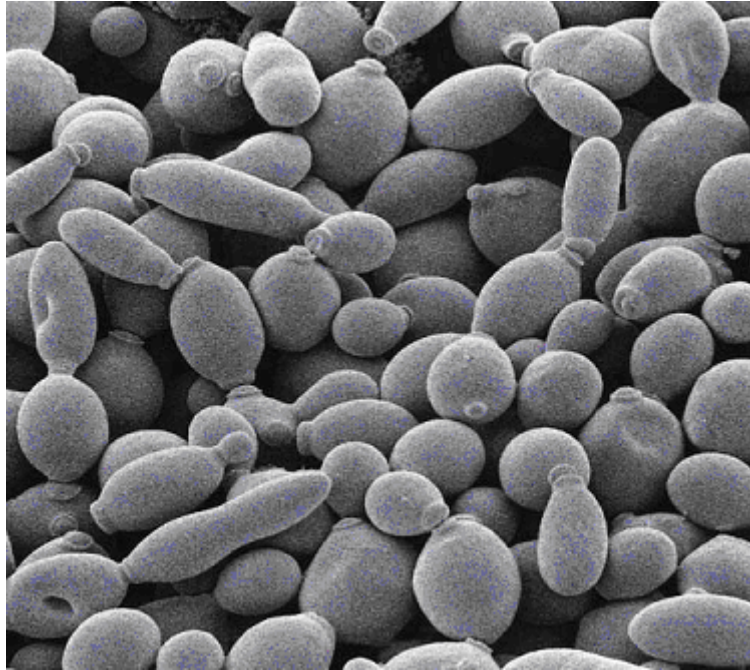


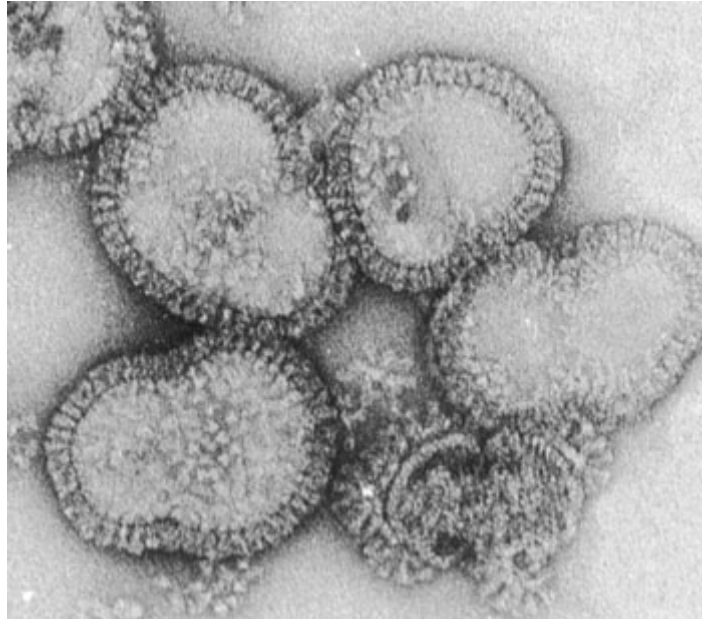
Micro-organisms



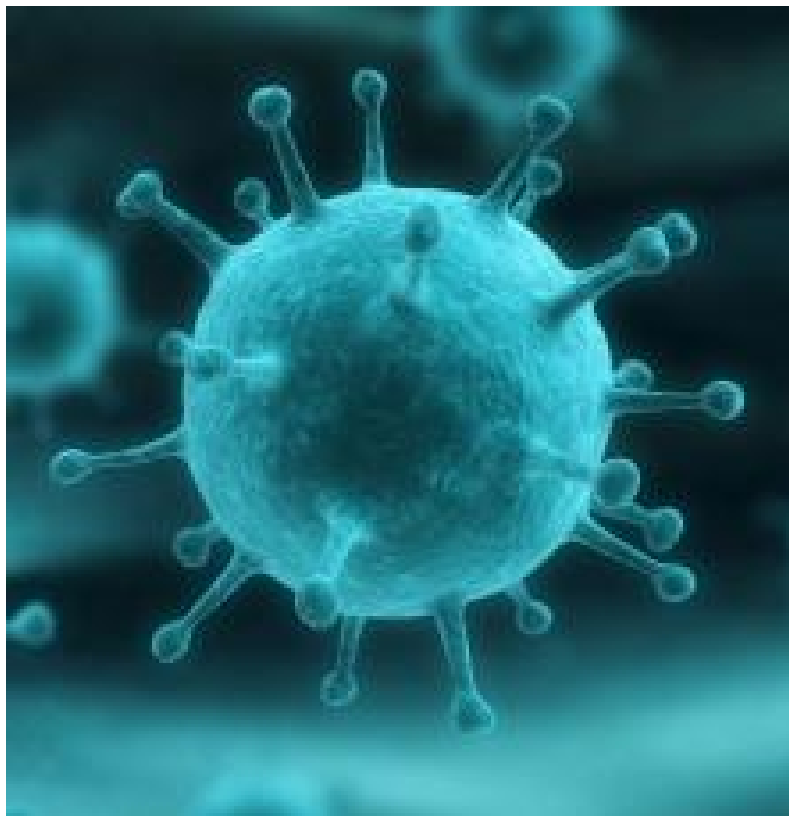
Budding yeast



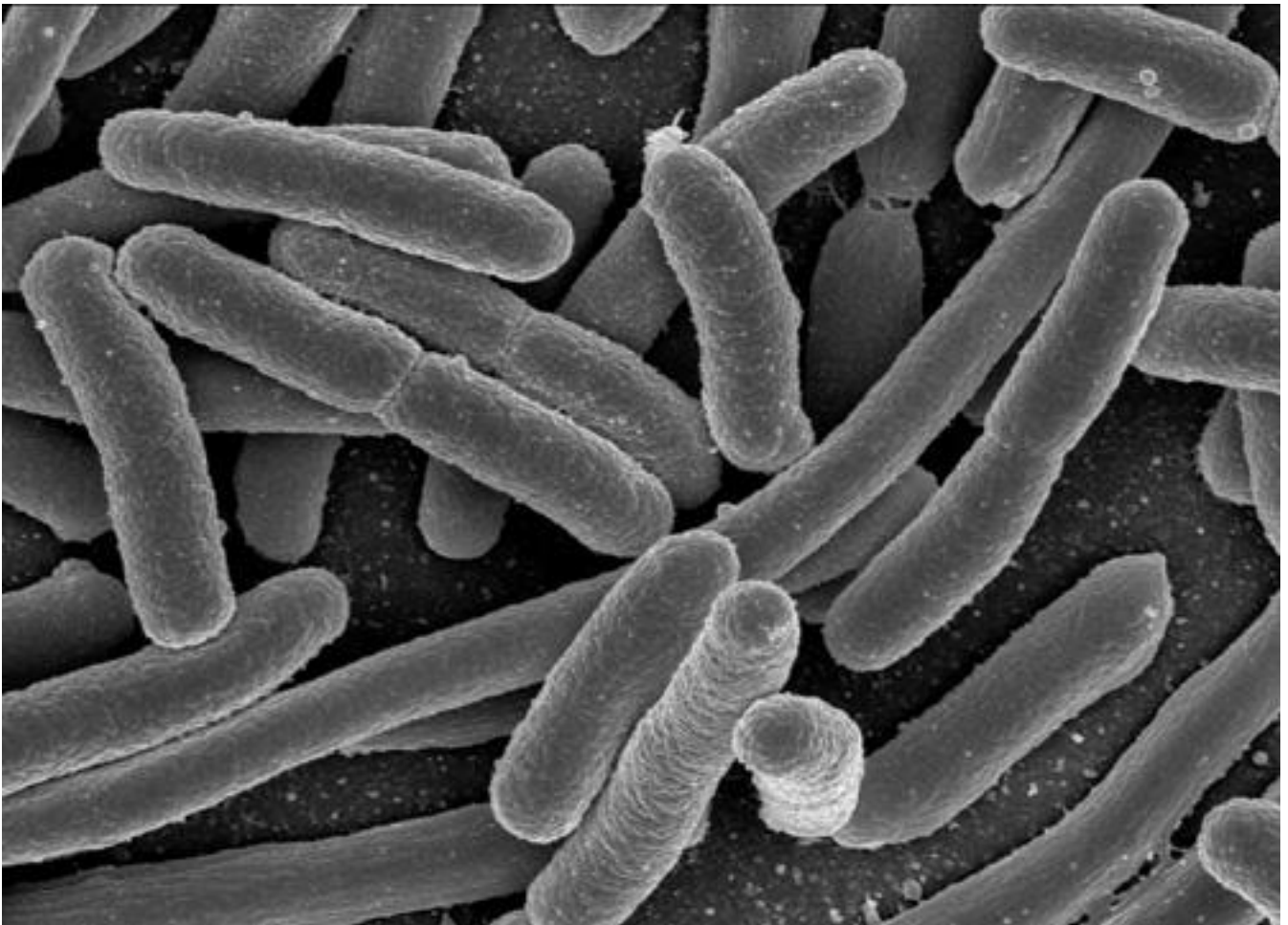
