CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

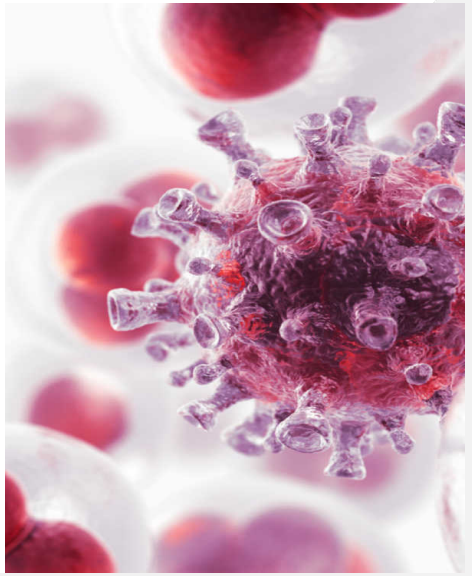
Subject Code- 20SZT148

IMMUNITY AND TYPES OF IMMUNITY

IMMUNITY AND TYPES OF IMMUNITY

Course Outcome

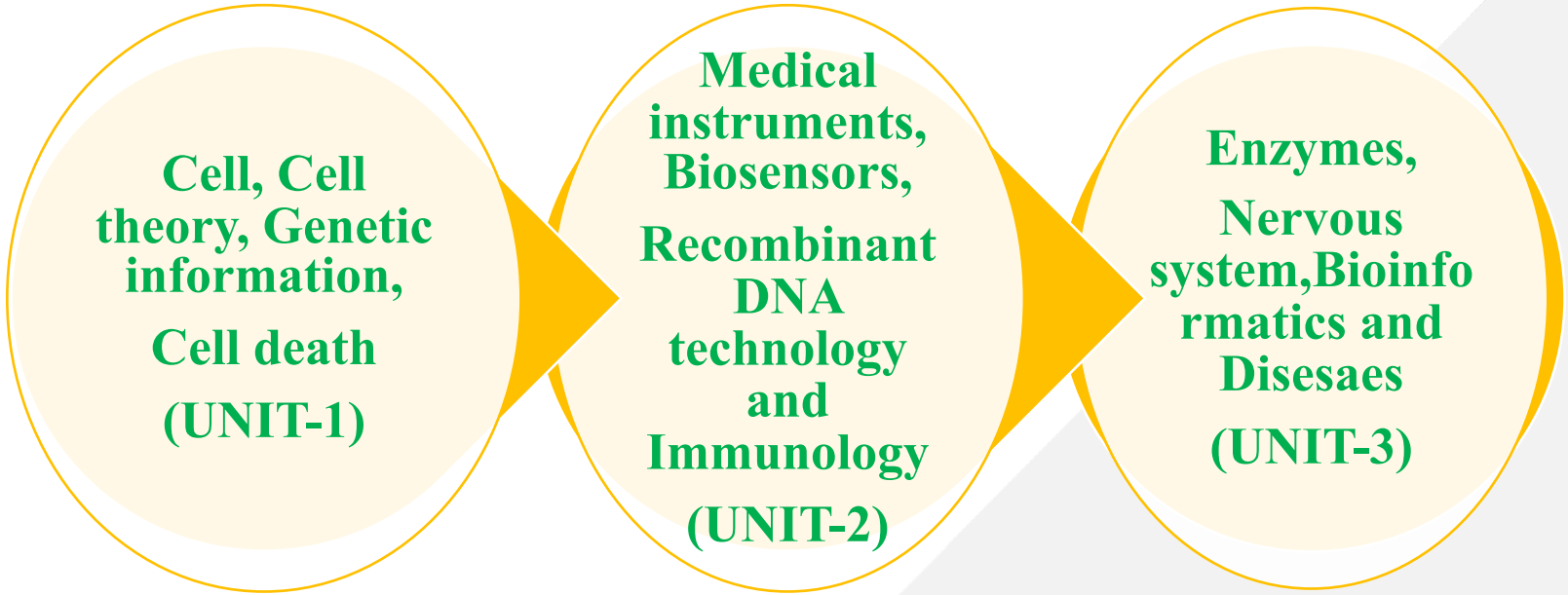
CO Number	Title	Level
CO1	It gives an idea about the about the basic cell biology.	**Understanding**
CO2	It deals with the idea of uses of biology in engineering.	**Understanding**
CO3	It provide knowledge about the uses of softwares in biology field.	**Remembering**



