adolescence means both a period and a process during which a child becomes mature in terms of his/her attitudes and beliefs for effective participation in society. The period between 12-18 years of age may be thought of as adolescence period. In other words, adolescence is a bridge linking childhood and adulthood. Adolescence is accompanied by several biological and behavioural changes. Adolescence, thus is a very vulnerable phase of mental and psychological development of an individual.

Curiosity, need for adventure and excitement, and experimentation constitute common causes, which motivate youngsters towards drug and alcohol use. A child's natural curiosity motivates him/her to experiment. This is complicated further by effects that might be perceived as benefits, of alcohol or drug use. Thus, the first use of drugs or alcohol may be out of curiosity or experimentation, but later the child starts using these to escape facing problems. Of late stress, from pressures to excel in academics or examinations, has played a significant role in persuading the youngsters to try alcohol and drugs. The perception among youth that it is cool or progressive to smoke, use drugs or alcohol, is also in a way a major cause for youth to start these habits. Television, movies, newspapers, internet also help to promote this perception. Other factors that have been seen to be associated with drug and alcohol abuse among adolescents are unstable or unsupportive family structures and peer pressure.

initial use of drugs

HUMAN HEALTH AND DISEASE

8.5.2 Addiction and Dependence

Because of the perceived benefits, drugs are frequently used repeatedly, the most important thing, which one fails to realise, is the inherent addictive nature of alcohol and drugs. Addiction is a psychological attachment to certain effects - such as euphoria and a temporary feeling of well-being - associated with drugs and alcohol. These drive people to use them even when these are not needed or even when their use becomes self-destructive. With repeated use of drugs, the tolerance level of the receptors present in our body increases. Consequently the receptors respond only to higher doses of drugs or alcohol leading to greater intake and addiction. However, it should be clearly borne in mind that use of these drugs even once, can be a fore-runner to addiction. Thus, the addictive potential of drugs and alcohol, pull the user into a vicious circle leading to their regular use (abuse) from which he/she may not be able to get out. In the absence of any guidance or counselling, the person gets addicted and becomes dependent on their use.

Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued. This is characterised by anxiety, shakiness, nausea and sweating which may be relieved when use is resumed again. In some cases, withdrawal symptoms can be severe and even life threatening and the person may need medical supervision.

Dependence leads the patient to ignore all social norms in order to get sufficient funds to satiate his/her needs. These result in many social adjustment problems.

8.5.3 Effects of Drug/Alcohol Abuse

The immediate adverse effects of drugs and alcohol abuse are manifested in the form of reckless behaviour, vandalism and violence. Excessive doses of drugs may lead to coma and death due to respiratory failure, heart failure or cerebral hemorrhage. A combination of drugs or their use make along with alcohol generally results in overdosing and even deaths. The most common warning signs of drug and alcohol abuse among youth include drop in academic performance, unexplained absence from school/college, lack of interest in personal hygiene, withdrawal, isolation, depression, fatigue, aggressive and rebellious behaviour, deteriorating relationships with family and friends, loss of interest in hobbies, change in sleeping and eating habits, fluctuations in weight, appetite, etc.

There may even be some far-reaching implications of drug/alcohol abuse. If an abuser is unable to get money to buy drugs/alcohol he/she may turn to stealing. The adverse effects are just not restricted to the person who is using drugs or alcohol. At times, a drug/alcohol addict becomes the cause of mental and financial distress to his/her entire family and friends.

Those who take drugs intravenously (direct injection into the vein using a needle and syringe), are much more likely to acquire serious infections like AIDS and Hepatitis B. The viruses, which are responsible for these diseases, are transferred from one person to another by sharing of infected needles and syringes. Both AIDS and Hepatitis B infections are chronic infections and ultimately fatal. Both can be transmitted through sexual contact or infected blood.

The use of alcohol during adolescence may also have long-term effects. It could lead to heavy drinking in adulthood. The chronic use of drugs and alcohol damages nervous system and liver (cirrhosis). The use of drugs and alcohol during pregnancy is also known to adversely affect the foetus.

Another misuse of drugs is what certain sportspersons do to enhance their performance. They (mis)use narcotic analgesics, anabolic steroids, diuretics and certain hormones in sports to increase muscle strength and bulk and to promote aggressiveness and as a result increase athletic performance. The side-effects of the use of anabolic steroids in females include masculinisation (features like males), increased aggressiveness, mood swings, depression, abnormal menstrual cycles, excessive hair growth on the face and body, enlargement of clitoris, deepening of voice. In males it includes acne, increased aggressiveness, mood swings, depression, reduction of size of the testicles, decreased sperm production, potential for kidney and liver dysfunction, breast enlargement, premature baldness, enlargement of the prostate gland. These effects may be permanent with prolonged use. In the adolescent male or female, severe facial and body acne, and premature closure of the growth centres of long bones may result in stunted growth.

8.5.4 Prevention and Control

The age-old adage of 'prevention is better than cure' holds true here also. It is also true that habits such as smoking, taking drug or alcohol are more likely to be taken up at a young age, more during adolescence. Hence, it is best to identify the situations that may push an adolescent towards use of drugs or alcohol, and to take remedial measures well in time. In this regard, the parents and the teachers have a special responsibility. Parenting that combines with high levels of nurturance and consistent discipline, has been associated with lowered risk of substance (alcohol/drugs/tobacco) abuse. Some of the measures mentioned here would be particularly useful for prevention and control of alcohol and drugs abuse among adolescents

- (i) **Avoid undue peer pressure** - Every child has his/her own character and personality, which should be respected and nurtured. A child should not be pushed unduly to perform beyond his/her threshold limits; be it studies, sports or other activities.