Dried yeast



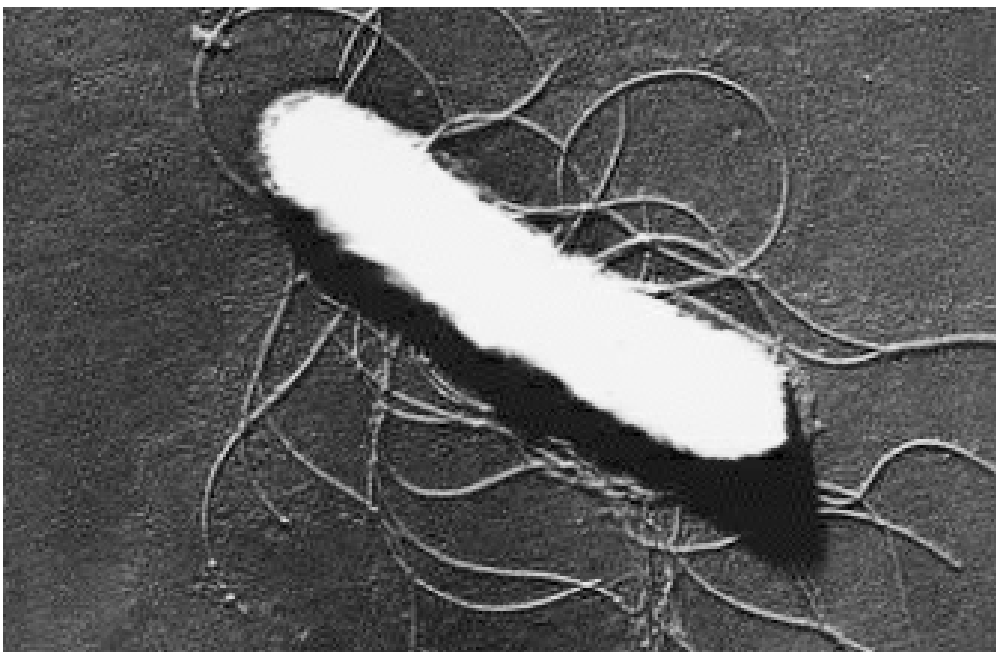
Electron micrograph of influenza virus



Scanning electron microscope image of influenza virus



Scanning electron micrograph of *E. coli* bacteria



Single *E. coli* bacterium

Measurements based on metres

Kilometre (km): a thousand metres

Metre (m): one thousandth of a kilometre ($1000\text{m} = 1\text{km}$)

