

### Nutrition – bacteria and fungi

Extracellular digestion (outside cells)

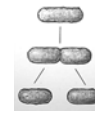
1. secrete enzymes
2. digest the food
3. reabsorb the digested food

nutrients - for growth or in respiration (release energy).

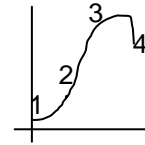
Best conditions - warm, moist, plenty of food.

### Reproduction – bacteria

By binary fission (mitosis) every 20 minutes under favourable\* conditions. DNA copies, cell membrane pinches cytoplasm in half to make 2 identical bacteria. \*food, oxygen (if aerobic), moisture, warmth, space.



1. lag
  2. exponential growth
  3. stationary
  4. death.
- @ At 3 - 4 bacteria run out of nutrients and space and become poisoned by their excretory products.

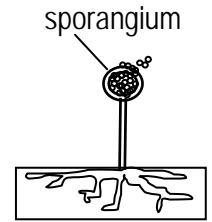


### Reproduction – fungi

Spores: small light tough reproductive cells.

Sporangium: produce spores and burst to release them - spores dispersed in the air and grow into new fungi further away (if fall on favourable conditions)

Yeast reproduces by budding.



### Growth – bacteria and fungi

Grow bigger by using nutrients gained by digestion of food, and energy released from the digested food by RESPIRATION. When cells reach above optimum size they divide.

Viruses don't grow - no chemical processes of own.

"growth" can refer to individual organism or growth of a population.

AS90168

Describe biological ideas relating to how humans use and are affected by micro-organisms  
Level 1 2 credits

How humans use and are affected by micro-organisms could include: nutrient cycling, food production, sewage treatment, food poisoning, disease in living things, microbial attack on everyday materials (helpful and harmful), antibiotics, and resistance to antibiotics.

### Reproduction – viruses

Virus attaches to cell (via protein coat), Penetrates cell membrane - injects viral genetic material. Viral genetic material replicated by host cell Protein coats are made and assembled with genetic information into new viruses. Cell bursts - releasing new viruses & cell usually dies.

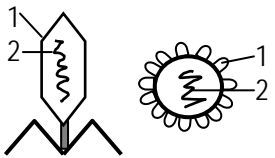
If host cell is a bacterium the virus is called a bacteriophage.

Viruses are always PATHOGENS.



### Structure – virus

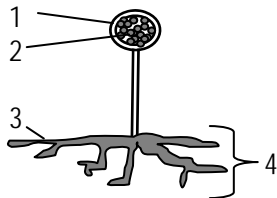
1. protein coat /capsid
2. genetic material/ nucleic acid/DNA/RNA



Viruses are NOT alive

### Structure – fungi

1. sporangium
2. spores
3. hyphae
4. mycelium

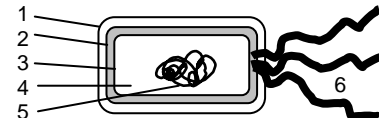


1&2 = repro 4 =feeding

### Structure – bacteria

different shapes - rod, spherical comma shaped or spiral

1. slime capsule (protection/prevents dehydration)
2. cell wall (shape)
3. cell membrane (controls entry /exit of substances)
4. cytoplasm (reactions occur here)
5. genetic material (control bacterium processes)
6. flagella (movement)



### Nutrition – fungi

Hyphae for feeding / growth / spread. Secrete enzymes (extracellular digestion), fix fungus to food, absorb water and digested nutrients. Absorbing nutrients allows growth of more hyphae forming a mycelium (spreads over a large area). As the hyphae grow, sporangia are produced (for reproduction).

Yeasts -single celled fungi, mushrooms - large fungi.  
Fungal diseases - thrush, ringworm, athlete's foot.



