The Royal College of Pathologists

Pathology: the science behind the cure

Curriculum for specialty training in veterinary microbiology

October 2017

Contents

INTRODUCTION

This curriculum has been prepared by the Specialty Advisory Committee on Veterinary Microbiology (SAC) to provide trainees, educational supervisors and trainers to set out the requirements for the successful completion of the veterinary microbiology training programme.

OVERALL AIM

The overall aim of the curriculum is to guide the training of veterinary microbiologists capable of assuming responsibility for the broad spectrum of specimens and problems encountered in clinical veterinary microbiology. In addition, it aims to guide the acquisition of competence and appropriate skills in a particular species group specialty, as demonstrated by the acquisition of the FRCPath examination. It is recognised that veterinary microbiologists work in a diverse range of posts, and it is intended that training can be acquired either as part of a dedicated residency programme or during employment in an appropriate veterinary microbiology laboratory.

The curriculum outlines common areas to be studied by all candidates and the additional requirements for candidates specialising in each of the subspecialties.

ENTRY REQUIRMENTS

Veterinary trainees will have achieved an RCVS recognisable degree; those with non-RCVS recognised degrees should contact the College for further guidance. A period of clinical experience is considered desirable.

Non-veterinary trainees will have a National Qualifications Framework Level 7 qualification (MSc or equivalent) or higher in veterinary microbiology and at least one year's experience of diagnostic and or research veterinary microbiology.

DURATION OF TRAINING

Training will normally be completed in three years full-time equivalent, but may be longer or occasionally shorter depending on the circumstances of the trainee and the requirements of the training centre or workplace. Where training is not achieved as part of a full time programme, trainees should ensure that they complete the equivalent period of training *pro rata*. Trainees should consult the Veterinary Microbiology Specialty Advisor for specific advice before embarking on their training or if their circumstances change.

Training is divided into two parts leading up to FRCPath Part 1 examination and the FRCPath Part 2 examination. The FRCPath Part 1 examination will assess competence in basic veterinary microbiology and the FRCPath Part 2 examination will assess more specialised aspects of the species group specialties.

The FRCPath Part 1 examination would normally be taken after one to two years' full-time training in veterinary microbiology, usually as part of a residency programme or equivalent experience. A period of study towards a directly relevant post-graduate qualification e.g. MSc, PhD, may be accepted as contributing to this time period by the College; candidates should consult the Veterinary Microbiology Specialty Advisor for specific advice.

It is recommended that candidates entering for the FRCPath Part 1 exam should demonstrate:

- Evidence of satisfactory completion of the veterinary microbiology curriculum and the minimum training period.

- Satisfactory outcomes in the requisite number of workplace-based assessments, appropriately tailored to the trainee's residency programme or workplace (see appropriate section below) and including a formal annual review with the trainee's Educational Supervisor.

The FRCPath Part 2 examination will normally be taken one to two years after successful completion of FRCPath Part 1 and on the recommendation of suitability to sit the exam from the candidate's Educational Supervisor. Candidates should normally pass their FRCPath Part 2 examinations within seven years of passing FRCPath Part 1. However, there will be circumstances where the guidelines will need to be applied flexibly and candidates who feel that they will not be able to comply with this timescale should contact the Examinations Department for advice.

STAGES OF TRAINING AND LEARNING

The curriculum is divided into three stages, A–C. These stages roughly correlate with years 1 to 3 of a full time residency training programme. Trainees should gain appropriate experience within their programme to achieve all necessary curricular objectives and to ensure they are adequately prepared to attempt FRCPath Parts 1 and 2 at the appropriate time.

It is strongly recommended that during Stages B–C, trainees should take increasing levels of responsibility for their work as they progress towards independent practice.

Throughout training, trainees must maintain a training portfolio (which may be paper based or electronic) using a template obtained from the Veterinary Microbiology Specialty Advisor. This is a record of learning for recording workplace-based assessment and multi-source feedback (MSF). It also allows trainees to record other infomation about their progress in training, more information can be obtained from the Veterinary Microbiology Specialty Advisor.

Stage A

Stage A of training is 12 months full-time equivalent.

The aims of this stage are to provide a general introduction to bacteriology, virology and mycology.

Competences required to complete stage A:

- collection of appropriate samples from most common and simple specimens
- ability to write an appropriate report for a wide range of samples and specimens, ability to demonstrate time management and task prioritisation (e.g. prioritisation of samples allowing time for primary culture, subculture and reporting, timely turn-around of reporting)
- independent microbiological investigation of a straightforward clinical case
- ability to give general advice on biosecurity, hygiene and prophylaxis
- ability to write a microbiology report including appropriate clinico-microbiological correlation for a straightforward case.

Recommended minimum practical experience for Stage A is provided below, but may vary between training centres and specialities:

General investigation of clinical cases	50 cases (including 30 in the species of interest
Identification of microbiological isolates	100 cases in the species of interest
Use of serological or molecular diagnostic techniques	50 cases in the species of interest

Assessments:

Workplace-based assessments	satisfactory (a minimum of 18 with at least 12 being from Directly Observed Practical Skills section)
Formal annual review	satisfactory
Educational Supervisor's report	satisfactory

Stages B–C: general advice regarding time spent in stages
The time spent in training in stages B and C should amount to a combined minimum of two years full-time equivalent.

Stage B
Stage B of training should generally take a minimum of 12 months full-time equivalent. The aims of this stage are to:

- broaden experience and understanding of classical and molecular methods in microbiology
- broaden understanding of the chosen species group
- develop a basic knowledge base in antimicrobial therapeutics and vaccinology
- the FRCPath Part 1 examination is normally taken during this stage of the curriculum.

Competencies required to complete stage B:

- independent evaluation of clinical cases covering all organ systems, selection of samples, use of appropriate isolation techniques and microbial identification methods
- use of a wide range of techniques to recover specimens for diagnosis from a variety of anatomical locations both ante and post mortem
- ability to write an appropriate report for a wide range of clinical situations
- use of a range of specialised serological and molecular diagnostic methods appropriate to the chosen species group
- ability to demonstrate effective time management and task prioritisation
- independent evaluation and investigation of more complex cases
- ability to write a report including appropriate clinico-microbiological correlation for a more complex case (as described above)
- ability to give specific preventive advice on biosecurity, hygiene and prophylaxis following investigation of a complex case.

Minimum practical experience for year 2 (based on 12 months spent in stage; increased *pro* rata for extended stage):

General investigation of clinical cases	250 cases (including 200 in the species of interest)
Identification of microbiological isolates	500 isolates (including 400 in the species of interest)
Use of serological or molecular diagnostic	150 tests (including 100 in the species of

techniques	interest)

Assessments:

Workplace-based assessments	satisfactory (a minimum of 18 with at least 12 being from Directly Observed Practical Skills section)
FRCPath Part 1	pass
Educational Supervisor's report	satisfactory

Stage C

Stage C of training is a minimum of 12 months full-time equivalent, unless extended training is required. The aims of this stage are to:

- develop increasing levels of confidence and the ability to work in appropriate contexts without direct supervision in veterinary microbiology
- satisfactorily complete all areas of the veterinary microbiology curriculum including that related to their chosen species group.

Competencies required to complete stage C:

- independent evaluation of clinical cases covering all organ systems, selection of samples, use of appropriate isolation techniques and microbial identification methods
- use of a wide range of techniques to recover specimens for diagnosis from a variety of anatomical locations both ante and post mortem
- ability to write an appropriate report for a wide range of clinical situations
- use of a range of specialised serological and molecular diagnostic methods appropriate to the chosen species group
- ability to demonstrate effective time management and task prioritisation
- independent evaluation and investigation of more complex cases
- ability to write a report including appropriate clinico-microbiological correlation for a more complex case (as described above)
- ability to give specific preventive advice on biosecurity, hygiene and prophylaxis following investigation of a complex case
- ability to demonstrate knowledge of specialist species group
- experience of teaching less experienced trainees.

Recommended minimum practical experience for year 3 (based on 12 months full-time equivalent spent in stage; increased *pro rata* for extended stage):

General investigation of clinical cases	250 cases (including 200 in the species of interest)
Identification of microbiological isolates	500 cases (including 400 in the species of interest)
Use of serological or molecular diagnostic techniques	150 cases (including 100 in the species of interest)

Assessments:

Workplace-based assessments	satisfactory (a minimum of 18 with at least 12 being from Directly Observed Practical Skills section)
FRCPath Part 2	pass
Educational Supervisor's report	satisfactory

OPTIONAL TRAINING

Research Methodology
Trainees are encouraged to actively participate in research during their training programme. Where possible an option to be involved in an original piece of research work should be included in the training programme.

The aims of this option should be to:

- prepare a trainee to undertake research within their job plan after completion of training
- enable traineesto recognise 'good research' of a type that might influence their clinical work.

Competencies required:

- ability to apply the fundamentals of the scientific process and evidence-based medicine
- ability to apply the ethical principles of research on humans, animals and tissue
- ability to design a research study that is recognised by peers and colleagues as relevant and well-constructed
- ability to review and critically analyse research and summarise its limitations and applications in clinical practice.

Practical experience:

- a 3-month attachment, preferably in a single block of time, which is likely to be within an academic department, although some non-academic departments may also be able to offer this training with appropriate facilities and expertise. Training may be offered during stages B or C of training
- design a research study, including addressing ethical and funding issues, which is recognised by the research supervisor as relevant and well-constructed
- if appropriate, write a scientific paper or book chapter that is peer reviewed and assessed by the research supervisor as being suitable for submission for publication.

TRAINING PROGRAMMES

Training programmes should be reviewed regularly by the Veterinary Microbiology Specialty Advisor who is appointed by the Veterinary Pathology SAC and accountable to its Chairman. This will enable all training centres to offer the same standards of training, and allow SAC members to offer assistance, where necessary, to the primary training centre.

