BIODIVERSITY & CLASSIFICATION OF MICRO-ORGANISMS

05 FEBRUARY 2014

Lesson Description

In this lesson we:

- Look at the basic structures and general characteristics of micro organisms
- Discuss the role of micro-organisms in maintaining balance in the environment

Summary

Biodiversity

Classification of Micro organisms

- A **virus** is acellular, parasitic, extremely small and has many different shapes.
- It uses the host to replicate itself so it multiplies inside a host's cell.

- **Bacteria** have a cellular structure are prokaryotes and unicellular with three distinctive shapes – coccus (spherical), bacillus (rod shaped) and spirillus (spiral shaped).
- Bacteria have three ways of obtaining energy; photosynthesis, chemosynthesis or Heterotropism.
- Bacteria reproduce through binary fission.

- **Protista** is a kingdom with three main groups that are classified according to how they obtain their nutrition and how they move
- Protozoa are animal-like protists that are heterotrophic or parasitic and move using pseudopodia, cilia or flagella. Plant-like protists are autotrophic and can be unicellular or multicellular. Fungus-like protists are heterotrophic and are decomposers.

- **Fungi** can be unicellular or multicellular, are all eukaryotic and have cell walls made of chitin.
- Multicellular fungi are inter-twined together by threads called hyphae.
- Fungi are heterotrophic saprophytes and get their food from whatever substrate they grow on. They replicate both sexually and asexually.

Role of Micro-organisms

- Micro-organisms maintain the balance in the environment because they are found everywhere and continually recycle nutrients and energy
- **Viruses** control ecological processes such as nutrient cycling, bacterial and algal biodiversity. They are also pathogens and cause disease
- **Bacteria** are producers, are decomposers or recyclers of nutrients, in particular nitrogen
- **Protists** produce food, are parasites, pathogens or decomposers
- **Fungi** convert organic matter by decomposing it and making nutrients available but can be pathogenic too

Test Yourself

Question 1

What do we call bacteria that are not killed by antibiotics?

A. Resistant
B. Reluctant
C. Spread
D. Reactant

Question 2

What controls the size of microbe populations?

A. Limiting growth
B. Waiting time
C. Limiting factors
D. Decay

Question 3

What is fermentation used to make?

A. Beer
B. Bread
C. Wine
D. All of the above

Question 4

What does your stomach use to kill microbes?

A. Acid
B. Water
C. Salt
D. Alkali

Question 5

Which gas is needed for aerobic respiration?

A. Hydrogen
B. Oxygen
C. Nitrogen
D. Carbon Dioxide

Question 6

How does the organism yeast reproduce?

A. Blobbing

B. Artificially

C. Artistically

D. Budding

Question 7

What cells do our bodies have to kill off microbes?

A. Red blood cells

B. Liver cells

C. kidney cells

D. White blood cells

Question 8

When a person is made immune to a disease by an injection they have usually been:

A. Vaccinated

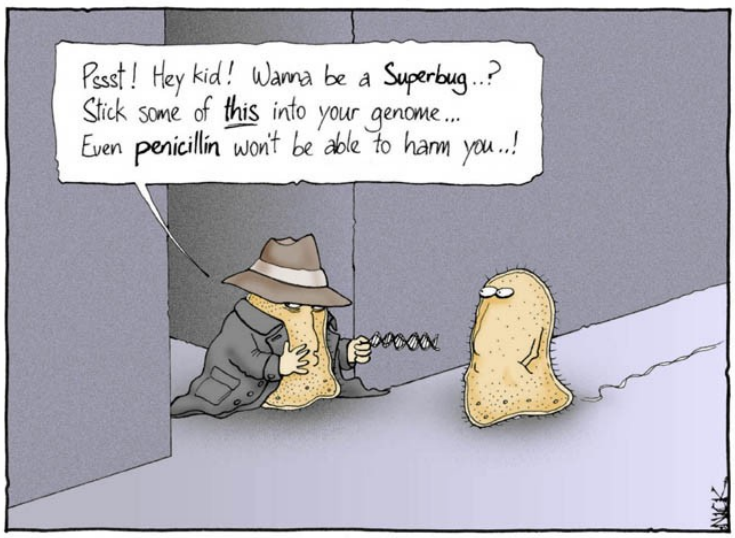
B. Infected

C. Infectious

D. None of these

Improve your Skills

Question 1



It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.

1.1 What does the term 'superbug' mean? (2)

1.2 What does the term "antibiotic resistance mean'? (2)

1.3 Explain why the bacteria appear to be slimy? (2)

1.4 What is the one bacterium handing over to the other? Why? (3)

1.5 What are the three usual modes of movement for bacteria? (3)

1.6 The cartoon indicates that bacteria can be found in hospitals. How can we prevent this from happening? (3)

1.7 What is penicillin? (1)

1.8 What does penicillin do? (1)

1.9 Not all bacteria are pathogenic. What other forms of bacteria do we find? (3)

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Question 2

Modern Beer Making

When Beer is made from barley, the following steps occur:

Malting: Barley grains are soaked for two to three days, drained, and incubated for ten days at 13° C to 17° C. Roots and shoots start to grow, and starch reserves are mobilised as sugar. The temperature is then raised to between 40° C and 70° C to stop germination.

