Ratna Sagar

RATNA SAGAR | PRIMUS | BYWORD | E-LIVE

Education, Our Mission

As per the latest ICSE syllabus

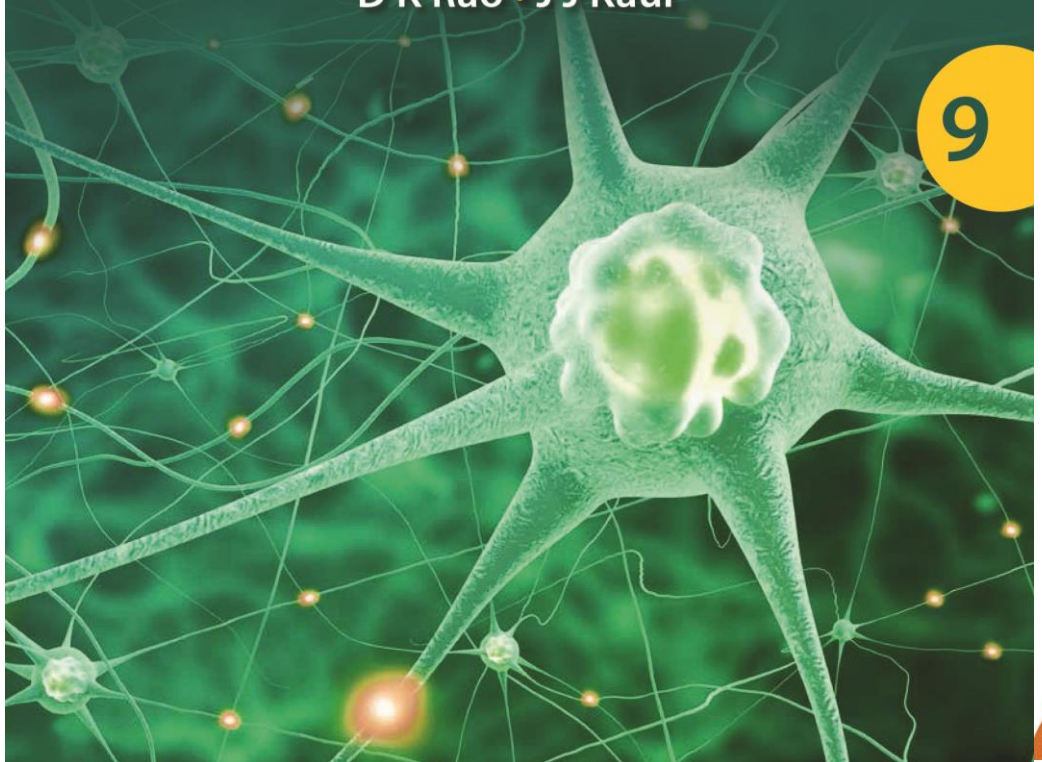
Rama Sagar
Education, Our Mission!

Revised and Updated

LIVING SCIENCE BIOLOGY

D K Rao • J J Kaur

9



ICSE
Living Science
Biology

Class 9

Chapter 17 Aids to Health

LEARNING OBJECTIVES

What is immunity?

- What are Pathogens and how do they attack our body?
- The immune response
- Antigen and antibody

Antiseptic

- Disinfectants
- Sterilization

Antitoxin and Serum

Antibiotics

- Discovery of penicillin
- Production of antibiotics
- Uses of antibiotics

Vaccination and Immunization

What is Immunity?

Immunity is the body's ability to fight against foreign substances and pathogens by producing antibodies that can kill or neutralize these foreign substances. Thus, immunity means body's defence against infections.

What are Pathogens and how do they attack our body?

Bacteria, viruses and many other microorganisms that may cause diseases are called **pathogens**. These **pathogens may attack our body in several ways**, such as:

- ❖ **directly through the skin**;
- ❖ **through mucous membranes** that line the body passages such as eye membrane, inner walls of digestive, respiratory and urinary tracts;
- ❖ **through contaminated air, food and water.**

The **defence system in our body works at two levels**:
1. local defence and **2. immune system**.

Local defence system (Skin and mucous secretions)

The local defence system is a barrier system which prevents the entry of germs at their possible entry points in our body. It includes skin and mucous scretions.

