Human Health and Diseases-2

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Class: XII **Biology**

Very Short Answer Type Questions

1. Certain pathogens are tissue/organ-specific. Justify the statement with suitable examples.

Certain pathogens are tissue/organ specific due to the following reasons;

(i) Tissues/ organs possess **receptors** for the specific pathogen.

(ii) They are adapted to overcome the **resistance mechanisms** of those tissues and organs.

The pathogens that enter the gut must be adapted to survive in the stomach at acidic, low pH environment and resistant to various digestive enzymes.

Pathogen	Tissue or Organ of infection
Rhino virus	Nasal passage and respiratory tract
Fungi responsible for Ringworm	Skin
Helicobacter pylori	Stomach
Streptococcus pneumoniae	Lungs
Entamoeba histolytica	Caecum and Colon

2. The immune system of a person is suppressed. In the ELISA test, he was found positive to a pathogen.

a. Name the disease the patient is suffering from.

b. What is the causative organism?

c. Which cells of the body are affected by the pathogen?

a. The patient is suffering from Acquired Immuno Deficiency Syndrome (AIDS).

b. The causative organism is the Human Immuno Deficiency Virus (HIV).

It is a retrovirus containing RNA as the genetic material.

c. Macrophages and Helper T-cells are affected by the pathogen.

3. Where are B-cells and T-cells formed? How do they differ from each other?

Both B-cells and T-cells are formed in the bone marrow.

B-cells get matured in the bone marrow but T-cells migrate to thymus and get matured in Thymus.

B-cells produce antibodies, while T-cells help in killing the pathogen and helping other immune cell to fight infection.

4. Given below are the pairs of pathogens and the diseases caused by them. Which out of these is not a matching pair, and why?

Pathogen	Disease
a. Virus	Cold
b. Salmonella	Typhoid
c. Microsporum	Filariasis
d. Plasmodium	Malaria

In the above question **option, 'c'** is incorrectly matched.
The disease filariasis is caused by Wuchereria bancrofti belongs to roundworms of the genus Filarioidea.

5. What would happen to the immune system, if the thymus gland is removed from the body of a person?

Thymus is the primary lymphoid organ. Maturation and differentiation of T lymphocytes into antigen-sensitive lymphocytes occur in Thymus.

If thymus gland is removed from the body of a person,

- Maturation of T cells will not occur.
- Cell-mediated immunity will decrease.
- The person will be more susceptible to infections.

6. Many microbial pathogens enter the gut of humans along with food. What are the preventive barriers to protect the body from such pathogens? What type of immunity do you observe in this case?

Our body has many preventive barriers, which are as follows:

1. Lysozyme present in saliva
2. The mucous coating on the epithelium lining of the gut.
3. Hydrochloric acid is secreted by the parietal cells in the stomach.

This type of immunity is known as **Innate Immunity**.

7. Why is the mother's milk, considered the most appropriate food for a newborn infant?

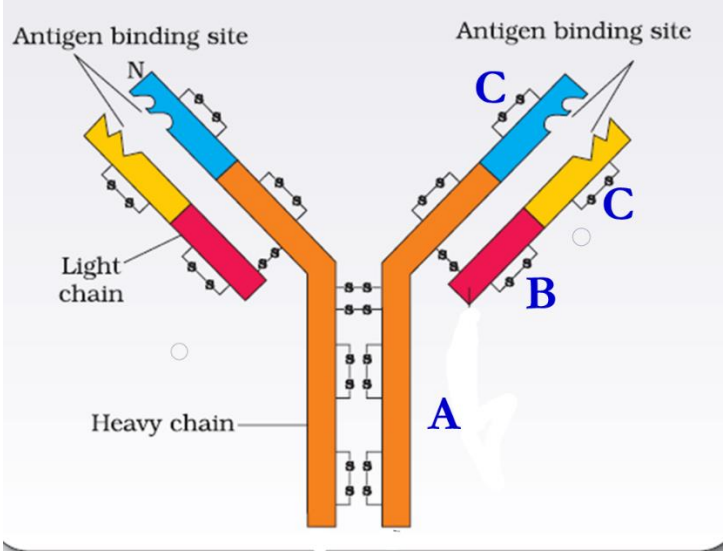
Mother's milk is considered the most appropriate food for a newborn infant because, the yellowish fluid **colostrum** secreted by mother during the initial days of lactation has abundant antibodies especially IgA, which are absolutely essential for developing resistance for the new-born babies.

8. What are interferons? How do interferons check the infection of new cells?

The proteins secreted by virus-infected cells are called interferons. Interferons protect other cells from infection. They act like cytokinin barriers.

Interferons also inhibit viral replication within the host cells.

9. In the figure, the structure of an antibody molecule is shown. Name the parts A, B and C.



Site A is the constant region for heavy chain.

Site B is the constant region for the light chain.

Site C is the variable region of light and heavy chain.

10. If a regular dose of drug or alcohol is not provided to an addicted person, he shows some withdrawal symptoms. List any four such withdrawal symptoms.

1. It leads to anxiety.
2. Trouble concentrating on things and thinking clearly.
3. Headache and nausea.
4. Mood swings.

11. Why is it that during changing weather, one is advised to avoid closed, crowded and air-conditioned places like cinema halls etc.?

During changing weather, one is advised to avoid closed, crowded and air-conditioned places like cinema halls, because pathogens are more prevalent and active as the moist condition favours them to grow fast. Further, people are more vulnerable as their body system is busy in adapting the changing environmental conditions and they get infected easily.

12. The harmful allele of sickle cell anaemia has not been eliminated from the human population. Such afflicted people derive some other benefit. Discuss.

The harmful allele of sickle cell anaemia has not been eliminated from the human population, because it is also a potential saviour from malaria.

Those with the benign sickle cell trait possess **resistance** to malarial infection.

Hence the afflicted people are less susceptible to malaria.

