

Section 7 Micro-organisms and humans

Chapter 38 Biotechnology

Page 332

1. *Yeast*; alcohol and carbon dioxide. *Penicillium*; penicillin. *Lactobacillus*; yoghurt, cheese. *Aspergillus*; enzymes.
2. Aerobic bacteria and protozoa play an important part in purifying human waste.
3. Sterile conditions are essential in order to exclude all micro-organisms but the ones needed for the process. 'Alien' microbes could produce undesired and unpredictable products. The other controlled conditions involve temperature, aeration (if any), pH and a controlled supply of nutrients.
4. Curds and whey are intermediate products of cheese-making. The curds are the semi-solid precipitate of milk protein produced when the enzyme chymosin is used to coagulate the milk. The whey is the liquid residue which is drained off.
5. If air is allowed in, aerobic bacteria will metabolise the wanted substances (e.g. methane) completely to carbon dioxide and water.
6. The starch is digested to maltose by the amylase enzymes already present in the barley grains or the flour.
7. If the wine is left exposed to air for long enough, aerobic bacteria will oxidise the alcohol in the wine to ethanoic (acetic) acid.
8. Different mutant forms of *Penicillium* produce different types of penicillin. The penicillin can also be altered by chemical processes to make it more effective.
9. The bacteria clump the finer particles, which are ingested by the protozoa along with the bacteria. Soluble substances are rendered harmless by being absorbed and metabolised by bacteria.

Chapter 39 Disease: causes, transmission and control

Page 335

1. If pathogenic bacteria had landed on the cooked meat, they will have started to multiply over a period of 24 hours. Simply warming the meat will greatly increase their rate of multiplication and the population may reach infective levels.
2. **a** Freezing arrests the multiplication of bacteria but does not kill them. In handling the defrosted chicken, the cook's hands could have picked up some bacteria which then became transferred to the cooked ham. Refrigeration slows bacterial reproduction but does not stop it. So the bacteria could have reached infective levels in the ham by the time the food was eaten.
b The outbreak could have been avoided if the cook had washed his hands after handling the chicken, before slicing the ham.
3. With gonorrhoea, bacteria in the infected woman's vagina can infect the baby. With syphilis the bacteria can cross the placenta from mother to foetus.

Page 336

1. The damage caused by the respiratory virus to the epithelial cells makes them vulnerable to a secondary infection caused by bacteria. It is for this infection that antibiotics are used.
2. If the potential donor's blood contains antibodies to the HIV virus, it means that the donor is carrying the HIV virus. If this blood is transfused the recipient would become infected with HIV.

3. There are many different strains of the cold virus. The explorers will at first infect each other with their particular strain.

The explorers will develop immunity to each strain after the infection has passed. Eventually there will be no new strains to infect the team. Once the supply ship arrives, however, the crew will carry strains of the virus to which the explorers do not have immunity and so the cycle of infection starts again.

4. The HIV virus attacks the patient's lymphocytes. These are the very cells which combat disease by producing antibodies. With a reduced population of lymphocytes, immunity cannot be achieved.

Page 338

1. **a** The two main lines of attack are (i) to destroy mosquitoes and (ii) to attack the malarial parasite in the blood.

The assault on mosquitoes is either by using insecticides against them or eliminating, as far as possible, their breeding sites.

b Mosquitoes lay their eggs in stagnant water. The eggs hatch out to the mosquito larvae which depend on water to grow, pupate and hatch into mosquitoes.

c The 'set-backs' are that the mosquitoes develop resistance to the insecticides and the malarial parasites develop resistance to the drugs.

2. Amoebic dysentery is an intestinal disease caused by the parasite *Entamoeba*. The infective stages of the parasite are present in the faeces of an infected person. Good sanitation keeps the faeces and drinking water well apart. Personal hygiene, such as washing the hands thoroughly after visiting the lavatory and before handling food reduces the chances of passing the parasite from one person to another. Hygienic practices in cleaning cooking- and work-surfaces also reduce the chance of cross infection.

3. The medical officer would probably first check the water source to see if it was contaminated by *Entamoeba* and, if so, close the source and find another or import clean water. He would advise everyone to boil water likely to be used for drinking, and offer advice on the hygienic disposal of human waste. He would further attempt to control the outbreak by administering the appropriate drugs to infected people.

Page 339

1. A great many diseases can be transmitted by contaminated food. If a person who sells, handles or cooks food carries pathogenic micro-organisms in or on his body, particularly his hands, he could introduce these pathogens to the food and to anyone who eats it. Good personal hygiene will reduce these risks.

2. If a person is carrying an infectious respiratory disease, whether or not he is aware of it, his coughs and sneezes will produce micro-droplets containing the pathogenic micro-organisms. The infectious droplets can remain in the air to be inhaled or fall on food and, consequently infect other people.

3. The lining of mucus in the respiratory tract traps many bacteria and is carried away from the lungs and bronchi by a current produced by the beating of millions of cilia. If the ciliary beat is arrested, the potential pathogens are not removed and start to multiply in the respiratory passages.

4. Unlike houseflies, wasps do not come into contact with human faeces and other sources of infection. Their method of feeding does not involve the regurgitation of potentially infected saliva.

1. **a** *Cornea*; tear fluid, which bathes the cornea, contains the enzyme, lysozyme, which dissolves the cell walls of some bacteria.

b *Hand*; the skin is a natural barrier to bacteria unless it is damaged, in which case white cells engulf the bacteria.

c *Bronchus*; the film of mucus which lines the bronchi and trachea, traps the bacteria which are then carried away from the air passages by ciliary currents.

d *The stomach* produces hydrochloric acid which kills most bacteria.

2. An earthquake can damage sewage pipes and water pipes. This means that raw sewage may escape into drinking water which must therefore be boiled to destroy pathogenic bacteria.

3. Immunization against diphtheria prompts the lymphocytes to produce antibodies to the diphtheria toxin. This antibody is specific to the diphtheria toxin and will not have any effect on the polio virus.

4. Diphtheria immunization would be continued as protection against outbreaks of the disease originating from people who had not received the vaccine.

5. There is an enormous variety of forms of the common cold. A vaccine effective against one form would be ineffective against other forms.

6. **a** HIV is the virus which can cause the disease known as AIDS.

b 'HIV positive' means that a person's blood test reveals the presence of antibodies against the HIV virus.

c High risk groups are homosexuals, drug users who inject themselves and people who have sexual intercourse with many different individuals.