<p><b>Why we get sick with viruses</b>  Reproduce quickly - so large numbers  Virus mutates quickly - new protein coat not recognised - requires new antibodies / host cannot produce new antibodies quickly enough.</p> <p><b>Why we catch colds more than once?</b>  Frequent mutations lead to different strains with different protein coats/antigens - not recognised by the immune system. Need to make new antibodies.</p>	<p><b>How viruses make us sick</b>  Viruses reproduce in a living cell - cells die and organs malfunction which leads to illness.</p> <p><b>Viral diseases</b> - measles, mumps, flu, AIDS</p> <p><b>How bacteria make us sick</b>  Bacterial reproduction doesn't destroy living cells. Large number of bacteria = large amount of toxin excreted. Toxin causes inflammation/sickness in parts of the body.</p> <p><b>Bacterial diseases</b> - meningitis, salmonella, TB</p>	<p><b>Antibiotics</b> eg penicillin  Chemicals/drugs - for fighting bacterial (&amp; fungal) infections. Based on natural compounds fungi make to compete vs bacteria for nutrients / space. <b>Antibiotic resistance</b> due to <b>overuse/inappropriate</b> use of antibiotics. <b>Variation/mutations</b> in bacteria <u>may</u> lead to resistance - some survive - resistance passed to next generations - antibiotics no longer work. Finishing course of antibiotics means more bacteria killed/less survive. <b>Viruses NOT killed by antibiotics.</b></p>
<p><b>Vaccines</b>  Vaccines cause body to make <u>specific*</u> antibodies. Vaccine is dead or weakened form, or fragment of a microbe, or inactivated toxin that induces body to make antibodies in advance - can then respond quickly to destroy microbes if they infect the body.</p> <p>*Specific: vaccine only works if microorganism/toxin is the same as the immunity built up. If different strain / mutated form the antibodies will not recognise - patient is likely to become ill.</p>	<p><b>Culturing bacteria, fungi &amp; viruses</b>  Inoculate sterile nutrient agar plate. Incubate sealed upside down - warm place. Don't seal air tight &amp; incubate near 37°C as encourage harmful anaerobes &amp; microbes that thrive in humans. Store upside down to avoid condensation falling on microbes. Plates later destroyed by burning/strong disinfectants.</p> <p>Fungi - fuzzy/furry/fluffy patches. Bacteria - shiny or greasy spots (colonies). Viruses can only be grown in living cells eg fertilized hens eggs.</p>	<p><b>How bacteria can cause food poisoning</b>  Bacteria reproduce on food - <b>release toxins</b> into the food - can be a poison to humans - make them sick.</p> <p><b>How disinfectants work</b>  Disinfectants kill / inhibit growth of harmful / pathogenic microorganisms - reduce chance of infection through food contamination / wounds / areas with high risk of infection (eg plates, chopping boards, kitchen areas, door handles etc).</p> <p><b>Antiseptics</b> kill the microbes without killing our cells.</p>
<p><b>Nutrient cycles - decomposers</b>  Need decomposition or nutrients (esp C &amp; N) are all locked up in dead things. Fungi &amp; bacteria make these nutrients available in usable form. <b>N<sub>2</sub> fixing bacteria</b> (root nodules &amp; soil) turn N<sub>2</sub> from air into nitrates (plants make proteins). <b>microbes</b> build structures / release energy (respiration). Nutrients recycled through food chain used by other organisms. microbes excrete useable nutrients - plants absorb from soil. Microbe respiration releases C as CO<sub>2</sub> - used in photosynthesis.</p>	<p><b>Uses of Fungi - yeast</b>  Yeast: glucose → ethanol + carbon dioxide + energy  Process = fermentation/anaerobic respiration. CO<sub>2</sub> makes dough rise/beer &amp; wine bubble. Ethanol makes beer/wine alcoholic. Released CO<sub>2</sub> &amp; ethanol = excretion</p> <p><b>Uses of bacteria</b>  Yoghurt/cheese produced by fermentation/respiration of bacteria added to milk. Milk sugar lactose by turned to lactic acid - lowers pH of the milk - milk (proteins) curdle.</p>	<p><b>Terms</b>  <b>Saprophyte/saprophytic</b> - feeds on dead/decomposing matter - beneficial in a decomposing role  <b>decomposer</b> - organisms that consume dead organisms, carry out the process of decomposition  <b>parasite/parasitic</b> - feeds on living organic matter / host: harmful  <b>pathogen/pathogenic</b> - disease causing microorganism  <b>aerobic bacteria</b> - require O<sub>2</sub> for respiration  <b>anaerobic bacteria</b> - don't require O<sub>2</sub> for respiration</p>