Cracking: Grains are lightly roasted to 80° C and then passed between rollers that crack them open.

Mashing: Hot water (62° C to 68° C) is used to wash the sugars and amino acids from the grains. Brewers' grains are left behind and are used in the feeding of herds of dairy cows.

Boiling: The liquor from the mashing process, known as wort, is boiled for several hours to concentrate it. Dried hops are added for flavour and for their antimicrobial properties. This is followed by a cooling step.

Fermentation: Yeast is now added, and converts the sugar to ethanol and carbon dioxide over a period of two to five days. As the yeast grows, it forms a thick head, which is skimmed off the surface. This is sold as a cake or as a slurry. The carbon dioxide produced is solidified at a low temperature and under high pressure and is sold as dry ice.

Conditioning: The beer should have an alcohol content of 4% to 8% ethanol. It is stored in barrels to allow final fermentation and for clearing the yeast. Under modern quality control and marketing procedures, it may be filtered, pasteurised, standardised and canned.

Adapted from 'The role of yeast in brewing' Oxford Successful Life Science p 20

Read the extract above and answer the following questions. Answers may be found in the text or may come from what you have learned.

2.1 Name the phylum to which yeast belongs. (1)

2.2 What is the nutrition of fungus. (1)

2.3 In the above process, name the substrate that yeast uses for food. (1)

2.4 Why do you think the barley is allowed to germinate? What significance does this have for the yeast later in the process? (3)

2.5 What are the by-products of yeast nutrition? (2)

2.6 In your own words, what does *'antimicrobial'* mean? Why do you think this property is important in the brewing process? (2)

2.7 Name three ecological benefits of yeast not mentioned in the article above. (3)

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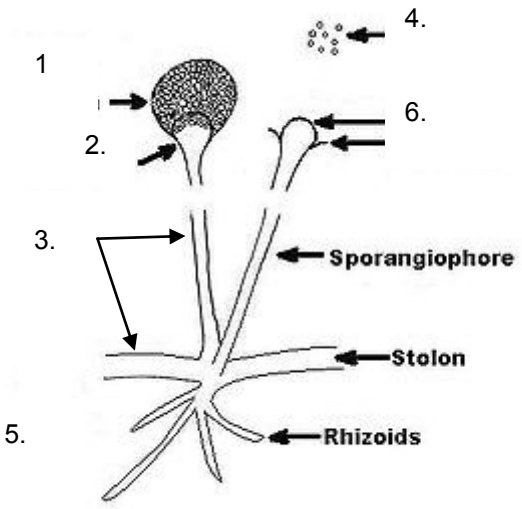
Question 3



3.1 Name the fungus represented in the diagram above. (1)

3.2 Identify the part numbered 1. (1)

3.3 Write down the number which represents the only cross wall developed in this plant. (1)

3.4 What is the term for having no cross walls? (1)

3.5 Identify the part numbered 4. (1)

3.6 Is this plant parasitic or saprophytic? Explain your answer. (3)

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Question 4

4.1 Explain why viruses are always harmful. (2)

4.2 Why is it difficult to control a viral infection? (3)

4.3 Name one virus that attacks plants and one that attacks animals. (2)

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Question 5

Contractile vacuoles occur in most Protozoa. Large groups of *Amoeba* were kept in different cultures of diluted sea water and the rate of elimination of water by their contractile vacuoles was measured. The results are shown in the table below.

% of sea water (concentration of medium)	10	15	20	25	30
Average fluid elimination (parts of water / million A*moeba* / minute)	8	5	4	3	1

5.1 The contractile vacuole serves two functions in *Amoeba*. It excretes nitrogenous wastes and / or removes excess water. Which of these two functions is supported by the results above? Explain your answer. (3)

5.2 Explain why the rate of contraction of the vacuole often increases when the animal feeds. (2)

5.3 Electron micrographs reveal that lots of mitochondria surround the contractile vacuoles. Explain why you think this is so. (3)

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Links

- Biodiversity Mindset Learn Xtra Live: http://www.youtube.com/watch?v=wayIMQhMACw&list=PLOaNAKtW5HLTO1XoZX23QHmMKQJffZoYG&index=1
- A comprehensive approach to life science : http://csls-text3.c.u-tokyo.ac.jp/inactive/01_08.html
- Classification and Biological diversity: http://www2.estrellamountain.edu/faculty/farabee/biobk/biobookdivers_class.html