13. Lymph nodes are secondary lymphoid organs. Explain the role of lymph nodes in our immune response.

Lymph nodes are small nodule-like structures present along the entire length of the lymphatic vessels.

These **filter out** the microbes present in the lymph and the tissue fluid.

The lymphocytes present in the lymph nodes interact with the pathogens, create an **immune response** and destroy them.

14. Why is an antibody molecule represented as H2L2?

The antibody molecule has two light chains (L2) and two heavy chains (H2), hence it is represented as H2L2.

15. What does the term `memory' of the Immune system mean?

The memory of the immune system means the body can remember the pathogens which encountered previously, recognize them if they reenter the body later and lead to a heightened immune response.

16. If a patient was advised for Anti Retroviral Therapy, which infection is he suffering from? Name the causative organism.

If a patient was advised for Anti Retroviral Therapy, the patient is suffering from Acquired Immuno Deficiency Syndrome (AIDS).

The causative organism is a virus called HIV or Human Immuno Deficiency Virus.

Short Answer Type Questions

1. Differentiate between active immunity and passive immunity.

Active Immunity	Passive Immunity
The immunity developed in our body by the antibodies produced in our own body in response to the entry of pathogens is active immunity	The immunity developed in our body by the introduction of antibodies produced in the body of other organisms is passive immunity
Antibodies develop in our own cells	Antibodies develop in other vertebrates and injected into our body
It takes time to develop immunity	Immune response is faster
It stays for a longer period	It stays for a shorter period
E.g. Immunity developed due to infection (natural exposure) to antigen or by vaccination	E.g. Immunity provided to infants in the form of colostrum, tetanus antitoxin

2. Differentiate between a benign tumour and malignant tumour.

Benign Tumour	Malignant Tumour
Benign tumour is non-cancerous.	Malignant tumour is cancerous.
The cells grow slowly.	The cells grow very rapidly.
It remains confined to its original location.	It does not remain confined to its original location.
The cells do not invade.	The cells invade.
It causes a little damage to the surrounding normal tissues.	It causes severe damage to the surrounding normal tissues.
It is harmless.	It is very harmful.

3. Do you consider passive smoking is more dangerous than active smoking? Why?

Yes, passive smoking is **more dangerous than active smoking** because a passive smoker is forced to inhale unfiltered and more smoke than an active smoker.

The active smoker inhales only 10% of the smoke while the passive smoker inhales 90% of the smoke.

4. "Prevention is better than cure". Comment.

Even though an infected person could be completely cured by medicine, he has to suffer a lot and face severe problems and discomfort during his illness.

He also has to suffer from the side effects of treatment, lose time, energy and money.

Hence, Prevention is always better than cure.

5. Explain any three preventive measures to control microbial infections.

Preventive measures to control microbial infection include

(i) Maintenance of personal and public hygiene by

Proper cleanliness standards and practices.

Proper disposal of waste.

Periodic cleaning of water reservoirs.

(ii) Control of vectors that transmit diseases by

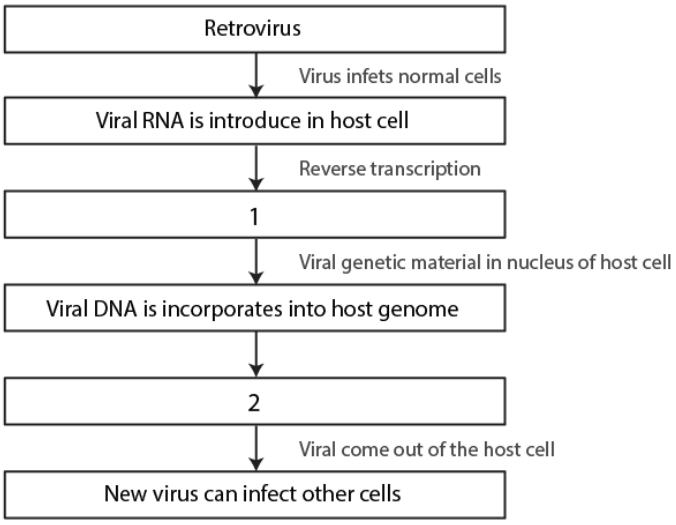
Checking water stagnation and garbage accumulation.

Using disinfectants or biological methods to check their breeding and spread.

(iii) Proper immunization by vaccination

Be vaccinated for prevention of all infectious diseases.

6. In the given flow diagram, the replication of retrovirus in a host is shown. Observe and answer the following questions.



a. Fill in (1) and (2)

b. Why is the virus called retrovirus?

c. Can the infected cell survive while viruses are being replicated and released?

(a) Block 1: Viral DNA is produced by reverse transcriptase.

Block 2: New viral RNA is produced by the infected cell.

(b) **RNA** is the genetic material of this virus. So, it produces DNA by reverse transcription. As, it does not follow the central dogma, it is known as a retrovirus.

(c) Yes, the infected cell survives while viruses are replicated and released.

7. "Maintenance of personal and public hygiene is necessary for prevention and control of many infectious diseases". Justify the statement by giving suitable examples.

Maintenance of personal and public hygiene is necessary for the prevention and control of many infectious diseases

If hygiene is not maintained, microbes would grow and would easily get transmitted.

Giving proper awareness programmes to people can give some knowledge about the importance of hygiene.

Proper sanitation should be provided so that air and water would not get contaminated.

Proper vaccination should be done to control the spread of infection.