Training programmes should include suitable rotational arrangements to cover all the necessary areas of the curriculum and an appropriate balance between general and specialist microbiology interests, such that each trainee gains the breadth of training required for satisfactory completion of the curriculum. The exact arrangements will vary according to the size of the department, the number of trainees on the training programme and the material accessible at the centre.

Each trainee should have an identified Educational Supervisor who has overall oversight and responsibility for their complete training programme. The Educational Supervisor should usually be the programme coordinator at their main training centre. A trainer is any person involved in training the trainee (e.g. microbiologist, laboratory scientist). A trainee may be trained by a number of trainers during their training.

If there is a breakdown of relationship between a trainee and their Educational Supervisor and the matter is not resolved to the trainee's satisfaction, then he/she should seek further

advice from an appropriate line manager at the centre where they are working. As a last resort, trainees can seek advice from the College through the Veterinary Microbiology Specialty Advisor.

TRAINING REGULATIONS

This section of the curriculum outlines the training regulations for Veterinary Microbiology.

Less than full time training
It is accepted that in some training environments and under some circumstances training in veterinary microbiology will occur as a less than full-time activity for well-founded individual reasons

Less than full time trainees should accept two important principles:

- less than full time training shall meet the same requirements (in depth and breadth) as full-time training
- the total duration and quality of less than full-time training of specialists must be not less than those of a full-time trainee.

In other words, a less than full-time trainee will have to complete the minimum training time for their specialty *pro rata*.

Trainees must have their less than full-time training agreed by the College in advance of beginning their less than full-time training.

Research
Some trainees may wish to spend a period of time in research after entering veterinary microbiology training.

Research undertaken prior to entry to a veterinary microbiology training programme
Trainees who have undertaken a period of research that includes clinical work directly relevant to the veterinary microbiology curriculum in the five years prior to entering a training programme may be able to have this period, or part thereof, recognised towards the time needed to complete training. Trainees should contact the Veterinary Microbiology Speciality Advisor.

Overseas training
Non-UK based veterinary microbiology trainees are welcome to attempt the FRCPath examinations. It is in their interests to familiarise themselves with this curriculum and ensure that their training programme meets the appropriate standards. If in doubt, trainees should contact the Veterinary Microbiology Speciality Advisor.

RATIONALE

Purpose of the curriculum
The purpose of the curriculum for specialty training in veterinary microbiology is to set the standards required by The Royal College of Pathologists for attainment of Fellowship of the College and to ensure that successful candidates are fully prepared to work independently as veterinary microbiologists.

The educational programme should provide opportunities for candidates to acquire or develop:

- **The habit of lifelong learning** by a combination of reading, literature searches, consultation with colleagues, attendance at scientific meetings, and the presentation of his/her own scientific work as part of his/her continuing professional development
- **Factual knowledge** of general microbiology including pathogenesis and disease processes with specific knowledge of bacteriology, mycology and virology
- **Interpretive skills**, both clinical and laboratory based skills, such that clinically useful opinions can be produced from clinical specimens and from the findings of microbial isolation and identification
- **Familiarity with health and safety regulations** (including COSHH) relating to veterinary microbiology, such that the working environment is safe both for themselves and for their colleagues
- **Sufficient technical knowledge** of the selection and collection of specimens, the isolation and processing of microbial isolates using both classical and molecular techniques and the selection of suitable antimicrobial agents, to be able to interact appropriately with colleagues responsible for the technical work and the clinical care of the cases
- **Understanding of information technology** sufficient to be able to use computers for producing microbiology reports, to search databases, access e-mail and internet services
- **Critical skills for the assessment of published literature** and, where possible, to contribute to the advancement of such knowledge
- **Management and communication skills** in order to interact appropriately with medical, scientific, technical and clerical colleagues in the workplace and eventually to function as a team leader, if so requested
- **Responsibility for their standard of professional practice** with an awareness of their own limitations, the benefits of team working, and the requirements for continuing professional development stipulated by the Royal College of Pathologists.

CURRICULUM DEVELOPMENT

This curriculum was originally developed in 2017 by the Veterinary Microbiology Curriculum Working Party with input from the Specialty Advisory Committee (SAC) on Veterinary Microbiology.

The content of this curriculum was derived from current UK University- and industry-based residency programmes in veterinary microbiology. Educational Supervisors and trainees were involved in its development via their representation on various College committees such as the Veterinary Microbiology SAC and the Trainees Advisory Committee (TAC).

This version of the curriculum is designed to be trainee-focussed, to allow trainees to take control of their own learning and to measure achievement against objectives. It will help in the formulation of a regularly updated education plan, in conjunction with an Educational Supervisor.

The curriculum was agreed by the Veterinary Pathology SAC on 04 August 2017 and approved by the Council of The Royal College of Pathologists on 07 September 2017.

CONTENT OF LEARNING

The curriculum details the level of knowledge and its application, skill and professional behaviour that a trainee should acquire and demonstrate in practice to provide a high quality service as a veterinary microbiologist.

The general professional and specialty-specific content of the curriculum is outlined below.

1. Basic knowledge and skills (see Appendix 1)
2. Veterinary microbiology (see Appendix 2)
3. Species specialist areas of veterinary microbiology (see Appendices 3 and 4)

The curriculum outlines the knowledge, skills, behaviours and expertise that a trainee is expected to obtain in order to achieve Fellowship of the Royal College of Pathologists.
Upon satisfactory completion of the veterinary microbiology training programme, the trainee must have acquired and be able to demonstrate:

- appropriate professional behaviour necessary to be able to work as a veterinary microbiologist
- good working relationships with colleagues and appropriate communication skills required for the practice of veterinary microbiology
- knowledge, skills and attitudes required to act in a professional manner at all times
- the knowledge, skills and behaviours required to provide appropriate teaching and to participate in effective research to underpin veterinary microbiology practice
- management skills required for the running of a veterinary microbiology laboratory
- familiarity with health and safety regulations, as applied to the work of a veterinary microbiology department.

PURPOSE OF ASSESSMENT

The Royal College of Pathologists' mission is to promote excellence in the practice of microbiology and to be responsible for maintaining standards through training, assessments, examinations and professional development.

The purpose of The Royal College of Pathologists' assessment system in veterinary microbiology is to:

- indicate the capability and potential of a trainee through tests of applied knowledge and skill relevant to the specialty
- demonstrate readiness to progress to the next stage(s) of training having met the required standard of the previous stage
- provide feedback to the trainee about progress and learning needs
- support trainees to progress at their own pace by measuring a trainee's capacity to achieve competencies for their chosen career path
- help to identify trainees who should change direction or leave the specialty
- promote and encourage learning
- gain Fellowship of The Royal College of Pathologists
- assure the public that the trainee is ready for and capable of unsupervised professional practice.

METHODS OF ASSESSMENT

Trainees will be assessed in a number of different ways during their training. Satisfactory completion of all assessments and examinations will be monitored and will be one of the criteria upon which eligibility to progress will be judged. Completion of appropriate workplace-based assessments and a pass in the FRCPath examinations are required to become a Fellow of the College.

FRCPath examination
The major summative assessments will occur during Stage B (FRCPath Part 1 examination) and towards the end of Stage C (FRCPath Part 2 examination).

Workplace-based assessment
Trainees will be expected to undertake workplace-based assessment throughout their training in veterinary microbiology, regardless of chosen species group. These are considered to be an essential and significant element of specialist training. Workplace-based assessment is the assessment of a trainee's professional skills and attitude and will provide evidence of appropriate everyday clinical competences. The Royal College of Pathologists supports and is fully committed to the development and implementation of workplace-based assessment as standard practice in all specialties and it forms an important part of assessing the competency of trainees, and ensuring that they are making satisfactory progress. The principle is that trainees are assessed on work that they are actually doing and that, as far as possible, the assessment is integrated into their day-to-day work.

In general, workplace-based assessments are designed to be formative in nature with written assessment made against stated criteria and as such they are best suited to determine educational progress in different contexts. To this end, it is strongly recommended that workplace-based assessment be carried out regularly throughout training to assess and document a trainee's progress. Some workplace-based assessments may be self assessment by the trainee, but some may be carried out by the Educational Supervisor, manager or more senior trainee. At least one formal face to face meeting with the trainee's Educational Supervisor should be carried out annually. Moreover, a minimum number of 'satisfactory' workplace-based assessments should be completed during each stage of training (see relevant section). The general format of workplace-based assessment should be included for review in the training programme submitted to the Veterinary Microbiology Specialty Advisor.

These should include at least the prescribed number of:

- Case-based Discussion (CbD)
- Directly Observed Practical Skills (DOPS)
- Evaluation of Clinical Events (ECE)
- Multisource Feedback (MSF)

OUTLINE OF THE WORKPLACE-BASED ASSESSMENT TOOLS

Case-based discussion (CbD)
Case-based discussion (CbD) is a way for trainees to present and discuss their cases with more experienced colleagues throughout their training and obtain systematic and structured feedback from the assessor. It is designed to assess decision-making and the application or use of their knowledge in relation to animal health where the trainee has been involved either clinically or through their laboratory involvement. It also enables the discussion of the ethical and legal framework of practice and it allows trainees to discuss why they acted as they did. The trainee and assessor jointly select a recent case with which the trainee has been significantly involved. The discussion, which will be centred on the trainee's documented involvement either in the clinical notes or laboratory records and reports, should take no longer than 15–20 minutes. The assessor will then spend 5–10 minutes providing immediate feedback. The assessor will complete the assessment form with the trainee present; it must be as soon as possible after the discussion takes place.

Direct observation of practical skills (DOPS)
Direct observation of practical skills (DOPS) is used for assessing competence in the practical procedures that trainees undertake. The assessments should be made by different

assessors and cover a wide range of procedures (please refer to the curriculum for topics). The observation takes place whilst the trainee undertakes the activity. The procedure being observed should last no more than 10–15 minutes before the assessment takes place. The assessor will then spend 5–10 minutes providing immediate feedback and completing the assessment form with the trainee present.