Decimetre (dm): one tenth of a metre ($10\text{dm} = 1\text{m}$)

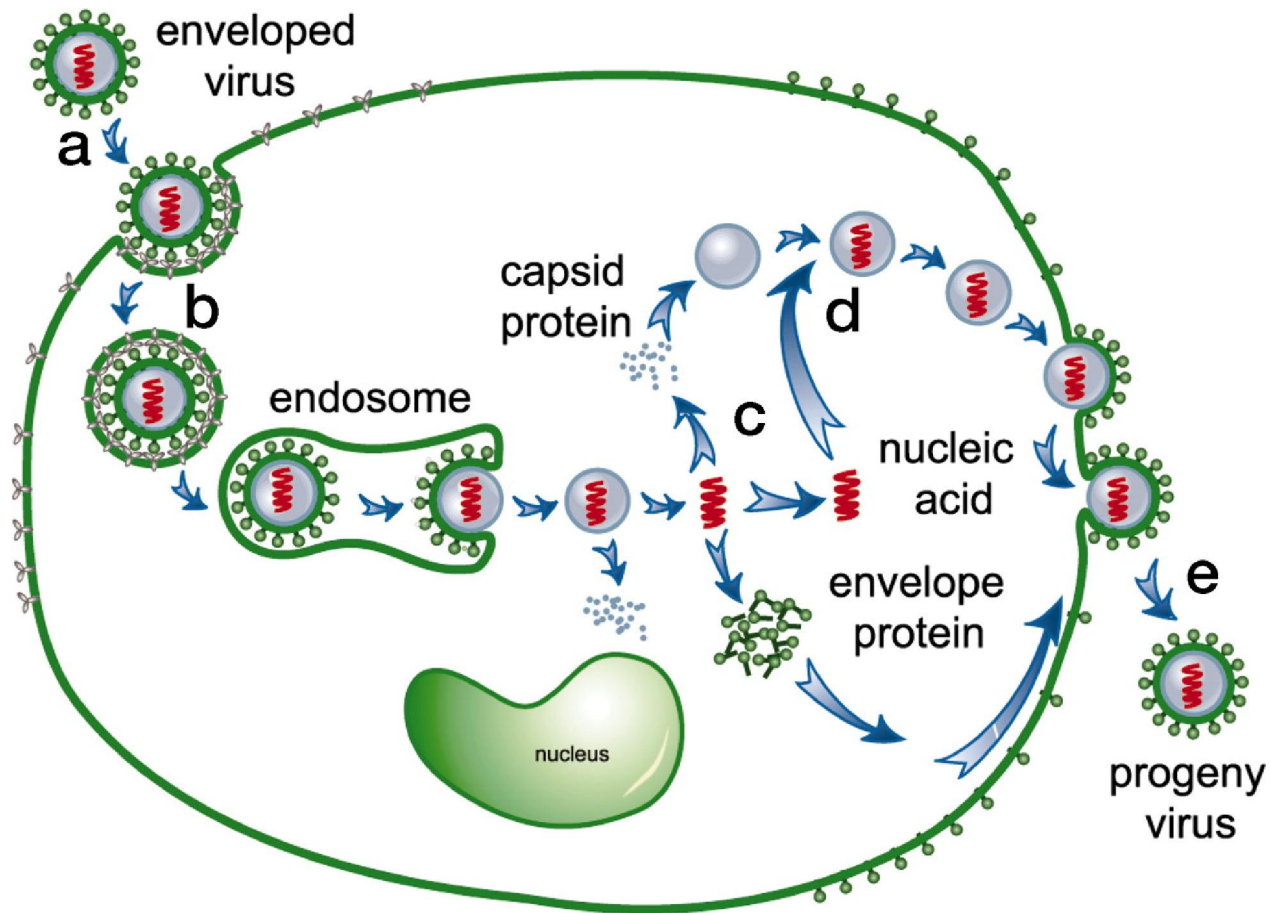
Centimetre (cm): one hundredth of a metre ($100\text{cm} = 1\text{m}$)
one tenth of a decimetre ($10\text{cm} = 1\text{dm}$)