8. The following table shows certain diseases, their causative organisms and symptoms. Fill the gaps.

	Name of the disease	Casuative organism	Symptoms
(i)	Ascariasis	Ascaris	_____
(ii)	_____	Trichophyton	Appearance of dry, scaly lesions on various parts of body
(iii)	Typhoid	Salmonella typhi	High fever, weakness, headache, stmach pain, constipation
(iv)	Pneumonia	Streptococcus pneumoniae	_____
(v)	_____	Rhino viruses	Nasal congestion and discharge, sore throat, cough, headache
(vi)	Filarisis	_____	Inflamation in lower limbs

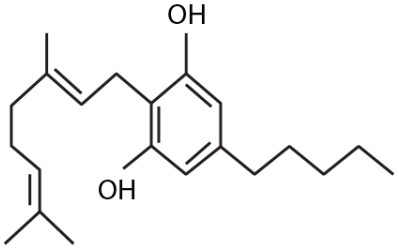
(i)	Ascariasis	Ascaris	Internal bleeding, muscular pain, fever, anemia and blockage of the intestinal passage
(ii)	Ringworm	Trichophyton	Appearance of dry, scaly lesions on various parts of body
(iii)	Typhoid	Salmonella typhi	High fever, weakness, headache, stmach pain, constipation
(iv)	Pneumonia	Streptococcus pneumoniae	Fever, chills, cough and headache
(v)	Commom cold	Rhino viruses	Nasal congestion and discharge, sore throat, cough, headache
(vi)	Filarisis	W. bancrofti and W. malayi	Inflamation in lower limbs

9. The outline structure of a drug is given below.

a. Which group of drugs does this represent?

b. What are the modes of consumption of these drugs?

c. Name the organ of the body which is affected by the consumption of these drugs.



a. It belongs to the Cannabinoids group of drugs.

b. This drug can be consumed either orally or by inhalation.

c. The cardiovascular system of the body is most affected.

10. Give the full form of CT and MRI. How are they different from each other? Where are they used?

CT : Computerized Tomography

MRI : Magnetic Resonance Imaging

CT : It uses X-ray and is an invasive technique.

MRI : It uses magnetic field and radiofrequency pulses, and is a non-invasive.

11. Many secondary metabolites of plants have medicinal properties. It is their misuse that creates problems. Justify the statement with an example.

The molecules produced by plants which do not play a major role in their vital life processes such as growth, development and reproduction, but they protect the plants from pests and provide resistance against stress, are called secondary metabolites.

Medicinal use of secondary metabolites of plants:

Belladona is obtained from roots & dried leaves of Atropa belladonna is used as diuretic and antispasmodic.

Atropine is obtained from the leaves of Atropa belladonna, used to dilate pupil of eye during eye test.

Drugs like **barbiturates, amphetamines, benzodiazepines, lysergic acid diethyl amides (LSD**) are used as medicines to treat mental illnesses like depression and insomnia.

Morphine is a very effective **sedative and painkiller** which is very useful in patients who have undergone surgery.

Drugs	Medicinal Use
Atropine	Dilating pupil of eye during eye test
Belladona	Diuretic and Antispasmodic
Morphine	Sedative and painkiller used during surgery
Barbiturates, amphetamines, benzodiazepines, lysergic acid diethyl amides	Treating depression and insomnia

Misuse of Drugs:

Opium, heroine and LSD are drugs that act on the receptors of brain, which are misused to make a person relax, improve their strength, and are keeping free from pain, nausea and anxiety.

Cocaine is used by abusers to get **euphoria and hallucination.**

Cannabinoids are misused to **enhance performance** of athletes. But scientifically it is not true.

12. Why are cannabinoids banned in sports and games?

Cannabinoids are banned in sports and games as they **enhance the performance** of athletes and **affect the health** in the long run.

13. What is secondary metabolism?

Secondary metabolism is a pathway of plants involved in the production of small molecules that are absolutely not required for their survival such as growth, development and reproduction.

The small molecules are known as secondary metabolites such as antibiotics and pigments produced in bacteria, fungi etc. In plants, these compounds help in protecting them from pathogens and pests, help in pollination, and provide protection against UV damage.

14. Drugs and alcohol give short-term 'high' and long-term 'damages', Discuss.

Short term 'high'

The feeling of euphoria, hallucination and heightened emotions arise due to the consumption of drugs.

Hence, it leads to short-term highness. These depress the activity of the brain and produce feelings of calmness, relaxation, drowsiness, and deep sleep.

Long term 'damages'

Long term effects of consumption of drugs and alcohol are:

It may irritate the lining of the stomach and can trigger nausea, vomiting and other gastric troubles.

Usage of intravenous drugs and sharing the needles may lead to development of AIDS which is not curable.

Drugs like cannabis, cocaine and heroin reduce testosterone levels.

Cannabis can reduce the sperm count, sperm motility and decrease the amount of semen, leading to male sterility.

Chronic use of alcohol leads to liver cirrhosis and cancer.

15. Diseases like dysentery, cholera, typhoid etc., are more common in overcrowded human settlements. Why?

The water gets mixed with the infected excreta, and the contaminated water spreads the disease. Open excretion is the main cause of this spread.

16. From which plant cannabinoids are obtained? Name any two cannabinoids. Which part of the body is affected by consuming these substances?

Cannabinoids are chemical substances that mainly act on the cannabinoid receptor in the brain.

Marijuana, hashish, charas and ganja are the different kinds of cannabinoids.

They are obtained from the Inflorescence, leaves and resins of Cannabis sativa.

Cardiovascular System is the most affected system by the inhalation and oral ingestion of these drugs.

17. In the metropolitan cities of India, many children are suffering from allergy/asthma. What are the main causes of this problem? Give some symptoms of allergic reactions.

1. Cities are highly polluted by air and noise. The use of factories and other industries releases pollutants which cause allergies.
2. It lowers immunity in children and makes them more sensitive towards allergens.

Symptoms:

1. Breathing Difficulty.
2. Sneezing
3. Runny Nose
4. Burning and watery eyes.

18. What is the basic principle of vaccination? How do vaccines prevent microbial infections? Name the organism from which the hepatitis B Vaccine is produced.

The introduction of attenuated or weakened pathogens or toxoids into the body to confer resistance against those antigens is called vaccination.

The antibodies produced by the immune system in response to the pathogen kill the pathogen and prevent the infection.

The immune system also produces Memory B and T cells that recognise the pathogen quickly on subsequent exposure and attack them vigorously with a massive production of antibodies.