Evaluation of clinical/management events (ECE)
Evaluation of clinical/management events (ECE) is a tool used for assessing the trainee in the performance of their duties in complex tasks, often involving team working or interacting with other professional staff. Examples include presentation of cases at a clinical team meeting, participation in Problem Based Learning (see below) or contributing to quality assurance and audit processes in clinical and laboratory settings. The assessment takes place whilst the trainee undertakes the activity, the assessor will then spend 5–10 minutes providing immediate feedback. The assessor will complete the assessment form as soon as possible after the assessment takes place with the trainee present.

Multisource feedback
Multi-Source Feedback (MSF) is used to collect colleagues' opinions of a trainee's clinical performance and professional behaviour and it provides data for reflection and self-evaluation as part of Workplace Based Assessment. It should be carried out annually and at least eight respondents representing both professional and non-professional colleagues who have observed the trainee in the workplace should be selected. The outcome of the assessment should be discussed with the Educational Supervisor.

MODELS OF LEARNING

The majority of the curriculum will be delivered through work-based experiential learning, but trainees will also need to develop independent self-directed learning skills. It is the trainee's responsibility to seek opportunities for experiential learning and make opportunities for relevant off-the-job education by making provision for attendance at local, national and, where appropriate, international meetings and courses. The trainee should ensure that all such training is fully recorded. The training programme may also allow for participation in research projects and this is to be encouraged.

Independent self-directed learning should be encouraged by, for example, making use of e-learning, or providing reference textbooks, etc. Learning for knowledge, competence, performance and independent action will be achieved by assessment and graded responsibility for reporting, allowing trainees at various stages of training to acquire responsibility for independent reporting.

LEARNING EXPERIENCES

The following teaching/learning methods will be used to identify how individual objectives will be achieved. The trainee should ensure that all such training is fully recorded.

- **Routine work/work based experiential learning:** the most important learning experience will be day-to-day work. Veterinary microbiology trainees will be closely supervised especially in the early stages of training. This close supervision allows frequent short episodes of teaching by mentors and trainers, which may hardly be recognised as such by trainees.
- **Textbooks:** veterinary microbiology departments should have a wide range of reference texts available. These should allow trainees to 'read around' routine cases that they are reporting. Veterinary microbiology is a subject requiring a great deal of background learning and reading, as well as the practical experience gained within

day-to-day working, and trainees should take every advantage to 'read around' their subject.

- **Private study/formal study:** more systematic reading of textbooks and journals will be required in preparation for examinations.
- **Regional and national CPD and training courses:** provided by a variety of organisations including Second Generation Multiplex (SGM), Society for Applied Microbiology (SfaM), Royal Society of Biology (RSoB), Institttue of Biomedical Science (IBMS) and the American Study of Microbiology (ASM), all of which are valuable learning opportunities. Trainees should be released from rotas and duties to attend.
- **Scientific meetings:** research and the understanding of research are essential to the practice of microbiology. Trainees should be encouraged to attend and present their work at relevant meetings.
- **Discussion with laboratory staff:** laboratory staff can provide excellent training, particularly in relation to laboratory methods, health and safety, service delivery, procurement and human resources.
- **Externships at other establishments:** attachments of this kind may be required to provide an all-round training and to complement in-house training for example where certain species or types of case are less common.
- **E-learning:** where available, e-learning material can often provide useful background information.
- **Learning with peers:** trainees should be encouraged to work together within their own centre or in external networks to share experience.
- **Problem based learning:** in problem-based learning (PBL) students use "triggers" from a problem case or scenario to define their own learning objectives. Subsequently they do independent, self directed study before returning to the group to discuss and refine their acquired knowledge.
- **Practical laboratory experience.**
- **Formal postgraduate teaching.**
- **Independent self-directed learning.**

SUPERVISION AND FEEDBACK

Specialist training must be appropriately supervised by the senior microbiology and scientific staff on a day-to-day basis under the direction of a designated Educational Supervisor (FRCPath or equivalent).

Trainees will usually work under the supervision of an experienced veterinary microbiologist gradually widening their knowledge and experience in each area so that by the time they have passed the FRCPath Part 2 examination they are able to work largely independently. The day-to-day supervised training will be supplemented by more formal teaching and on regionally and nationally organised training courses (see above).

If a veterinary microbiology report generated by the trainee states that they have been supervised by an experienced veterinary microbiologist, this is usually taken to mean that the supervising microbiologist has examined that report with the trainee. It also implies that the supervising microbiologist accepts not only the microscopic but also any macroscopic description as accurate, even if the Educational Supervisor has not personally reviewed the specimen. However, there is also a more general level of supervision in day-to-day work. A trainee may ask for assistance at any time if a specimen with which they are dealing is unfamiliar or unusual. Supervision also extends to working relationships and communication within and beyond the veterinary microbiology department.

Educational supervision is a fundamental conduit for delivering teaching and training. It takes advantage of the experience, knowledge and skills of Educational Supervisors/trainers and their familiarity with microbiological situations to guide and steer the learning process of the trainee.

The College expects all trainees reaching the end of their training to demonstrate competence in supervision of junior colleagues. The College also acknowledges that the process of gaining competence in supervision starts at an early stage in training, with trainees potentially supervising veterinary students and/or technicians, and late-stage trainees supervising more junior trainees.

The role of the Educational Supervisor is to:

- have overall educational and supervisory responsibility for the trainee in a given post
- ensure that the trainee is familiar with the curriculum relevant to the year/stage of training of the post
- ensure that the trainee has appropriate day-to-day supervision appropriate to their stage of training
- ensure that the trainee is making the necessary clinical and educational progress during the post
- ensure that the trainee is aware of the assessment system and undertakes it according to requirements
- act as a mentor to the trainee and help with both professional and personal development
- agree a training plan with the trainee and ensure that an induction (where appropriate) has been carried out soon after the trainee's appointment
- discuss the trainee's progress with each trainer with whom a trainee spends a period of training
- undertake regular formative/supportive appraisals with the trainee (two per year, approximately every six months) and ensure that both parties agree to the outcome of these sessions and keep a written record
- regularly inspect the trainee's training record, inform trainees of their progress and encourage trainees to discuss any deficiencies in the training programme, ensuring that records of such discussions are kept

In order to become an Educational Supervisor, a veterinary microbiologist must have a demonstrated interest in teaching and training and recognise that it is part of their professional duty. Educational Supervisors should have access to appropriate teaching resources and are expected to keep up-to-date with developments in postgraduate medical training. They should have access to the support and advice of their senior colleagues regarding any issues related to teaching and training and to keep up-to-date with their own professional development. All such training and continuing professional development should be recorded.

MANAGING CURRICULUM IMPLEMENTATION

The curriculum outlines the minimum training requirements for delivery in a suitable training programme. It guides Educational Supervisors as to what is required to deliver the curriculum and guides trainees in the learning and assessment methods required for satisfactory completion of training.

It is the responsibility of the head of department at each training centre, to ensure that the programme delivers the depth and breadth of training outlined in the curriculum.

It is the responsibility of the educational supervisor of a particular post or attachment within a programme to ensure that the training delivered in their post meets the requirements of the relevant section(s) of the curriculum. The Educational Supervisor must undertake regular educational appraisal with their trainee, at the beginning, middle and end of a section of training, to ensure structured and goal-oriented delivery of training.

Trainees must register with the Royal College of Pathologists on appointment to a veterinary microbiology training programme. It is the trainee's responsibility to familiarise themselves with the curriculum and assessment requirements both for the satisfactory completion of each stage of training. They must be familiar with all aspects of the assessment system; workplace-based assessment and the FRCPath examination. It is the trainee's responsibility to ensure that they apply in good time for any assessments and examinations that demand an application.

CURRICULUM REVIEW AND UPDATING

The curriculum will be evaluated and monitored by The Royal College of Pathologists as part of continuous feedback from Examiners, Specialty Advisors, trainers and trainees.

The curriculum will be formally reviewed in the first instance within 2 years of publication. In reviewing the curriculum, opinions will be sought from the College's SAC on Veterinary Microbiology, its related subspecialty sub-committees, the Trainees Advisory Committee, and its Fellows and Registered Trainees.

Any significant changes to the curriculum will need the approval of The Royal College of Pathologists' Council.

EQUALITY AND DIVERSITY

The Royal College of Pathologists is committed to the principle of diversity and equality in employment, membership, academic activities, examinations and training as underpinned by the Equality Act 2010.

Integral to our approach is the emphasis we place on our belief that everyone should be treated in a fair, open and honest manner. Our approach is a comprehensive one and reflects all areas of diversity, recognising the value of each individual. We aim to ensure that no one is treated less favourably than another on the grounds of gender, race, age, sexual orientation, gender reassignment, disability, pregnancy and maternity, religion and belief and marriage and civil partnership. Our intention is to reflect not only the letter but also the spirit of equality legislation.

Further detail is available in the College's Equality and Diversity policy available on the College website.

ACKNOWLEDGEMENTS

Development of this draft curriculum was dependent on input from numerous veterinary microbiologists including a number of Fellows of the Royal College of Pathologists, whose input is gratefully acknowledged.

APPENDIX 1: PROFESSIONAL PRACTICE CURRICULUM FOR VETERINARY MICROBIOLOGY

This section outlines the generic knowledge, skills and attitudes that are tailored to and required for specialist training in veterinary microbiology and the competencies acquired in relation to the practice of veterinary microbiology. It is intended that trainees follow this curriculum for their entire training period in veterinary microbiology.

GOOD CLINICAL CARE

Objective: to demonstrate adequate knowledge and skills and appropriate attitudes in routine clinical work.

New specialists will:

- have the breadth of knowledge and skills to take responsibility for safe clinical decisions
- have the self-awareness to acknowledge where the limits of their competence lie and when it is appropriate to refer to other senior colleagues for advice
- have the potential (or the ability) to take responsibility for clinical governance activities, risk management and audit in order to improve the quality of service provision.

