Unit 37: Defence against Disease

Unit code: K/600/8994

QCF Level 3: BTEC Nationals

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit aims to enable learners to gain knowledge about the mechanisms that defend the human body against hazards and an understanding of specific and non-specific resistance to infection.

Unit introduction

Learners will explore the nature of common hazards to the human body in the external environment, and the means by which the body can defend itself against these hazards. The protective functions of the skin will be examined in some detail, as will the complex mechanisms involved in blood clotting, and the non-specific and specific responses to infection.

The role of the lymphatic system will also be investigated, as will the role of immunisation in providing resistance to infection. Finally, learners will have the opportunity to consider the role of vaccination programmes.

This unit will be useful for learners planning to seek employment in the health and social care sectors on completion of their programmes, or for those aiming to study at a higher level.

Learning outcomes

On completion of this unit a learner should:

1 Know how the body is protected from the external environment

2 Understand non-specific resistance to infection

3 Understand specific resistance to infection.

Unit content

1 Know how the body is protected from the external environment

Environmental hazards: heat and cold; effects of radiation, eg ultraviolet; injury, eg cuts and abrasions, burns; infection; poisoning

Physical barriers: skin (waterproof, sebum, epidermal renewal and scar formation, subcutaneous fat, sensory receptors, melanin); mucous membranes

Defensive mechanisms: reflexes, eg withdrawal, expulsive, (eg coughing, sneezing), vomiting and diahrroea; tear production; wound healing; inflammatory response; role of the blood

Blood: coagulation response, action of platelets; blood groups and tissue matching; cells – phagocytes; lymphocytes

Defensive responses: non-specific; specific

2 Understand non-specific resistance to infection

Mechanical and chemical barriers: intact skin; mucous membranes (secretion of mucus, ciliary action); acidity in stomach and vagina; action of lysozyme in tears and saliva; normal flora

Non-specific defensive responses: inflammation, phagocytosis; natural killer cells; fever

Phagocytes: macrophages; neutrophils

3 Understand specific resistance to infection

Immunity: natural, artificial; active, passive; examples of each natural immunity: action of phagocytes; role of lymphocytes, cellular immunity, humoral immunity

Lymphocytes:

- cellular immunity: T lymphocytes, cytotoxic T cells, T helper cells, memory T cells, T cell receptors
- humoral immunity: B lymphocytes, antibody formation and actions against antigens, eg agglutination, precipitation, lysis; immunological memory, primary and secondary immune response; antigenic variation

Artificially acquired immunity: active, eg against bacterial infections such as pertussis, tuberculosis, against viral infections such as Hepatitis A and B, influenza, measles, mumps, poliomyelitis; passive, eg Hepatitis A, established cases of tetanus

Vaccination programmes: common vaccination programmes, eg influenza, MMR, poliomyelitis; role in public health, eg specific protection, local/regional/national/international, herd immunity, human/economic costs

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 describe how the body is protected from hazards in the external environment [IE1; IE4; SM2]	**M1** assess the role of the skin in protecting the body from external hazards in the environment	
P2 explain barriers to infection and non-specific defensive responses [IE1; RL6; SM2]	**M2** assess how barriers to infection and non-specific defensive responses protect the body	**D1** evaluate the relative roles of the non-specific and specific defensive responses in protecting the body
P3 explain the role of lymphocytes in defending the immune system [IE1; IE4]		
P4 explain active and passive artificially acquired immunity [IE1; IE4; RL6; SM2]	**M3** discuss the development of natural specific resistance to infection.	
P5 explain the purpose of vaccination programmes. [IE1; CT2; CT4; RL6; SM2]		**D2** evaluate the success of a recent vaccination programme in relation to public health.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills which are embedded in the assessment of this unit. By achieving the criteria, learners will have demonstrated effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit would benefit from being delivered by a tutor who is qualified in biological sciences, or a health professional with a public health background.

The unit could be introduced through initial class discussions to encourage thinking about the potential hazards to the human body from its environment. This will raise learner awareness of the focus of this unit, which is to explore the body's mechanisms for protecting itself and ensuring its survival. It would be helpful to look at worldwide hazards.

Following this introduction, the unit could be delivered through a combination of tutor input, individual/small-group research followed by posters and/or presentations, and the use of videos/DVDs. Some of the more complex biological aspects will require clear explanation, using diagrammatical representations and worksheets to reinforce understanding. Active learning techniques should be used as appropriate.

Learners could be briefly introduced to the concept of artificially acquired immunity through discussing their own experiences, with individual research or tutor input then being used to extend and enhance learning. For example, learners could explore why visitors to different countries may suffer from particular hazards whereas the local population does not, and relate this to issues of immunity and resistance.

Learners should be encouraged to research vaccination programmes of their choice, particularly if they are currently topical, as this would not only provide opportunities to use a variety of media for research purposes but would give learners a chance to discuss how the programme is working. It would be useful to explore a national vaccination programme such as for influenza, or an international programme such as for poliomyelitis, to illustrate the importance of acquired immunity. A more historical approach, such as the smallpox eradication programme, would provide a good example. Class presentations can then be used to broaden learner experience.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Unit introduction.
Tutor input: introduction to assignment brief and deadlines of tasks.
Tutor input and group discussion: environmental hazards that can affect the body.
Tutor input: physical barriers and defensive mechanisms.
DVD/online resources: to demonstrate defensive mechanisms.
Learner research: in preparation for first assessment task.
Assignment 1: Physical protection (P1, P2, M1, M2)
Tutor input: resistance to infection – mechanical and chemical barriers.
Group research: non-specific defensive responses.
Tutor input/worksheets: phagocytes/lymphocytes.
Learner research: internal protection; presentation.
Assignment 2: Internal protection (P3, P4, M3, D1)
Tutor input: immunity – natural, artificial, active, passive.
Tutor input: artificially acquired immunity.
Group discussion: own experiences of immunisation.
Tutor input: vaccination programmes.
DVD/internet resources: local/regional/national/international vaccination programmes in the media; controversial views regarding their use; costs etc.
Group discussion: various attitudes to immunisation; why some countries suffer from particular hazards; immunity.
Learner/tutor discussion: to decide which vaccination programme to research.
Assignment 3: Artificial protection (P5, D2)
Unit review and assessment.

