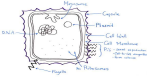


# Microbiology & Disease

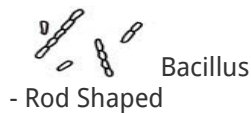


The diagram above shows the typical prokaryotic bacteria cell and its many components

## Classifications of Bacteria

Bacteria are the smallest cellular organisms and are prokaryotes. They can be identified in three ways, judging their shape, whether they are gram-positive or negative and the way they move.

### Shape



## Gram Staining

Gram-Positive turn Violet, Gram-Negative turn Red

There are also differences other than shape, these include whether the bacteria is gram-positive or gram-negative. Gram-positive bacteria turn violet in colour when gram stained, whereas gram-negative bacteria absorb the red counter-stain because the size of the peptidoglycan (murein) layer. The gram-positive bacterial peptidoglycan layer is between 20 and 80 nanometers wide compared with 7 to 8 with gram-negative bacteria.

## Bacterial Diseases

### Salmonella

Salmonella is a type of bacteria usually found within poultry eggs, unprocessed milk, meat and water. It is a rod-shaped gram-negative enterobacteria that causes typhoid fever. It was discovered by an American scientist named Dr. Daniel Salmon.

It can cause:

- Diarrhoea, constipation
- Headaches
- Stomach cramps
- Nausea and vomiting
- Fever

- Possibility of blood in faeces

Every year approximately 40,000 cases of salmonella are reported. It can be avoided by thoroughly cooking food to the boil. It can also be transported by turtles and birds. There is a very high chance of dehydration with the disease, not directly but from the diarrhoea, vomiting and loss of salts.

After being eaten the salmonella bacteria passes through the stomach and into the intestines where it binds to the wall of the intestine. Through some special proteins that it makes in response to the particular conditions in the intestine it actually penetrates the barrier between us and the outside. Once it has gained access to our insides it is taken to our liver or spleen. Most other bacteria would be killed along this journey but the salmonella has evolved such a mechanism to prevent our immune system from doing its job effectively. In the liver it then grows and spreads.

## Cholera

Cholera is a wide spread, bacteria caused, disease which is spread by unclean water. It is specifically caused by the bacterium vibrio cholerae which is a gram-negative bacteria. It is transmitted via unclean water but it doesn't multiply in the water itself. Certain blood types within people are better at dealing vibrio cholerae, blood type AB is most resistant whereas blood type O is the most susceptible.

Effects:

- Diarrhoea
- Headaches
- vomiting

Treatment:

- Rehydration therapy
- Inputs of salts and glucose back into the body

Preventative:

- Clean drinking, washing and cooking water
- Safe disposal of sewage
- Hygienic preparation of food

## Protoctistan Diseases

### Malaria

Malaria is a one of the most destructive diseases to humans. It is caused by a parasite called Plasmodium, of which there are two types, Plasmodium falciparum and Plasmodium vivax. The life cycle of Plasmodium is shown below.



The life cycle of Plasmodium has to take part within a female anopheles mosquito and a human. The effects of Plasmodium within a human can be seen in two stages, bursting out of the liver cells and releasing toxins is the first stage and a major fever results. The second stage is when they burst out of the red blood cells also releasing toxins and producing a fever.

Malaria can be combated by:

- Preventing the mosquito from biting humans with nets, protective clothing and insect repellents.
- Killing the mosquitoes by using insecticides like DDT, spraying or draining the breeding grounds and biological control e.g. fish.
- Attack the parasite with drugs (quinine) and vaccines.

# Viral Diseases

## Influenza

Influenza is an endemic disease caused by a virus consisting of a central strand of RNA coated in protein. It affects the upper respiratory system causing sore throat, cough and inflammation of sinuses. It is transmitted by droplet infection, i.e. with sneezing or via tissues. It would be prevented by quarantine but is very difficult to control. Vaccines are available but due to the number of different types of the virus they are not always effective.

## Table Showing of all four diseases

	<b>Organism that Causes Disease</b>	<b>Tissue Affected</b>	<b>Source of Infection</b>	<b>Mode of Transmission</b>	<b>Prevention and Control Methods</b>
<b>Salmonella</b>	Bacteria - gram negative rod shaped	Digestive system - toxins released causing diarrhoea	Bacteria on Food	Not thoroughly heating food and being unhygienic	Better hygiene when cooking
<b>Cholera</b>	Bacteria - gram negative	Digestive system - toxins released causing diarrhoea + vomiting	Faeces infected water	Consuming unclean water	Provide clean water for drinking, washing and cooking
<b>Influenza</b>	Virus	Upper Respiratory System	Exhaling - Droplet infection	Inhaling - Droplet infection	Prevent Contamination + Vaccines
<b>Malaria</b>	Parasite	Liver + Red Blood Cells (fever in two stages)	Female Anopheles mosquito	Mosquito biting human	Prevent mosquito biting human, eliminate the mosquito or attack parasite