Clinical history and laboratory records

Knowledge	Assessment Methods
Describe and explain the appropriate content of clinical records	CbD, DOPS
Explain the relevance of data protection in maintaining confidentiality	CbD, DOPS
Skills	
Take and analyse a clinical history in a relevant succinct and logical manner	CbD, DOPS
Communicate with owners, farm and animal care staff using appropriate language	CbD, DOPS
Produce accurate reports with clear conclusions and other written correspondence	CbD, DOPS
Behaviours	
Show empathy with owners	CbD, DOPS
Reflect the importance of timely and accurate communication with clinicians	CbD, DOPS

Investigations including imaging	
Knowledge	**Assessment Methods**
Define the pathophysiological basis of investigations	CbD, DOPS
Define the indications for investigations	CbD, DOPS
Define the risks and benefits of investigations	CbD, DOPS
Know the clinical and cost effectiveness of individual investigations	CbD, DOPS
Skills	
Use and perform appropriate investigations	CbD, DOPS
Correctly interpret the results of investigations	CbD, DOPS
Liaise and discuss investigations with colleagues and advise them appropriately	CbD, DOPS
Behaviours	
Demonstrate the importance of team-working with other veterinary and animal care staff	CbD, DOPS
Be able to provide explanations to animal owners as to the rationale for investigations, and possible unwanted effects	CbD, DOPS

Treatment (therapeutics)	
Knowledge	**Assessment Methods**
Outline scientific theory relating to pharmacology and the pathophysiology of therapeutic interventions for infection	CbD, DOPS
Skills	
Assess accurately the animals' needs	CbD, DOPS
Behaviours	
Clearly and openly explain treatments and side effects of drugs	CbD, DOPS

Time Management	
Knowledge	**Assessment Methods**
Explain which case/tasks take priority	CbD, DOPS
Skills	
Appropriately prioritise important tasks	CbD, DOPS
Work more efficiently as clinical skills develop	CbD, DOPS
Recognise when falling behind and re-prioritise or ask for help	CbD, DOPS
Behaviours	
Have realistic expectations of tasks to be completed by self and others	CbD, DOPS
Willingness to consult and work as part of a team	CbD, DOPS

Decision making	
Knowledge	**Assessment Methods**
Identify clinical priorities for investigation and management	CbD, DOPS
Demonstrate sufficient clinical and microbiology knowledge to enable integration of clinical data and pathological features	CbD, DOPS
Be aware of the extent of one's own limitations and know when to ask for advice	CbD, DOPS
Skills	
Analyse and advise on clinical infection problems	CbD, DOPS
Correctly interpret test results in the context of available clinical information	CbD, DOPS
Have a clear understanding of sources of advice on technical, professional, ethical and personal problems and when to seek help	CbD, DOPS
Behaviours	
Be flexible and willing to change in the light of changing conditions	CbD, DOPS
Be willing to ask for help	CbD, DOPS
Consult and admit mistakes	CbD, DOPS
Critically appraise the available clinical and laboratory data in coming to diagnostic/treatment decisions	CbD, DOPS

Values, ethics and law	
Knowledge	**Assessment Methods**
Ensure that all decisions and actions are in the best interests of the animals	CbD, DOPS
Practise in accordance with an appropriate knowledge of contemporary legislation	CbD, DOPS
Act with appropriate professional and ethical conduct in challenging situations	CbD, DOPS
Skills	
Seek out and utilise opportunities for health promotion and disease prevention	CbD, DOPS
Based on an understanding of risk, be able to apply epidemiological and microbiological knowledge to improve animal and public health	CbD, DOPS
Recognise important issues in disease prevention and take opportunities to raise these issues with colleagues and animal owners or care	CbD, DOPS
Professional responsibility with regards to notifiable, reportable and Genetically Modified Organism infections	CbD, DOPS
Behaviours	
Respond to people in an ethical, honest, and non-judgmental manner	CbD, DOPS
Use appropriate methods of ethical reasoning to come to a balanced decision where complex and conflicting issues are involved	CbD, DOPS
Appreciate the importance of psychological, financial and social factors in animal treatment	CbD, DOPS

Policy, research and change	
Knowledge	**Assessment Methods**
Be aware of current UK legislation, surveillance and disease control schemes	CbD, DOPS
Be aware of and maintain an up- to-date knowledge of research evidence supporting your practice	CbD, DOPS
Describe and explain research methods and how to evaluate scientific publications including the use and limitations of different methodologies for collecting data	CbD, DOPS
Know how to access resources to promote better animal health	CbD, DOPS

and welfare	
Skills	
Be able to access and make use of appropriate population, demographic, socio-economic and health data	CbD, DOPS
Conduct an assessment of herd or individual animal health needs and where appropriate apply these in practice	CbD, DOPS
Demonstrate the ability to use a broad range of scientific and policy publications relating to delivering services	CbD, DOPS
Behaviours	
Evaluate issues and potential solutions before acting	CbD, DOPS

Life-long learning	
Knowledge	**Assessment Methods**
Describe and explain in practice the importance of continuing professional development	CbD, DOPS
Skills	
Recognise and use learning opportunities	CbD, DOPS
Able to maintain a professional portfolio	CbD, DOPS
Monitor own performance through audit and feedback	CbD, DOPS
Behaviours	
Be self-motivated and eager to learn	CbD, DOPS
Show willingness to learn from colleagues and to accept constructive feedback	CbD, DOPS

Managing resources	
Knowledge	**Assessment Methods**
Describe and explain how financial pressures are experienced by the department and are managed	CbD, DOPS
Skills	
Demonstrate the ability to respond effectively in terms of delivering services	CbD, DOPS
Behaviours	
Demonstrate awareness that in addition to specific clinical records, clinical staff also have responsibilities for other records (e.g. research)	CbD, DOPS

Risk management

Knowledge	Assessment Methods
Describe and explain risk assessment, perception and relative risk	CbD, DOPS
Skills	
Balance risks and benefits	CbD, DOPS
Behaviours	
Be truthful and admit error to colleagues	CbD, DOPS

Managing people

Knowledge	Assessment Methods
Describe and explain: • relevant legislation (e.g. equality and diversity, health and safety, employment law) and local human resource policies • the duties, rights and responsibilities of an employer, and of a co-worker (e.g. looking after occupational safety of fellow staff) • individual performance review purpose, techniques and processes, including difference between appraisal, assessment and revalidation	CbD, DOPS
Skills	
• prepare rotas; delegate; organise and lead teams • contribute to the recruitment and selection of staff • contribute to staff development and training, including mentoring, supervision and appraisal	CbD, DOPS
Behaviours	
Demonstrate: • a willingness to supervise the work of less experienced colleagues • commitment to good communication whilst also inspiring confidence and trust	CbD, DOPS

Media awareness

Knowledge	Assessment Methods
Explain the importance of media awareness and public communications training and where to obtain it	CbD, DOPS
Skills	
Recognise situations when it may be appropriate to implement such training and/or seek further advice	CbD, DOPS
Behaviours	
Act professionally and be willing to ask for help	CbD, DOPS

TEACHING AND TRAINING

Objective: to demonstrate the knowledge, skills and attitudes to provide appropriate teaching and to participate in effective research.
New specialists will:

- be able to demonstrate the potential to teach and train effectively at all levels of undergraduate and postgraduate education where required
- demonstrate skills and strategies in the process of feedback to colleagues and trainees, ensuring positive and constructive outcomes
- be capable of judging competence and professional attributes in others.

To have the skills, attitudes and practices of a competent teacher	
Knowledge	**Assessment Methods**
To have the skills, attitudes and practices of a competent teacher	CbD, DOPS, ECE
Skills	
Identify adult learning principles	CbD, DOPS, ECE
Identify learner needs	CbD, DOPS, ECE
Ability to structure a teaching activity	CbD, DOPS, ECE
Employ varied teaching strategies	CbD, DOPS, ECE
Identify learning styles	CbD, DOPS, ECE
Identify principles of evaluation	CbD, DOPS, ECE
Behaviours	
Identify learning outcomes	ECE
Design and plan an effective teaching event	ECE
Communicate effectively with learners	ECE
Teach large and small groups effectively	ECE
Demonstrate giving constructive effective feedback	ECE
Accurate maintenance of relevant records, particularly for any self-directed activities	ECE

To be able to plan and analyse a research project	
Knowledge	**Assessment Methods**
Describe and explain the principles of performing a research study	CbD, DOPS, ECE
Use appropriate statistical methods	CbD, DOPS, ECE

Describe and explain the principles of research ethics and the structure and function of local research ethics committees	CbD, DOPS, ECE
Describe and explain how to write a scientific paper	CbD, DOPS, ECE
Describe and explain the principles of research funding and how to obtain it	CbD, DOPS, ECE
Skills	
Prepare a systematic critical review of scientific literature	CbD, DOPS, ECE
Frame questions to be answered by a research project	CbD, DOPS, ECE
Develop protocols and methods for research	CbD, DOPS, ECE
Demonstrate use of databases	CbD, DOPS, ECE
Demonstrate accurate analysis of data	CbD, DOPS, ECE
Write a scientific paper	CbD, DOPS, ECE
Demonstrate good written and verbal presentation skills	CbD, DOPS, ECE
Participate as part of a team involved in a research project or two case reports by the end of training, and be able to demonstrate their role in its publication or presentation	CbD, DOPS, ECE
Behaviours	
Demonstrate curiosity and a critical spirit of enquiry	ECE
Ensure confidentiality at all times	ECE
Describe and explain the importance of ethical approval and patient consent for clinical research	ECE
Humility	ECE

WORKING WITH COLLEAGUES

Objective: to demonstrate good working relationships with colleagues and appropriate communication skills.

New specialists will:

- strive for continuing improvement in all aspects of their work and that of colleagues while mindful of priorities and high standards
- have effective interpersonal skills that enable them to bring out the best in colleagues, to resolve conflicts when they arise and to develop working relationships within the team
- support teams that bring together different professions and disciplines and other agencies, to provide high quality healthcare
- develop an understanding of leadership by drawing on values, strengths and abilities to deliver high standards of care.

