



Higher National Unit specification

General information for centres

Unit title: Clinical Microbiology and Epidemiology

Unit code: DW8H 35

Unit purpose: This Unit is designed to introduce candidates to the subject of epidemiology and to consider the ways in which infective agents are spread within the population. The Unit provides candidates with a working knowledge of clinical microbiology, considering methods used in the isolation and identification of pathogenic bacteria, and relating such bacteria to specific infections. On completion of this Unit the candidates should be able to:

- 1 Explain the concept of epidemiology and the ways by which infective agents are spread.
- 2 Explain and demonstrate a knowledge of clinical microbiology.
- 3 Evaluate the action of antimicrobial agents.
- 4 Analyse the results of identification tests used to classify microorganisms.

Credit points and level: 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the centre. It would however be beneficial if candidates have completed a level 7 Unit in microbiology such as Microbiology; Theory and practice (DH55 34).

Core Skills: There are opportunities to develop the Core Skill of Problem Solving at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: This Unit should be assessed by a closed-book assessment and two laboratory practicals. For Outcomes 1-3 this will take the form of a supervised holistic assessment with a cut off score of 60%. In Outcome 4, where practical skills are assessed, evidence should be recorded in the form of checklists and a laboratory report. Candidates must meet the level of performance specified in the Evidence Requirements in order to achieve the Unit.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the concept of epidemiology and the ways by which infective agents are spread

Knowledge and/or Skills

- ◆ Epidemiological techniques
- ◆ Epidemiological markers
- ◆ Role of the host in infectious disease
- ◆ Modes of transmission of infective agents

Evidence Requirements

Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- ◆ explain the use of epidemiological techniques
- ◆ explain the use of epidemiological markers
- ◆ describe the relevance of different forms of carriers
- ◆ demonstrate an understanding of different modes of transmission of infective agents

For this Outcome at least three of four knowledge and skills listed above must be assessed on each occasion. This should take place under closed-book, controlled conditions and should have a pass mark of 60%.

This closed-book assessment could take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes, to reflect the workload of each Outcome. Assessment for this Outcome could be integrated with that for Outcomes 2 and 3.

Higher National Unit specification: statement of standards (cont)

Unit title: Clinical Microbiology and Epidemiology

Outcome 2

Explain and demonstrate a knowledge of clinical microbiology

Knowledge and/or Skills

- ◆ Causes of common microbial infections
- ◆ Sites of common microbial infections
- ◆ Cultural techniques for isolation of pathogens
- ◆ Identification of pathogens

Evidence Requirements

Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- ◆ identify the causative pathogens of selected microbial infections
- ◆ relate specific pathogens to body tissues and systems
- ◆ relate specific culture media to the isolation of pathogens
- ◆ explain the use of different forms of microscopy
- ◆ explain the principle of different staining techniques

For this Outcome at least three of the four knowledge and skills listed above must be assessed on each occasion. This should take place under closed-book, controlled conditions and should have a pass mark of 60% although candidates should attain a pass in each question.

This closed-book assessment could take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes, to reflect the workload of each Outcome. Assessment for this Outcome could be integrated with that for Outcomes 1 and 3.

Outcome 3

Evaluate the action of antimicrobial agents

Knowledge and/or Skills

- ◆ Mechanism of action of common disinfectants
- ◆ Antibiotics and their modes of action
- ◆ Antifungal drugs and their modes of action
- ◆ Antiviral drugs and their mode of action

Higher National Unit specification: statement of standards (cont)

Unit title: Clinical Microbiology and Epidemiology

Evidence Requirements

Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- ◆ evaluate commonly used disinfectants
- ◆ describe the mode of action of common antibiotics
- ◆ describe the mode of action of antifungal drugs
- ◆ describe and evaluate the mode of action of antiviral drugs

For this Outcome three out of the four knowledge and skills items listed above must be assessed on each occasion. This should take place under closed-book, controlled conditions and should have a pass mark of 60% although candidates should attain a pass in each question.