Hepatitis B vaccine is produced from Yeast.

19. If there are two pathogenic viruses, one with DNA and the other with RNA, which would mutate faster? And Why?

If there are two pathogenic viruses, one with DNA and the other with RNA, then the one having RNA would mutate faster because RNA being a single-stranded structure, is quite unstable and can mutate at a faster rate.

DNA is more stable and also has better repair mechanisms that correct the changes in base pairs as soon as it is introduced.

RNA mutates faster than DNA.

So RNA viruses mutate faster than DNA viruses.

20. What is cancer? How is a cancer cell different from the normal cell? How do normal cells attain cancerous nature?

The uncontrolled and rapid cell division caused due to mutation, gives rise to masses of cells called **tumors** is known as cancer.

Cancer cells have lost the property of **contact inhibition,** leading to uncontrolled growth.

Normal Cell	Cancer cell
In normal cell, the cell growth and differentiation is highly controlled and regulated.	In cancer cells, there is breakdown of the regulatory mechanisms.
They show a property called **contact inhibition** by which contact with other cells inhibits their uncontrolled growth.	They have lost the property of **contact inhibition,** which causes uncontrolled growth.
They divide and growth normally and do not starve any cell and do not compete for vital nutrients.	They actively divide and grow and also starve the normal cells by competing for vital nutrients.
They do not show the property called metastasis.	They show the property called metastasis and reach distant sites through blood.
They do not cause tumour.	They cause tumour wherever they get lodged in the body.

21. A person shows strong unusual hypersensitive reactions when exposed to certain substances present in the air. Identify the condition. Name the cells responsible for such reactions. What precautions should be taken to avoid such reactions?

Diagnosis:

The hypersensitive response of the immune system to certain antigens present in the environment is called **allergy**.

Cause:

This unusual hypersensitive reaction is allergy which is caused due to exposure to allergens.

The substances that cause allergy are called allergens.

Common allergens are mites in dust, pollens, animal dander, etc.

The antibodies produced to these are of IgE type.

Cells Responsible for Allergy:

Mast cells are responsible for such reactions because allergy is due to the release of chemicals like **histamine and serotonin** from the mast cells.

Precaution:

This can be prevented by taking precautions like avoiding exposure to allergens.

The use of drugs like **anti-histamine, adrenalin and steroids** quickly reduce the symptoms of allergy.

22. For an organ transplant, it is an advantage to have an identical twin. Why?

Identical twins are genetically identical. They have the **same blood group** and **tissue antigens**. Hence the chances of organ rejection is negligible.

So, it is an advantage to have an identical twin for organ transplantation.

23. What are lifestyle diseases? How are they caused? Name any two such diseases.

The diseases caused due to the lack of physical activity, unhealthy eating, drinking and smoking are called life style diseases.

They are caused by unhealthy eating and lacking physical activity and exercise.

Diabetes and hypertension are the two diseases.

Long Answer Type Questions

1. Compare the lifestyle of people living in urban areas with those of rural areas and briefly describe how lifestyle affects their health.

Rural area	Urban area
Lack of health facilities	Health facilities are present
Poor sanitation	Better sanitation facilities
Poor living condition	Better standard of living
Unavailability of water, electricity etc.	Available all the basic sources.

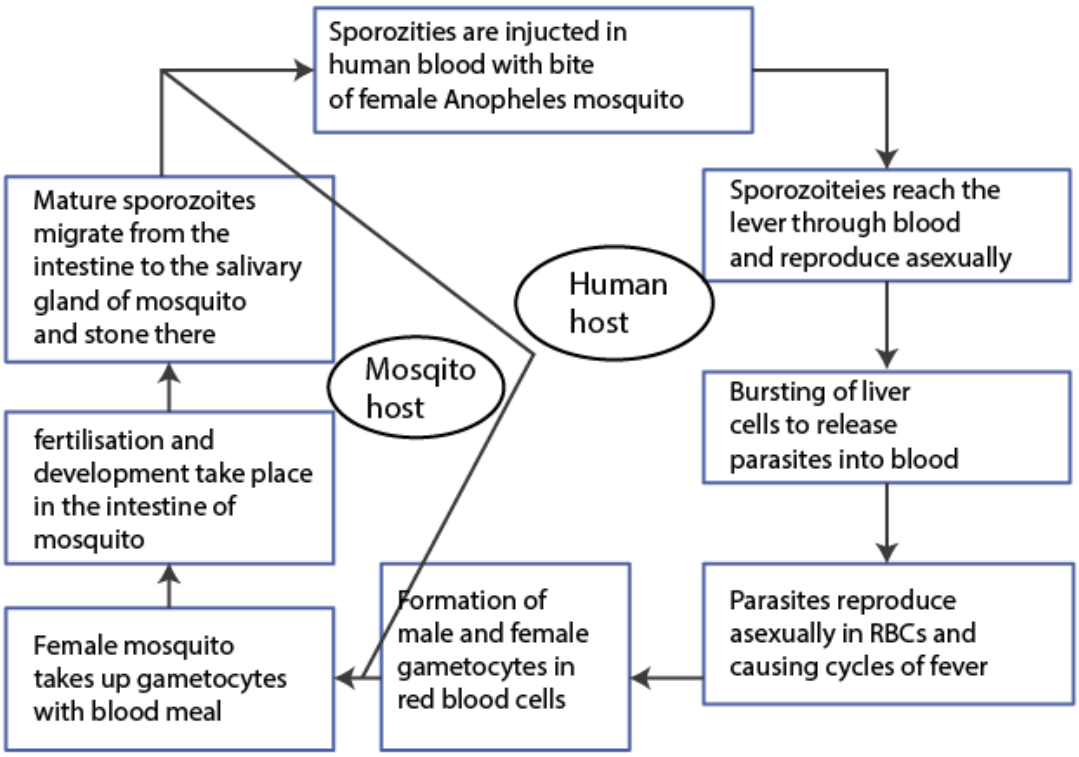
2. Drugs like LSD, barbiturates, amphetamines, etc., are used as medicines to help patients with mental illness. However, excessive doses and abusive usage are harmful. Enumerate the major adverse effects of such drugs in humans.