Working with multi-disciplinary teams	
Knowledge	**Assessment Methods**
Use specific techniques and methods that facilitate effective and empathic communication	CbD, DOPS, ECE
Appropriately apply facilitation and conflict resolution methods	CbD, DOPS, ECE
Skills	
Communicate effectively. Seek advice if unsure	CbD, DOPS, ECE
Recognise when input from another specialty is required	CbD, DOPS, ECE
Work effectively with other professionals, including demonstration of material at meetings	CbD, DOPS, ECE
Respect skills and contribution of colleagues	CbD, DOPS, ECE
Recognise and work within own limitations	CbD, DOPS, ECE
Recognise when to delegate	CbD, DOPS, ECE
Show leadership and supervise safely	CbD, DOPS, ECE
Behaviours	
Show respect for opinions of others	ECE
Be conscientious and work cooperatively	ECE
Respect colleagues, including non-medical professionals, and recognise good advice	ECE
Recognise and work within own limitations	ECE
Show recognition of a team approach and willingness to	ECE

consult and work as part of a team

Communication with colleagues

Knowledge	Assessment Methods
Communicate with other members of the microbiology department, and other departments	CbD, DOPS, ECE
Communicate appropriately in writing, through letters and reports	CbD, DOPS, ECE
Justify when to phone a referring vet or client	CbD, DOPS, ECE
Skills	
Use appropriate language	CbD, DOPS, ECE
Select an appropriate communication method	CbD, DOPS, ECE
Behaviours	
Be prompt and respond courteously and fairly	ECE

Complaints

Knowledge	Assessment Methods
Show awareness of the local complaints procedures	CbD, DOPS, ECE
Show an awareness of systems of independent review	CbD, DOPS, ECE
Skills	
Anticipate potential problems	CbD, DOPS, ECE
Manage dissatisfied colleagues	CbD, DOPS, ECE
Behaviours	
Act with honesty and sensitivity and promptly	ECE
Prepared to accept responsibility when appropriate	ECE

Creating an environment in which mistakes can be openly discussed and lessons learned

Knowledge	Assessment Methods
Show awareness of good diagnostic and laboratory practices in place within institutions	CbD, DOPS, ECE
Skills	
Recognise the advantages and disadvantages of guidelines	CbD, DOPS, ECE
Report and investigate critical incidents	CbD, DOPS, ECE

Self-awareness

Knowledge	Assessment Methods
Describe and explain: • ways in which individual behaviours impact on others; personality types, group dynamics, learning styles, leadership styles • methods of obtaining feedback from others	CbD, DOPS, ECE
Skills	
Maintain and routinely practice critical self-awareness, including ability to discuss strengths and weaknesses with Educational Supervisor, recognising external influences and changing behaviour accordingly	CbD, DOPS, ECE
Show awareness of and sensitivity to the way in which cultural and religious beliefs affect approaches and decisions, and to respond respectfully	CbD, DOPS, ECE
Behaviours	
Recognise and show respect for diversity and differences in others	ECE

Self-management

Knowledge	Assessment Methods
Appropriately apply tools and techniques for managing stress	CbD, DOPS, ECE
Recognise the role and responsibility of occupational health and other support networks	CbD, DOPS, ECE
Recognise the limitations of self-professional competence	CbD, DOPS, ECE
Skills	
Recognise the manifestations of stress on self and others and know where and when to look for support	CbD, DOPS, ECE
Balance personal and professional roles and responsibilities	CbD, DOPS, ECE
Prioritise tasks, having realistic expectations of what can be completed by self and other	CbD, DOPS, ECE
Behaviours	
Be conscientious, able to manage time and delegate appropriately	ECE
Recognise personal health as an important issue	ECE

Self-development	
Knowledge	**Assessment Methods**
Describe local processes for dealing with and learning from errors	CbD, DOPS, ECE
Acknowledge the importance of best practice, transparency and consistency	CbD, DOPS, ECE
Skills	
Use a reflective approach to practice with an ability to learn from previous experience	CbD, DOPS, ECE
Use assessment, appraisal, complaints and other feedback to discuss and develop an understanding of own development needs	CbD, DOPS, ECE
Behaviours	
Be prepared to accept responsibility when appropriate	ECE
Show commitment to continuing professional development which involves seeking training and self-development opportunities, learning from colleagues and accepting constructive criticism	ECE

Acting with integrity	
Knowledge	**Assessment Methods**
Describe the professional, legal and ethical codes pertaining to the trainee's specialty	CbD, DOPS, ECE
Skills	
Recognise, analyse and know how to deal with unprofessional behaviours in colleagues	CbD, DOPS, ECE
Create open and non-discriminatory professional working relationships with colleagues	CbD, DOPS, ECE
Demonstrate awareness of the need to prevent bullying and harassment	CbD, DOPS, ECE
Behaviours	
Acceptance of professional regulation	ECE
Promotion of professional attitudes and values	ECE
Act with probity and willingness to be truthful and to admit errors	ECE

Applying knowledge and evidence	
Knowledge	**Assessment Methods**
Describe and explain how to evaluate scientific publications including the use and limitations of different methodologies for collecting data based on an understanding of research methods	CbD, DOPS
Skills	
Demonstrate comparing and benchmarking services	CbD, DOPS
Use a broad range of scientific publications relating to delivering services	CbD, DOPS
Behaviours	
Evaluate issues and potential solutions before acting	CbD, DOPS

HEALTH

Objective: to understand the importance of personal health.

New specialists will:

- act quickly and effectively if they have reason to believe that their own or a colleague's conduct, performance or health may put animals, colleagues or study data at risk.

Personal health

Knowledge	Assessment Methods
Describe and explain the occupational health services	CbD, DOPS, ECE
Describe and explain your responsibilities to staff	CbD, DOPS, ECE
Skills	
Recognise when personal health takes priority over work pressures and to be able to take the necessary time off	CbD, DOPS, ECE
Behaviours	
Recognise personal health as an important issue	ECE

Stress

Knowledge	Assessment Methods
Describe the effects of stress	CbD, DOPS, ECE
Describe and explain support facilities for veterinarians	CbD, DOPS, ECE
Skills	
Develop appropriate coping mechanisms for stress and ability to seek help if appropriate	CbD, DOPS, ECE
Behaviours	
Record any indications of stress on self and others	ECE

PROBITY

Objective: to be able to demonstrate probity in all aspects of professional practice.

New specialists will:

- always act in their personal and professional lives to maintain public trust in the profession
- undertake duties such as writing reports, giving evidence and completing and signing documents in a timely, honest and conscientious way
- through their leadership encourage the development and practice of these qualities in their colleagues

Service information

Knowledge	Assessment Methods
Explain the legal framework for advertisements	CbD, DOPS, ECE
Skills	
Produce clear and accurate advertisements and supporting paperwork	CbD, DOPS, ECE
Behaviours	
Demonstrate the absolute importance of accuracy and impartiality	ECE

Writing reports and giving evidence

Knowledge	Assessment Methods
Describe and explain pathological data required to produce reports and prepare written or oral evidence	CbD, DOPS, ECE
Skills	
Produce clear and accurate oral and written reports	CbD, DOPS, ECE
Behaviours	
Show honesty and integrity	ECE
Demonstrate timeliness	ECE

Research

Knowledge	Assessment Methods
Describe methodologies applied to research projects	CbD, DOPS, ECE
Skills	
Understand the importance of appropriate licences for any work involving animals, and how to obtain ethical approval	CbD, DOPS, ECE
Behaviours	
Conduct research with honesty and integrity	ECE

Financial dealings	
Knowledge	**Assessment Methods**
Explain the financial basis of microbiological investigations	CbD, DOPS, ECE
Skills	
Monitor annual budget information	CbD, DOPS, ECE
Behaviours	
Manage funds for the purpose for which they are intended	ECE
Declare conflicts of interest	ECE

APPENDIX 2: SPECIALTY-SPECIFIC VETERINARY MICROBIOLOGY CURRICULUM – Stage A

INTRODUCTION

For many trainees, this period of training represents their first exposure to laboratory medicine and how it is applied to common infectious disease problems. During this period there will be training in bacteriology, mycology and virology. It is expected that there should be a period of instruction under supervision to provide an introduction to laboratory procedures. This introductory period should equip the trainee with the fundamental knowledge and skills for the safe practice of veterinary microbiology. Knowledge will also be acquired through attendance at courses and by self-directed learning. All such training should be recorded.

The general veterinary microbiology curriculum outlines the training requirements for all trainees. Specialty requirements are detailed in Appendices 2a-e.

All trainees are expected to undertake training in the basic knowledge and skills of veterinary microbiology in their chosen speciality. This includes bacteriology, mycology and virology (during stages A and B).

Trainees are also expected to have some exposure to more specialised techniques used in these disciplines and prophylactic measures including biosecurity, vaccines, pre- and pro-biotics, phage therapy and antimicrobials as part of their general microbiology training.

Expected training during Stage A of training

There is no intention to use this appendix as a measure of aptitude or achievement. It is simply an indication of the range and level of experience that could be reasonably expected of a trainee in Stage A. In serving as an indicator, the list should be interpreted in the light of workload and case-mix in the training institution.

The curriculum for this stage is divided into two sections:

- fundamental skills
- core knowledge

FUNDAMENTAL SKILLS

Objective: To acquire sufficient knowledge of laboratory techniques to underpin clinical practice.

