


DC 11. PAPER 21: Food Microbiology





1. Write the history of microbiology.

Microbiology is the study of microorganisms / microbes which is visible only with a microscope. The diverse group of organisms includes algae, archae, bacteria, cyanobacteria, fungi, protozoa, viruses. Most of the microorganisms are harmless. 99% are good. Eg: Cynobacteria (blue green algae) 1% are bad. Eg: Pathogens.

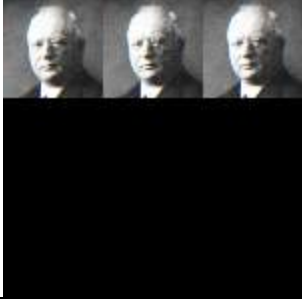


The word microbiology comes from the Greek words micro which means “small or minute”, and logos which means “study of”. Hence, microbiology in broad terms is the scientific study of microorganisms. Microbiology has numerous sub-fields and these include phycology (algae), virology (virus), mycology (fungi), bacteriology (bacteria), protozoology (protozoans), and medical microbiology (pathogenic microorganisms).

Time	Inventor	Invention
<i>During the 16th Century</i>		
1546	Girolamo Fracastoro 	he proposed the theory of contagious diseases
<i>During the 18th Century</i>		
1798	Edward Jenner	helped developed a vaccine for smallpox

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<i>During 19th Century</i>		
1868	<p>Armauer Hansen</p> 	Hansen demonstrated that certain rods represented the infectious origin of leprosy. This is the first time that a chronic infectious disease in humans was shown to be related to Bacillus.
1876	<p>Robert Koch</p> 	Robert Koch published a paper on his work with anthrax. This pointed to a bacterium as the cause of this disease and this validated the germ theory of disease.
1877	<p>John Tyndall</p> 	John Tyndall published a method for fractional sterilization and clarifies the role of heat resistant factors (spores) in putrefaction.
<i>The 20th Century up to the present</i>		
1906	<p>N. L. Sohngen</p>	N. L. Sohngen discovered methane-utilizing and methane-producing bacteria.

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1910	<p>Paul Ehrlich</p> 	<p>Paul Ehrlich discovered the cure (Salvarsan) for the disease syphilis. In the field of medicine, this was the first specific chemotherapeutic agent for a disease caused by a bacterium.</p>
1928	<p>Frederick Griffith</p> 	<p>Frederick Griffith discovered bacterial transformation and this established the foundation of molecular genetics.</p>

2. Microorganisms involved in food fermentation and their role

a) Fish sauce

In production of fish sauce, uneviscerated fish is mixed with salt and placed in fermented tanks to allow liquefaction for about six months. The collected liquid is further ripened for few more months. Halophilic microbes are involved in this fermentation process. Streptococcus, Micrococcus and Bacillus species predominate. This product is dark coloured with a distinct aroma.

b) Sauerkraut

This refers to fermented cabbage. Normal microflora in cabbage is involved in the fermentation process under anaerobic conditions. Leuconostoc mesenteroides and Lactobacillus plantarum is involved. Temperature is a crucial factor in the control of fermentation. If the temperature is below 21 degrees Celcius, Lactobacilli outgrow. L. mesenteroides require a lower temperature below 21° C. Acidity created by Lactobacilli prevents the growth of L. mesenteroides.

c) Pickels

Pickels consist of vegetables like cucumber, onions, chilies etc. Lactic acid bacteria such as Leuconostoc mesenteroides, P. cerevisiae, L. brevis, L. plantarum are involved in the fermentation process These bacteria also take part in fermentation of olives.

d) Soy sauce

In production of soy sauce, a mixture of soybean and wheat flour is inoculated with Aspergillus oryzae and Aspergillus soyae. These fungi digest complex starch and produce sugars which facilitate the growth of bacteria. Anaerobic bacteria carry out fermentation to produce soy sauce.

e) Beer and Ale

Malted beverages are produced by brewing. Mainly the yeasts are involved in the

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process. Yeasts convert fermentable sugars to ethanol and carbon dioxide. As yeasts do not produce enough amylases to hydrolyze starch in barley grains, they are germinated prior to brewing. Hops which are added for bitterness have an inhibitory effect on gram positive bacteria.

f) Wine

Wine is made from grape juice in large scale. Yeasts; Saccharomyces cerevisiae var. ellipsoideus is the culture used in wine fermentation. High temperature is not suitable for this fermentation as yeasts die while low temperature allows the growth of lactic acid bacteria.

Sl no.	Microbes	Fermented products
1.	Acetobacter malorum	vinegar
2.	Bacillus sphaericus	stinky tofu
3.	Bacillus subtilis	natto
4.	Bifidobacterium adolescentis	yogurt
5.	Candida colliculosa	cheese
6.	Dekkera bruxellensis	beer
7.	Enterococcus faecalis	soy sauce
8.	Enterococcus faecium	pickle
9.	Lactobacillus acidifarinae	sourdough bread
10.	Lactobacillus casei	Idiazabal cheese
11.	Lactobacillus casei	yogurt
12.	Leuconostoc spp.	wine
13.	Tetragenococcus koreensis	kimchi
14.	Zygotorulaspora florentina	kefir
15.	Zymomonas mobilis	palm wine