Drugs are chemical substances that have a psychological and physiological effect on your system, but overdose may lead to the following adverse effects:

1. If it is overdosed, it causes anxiety and shakiness
2. Vomiting and Nausea

3. A person will show less interest in personal and professional life.
4. Social adjustment problems are seen.
5. Reckless behaviour, violence and vandalism
6. General lack of interest is seen.

3. Represent the life cycle of a malarial parasite schematically.



4. Why do some adolescents start taking drugs? How can this be avoided?

The following are the reasons for adolescents to start taking drugs:

- Peer group pressure
- Curiosity of child motivates him/her to experiment.
- Need for adventure and excitement.
- Desire to do more physical and mental work.
- To overcome frustration and depression, due to failure in examinations or in other activities.
- Unstable or unsupportive family structures.

The following measures can be taken to avoid taking drugs:

- Avoid undue pressure on child to perform beyond his/her capability in studies, sports or any other activities.
- Education and counseling are very important to face the problem of stress and failure in life.
- Seeking help from parents, elders, and peers. This would help the young to share their feelings and concern.
- Looking for danger signs and taking appropriate measures to treat them.
- Seeking professional and medical help for de-addiction and rehabilitation

5. What are the methods of cancer detection? Describe the common approaches for the treatment of cancer.

Early detection of cancers is essential as it allows the disease to be treated successfully in many cases.

Cancer detection is based on

Diagnosis of Cancer:

- Biopsy and histopathological studies of the tissue.
- In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope (histopathological studies) by a pathologist.
- Blood and bone marrow tests for increased cell counts in the case of leukemias.
- 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.
- CT (Computed tomography) uses X-rays to generate a three-dimensional image of the internals of an object.
- MRI uses strong magnetic fields and non-ionizing radiations to accurately detect pathological and physiological changes in the living tissue.
- Monoclonal Antibodies against cancer-specific antigens, are used for the detection of certain cancers.
- Techniques of molecular biology can be applied to detect genes in individuals with inherited susceptibility to certain cancers.

Treatment of Cancer:

- Surgery, Radiation therapy and Immunotherapy.
- In radiotherapy, tumor cells are irradiated lethally, taking proper care of the normal tissues surrounding the tumor mass.

- Several chemotherapeutic drugs are used to kill cancerous cells. Some of these are specific for particular tumors.

6. What is the Pulse Polio Programme of the Government of India? What is OPV? Why is it that India is yet to eradicate Polio?

Pulse Polio Programme is the Government of India's initiative to abolish Polio in India since 1995.

In this programme, all children below the age of five are immunized orally against the poliovirus.

The programme is aimed to eradicate polio from India.

Polio, also known as Poliomyelitis, is an infectious disease caused by poliovirus, which leads to muscle weakness and further inability to move.

OPV is the Oral Polio Vaccine. This vaccine is used to eradicate polio. In OPV, a weakened poliovirus is given orally through the mouth.

It consists of a mixture of live attenuated poliovirus strains, which are injected inside the body to initiate an immune response.

One dose of OPV produces long-lasting immunity towards all three types of strains of the poliovirus

7. What are recombinant DNA vaccines? Give two examples of such vaccines. Discuss their advantages.

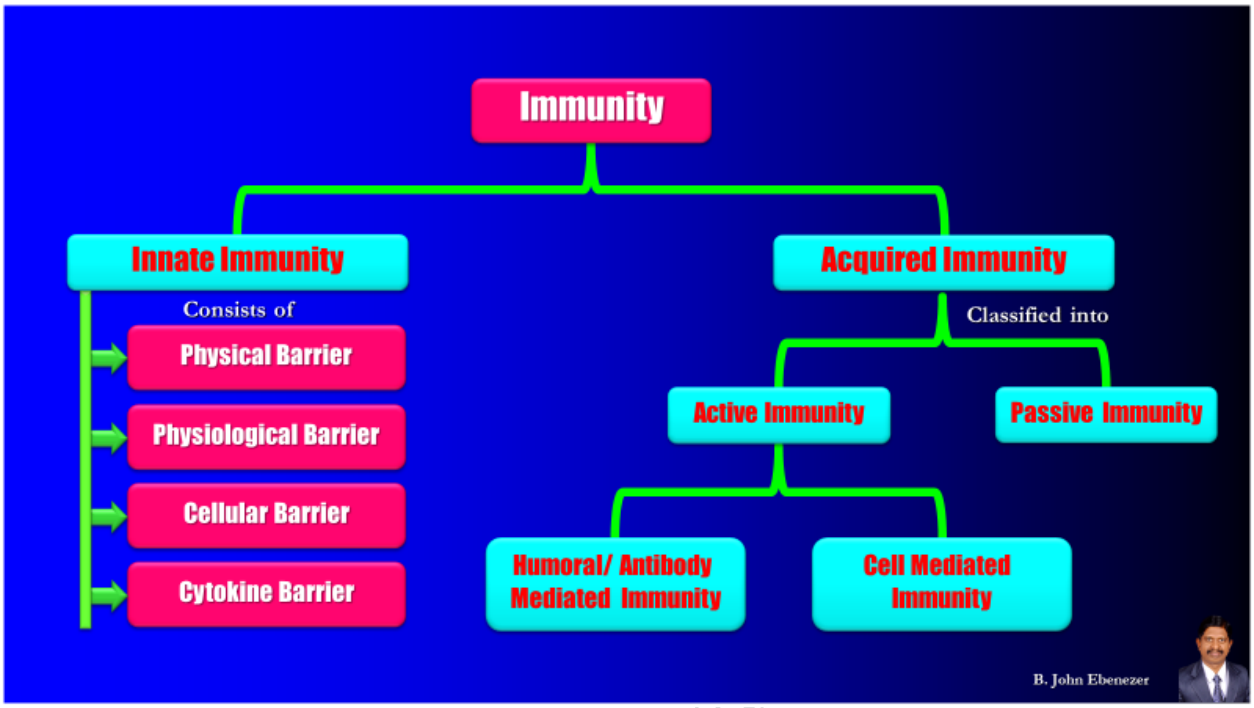
A recombinant DNA is formed by introducing a foreign DNA containing the desirable gene into the plasmid. This recombinant plasmid is then introduced into the microbe where it replicates.