By the end of this stage, and before proceeding to Stage B of training, the trainee should:

- have gained a thorough understanding of laboratory and clinical health and safety practice
- have gained understanding and experience in the safe handling of clinical samples in the post-mortem room and the laboratory
- have gained a basic understanding of quality assurance in the diagnostic laboratory
- have developed core reporting skills, under supervision,
- have sufficient understanding of bacteriology, mycology and virology to offer basic advice on the interpretation of laboratory results
- be able to manage common veterinary emergencies relevant to their clinical practice (MRCVS only)
- understand the role of the microbiologist in disease surveillance and in the detection of exotic or new and emerging disease outbreaks
- understand the importance of taking the required actions and the submission of the appropriate samples to the relevant diagnostic services and reference laboratories in a timely manner in the detection reporting of notifiable diseases and knowledge of the corresponding legislation
- understand the role of the veterinary microbiologist in controlling zoonotic diseases and their role in the whole public health team
- understand the role of the veterinary microbiologist in managing risk in the food chain
- be able to function as part of a multidisciplinary team
- recognise disease emergencies and start to understand how to manage them
- understand the importance of clinical governance including clinical audit and risk management

Objective: To support the trainee's practice of microbiology, the candidate should have developed a basic understanding of:

- Epidemiology
- Aetiology and pathogenesis
- Immunity
- Clinical features
- Diagnostic techniques
- Microbial isolation and identification
- Prophylactic measures
- Major complications of treatment

It is important that sufficient basic knowledge of major processes of infection and immunity, and AMR is gained at this early stage. This should include topics such as: role of normal flora, innate and adaptive immunity, microbial pathogenesis, the effects of genetics and the environment in health and disease, the effect of antimicrobial agents and vaccines.

Only candidates that are Members of the Royal College of Veterinary Surgeons (MRCVS) will be permitted to make a clinical diagnosis under the Veterinary Surgeons Act (1966).

CORE KNOWLEDGE

Objective: to achieve sufficient understanding of laboratory microbiology and virology to offer basic advice on relevant investigations, infection control procedures and interpretation of results.

Basic biology relevant to microorganisms and infection

Knowledge	Assessment Methods
Explain basic biology (structure, genetics, taxonomy, epidemiology) of major bacterial, viral, fungal agents	CbD
Compare and contrast cellular and humoral immunity	CbD
Explain basics of the immune response to infection	CbD
Explain innate, adaptive and maternally derived immunity	CbD
Explain the basis of how vaccines work	CbD
Explain the basics of molecular biology	CbD
Explain the basis of genetic susceptibility to pathogens and disease	CbD
Skills	
Use knowledge of basic biology to justify investigations, infection prevention and control procedures and interpretation of results	CbD, DOPS
Behaviours	
Enthusiastic approach to learning and application of knowledge	CbD, DOPS

Host pathogen relationships

Knowledge	Assessment Methods
Explain: • the basis of how the immune response protects against infection, and how it may contribute to pathogenesis of infectious diseases • the basis of different types of host/parasite relationships, e.g. symbiosis, viral latency, quasispecies, evolution, etc. • how immunodeficiency and immunosuppression affect susceptibility to and control of infectious diseases • pathogenic mechanisms involved in infectious diseases and the role of host response in immunopathology • how environmental conditions and husbandry practices affect infectious diseases	CbD, DOPS

Skills	
Use knowledge of host/pathogen relationships to analyse clinical presentation of infections and justify investigations and interpretations of results	CbD, DOPS
Behaviours	
Demonstrate an enthusiastic approach to learning and application of knowledge	CbD, DOPS

Laboratory safety	
Knowledge	**Assessment Methods**
Explain basic laboratory hazards and precautions against them	CbD, DOPS
Skills	
Demonstrate working safely in a laboratory	CbD, DOPS
Behaviours	
Recognise safe working practices	CbD, DOPS

ACDP classification of pathogens	
Knowledge	**Assessment Methods**
Explain principles of standard precautions, hazard groups and containment levels	CbD, DOPS
Skills	
Demonstrate working safely in a laboratory at appropriate ACDP/SAPO containment level	CbD, DOPS
Behaviours	
Demonstrating working safely	CbD, DOPS

Standards of practice	
Knowledge	**Assessment Methods**
Describe and explain the importance and relevance of standards to good laboratory practice	CbD, DOPS
Understand the evidence base behind standard operating procedures (SOPs) and the importance of audit and quality control to establish validity	CbD, DOPS
Behaviours	
Maintain good rapport with both laboratory and clinical staff	CbD, DOPS

Basic principles of diagnostic microbiology	
Knowledge	**Assessment Methods**
Describe and explain: • safety considerations when handling diagnostic materials that may contain hazardous organisms • sampling, testing and biosecurity considerations for suspect cases of notifiable diseases • basic methods of handling microbiological specimens and isolates • the range of tests available, and the circumstances in which they are used • common methods of microbial identification • methods of sample collection ante and *post-mortem, suitable for different diagnostic technologies* • basic techniques for serodiagnosis in infectious diseases • nucleic acid-based detection system such as polymerase chain reaction (PCR) • understand the differences between conventional real-time pcR, quantitude real time pcR and reverse transcriptase pcR(, as currently used for many diagnostic assay systems • rapid pen-side tests such as Loop-mediated isothermal amplification (LAMP), lateral flow devices • mass-spectrometry techniques such as Matrix Assisted Laser Desorption/Ionisation (MALDI)/Tracheo-Oesophageal Fistula (TOF) • Next-generation sequencing (NGS) / high throughput sequencing) as currently used and potential future developments and uses • understand molecular epidemiological techniques – Multilocus sequence typing (MLST), Pulsed-field gel electrophoresis (PFGE), Variable number tandem repeat (VNTR), Next-generation sequencing (NGS) etc • simple antimicrobial and antiviral susceptibility testing and its interpretation • the basic principles behind drug selection and development of resistance • the genetics of virulence and antibiotic resistance	CbD, DOPS
Skills	
• perform sample processing for simple microbiology and virology specimens according to SOPs • identify common viral/microbial pathogens with confirmation of identity, and distinction between clinically significant and non-significant pathogens • perform simple antimicrobial sensitivity assays and interpret the results	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Clinical syndromes – advice and management	
Knowledge	**Assessment Methods**
Outline the principles of epidemiology, presentation, diagnosis and management of infectious diseases: • respiratory tract infections • gastrointestinal infections • skin and soft tissue infection • musculo-skeletal infections • eye infection • infection of the heart and circulatory system • infection of the nervous system • infections in pregnancy, including implications for mother and fetus (risk periods) • genitourinary tract infection including sexually transmitted infections • congenital infection and infection acquired perinatally • exotic, epidemic and transboundary diseases • vector-borne diseases • zoonotic and food-borne-zoonotic diseases	CbD, DOPS
Skills	
Demonstrate taking relevant basic clinical or infection history	CbD
Manage (under supervision) microbiological support for diagnosis and treatment of common clinical syndromes	CbD
Behaviours	
Establish rapport with and explain results and clinical management plans simply and effectively to owners, animal care or farm staff	CbD
Maintain good rapport with clinical colleagues	CbD

Treatment and prevention strategies	
Knowledge	**Assessment Methods**
Explain: • the range of therapies available for infectious disease, the clinical indications for their use and their side effects • the classification of antimicrobial agents • in detail the mechanism of action of common antimicrobial agents and mechanisms for development of resistance to these agents • the basic principles of prophylaxis, both with antimicrobials and with immune globulins (immunoglobulins) • the use of common vaccines and the schedules of immunisation • DIVA vaccines	CbD, DOPS

Skills	
Demonstrate knowledge of treatment and prevention strategies in the management of clinical infection under supervision	CbD, DOPS
Behaviours	
Demonstrate an enthusiastic approach to learning	CbD, DOPS

Infection prevention and control

Knowledge	**Assessment Methods**
Describe routes of transmission and methods of controlling common and important diseases, including: • OIE listed diseases • zoonoses • reportable diseases • notifiable diseases • SAPO diseases	CbD
Describe issues surrounding the control of disease associated with international trade	CbD
Describe the principles and practice of veterinary disease surveillance of endemic disease and for detection of exotic or emerging disease outbreaks	CbD
Describe issues surrounding the public health risks of zoonotic disease through direct exposure or the food-borne route	CbD
Skills	
Demonstrate knowledge of epidemiology, immunology, microbiology, veterinary surveillance, biosecurity and methods of disease control in the management of disease outbreaks	CbD, DOPS
Behaviours	
Liaise effectively with practising and government veterinary staff, with border and public health authorities	CbD, DOPS

Sterilisation, cleansing and disinfection	
Knowledge	**Assessment Methods**
Describe the basis of the different methods available for: • pre-operative sterilization • decontamination following disease outbreaks on farms and other animal environments • decontamination of environmental sources	CbD, DOPS
Behaviours	
Enthusiastic approach to learning	CbD
Maintain good rapport with laboratory staff	CbD
Liaise effectively with owners, clinical, farm and animal care staff	CbD

APPENDIX 3: SPECIALTY-SPECIFIC VETERINARY MICROBIOLOGY CURRICULUM – Stages B and C

INTRODUCTION

This period of training in veterinary microbiology will consist of consolidation of clinical and laboratory work started in Stage A. Flexibility at this stage will be encouraged to reflect the needs of the trainee and may additionally include modules such as epidemiology, veterinary public health, research, time in another laboratory, etc.

The precise composition of an individual training programme should be agreed by the trainee and their Educational Supervisor. It should be structured around the past experience and aspirations of each trainee and should set out educational objectives against which progress can be assessed and recorded. Programmes should identify how specific areas of training not covered by the departments involved will be obtained (e.g. secondment for experience in virology, veterinary surveillance/epidemiology, public health microbiology), and together with any courses deemed necessary.

LABORATORY ASPECTS OF MICROBIOLOGY

Objective: to be competent in the management of the microbiology laboratory.

