

Antibiotics and Enzymes

10+2

MICROBES IN HUMAN WELFARE

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Antibiotics

Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other (disease-causing) microbes.

Antibiotics produced by microbes are regarded as one of the most significant discoveries of the twentieth century. They have greatly contributed towards the welfare of the human society. *Anti* is a Greek word that means 'against', and *bio* means 'life', together they mean 'against life' (in the context of disease causing organisms); whereas with reference to human beings, they are 'pro life' and not against.

Penicillin was the first antibiotic to be discovered. Alexander Fleming while working on *Staphylococci* bacteria, once observed a mould growing in one of his unwashed culture plates around which *Staphylococci* could not grow. He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould *Penicillium notatum*. However, its full potential as an effective antibiotic was established much later by Ernest Chain and Howard Florey. This antibiotic was extensively used to treat American soldiers wounded in World War II. Fleming, Chain and Florey were awarded the Nobel Prize in 1945, for this discovery.

After Penicillin, other antibiotics were also purified from other microbes.

Microbes and Antibiotics

Antibiotics	Microbes
Streptomycin	<i>Streptomyces griseus</i>
Chloramphenicol	<i>Streptomyces venezuelae</i> ,
Tetracyclines	<i>Streptomyces rimosus</i>
Erythromycin	<i>Streptomyces erythreus</i>
Gentamycin	<i>Micromonospora purpurea</i>

Rifamycin	<i>Streptomyces mediterranei</i>
Gentamicin	<i>Micromonospora purpurea</i>
Neomycin	<i>Streptomyces fradiae</i>

Antibiotics have greatly improved our capacity to treat deadly diseases such as plague, whooping cough (*kali khansi*), diphtheria (*gal ghotu*) and leprosy (*keusht rog*), which used to kill millions all over the globe. Today, we cannot imagine a world without antibiotics.

Commercial and Industrial

Microbes are also used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes.

Microbes and Products

Microbes	Products
<i>Aspergillus niger</i> (fungus)	Citric Acid
<i>Acetobacter aceti</i> (bacterium)	Acetic Acid
<i>Clostridium butylicum</i> (bacterium)	Butyric Acid
<i>Lactobacillus</i> (bacterium)	Lactic Acid
<i>Streptococcus</i> (bacterium)	Streptokinase
<i>Trichoderma polysporum</i> (fungus)	Cyclosporin A
<i>Monascus purpureus</i> (yeast)	Statins

Microbes are also used for production of enzymes. Lipases are used in detergent formulations and are helpful in removing oily stains from the laundry. You must have noticed that bottled fruit juices bought from the market are clearer as compared to those made at home. This is because the bottled juices are clarified by the use of pectinases and proteases. Streptokinase produced by the

bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.

Cyclosporin A is used as an immunosuppressive agent in organ-transplant patients. Statins has been commercialised as blood-cholesterol lowering agents. It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.