Will be covered in this lecture

https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/what-is-herd-immunity-and-how-can-it-affect-coronavirus-spread/articleshow/74736884.cms

BIOLOGY FOR ENGINEERS

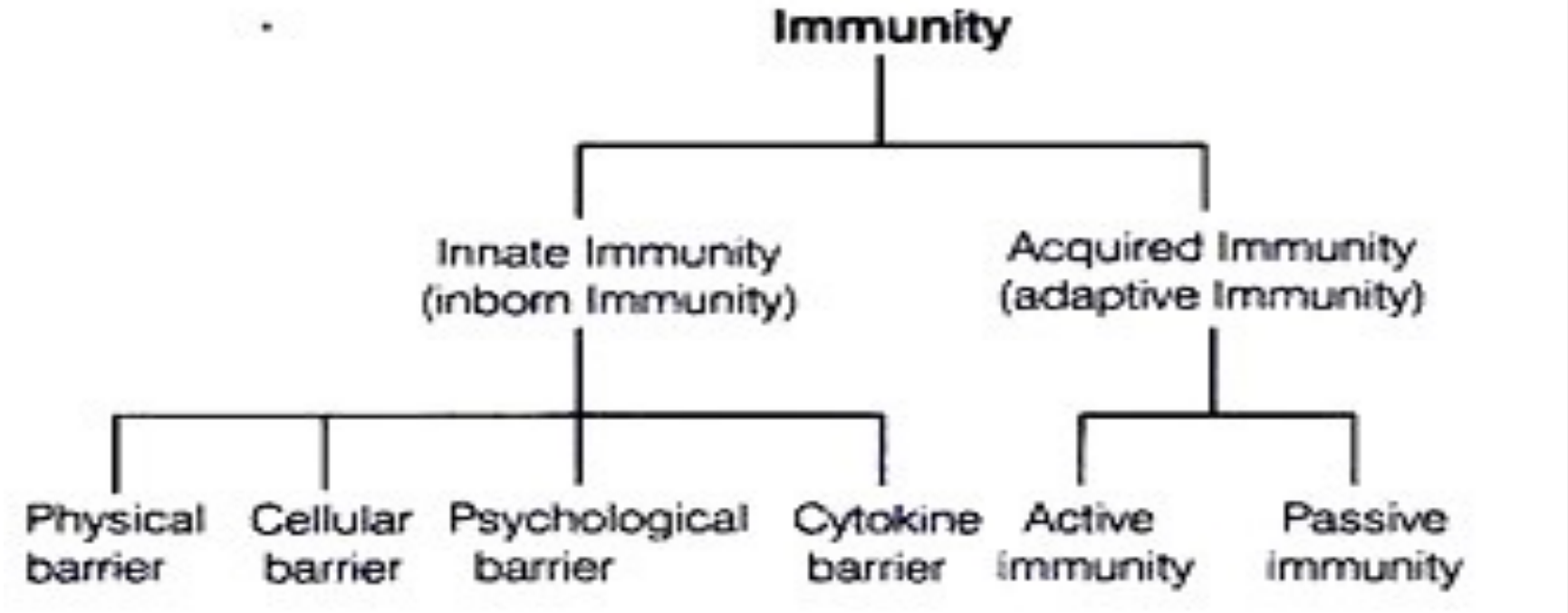


IMMUNITY

•In biology, immunity is the balanced state of multicellular organisms having adequate biological defenses to fight infection, disease, or other unwanted biological invasion. Immunity is the capability of multicellular organisms to resist harmful microorganisms from entering their cells.

https://medium.com/alphagreen/building-immunity-against-the-covid-19-disease-bedcab44c981

TYPES OF IMMUNITY



https://www.biologydiscussion.com/immunology/types-of-immunity-innate-and-acquired/56277

INNATE IMMUNITY

- It refers to all the defence elements with which an individual is born and always available to protect the body. It is a non-specific type of defence system.

(i) It is present from the time of birth and inherited from parents.

(ii) It consists of four types of barrier system that prevent the entry of pathogen or foreign element in to the body.