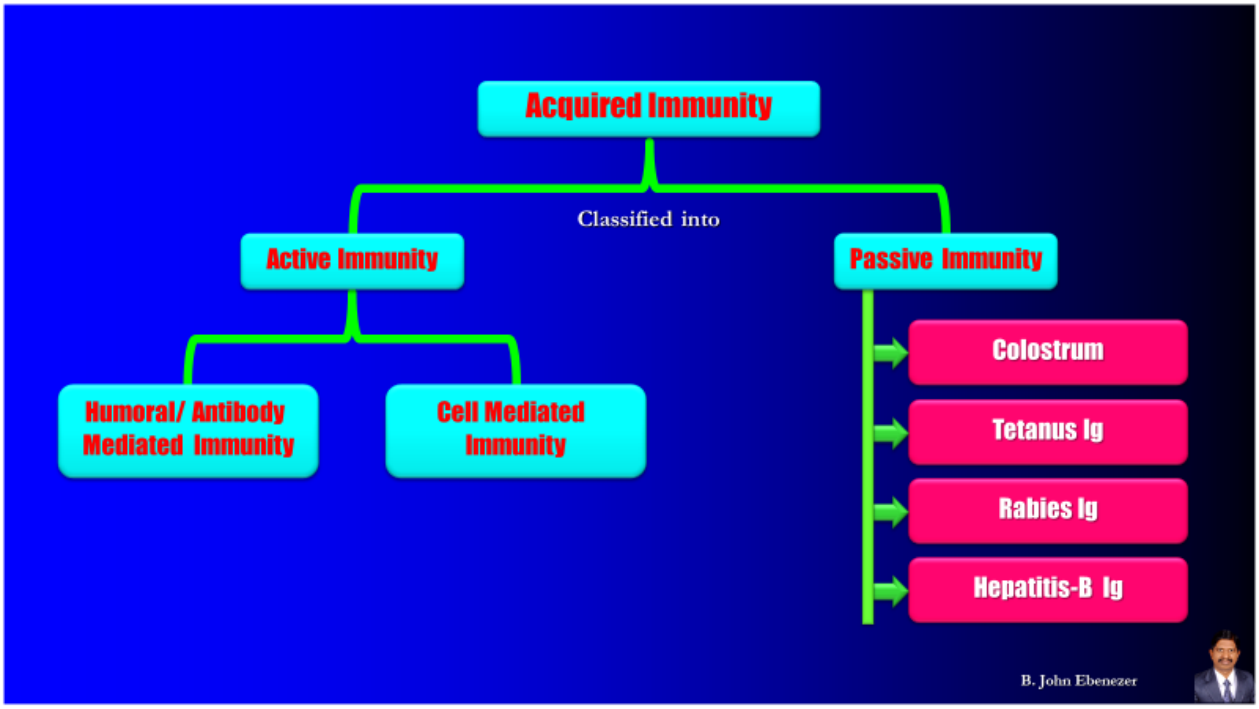
Examples of rDNA vaccines:

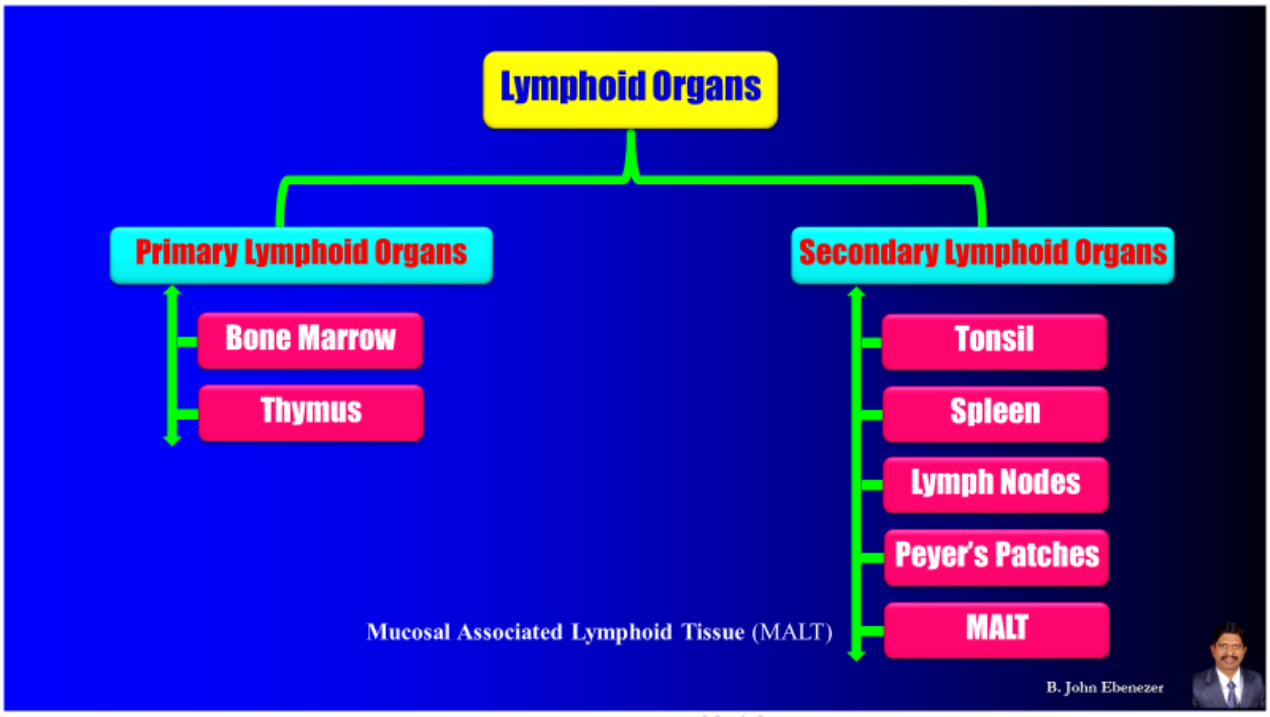
Hepatitis B vaccine and HPV (Human Papillomavirus) vaccine for humans are examples of rDNA vaccines.