This closed-book assessment could take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes, to reflect the workload of each Outcome. Assessment for this Outcome could be integrated with that for Outcomes 1 and 2.

Assessment Guidelines for Outcomes 1–3

It is highly recommended that assessment for Outcomes 1–3 is integrated into one supervised holistic assessment under closed-book conditions with a cut off score of 60%

Outcome 4

Analyse the results of identification tests used to classify microorganisms

Knowledge and/or Skills

- ◆ Adherence to instructions
- ◆ format of data
- ◆ Data analysis

Evidence Requirements

Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- ◆ perform techniques in accordance with health and safety regulations
- ◆ perform techniques in accordance with instructions given
- ◆ ensure that the data is presented in appropriate format in practical reports
- ◆ analyse the data correctly
- ◆ draw appropriate conclusions and evaluate the results

Candidates should perform a range of experiments to isolate and identify a selection of microorganisms within the safety specifications of the laboratory. A minimum of two practical experiments should be used for assessment purposes. The candidate must also produce one report which demonstrates the candidates ability to plan and evaluate a laboratory exercise. A checklist should also be used to record practical skills on at least two occasions.

Higher National Unit specification: statement of standards (cont)

Unit title: Clinical Microbiology and Epidemiology

The report should contain approximately 1,000 words and should discuss safety aspects, method, selection of media along with an analysis and evaluation of the practical.

Results of biochemical tests should be analysed and interpreted. Candidates could make use of computer aided programmes if available and could also utilise classification manuals.

Assessment Guidelines

This Outcome should be assessed by laboratory based practical experiments. Two investigations should be undertaken in this Outcome.

Candidates should submit one report and checklists should be used to record practical skills. The experiments listed in the support notes are for guidance only and appropriate alternatives may be substituted providing that they:

- ◆ are of an equivalent standard in terms of skills development
- ◆ have a direct relationship to a theoretical topic covered in Outcomes 1–3

Administrative Information

Unit code:	DW8H 35
Unit title:	Clinical Microbiology and Epidemiology
Superclass category:	RH
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History of Changes:

Version	Description of change	Date
02	Changes made to standardise assessment guidelines.	03/06/09

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Higher National Unit specification: support notes

Unit title: Clinical Microbiology and Epidemiology

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is intended to provide the candidate with an understanding of common hospital infections and factors which aid the spread of such infections. It will also make the candidate aware of the importance of epidemiology in tracing the sources of such infections.

Candidates will learn techniques used in the isolation of common hospital pathogens, and will become aware of the characteristics and cultural requirements of such pathogens.

Practical laboratory work will reinforce the above and will involve the student in using modern identification techniques in the identification of Gram negative bacteria.

Outcome 1

Provides an introduction to epidemiology and the ways by which infective agents are spread.

- ◆ Epidemiological techniques: no of cases of a particular disease may be plotted against time, geographical region, age, sex, race, occupation.
- ◆ Epidemiological markets: use of stereotyping for example M proteins in *Streptococcus pyogenes*, Phage typing of *Staphylococcus aureus*, Biotyping of *Brucella*, Antibiograms.
- ◆ Role of the host: Healthy carriers, convalescent carriers, herd immunity.

Modes of transmission: airborne droplets and droplet nuclei, infectious dust, waterborne transmission, foodborne transmission, direct contact, Arthropod transmission.

Outcome 2

Introduces candidates to common bacterial pathogens and their sites of infection. Instruction will be given on methods used to selectively isolate and identify the latter.

- ◆ Pathogens: *Staphylococcus aureus*; *Streptococcus pyogenes*; *Helicobacter pylori*; *Neisseria gonorrhoeae*; *Neisseria meningitidis* Enteric bacteria for example *Salmonella typhi*
- ◆ Sites of infection: *Staph aureus* — wounds, skin, food-poisoning; *Helicobacter*-stomach, duodenum; *Neisseria* — reproductive tract, meninges; *Salmonella* – small intestines, liver, gall bladder, blood;
- ◆ Cultural techniques: enriched media; selective media; anaerobic cultivation; carbon dioxide enrichment.
- ◆ Identification methods: Staining reactions for example Gram; spore stains; fluorescent antibody techniques; serological testing (H&O) agglutination reactions.