Immune system (Antibodies and lymphocytes)

The immune system tackles the germs after they have entered the body. It includes action by antibodies, lymphocytes and immune response.

Merits of local defence system

- ❖ They eliminate many microorganisms before they can enter the body tissues.

❖ They respond to any microbial infection without waiting to determine the invader's identity.
❖ They provide fast responses to protect us against wide range of diseases.

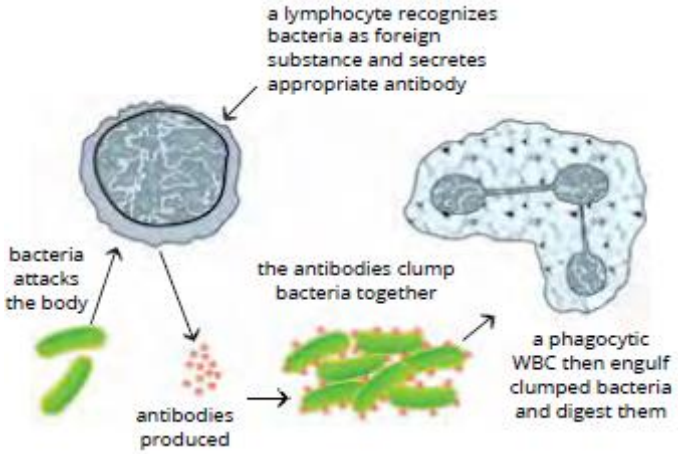
The immune response

Immunity is the body's ability to fight against foreign substances, viruses or bacteria by producing antibodies.
When the body recognizes foreign substances (pathogens), **it makes special antibodies that attack the pathogens and inactivates them**. When these antibodies and special cells are produced it is called the **immune response**.**Immune system** is a system which consists of cells, organs and molecules that protect our body from harmful pathogens.

Antigen and antibody

An **antigen** is any foreign molecule that can trigger a specific immune response in the body. An **antibody** is a protein molecule produced in an animal in response to an antigen or a foreign substance.
❖ Antibodies belong to the category of proteins called **immunoglobulin**. When a foreign particle or germ attacks the body, an antibody is produced by **lymphocytes**

❖ These lymphocytes are **WBCs** present in large numbers in the **lymphoid tissues** such as the **lymph nodes** and the **spleen**. They are also found in circulating blood. In fact, these lymphocytes originate in **bone marrow** and are known as **B lymphocytes** or **B cells**



❖ The antibodies are specific. **Only one kind of antibody acts against one kind of antigen.**

❖ When an antigen attacks the body, the antibodies are produced. Then they travel via blood to reach the antigen and then bind with it. They then subsequently attack the antigen and kill it.

Antiseptic

An **antiseptic** is a mild chemical substance that when applied on the external surfaces of the body kills or prevents the growth and reproduction of disease-causing germs. Antiseptics reduce the possibility of infection, or putrefaction by germs.

Some common antiseptics are:

❖ **Methylated spirit or alcohol:** Used to disinfect the skin before injections are given.

❖ **Boric acid:** Used to treat yeast infections, and also used in creams for burns.
❖ **Hydrogen peroxide:** Used as very dilute solution to clean wounds and ulcers.
❖ **Iodine:** Used as a pre- and post-operative antiseptic.

Disinfectants

Disinfection is the destruction of pathogenic and other kinds of microorganisms by physical or chemical means. **Disinfectants** are strong chemical substances applied on spots or places where germs thrive and multiply. Disinfectants are frequently used in hospitals, dental surgeries, kitchens and bathrooms to kill infectious organisms.
Some common disinfectants are:
❖ **Chlorine:** Used in drinking water.
❖ **Chlorine dioxide:** Used as an advanced disinfectant in drinking water.
❖ **Alcohol – usually ethanol or isopropanol:** Used over bruises on the skin and allowed to evaporate for quick disinfection.

Sterilization

Sterilization (or sterilisation) is the elimination of all transmissible agents (such as bacteria, fungi and viruses) from a surface or piece of equipment or surgical instruments.