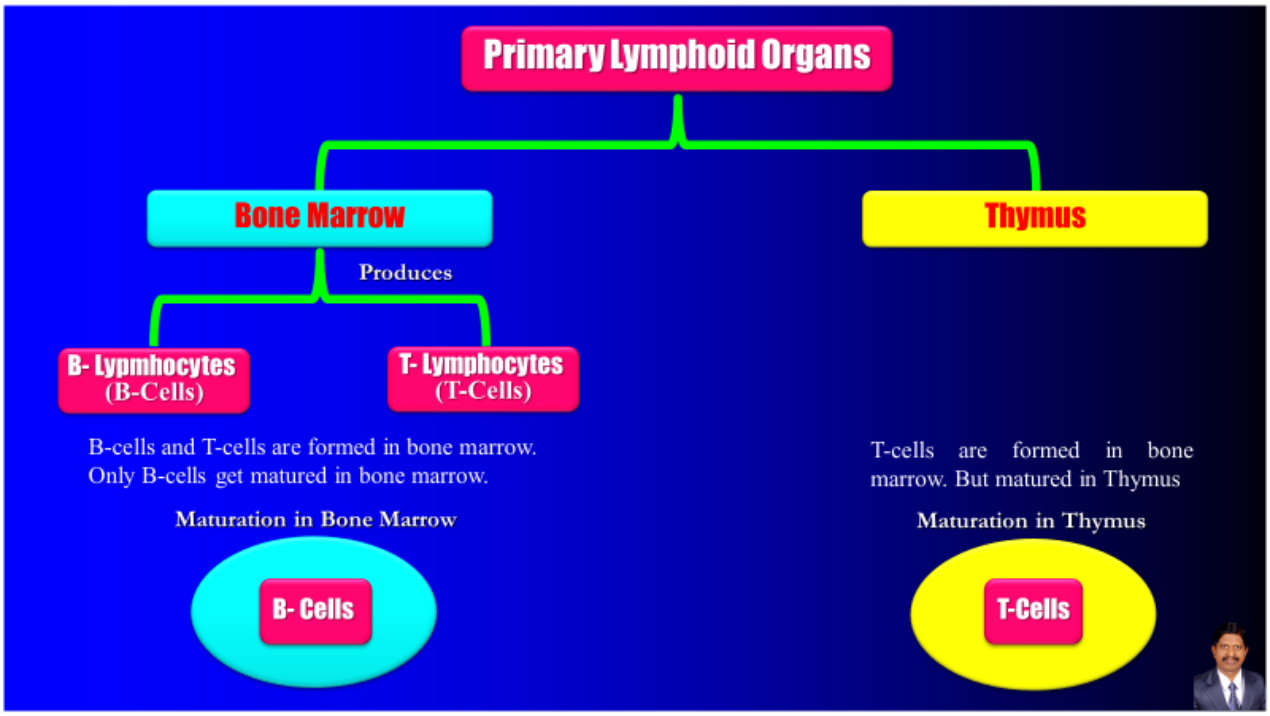
Advantages of rDNA vaccines:

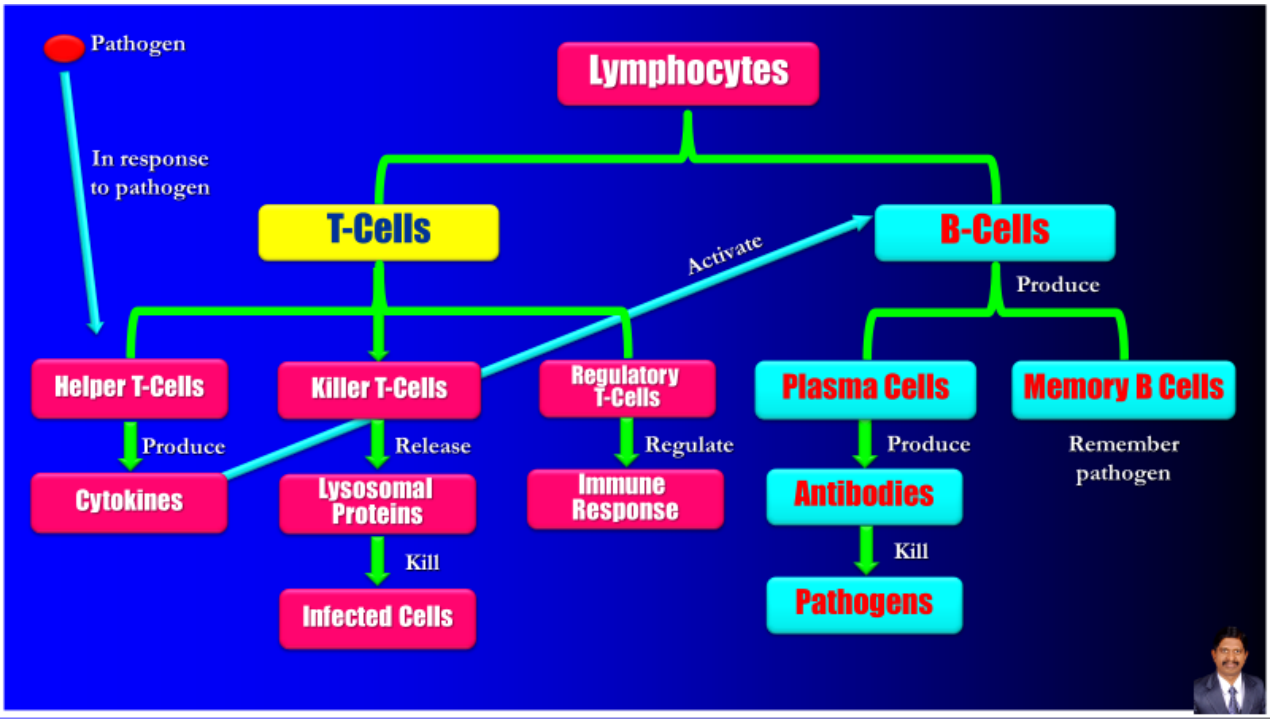
- They are cost effective.
- Initiate both cell-mediated and humoral immunity.
- Since the chances of contamination are less during production, the vaccine is specific and side effects are less.
- The manufacture of such vaccines is faster and each vial contains a uniform composition of the vaccine.