1. Physical Barrier:

- Skin is the first line of mucous coating on defence. It prevents the entry of the pathogens of the body.
- Mucous coating on the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes.

INNATE IMMUNITY

2. Physiological Barrier:

- Some of the important examples of physiological barriers are as follows:

(a) Acid of the stomach kills most ingested microorganisms

(b) Bile does not allow growth of microorganisms,

(c) Cerumen (ear wax) traps dust particles, kills bacteria and repels insects,

(d) Lysozyme is present in tissue fluids and in almost all secretions except in cerebrospinal fluid, sweat and urine. Lysozyme is in good quantity in tears from eyes. Lysozyme attacks bacteria and dissolves their cell walls. Lysoenzyme is also found in saliva,

(e) Nasal Hair. They filter out microbes and dust in nose

INNATE IMMUNITY

3. Cellular Barriers: These are certain white blood corpuscles (leucocytes), macrophages, natural killer cells, complement system, inflammation, fever, antimicrobial substances, etc.

(i) Certain Leucocytes:

- Neutrophils and monocytes are major phagocytic leucocytes.

(ii) Macrophages:

- Monocytes circulate in the bloodstream for about 8 hours, during which time they enlarge and then migrate into the tissues and differentiate into specific tissue macrophages. Macrophages are long lived and are highly motile phagocytic. Some examples are Kupffer cells in the liver, Glomerular Mesangial cells in the kidney, Osteoclasts in bone

INNATE IMMUNITY

(iii) Natural Killer Cells (NK Cells):

- Besides the phagocytes, there are natural killer cells in the body which are a type of lymphocytes and are present in the spleen, lymph nodes and red bone marrow. NK cells do not have antigen receptors like T cells and B cells. NK cells cause cellular destruction in at least two ways:

(a) NK cells produce perforins which are chemicals that when inserted into the plasma membrane of a microbe make so weak that cytolysis (breakdown of cells particularly their outer membrane) occurs and creates pores in the plasma membrane of the target cells. These pores allow entry of water into the target cells, which then swell and burst. Cellular remains are eaten by phagocytes.

(b) Another function of NK cells is apoptosis which means natural cell death. It occurs naturally as part of the normal development, maintenance and renewal of cells, tissues and organs.

INNATE IMMUNITY

(iv) Complement:

- Complement is a group of 20 proteins, many of which are enzyme precursors and are produced by the liver. These proteins are present in the serum of the blood (the fluid portion of the blood excluding cells and clotting factors) and on plasma membranes. They are found circulating in the blood plasma and within tissues throughout the body.
- Complement proteins create pores in the plasma membrane of the microbes. Water enters the microbes. The latter burst and die.
- The proteins of complement system destroy microbes by (i) cytolysis (ii) inflammation and (iii) phagocytosis. These proteins also prevent excessive damage of the host tissues.

INNATE IMMUNITY

(v) Inflammation:

- Inflammation is a defensive response of the body to tissue damage. The conditions that may produce inflammation are pathogens, abrasions (scraping off) chemical irritations, distortion or disturbances of cells, and extreme temperatures. The signs and symptoms of inflammation are redness, pain, heat and swelling.

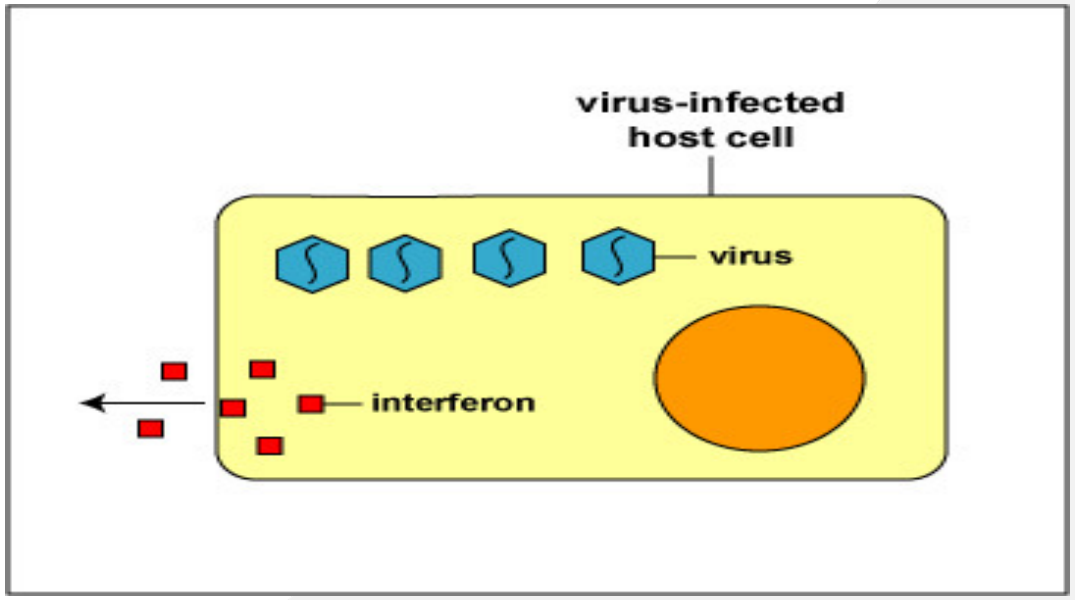
(vi) Fever:

- Fever may be brought about by toxins produced by pathogens and a protein called endogenous pyrogen (fever producing substance), released by macrophages. When enough pyrogens reach the brain, the body's thermostat is reset to a higher temperature, allowing the temperature of the entire body to rise.
- Mild fever strengthens the defence mechanism by activating the phagocytes and by inhibiting the growth of microbes.

INNATE IMMUNITY

4. Cytokine Barriers:

- Cytokines (Chemical messengers of immune cells) are low molecular weight proteins that stimulate or inhibit the differentiation, proliferation or function of immune cells.
- They are involved in the cell to cell communication. Kinds of cytokines include interleukins produced by leucocytes, lymphocytes produced by lymphocytes, tumour necrosis factor and interferon's (IFNs). Interferon's protect against viral infection of cells.



https://www.google.com/search?q=interferon+action&rlz=1C1CHBF_enIN839IN840&source=lnms&tbm=isch&sa=X&ved=2ahUKEwi4scm-rOPqAhXaXSsKHZbhDfUQ_AUoAXoECBUQAw&biw=1366&bih=576#imgrc=i4eTNlWlRTgJLM

ACQUIRED IMMUNITY

Acquired immunity can also be classified as:

(i) Active Immunity:

- It is the immunity developed by the body, when it is exposed to the antigens. Antibodies are produced by the body in this case.
- Introduction of pathogens or microbes either during immunisation or by any infection induce active immunity. It is slow but long lasting process and has no side effects.
- Few examples of this immunity are as follows:

(a) Immunity developed by vaccination

(b) Immunity developed during natural infection

ACQUIRED IMMUNITY

(ii) Passive Immunity:

- It occurs when antibodies are directly given into the body. It is used when the immune response has to be faster.
- **Some examples of passive immunity are:**

(a) Antibodies received by foetus from mother through placenta.

(b) Antibodies in the colostrum (IgA rich), i.e., yellowish fluid secreted by mother during the initial days of lactation.

(c) It is fast but lasts only for few days.

CONCLUSION

- Immunity is a biological term that describes a state of having sufficient biological defences to avoid infection, disease, or other unwanted biological invasion.
- Innate, or nonspecific, immunity is the natural resistance with which a person is born.
- Innate immunity. We are all born with some level of immunity
- Adaptive (acquired) immunity. This protect from pathogens develops as we go through life.

ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1st Hourly Test	36
2nd Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

REFERENCES

- C.B.Powar, 2010.Cell Biology.5th Ed,Himalyan Publishing House.
- Leshie Cromwell, Fred.J. Weibell and Erich.A.Pfeiffer. 2003. Biomedical instrumentation and measurements. 2nd edition, PHI.
- John G. Webster 1998. Medical Instrumentation: Applications and Design, 3rd edition, Jon Wiley and Sons, New York.
- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. 2006. "Biochemistry," 6th Ed. W.H. Freeman and Co. Ltd.
- Robert Weaver. 2012 "Molecular Biology," 5th Edition, MCGraw-Hill.
- Jon Cooper, , **2**004. "Biosensors A Practical Approach" Bellwether Books.
- Martin Alexander, 1994 "Biodegradation and Bioremediation," Academic Press.

THANK YOU

For queries
Email: subject_code_2020@gmail.com