Millimetre (mm): one tenth of a centimetre ($10\text{mm} = 1\text{cm}$)
one thousandth of a metre ($1000\text{mm} = 1\text{m}$)

Micron or micrometer (μm):
one thousandth of a millimetre ($1000\ \mu\text{m} = 1\text{mm}$)
one millionth of a metre ($1000\ 000\text{mm} = 1\text{m}$)

Nanometre (nm): one millionth of a millimetre ($1000\ 000\text{nm} = 1\text{mm}$)
one billionth of a metre ($1000\ 000\ 000\text{nm} = 1\text{m}$)
one thousandth of a micron ($1000\text{nm} = 1\mu\text{m}$)

Virus life cycle



The life cycle of an animal virus. (a) Adsorption or docking with the host receptor protein. (b) Entry into the host cytoplasm. (c) Biosynthesis of viral components. (d) Assembly of viral components into complete viral units. (e) Budding from the host cell.

Videos of bacteria reproducing can be found on these websites:

On YouTube

<http://www.youtube.com/watch?v=gEwzDydcIWc&feature=related>

Cells Alive

Go to <http://www.cellsalive.com/ecoli.htm>

In this video, see how two *E. coli*, given a suitable environment for growth, divide and form a colony of hundreds of bacteria in about three hours.

Digestion in Ruminants

Cows, sheep and goats are ruminants i.e. their digestive system contains a structure known as a rumen. Humans cannot digest cellulose which is the main material that plants are made of. The rumen is one of several structures in the ruminant digestive tract, which allow ruminants to derive energy from cellulose.

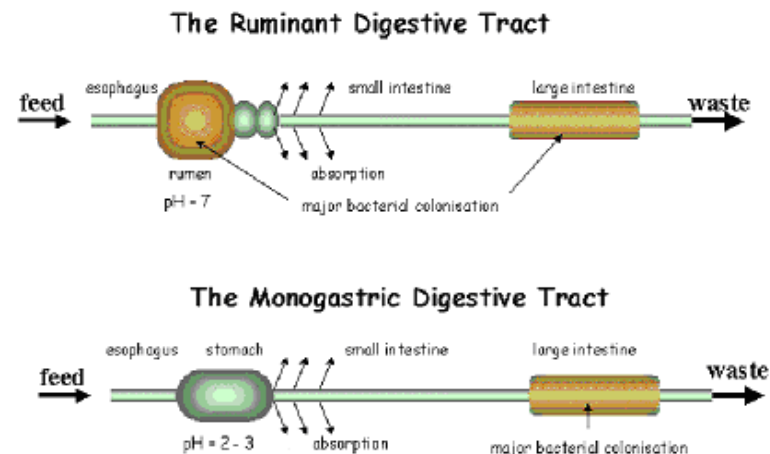
The structures additional to those found in humans are: rumen, reticulum and omasum. These three structures are found before the abomasum (the structure equivalent to the human's stomach). All four structures are sometimes referred to as a four-chamber stomach. Ruminants 'chew the cud', i.e. they chew food for long periods, swallow it, regurgitate it and then chew it again. This chewing is a circular motion providing a grinding action to break the food into small pieces.

When the food is swallowed it becomes mixed with anaerobic bacteria that are present in the rumen. The chewing (mechanical digestion) increases the surface area available to the bacteria, which carry out anaerobic fermentation on the cellulose. When the bacteria break down the cellulose, one of the materials produced is carbon dioxide and the belching of cows adds to the problem of carbon dioxide in our atmosphere. The energy that is produced during the breakdown is used by the bacteria themselves. Note that the rumen bacteria also digest proteins and make some of the amino acids available to the cow.