Assessment

This unit be assessed by using one holistic assignment towards the end of the period of delivery. This could be based on a case study, for example of an individual acquiring an infection due to skin their defences breaking down. Subsequent tasks within the assignment can then be tailored to the specific case. Alternatively, each learning outcome could be assessed separately, as appropriate to the particular cohort of learners.

For P1, learners will describe a range of environmental hazards commonly faced by humans accurately and all the different mechanisms the body uses to protect itself. A piece of writing, possibly supported by diagrams or other visual images, would be an appropriate format for evidence. For M1, learners will assess how the skin protects the body in different ways.

For P2, learners will clearly explain the difference between mechanical and chemical barriers deployed by the body for protection. For M2, learners will assess how these protective mechanisms work, providing examples of each.

P3 requires an explanation of the role of lymphocytes in both cellular and humoral immunity. Clearly annotated diagrammatical representations will be useful here to support learner evidence, but tutors need to ensure that evidence is entirely that of the learner. For P4, learners must explain active and passive artificially acquired immunity, using two examples to support their explanation. For M3, learners should discuss clearly how natural, infection specific resistance develops, providing examples that illustrate clearly that they have understood the concept of immunity.

For D1, learners will look holistically at protective mechanisms and immunity to evaluate the relative roles of the non-specific and specific defensive responses. The use of examples will help to support this evaluation.

For P5, learners will have carried out research to explain the purpose of vaccination programmes, using two examples of their choice, and relating their response to the health and immunity of the public. There are strong links here with Unit 12: Public Health, and learners need to consider the role of the chosen vaccination programmes in terms of their specific protection function. This can be considered locally, regionally, nationally or internationally, as appropriate for the chosen programme. The response for D2 will be more detailed and will evaluate the vaccination programmes, in terms of their success and future role in public health.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, M2	Physical protection	You have been asked to prepare a selection of reports and diagrams for the 'Live Well' section of the NHS website based on immunity, how the body protects itself against external forces and how we can artificially protect the human body.	Written report, annotated diagrams/images.
P3, P4, M3, D1	Internal protection		
P5, D2	Artificial protection		

Links to National Occupational Standards (NOS), other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Health and Social Care sector suite (see *Appendix A*) and has links with units from other qualifications in that suite. See *Appendix E* for NOS links and *Appendix G* for a mapping of the NHS Knowledge and Skills Framework against particular units in this qualification.

Essential resources

The following resources are essential for delivery of this unit:

- an appropriately qualified tutor
- library resources with key texts and other reference material
- internet/computer access.

In addition, audio and visual records are considered to be highly valuable.

Employer engagement and vocational contexts

The use of guest speakers would greatly enhance delivery of this unit.

Indicative reading for learners

Textbooks

Clancy J and McVicar A – *Physiology and Anatomy: A Homeostatic Approach* (Hodder Arnold, 2002) ISBN 9780340762394

Kent M – *Advanced Biology (Advanced Science)* (Oxford University Press, 2000) ISBN 9780199141951

Myers B – *The Natural Sciences* (Nelson Thornes, 2004) ISBN 9780748785834

Shaw L – *Anatomy and Physiology* (Nelson Thornes, 2004) ISBN 9780748785841

Stretch B and Whitehouse M – *BTEC Level 3 Nationals in Health and Social Care Student Book 1* (Pearson, 2010) ISBN 9781846907663

Stretch B and Whitehouse M – *BTEC Level 3 Nationals in Health and Social Care Student Book 2* (Pearson, 2010) ISBN 9781846907470

Toole A and S – *Understanding Biology for Advanced Level* (Nelson Thornes, 1999) ISBN 9780748739578

Tortora G – *Principles of Anatomy and Physiology* (John Wiley and Sons, 2005) ISBN 9780471718710

Ward J, Clarke R W and Linden R – *Physiology at a Glance* (Blackwell Publishing, 2005) ISBN 9781405113281

Journals and magazines

Biological Science

New Scientist

Nursing Times

Websites

www.bbc.co.uk	BBC
www.hpa.org.uk	Health Protection Agency

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] identifying questions to answer when researching the various mechanisms for protecting the body from external environments [IE4] evaluating the relevance of information gathered from discussions or guest speakers, judging its value for inclusion in assignment work
Creative thinkers	[CT2] asking questions to further their thinking about the purpose of vaccination programmes [CT4] questioning their own and others' assumptions about vaccination programmes
Reflective learners	[RL6] communicating their learning in relevant ways, through presentations and report writing
Self-managers	[SM2] working towards set deadlines, showing commitment and perseverance.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using ICT systems to prepare assignments, manipulate text and graphs and to produce presentations
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	selecting the right information to be included in a complex report
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	entering and developing information on vaccination programmes and the protective mechanisms in the body, to include text, tables, graphs and annotated diagrams or images
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	contributing to group discussions about personal experiences of immunisation listening to DVDs and presentations about the body's defence mechanisms
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading and synthesising information from a variety of texts related to vaccination programmes
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing different types of documents, including an extended report to cover the assessment criteria.