Basic principles

Knowledge	Assessment Methods
Describe principles of: • choosing a laboratory test • sending samples to the laboratory • requirements for and importance of full and accurate documentation of sample origins	CbD, DOPS
Skills	
Process all routine specimens received in the laboratory	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Collection, preservation and transportation	
Knowledge	**Assessment Methods**
Describe methods of safely collecting and transporting specimens to arrive in good condition for culture	CbD, DOPS
Skills	
Collect specimens using appropriate techniques and equipment for the relevant /chosen diagnostic method(s)	CbD, DOPS
Transport to the laboratory using the correct transport medium (as appropriate)	CbD, DOPS
Demonstrate the use of appropriate methods of transport depending on the level of hazard, required storage conditions (temperature) etc	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Understanding of appropriate staining and culture techniques	
Knowledge	**Assessment Methods**
Describe full range of methods for initial isolation and identification	CbD, DOPS
Skills	
Process all routine specimens received in the laboratory and carry out further tests necessary for full identification of pathogens	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Antimicrobial susceptibility testing	
Knowledge	**Assessment Methods**
Describe current techniques for susceptibility testing including E- test, broth dilution and automated methodologies with appropriate quality control	CbD, DOPS
Describe and explain methods of antiviral susceptibility testing	CbD, DOPS
Skills	
Perform simple susceptibility tests	CbD, DOPS
Provide clinical advice based on interpretation of the results of susceptibility testing	CbD, DOPS

Analyse use and limitations of the antibiogram for outbreak investigation and control	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Understand serological and antigen-based techniques	
Knowledge	**Assessment Methods**
Describe the basis and clinical interpretation of results of latex agglutination, ELISA, immunofluorescence, CFT, virus neutralising antibody testing, AGID, HI, latex agglutination, immunofluorescence, immunoblotting, and the various controls	CbD, DOPS
Skills	
Perform simple serological tests	CbD, DOPS
Provide clinical advice based on interpretation of the results of serology at individual and herd levels	CbD, DOPS
Behaviours	
Maintain good rapport with laboratory staff	CbD, DOPS

Molecular diagnostic techniques	
Knowledge	**Assessment Methods**
Describe the principles of current clinically used nucleic acid-based techniques including conventional or real-time PCR and reverse transcriptase (RT)-PCR, the significance of quantitative PCR and techniques used for sequence analyses and comparisons for molecular epidemiology	CbD, DOPS
Describe the contribution of molecular epidemiology to controlling animal and human disease (e.g. pathogen identification, surveillance and vaccine selection)	CbD, DOPS
Skills	
Provide clinical advice based on interpretation of the results of nucleic acid-based techniques	CbD, DOPS
Describe the selection of appropriate tests taking account of their advantages and limitations	CbD, DOPS
Behaviours	
Establish close rapport and understanding with laboratory staff, including reference laboratory staff where appropriate	CbD, DOPS

Knowledge of automated and semi-automated methodologies in microbiology	
Knowledge	**Assessment Methods**
Describe automated culture and identification methodologies	CbD, DOPS
Skills	
Demonstrate competence in the use of the use of automated robotic extraction for nucleic acids and high throughput assay systems for ELISA and real time PCR	CbD, DOPS

Point-of-care testing	
Knowledge	**Assessment Methods**
Describe the issues surrounding the clinical governance including quality assurance of pen-side or in-clinic testing	CbD, DOPS

Virological techniques	
Knowledge	**Assessment Methods**
Describe and explain: • Virus isolation and storage • Electron microscopy • Haemagglutination • Histopathology	CbD, DOPS

Bacteriological techniques	
Knowledge	**Assessment Methods**
Describe and explain: • Direct identification • Bacterial culture	CbD, DOPS

Mycological techniques	
Knowledge	**Assessment Methods**
Describe and explain: • Direct identification • Mycological culture	CbD, DOPS

Knowledge of typing methods available	
Knowledge	**Assessment Methods**
Explain the principles, advantages and limitations of various phenotypic, serological and genotypic methods	CbD, DOPS
Describe the role of typing in incident/outbreak investigations	CbD, DOPS

Skills	
Demonstrate the ability to recommend appropriate typing methods for clinical situations and interpret the results	CbD, DOPS

Reference centres

Knowledge	Assessment Methods
Describe the indications for referral of specimens to reference facilities	CbD, DOPS
Describe regulations for transportation of samples	CbD, DOPS
Describe requirements for suspect samples of notifiable diseases	CbD, DOPS
Explain the importance of complete and accurate sampling data and documentation	CbD, DOPS
Skills	
Refer specimens to reference lab appropriately	CbD, DOPS
Behaviours	
Establish rapport and understanding with laboratory staff	CbD, DOPS

Principles of laboratory management
External bodies/Institutions relevant to service and their role

Knowledge	Assessment Methods
Explain: • external quality control schemes (e.g. ISO17025 accreditation) and auditing/quality assurance • internal quality control and internal quality assurance • commercially available laboratory computer systems • staff performance management and appraisals • wider organisational issues, e.g. reorganization of surveillance programmes	CbD, DOPS
Skills	
Demonstrate the ability to: • work effectively as part of a team • appropriate time management • decision making and prioritisation skills • negotiation skills • manage underperformance	CbD, DOPS
Behaviours	
Establish rapport and understanding with laboratory staff	CbD, DOPS

KNOWLEDGE OF HEALTH AND SAFETY

Objective:

- to obtain an in-depth understanding of health and safety issues both locally and nationally in order to practise safely in a laboratory and in a clinical or other setting and to advise on safe practice
- to obtain an understanding of risk assessment for dealing with category 3 and 4 pathogens and be familiar with the requirements for handling of such pathogens.

Health & safety

Knowledge	Assessment Methods
Describe and explain the current legislative framework underpinning health and safety (H&S) at work, including: • Health and Safety at Work Act (1974) • Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) (2013) • Control of Substances Hazardous to Health (COSHH) Regulations (2002) • Genetically Modified Organisms (Contained Use) Regulations (2014) • The Specified Animal Pathogens Order (2008) • Management of Health and Safety at Work Regulations (1999)	CbD, DOPS
Explain principles of standard precautions, personal protection equipment and containment	CbD, DOPS
Explain biosecurity – Laboratory, farm etc	CbD, DOPS
Explain the use of hazard groups and the ACDP and SAPO classification of pathogens and relevant regulations e.g. restrictions on subsequent contacts	CbD, DOPS
Explain the terms and give examples of: • notifiable disease • reportable disease	CbD, DOPS
Explain the importance of training, health surveillance, written procedures and equipment testing to maintaining a safe working environment	CbD, DOPS
Skills	
Perform risk assessments when required for all procedures undertaken in the clinic, the laboratory, the abattoir and on farm, for all categories of worker, including the pregnant and immunocompromised	CbD, DOPS
Demonstrate working safely in different safety environments	CbD, DOPS
Demonstrate working safely in a laboratory at appropriate ACDP containment level	CbD, DOPS

Behaviours	
Demonstrate putting safety first	CbD, DOPS

APPENDIX 4 A-G

SPECIES SPECIFIC MICROBIOLOGY

Trainees will be expected to have studied the microbiology of infectious diseases in a range of commonly kept animal species and in wildlife. They will also be expected to be able to apply this knowledge to other species when encountered.

The species specific curricula are intended as a guide only to the range of skills and knowledge that are required and are not intended to be exhaustive.

Objective: By the end of the educational programme, trainees would be expected to provide microbiological advice on diagnosis, treatment and prevention of infectious disease in one of the following classes of animal:

- Small domestic animals (dog, cat)
- Large domestic animals (cattle, sheep, goat, deer, horse, pig)
- Laboratory animals/small pets (rabbit, rat, mouse, guinea pig, hamster, dog, non-human primate)
- Birds (poultry, game birds, cage birds, wild birds)
- Fish (farmed and ornamental)
- Wildlife
- Equids

APPENDIX 4A - SMALL DOMESTIC ANIMALS (DOGS AND CATS)

NORMAL FLORA

Microbiota

Knowledge and skills	Assessment Methods
Describe and explain what isolates should be expected in normal flora and what would suggest an abnormality For example: • interpreting the presence of *Campylobacter* or *Salmonella* in faeces • prevalence levels of antibacterial resistance, e.g. bacterial species or hosts of the bacteria	CbD, DOPS

GENERALISED INFECTIONS

Pyrexia of unknown origin

Knowledge and skills	Assessment Methods
Describe and explain approaches to: • differential diagnosis • diagnostic plan	CbD, DOPS

EXOTIC DISEASE

Diseases not currently present in the UK that pose a threat in imported animals

Knowledge and skills	Assessment Methods
Describe and explain the implication of movement of animals under the PETS Scheme and the infectious disease that might be imported.	CbD, DOPS

VETERINARY PRACTICE

CbD, DOPS

Knowledge and skills	Assessment Methods
Describe and explain the role of the microbiologist in supporting the work of veterinary practices including advising on supporting diagnosis, monitoring post-operative complications and on the development of protocols.	CbD, DOPS

SMALL ANIMAL ANTIMICROBIAL CHEMOTHERAPY

Basic action

Knowledge and skills	Assessment Methods
Describe and explain: • their mode of action • microbial killing and microbial growth inhibition • synergistic and antagonistic reactions • resistance	CbD, DOPS

Antibacterial drugs

Knowledge and skills	Assessment Methods
Describe and explain: • spectra of activity • bacterial sensitivity testing • use of combinations of antimicrobial drugs	CbD, DOPS

Pharmacokinetics

Knowledge and skills	Assessment Methods
Describe and explain: • routes of administration and rates of absorption • distribution to the site of infection • excretion of antibacterial drugs • dosing regimens • inhibitors of antibacterial drug action	CbD, DOPS

Adverse effects

Knowledge and skills	Assessment Methods
Describe and explain pharmacodynamic considerations in avoiding adverse reactions	CbD, DOPS

Antibiotic resistance

Knowledge and skills	Assessment Methods
Describe and explain: • mechanisms • epidemiology • strategies to avoid development of AMR • prescribing and dosing regimes	CbD, DOPS

Antiviral drugs

Knowledge and skills	Assessment Methods
Describe and explain: • anti-herpes drugs • antiretroviral drugs	CbD, DOPS

Antifungal drugs

Knowledge and skills	Assessment Methods
Describe and explain: • therapeutic classification of antifungal drugs • antifungal drugs given topically • antifungal drugs given systemically	CbD, DOPS

Immunomodulators

Knowledge and skills	Assessment Methods
Describe and explain immunomodulators such as interferon for the treatment of canine parvovirus	CbD, DOPS