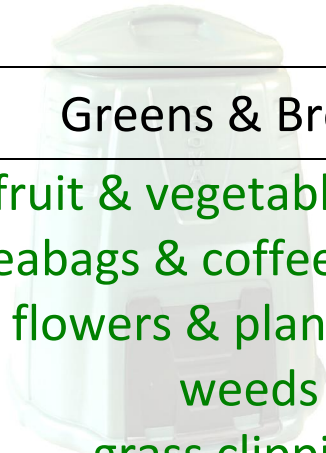
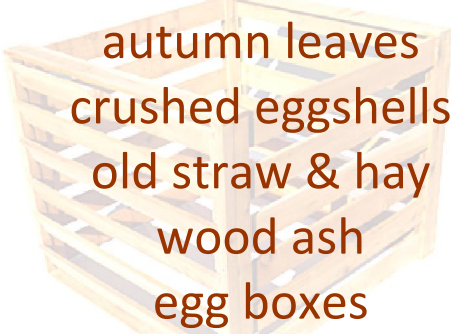
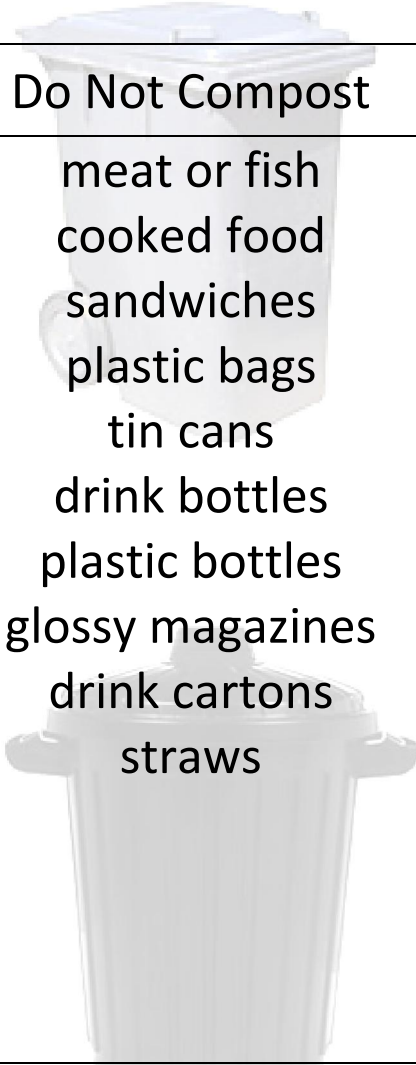
Once the food has been fermented it passes into the reticulum. The reticulum passes the food back into the oesophagus and it is regurgitated. After more chewing the food is re-swallowed but, this time, bypasses the rumen and enters the reticulum directly. From the reticulum it enters the remainder of the digestive tract.

The food now enters the omasum where water and organic acids are absorbed. Then the food enters the abomasum (which is equivalent to the human stomach). From this point on the process is equivalent to that in humans. Remember that humans have bacteria in their colon which digest starch.

The diagram below illustrates the similarities and differences between humans and cows with regards to intestinal bacteria.



Compost or not?

Greens & Browns	Do Not Compost
 <p>fruit & vegetable scraps teabags & coffee grounds flowers & plant stems weeds grass clippings</p> <p>paper hand towels newspaper cardboard autumn leaves crushed eggshells old straw & hay wood ash egg boxes</p> 	 <p>meat or fish cooked food sandwiches plastic bags tin cans drink bottles plastic bottles glossy magazines drink cartons straws</p>

Greens – soft, sappy materials with high water content. **Browns** – dry fibrous material with low water content.

Some foods are not composted for health & safety reasons.

Which of the Do Not Compost things could you recycle instead?

Name:

Date:

Yeast enquiry observations

Test tube	Kept in cold place	Kept in warm place
Level teaspoon of yeast + level teaspoon of sugar + 15ml warm water (at about 38°C)		
Level teaspoon of talcum powder + level teaspoon of sugar + 15ml warm water (at about 38°C) (control)		

Yeast needs _____ and _____ to grow and produce the gas _____.

The control test tube was to show that _____.

Extension: Record the diameter of the balloons at 10 min intervals.