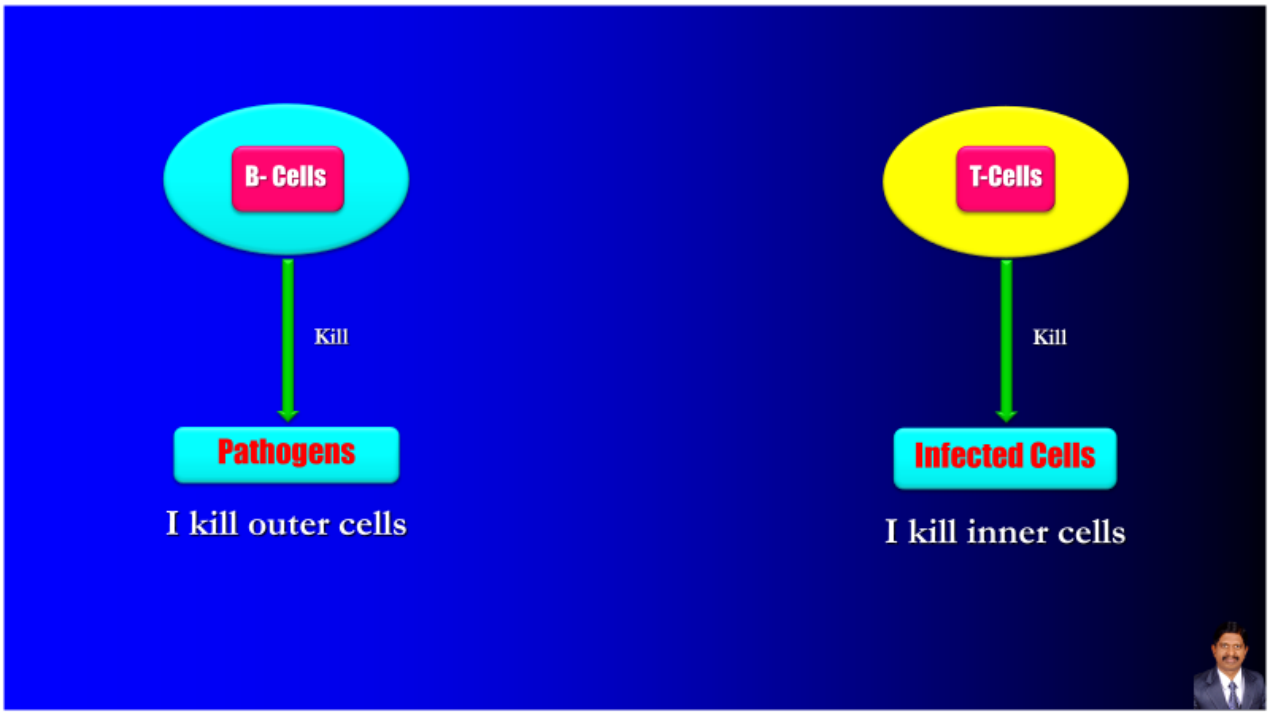

Immunity
Innate Immunity
Consists of
Physical Barrier
Physiological Barrier
Cellular Barrier
Cytokine Barrier
Acquired Immunity
Classified into
Active Immunity
Passive Immunity
Humoral/ Antibody Mediated Immunity
Cell Mediated Immunity
B. John Ebenezer


Acquired Immunity
Classified into
Active Immunity
Passive Immunity
Humoral/ Antibody Mediated Immunity
Cell Mediated Immunity
Colostrum
Tetanus Ig
Rabies Ig
Hepatitis-B Ig
B. John Ebenezer


Lymphoid Organs
Primary Lymphoid Organs
Bone Marrow
Thymus
Secondary Lymphoid Organs
Tonsil
Spleen
Lymph Nodes
Peyer's Patches
MALT
Mucosal Associated Lymphoid Tissue (MALT)
B. John Ebenezer


Primary Lymphoid Organs
Bone Marrow
Thymus
Produces
B- Lypmhocytes (B-Cells)
T- Lymphocytes (T-Cells)
B-cells and T-cells are formed in bone marrow.
Only B-cells get matured in bone marrow.
Maturation in Bone Marrow
B- Cells
T-cells are formed in bone marrow. But matured in Thymus
Maturation in Thymus
T-Cells


Pathogen
Lymphocytes
In response to pathogen
T-Cells
B-Cells
Activate
Produce
Helper T-Cells
Killer T-Cells
Regulatory T-Cells
Plasma Cells
Memory B Cells
Produce
Release
Regulate
Produce
Remember pathogen
Cytokines
Lysosomal Proteins
Immune Response
Antibodies
Kill
Kill
Infected Cells
Pathogens


B- Cells
Kill
Pathogens
I kill outer cells
T-Cells
Kill
Infected Cells
I kill inner cells

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