Higher National Unit specification: support notes (cont)

Unit title: Clinical Microbiology and Epidemiology

Outcome 3

Provides candidates with a knowledge of the mechanism of action of common antimicrobial agents.

- ◆ Disinfectants: Halogens; phenol compounds; alcohols; formaldehyde; glutaraldehyde; ethylene oxide.
- ◆ Antibiotics: Sulphonamides; penicillins; tetracyclines; erythromycin; rifampin; clindamycin.
- ◆ Antifungal drugs: Nystatin; griseofulvin; amphotericin B; flucytosine.
- ◆ Antiviral drugs: Amantadine; acyclovir; nevirapine.

Outcome 4

Enables candidates to acquire practical skills relevant to Outcomes 2 and 3. It also encourages them to apply their knowledge and/of skills from these Outcomes to the analysis of experimental data. Practical work should be appropriate to the laboratory safety specifications.

Possible experiments:

- 1 Identification of three gram negative bacilli using the API 20E system.
- 2 Determination of antibiotic sensitivity of one gram positive and three gram negative organisms.
- 3 Staining reactions to include Gram stain, spore stain and demonstration of flagella.
- 4 Identification of a yeast.
- 5 Identification of a Fungus.

Guidance on the delivery and assessment of this Unit

This Unit is designed to form part of the HNC/D Science Group Awards. It is recommended that this Unit is delivered only as part of a HND second year programme. Candidates should have experience of a background in basic microbiology and working with microorganisms.

Owing to the breadth of the topics it is recommended that the key areas of each topic are covered to an appropriate level. Emphasis should be on clinical conditions and case histories.

Outcomes 1–3 should be assessed by a holistic supervised, closed-book test with a cut-off score of 60%. Evidence should be generated on a sample basis, evenly spread across each Outcome to reflect the workload of each Outcome.

Students should attain a pass in each question.

Outcome 4 should be assessed by laboratory based practicals. Assessment of practical skills should be by checklists and submission of one laboratory report.

Opportunities for developing Core Skills

There are opportunities to develop the Core Skill of Problem Solving at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Higher National Unit specification: support notes (cont)

Unit title: Clinical Microbiology and Epidemiology

Open learning

If this Unit is delivered by open on Distance Learning methods, additional planning resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

General information for candidates

Unit title: Clinical Microbiology and Epidemiology

This is a 1 credit HN Unit at SCQF level 8 and is intended for candidates undertaking a Biological Sciences/Biotechnology related qualification. It is designed for candidates who already have a good knowledge of microbiology and working with microorganisms at Intermediate 2 level.

The Unit introduces you to more advanced concepts of microbiological practices. You will study some basic aspects of epidemiology learning how certain structural aspects of bacteria can be used in order to trace the source of an infection.

Instruction will also be given on the use of selective culture media in the isolation of pathogenic bacteria.

You will also learn some of the techniques used to identify pathogenic bacteria, and gain practical experience in the use of such techniques.

In order to complete this Unit successfully, you should be able to:

- 1 Explain the concept of epidemiology and the ways by which infective agents are-spread.
- 2 Explain and demonstrate a knowledge of clinical microbiology.
- 3 Evaluate the action of antimicrobial agents.
- 4 Analyse the results of identification tests used to classify microorganisms.

The Unit will be delivered by lectures/tutorials and laboratory practicals.

Your knowledge and skills acquired in this Unit will be tested by production of evidence produced through an end-of-Unit closed-book assessment. The pass mark will be 60%. In Outcome 4, practical skills will be assessed by laboratory based practicals (for which you will write one laboratory reports) and checklists.

You must achieve a satisfactory level of performance in all assessments in order to achieve this Unit.