

OCR 21st Century Core Science - Biology B2

KEEPING HEALTHY

B2.1 How do our bodies resist infection?

- recall that there are natural barriers to reduce the risk of harmful microorganisms entering the body (limited to the skin, chemicals in tears, sweat and stomach acid);
- understand that in suitable conditions (such as inside the body) these microorganisms can reproduce rapidly;
- understand that symptoms of a disease are caused by damage done to cells by the microorganisms or the poisons (toxins) they produce;
- recall that our bodies have immune systems to defend themselves against the invading microorganisms;
- understand that white blood cells can destroy microorganisms by engulfing and digesting them, or by producing antibodies;
- understand that a different antibody is needed to recognise each different type of microorganism;
- understand that once the body has made the antibody to recognise a particular microorganism, it can make that antibody again very quickly, therefore protecting against that particular microorganism.

B2.2 What are vaccines and how do they work?

- understand that microorganisms may enter the body and cause illness before the immune system can destroy them;
- understand that vaccinations provide protection from microorganisms by establishing antibodies before infection;
- recall that a vaccination contains a form of a disease-causing microorganism that is usually safe;
- understand that vaccination can never be completely safe, since individuals have varying degrees of side-effects from a vaccine;
- **understand why, to prevent epidemics of infectious diseases, it is necessary to vaccinate a high percentage of a population;**
- understand that there is a conflict between a person's right to decide about vaccination for themselves or their children, and what is of benefit to society as a whole;
- understand that new vaccines against influenza have to be developed regularly because the virus changes very quickly;
- **understand that it is difficult to develop an effective vaccine against the HIV virus (which causes AIDS) because the virus damages the immune system and has a high mutation rate;**
- with respect to vaccination policy can:
 - say clearly what the issue is;
 - summarise different views that may be held;
 - **distinguish what can be done (technical feasibility) from what should be done (values);**
 - **explain why different courses of action may be taken in different social and economic contexts;**
 - identify, and develop, arguments based on the ideas that:
 - the right decision is the one which leads to the best outcome for the majority of people involved;
 - certain actions are never justified because they are unnatural or wrong.

B2.3 What are antibiotics and why can they become less effective? How are new drugs developed and tested?

- recall that we can kill bacteria and fungi, but not viruses, using chemicals called antibiotics;
- recall that over a period of time bacteria and fungi may become resistant to antibiotics;
- **understand that random changes (mutations) in the genes of these microorganisms sometimes lead to varieties which are less affected by the antibiotic;**
- understand that to reduce antibiotic resistance we should only use antibiotics when necessary and always complete the course;
- recall that new drugs are first tested for safety and effectiveness using human cells grown in the laboratory and animals;
- recall that human trials may then be carried out: on healthy volunteers to test for safety and on people with the illness to test for safety and effectiveness;
- **describe and explain the use of 'blind' or 'double-blind' human trials in the testing of a new medical treatment;**

- understand why placebos are not commonly used in human trials.

B2.4 What factors increase the risk of heart disease?

- understand why heart muscle cells need their own blood supply;
- explain how the structure of arteries and veins is related to their function;
- understand how fatty deposits in the blood vessels supplying the heart muscle can produce a 'heart attack';
- recall that heart disease is usually caused by lifestyle factors and/or genetic factors, not microorganisms;
- recall that these lifestyle factors include poor diet, stress, cigarette smoking, excessive alcohol intake;
- understand that heart disease is more common in the UK than in non-industrialised countries;
- recall that regular moderate exercise reduces the risk of developing heart disease;
- in the context of how lifestyle factors that can increase the risk of heart disease are identified, via epidemiological studies:
 - can give an example from everyday life of a correlation between a factor and an outcome;
 - uses the ideas of correlation and cause appropriately;
 - **can explain why a correlation between a factor and an outcome does not necessarily mean that one causes the other, and give an example to illustrate this;**
 - can suggest factors that might increase the chance of an outcome but not invariably lead to it;
 - can explain that individual cases do not provide convincing evidence for or against a correlation;
 - can evaluate the design for a study to test whether or not a factor increases the chance of an outcome, by commenting on sample size and how well the samples are matched;
 - **can use data to develop an argument that a factor does/does not increase the chance of an outcome;**
 - **can identify the presence (or absence) of a plausible mechanism as significant for the acceptance (or rejection) of a claimed causal link;**
 - can describe in broad outline the 'peer review' process, in which new scientific claims are evaluated by other scientists;
 - can recognise that new scientific claims which have not yet been evaluated by the scientific community are less reliable than well-established ones;
 - can identify absence of replication as a reason for questioning a scientific claim;
 - **can explain why scientists regard it as important that a scientific claim can be replicated by other scientists.**