This is different from disinfection, where only organisms (that can cause disease) are removed by a disinfectant. Sterilization can be performed by heat, chemicals or even radiation.

Antitoxin and Serum

A **toxin** is a poisonous substance produced by an organism such as microbe, plant, animal or fungus.
An **antitoxin** is a chemical which has the ability to neutralize a specific toxin.

Both serum and antitoxins are means of fighting infections in the body. The introduction of such chemicals in the body develops immunity against pathogens or their toxins before the microbes actually invade the body. Antitoxins are produced by certain animals, plants, and bacteria. Although **they are most effective in neutralizing toxins**, they can also kill bacteria and other microorganisms. **Antitoxins are made within organisms**, **but can be injected into the body of other organisms, including humans**.
Blood serum from the tissues of immunized animals, containing antibodies are used to transfer immunity to another individual.

Antibiotics

An **antibiotic** is a chemical substance produced by a microorganism, that kills or inhibits the growth of another microorganism.

Antibiotics are one class of antimicrobials which are relatively harmless to the host, and therefore can be used to treat infections.

Some antibiotics actually kill the bacteria (**bactericidal**), whereas others prevent the bacteria from multiplying (**bacteriostatic**) so that the host's immune system can overcome them.

Discovery of penicillin

Penicillin was the first antibiotic discovered in 1929 by **Sir Alexander Fleming (1881–1955)**. Sir Alexander Fleming discovered the antibiotic substance lysozyme, and isolated the **antibiotic penicillin from the fungus *Penicillium notatum.***

Penicillium notatum

Production of antibiotics

- ***Penicillium notatum* was the first mould from which penicillin was obtained.** Commercially, penicillin is being produced from *Penicillium chrysogenum*, as well as synthetically.
- **Streptomycin** is one of the most widely used antibiotic obtained from a bacterium *Streptomyces griseus*.
- **Chlortetracycline** is produced from *Streptomyces aureofaciens*.
- **Chloramphenicol** is produced from *Streptomyces venezuelae*.

Uses of antibiotics

- In medicine **to fight infections**
- **As food preservative** to preserve meat and fish
- In **treating animal feed** to prevent internal infections
- **To control plant pathogens**

Vaccination and Immunization

Vaccination is a term coined by **Edward Jenner.** Vaccination is the process of introducing live, weakened microbes into the body of a living being, for developing resistance against a particular disease.

A **vaccine is a preparation used to produce active immunity to a disease**, in order to prevent infection by any organism. The vaccine is introduced in the body of a person mostly by injection and sometimes orally. When vaccine enters the body, it stimulates white blood cells (WBCs) in the body to produce antibodies against the disease-causing germ. This practice is known as **prophylaxis**.

SUMMARY...

❖ Immunity means body's defence against infections.

❖ Bacteria, viruses and many other microorganisms that may cause diseases are called pathogens. Pathogens may enter our body through various routes.

❖ Our body has three lines of defences; first-line (through tears, mucus, sweat and stomach acid); second-line (through inflammation, redness and swelling) and thirdline (through antibodies, lymphocytes and immune system).

❖ Immunity is of two types – innate immunity (natural or inborn immunity) and acquired immunity (immunity acquired during life time). There are further sub-types of these two types of immunity.

❖ An antigen is any foreign molecule that can trigger a specific immune response in the body.

❖ An antibody is a protein molecule produced in the body by lymphocytes (WBCs) in response to an antigen.

❖ An antiseptic is a mild chemical substance applied on external surface to kill or prevent the growth of various disease-causing microorganisms.

❖ Disinfectants are strong chemical substances applied on spots or places where germs thrive and multiply.

❖ Sterilization is the elimination of all transmissible agents from a surface or piece of an object.

❖ An antitoxin is an antibody which has the ability to neutralize a specific toxin.

❖ An antibiotic is a substance produced by a microorganism, that inhibits the growth or kills other microorganisms. Penicillin is an antibiotic produced from *Penicillium notatum*.

❖ Vaccination is a process of administering live, weakened microbes into the body of a patient, for developing resistance to a particular disease. Immunization is the term used for vaccination.


RATNA SAGAR
PRIMUS
BYWORD
E-LIVE
THANK
YOU