RESPIRATORY TRACT

Features

Knowledge	Assessment Methods
Describe and explain: • defence mechanisms • aetiology of respiratory tract disease • diagnosis	CbD, DOPS

Nasal infections

Knowledge and skills	Assessment Methods
Describe and explain: • general clinical features • acute nasal disease • chronic nasal disease • rhinitis/sinusitis • nasal mycoses	CbD, DOPS

Infections of the upper respiratory tract

Knowledge and skills	Assessment Methods
Describe and explain: • canine infectious respiratory disease and organisms implicated in its aetiology including canine respiratory coronavirus, parainfluenza virus, adenovirus, distemper virus, herpes virus, influenza virus, *Bordetella bronchiseptica*, *Mycoplasma* spp, and *Streptococcus zooepidemicus* • *zoonotic aspects of influenza virus in companion animals* cat 'flu and organisms implicated in its aetiology including feline calicivirus, feline herpes virus, *Bordetella bronchiseptica*, and *Chlamydophila feli*	CbD, DOPS

Infections of the lower respiratory tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • canine distemper • feline pox virus • bacterial infections • fungal infections	CbD, DOPS

Pleural and mediastinal infections	
Knowledge and skills	**Assessment Methods**
Describe and explain: • pyothorax • feline infectious peritonitis • feline leukaemia virus • pulmonary infection	CbD, DOPS

SKIN AND SOFT TISSUE

Bacterial skin disease	
Knowledge and skills	**Assessment Methods**
Describe and explain: • Pyoderma • detailed knowledge of common skin pathogens such as *Staphylococci* and *Streptococci* • cutaneous mycobacterial disease • awareness of less common pathogens	CbD, DOPS

Fungal skin disease	
Knowledge and skills	**Assessment Methods**
Describe and explain: • dermatophytoses • *Malassezia pachydermatis*	CbD, DOPS

Viral skin disease	
Knowledge and skills	**Assessment Methods**
Describe and explain knowledge of the canine papilloma virus	CbD, DOPS

Microbiological problems of the ear	
Knowledge and skills	**Assessment Methods**
Describe and explain: • the normal flora of the ear • microbiological investigation of otitis externa	CbD, DOPS

• common and less common pathogens

ALIMENTARY TRACT

Defence mechanisms	
Knowledge and skills	**Assessment Methods**
Describe and explain defence mechanisms in health and disease	CbD, DOPS

Oral cavity, pharynx, salivary glands	
Knowledge and skills	**Assessment Methods**
Describe and explain: • history and clinical features • diagnosis • causes and treatment	CbD, DOPS

Oesophagus	
Knowledge and skills	**Assessment Methods**
Describe and explain: • history and clinical features • diagnosis • causes and treatment	CbD, DOPS

Stomach	
Knowledge and skills	**Assessment Methods**
Describe and explain: • history and clinical features • diagnosis • causes and treatment	CbD, DOPS

Intestine	
Knowledge and skills	**Assessment Methods**
Describe and explain: • history and clinical features • diagnosis • causes and treatment	CbD, DOPS

PERITONEAL CAVITY

Basic features	
Knowledge and skills	**Assessment Methods**
Describe and explain aetiology and pathophysiology of peritonitis	CbD, DOPS

Septic peritonitis	
Knowledge and skills	**Assessment Methods**
Describe and explain: • causes and treatment history and clinical signs • diagnosis • treatment	CbD, DOPS

Feline infectious peritonitis	
Knowledge and skills	**Assessment Methods**
Describe and explain: • aetiology • pathogenesis • clinical features • differential diagnoses • diagnosis • treatment • prognosis • control and prevention	CbD, DOPS

LIVER, PANCREAS AND SPLEEN

Liver	
Knowledge and skills	**Assessment Methods**
Describe and explain: • bacterial cholangiohepatitis • leptospirosis • liver abscesses • *Bacillus piliformis* (Tyzzer's disease) • canine adenovirus • canine herpesvirus • feline coronavirus • toxoplasmosis	CbD, DOPS

MUSCULO-SKELETAL

Bacterial arthritis	
Knowledge and skills	**Assessment Methods**
Describe and explain: • lyme disease	CbD, DOPS

- mycoplasmal arthritis
- mycobacterial arthritis

Osteomyelitis

Knowledge and skills	Assessment Methods
Describe and explain: • bacterial osteomyelitis • fungal osteomyelitis • viral osteomyelitis	CbD, DOPS

Infective myopathies

Knowledge and skills	Assessment Methods
Describe and explain bacterial myopathies	CbD, DOPS

HEART AND CIRCULATORY SYSTEM

Infectious conditions

Knowledge and skills	Assessment Methods
Describe and explain: • pericardial infections • mycocardial infections • endocardial infections • bacteraemia and septicaemia	CbD, DOPS

HAEMOPOIETIC AND LYMPHORETICULAR SYSTEM

Infections associated with tumours

Knowledge and skills	Assessment Methods
Describe and explain: • feline leukaemia virus • other viral causes of neoplasia • lymphadenopathy	CbD, DOPS

Infections associated with anaemia

Knowledge and skills	Assessment Methods
Describe and explain: • viral causes of anaemia • bacterial causes of anaemia • other infectious causes of anaemia	CbD, DOPS

Infections associated with immunosuppression	
Knowledge	**Assessment Methods**
Describe and explain: • physical and laboratory investigations • feline immunodeficiency virus • other infectious causes of immunosuppression	CbD, DOPS

Infections associated with immune mediated diseases	
Knowledge	**Assessment Methods**
Describe and explain: • physical and laboratory investigations • leishmaniasis • ehrlichiosis	CbD, DOPS

NERVOUS SYSTEM

Diagnostic techniques	
Knowledge	**Assessment Methods**
Describe and explain: • lesion localisation • clinical pathology • CSF analysis	CbD, DOPS

Infections resulting in pain	
Knowledge and skills	**Assessment Methods**
Describe and explain: • bacterial meningoencephalitis • viral meningoencephalitis	CbD, DOPS

Infections resulting in focal signs	
Knowledge and skills	**Assessment Methods**
Describe and explain: • distemper • feline infectious peritonitis • feline leukaemia virus	CbD, DOPS

Infections resulting in altered behaviour or movement	
Knowledge and skills	**Assessment Methods**
Describe and explain: • rabies • borna disease • feline immunodeficiency virus • feline spongiform encephalopathy • feline parvovirus • tetanus • botulism	CbD, DOPS

GENITOURINARY TRACT INFECTION AND THE NEONATE

Urinary tract infections	
Knowledge and skills	**Assessment Methods**
Describe and explain: • routes of infection • defence mechanisms • aetiology • clinical features • diagnosis • treatment	CbD, DOPS

Renal infections	
Knowledge and skills	**Assessment Methods**
Describe and explain: • feline coronavirus • leptospirosis • canine herpesvirus • septicaemia/bacteraemia • FIV • FeLV	CbD, DOPS

Female reproductive tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • normal bacterial flora • juvenile vaginitis • vaginitis • cystic endometrial hyperplasia/pyometra • resorption/abortion • metritis • mastitis	CbD, DOPS

Male Reproductive tract

Knowledge and skills	Assessment Methods
Describe and explain: • posthitis • canine herpes virus • orchitis • epididymitis • bacterial prostatitis • prostatic abscessation	CbD, DOPS

Neonate

Knowledge and skills	Assessment Methods
Describe and explain: • septicaemia • viral infections • 'fading puppy/kitten syndrome', the pathogens involved	CbD, DOP

MULTI-ANIMAL ENVIRONMENTS

Basic knowledge

Knowledge and skills	Assessment Methods
Describe and explain: • factors determining the extent of disease • 'prevention is better than cure' • investigating outbreaks of infectious diseases	CbD, DOPS

Common infectious organisms

Knowledge and skills	Assessment Methods
Describe and explain: • the multifactorial nature of disease • method of dissemination	CbD, DOPS

Facilities

Knowledge and skills	Assessment Methods
Describe and explain: • construction • facilities • disinfection	CbD, DOPS

Management of facilities	
Knowledge and skills	**Assessment Methods**
Describe and explain the influence of: • numbers of animals • grouping animals • hygiene measures	CbD, DOPS

Breeding establishments	
Knowledge and skills	**Assessment Methods**
Describe and explain: • special considerations • requirements for kittening/whelping rooms	CbD, DOPS

Veterinary practice	
Knowledge and skills	**Assessment Methods**
Describe and explain: • types and causes of nosocomial infections • veterinary factors predisposing to spread of nosocomial infections • preventing nosocomial infections	CbD, DOPS

Developing protocols	
Knowledge and skills	**Assessment Methods**
Describe and explain how to provide advice and develop protocols for the prevention of diseases in multi-animal situations including: • antibiotic usage • kennel cough • MRSA/MRSP etc • canine parvovirus • feline respiratory viruses	CbD, DOPS

VACCINATION

Vaccination regimes	
Knowledge and skills	**Assessment Methods**
Describe and explain: • WSAVA and other vaccination guidelines • the concept of core and non-core vaccination • vaccines in use elsewhere, but not in the UK such as FIP and *Microsporum canis*	CbD, DOPS

Types of vaccine

Knowledge and skills	Assessment Methods
Describe and explain: • modified live vaccines • inactivated vaccines • adjuvants • DNA vaccines • sub-unit vaccines • autogenous vaccines • virus vectored • routes of administration	CbD, DOPS

Factors influencing vaccine efficiency

Knowledge and skills	Assessment Methods
Describe and explain: • revaccination • maternal antibodies • pre-existing infections • immune system function • human factors • environmental factors • off-label use of vaccines	CbD, DOPS

Risks of vaccination

Knowledge and skills	Assessment Methods
Describe and explain: • adverse reactions • lack of efficacy • investigation of suspected vaccine breakdowns • surveillance/DIVA assays	CbD, DOPS

Alternatives to vaccination

Knowledge and skills	Assessment Methods
Describe and explain: • isolation/biosecurity • pre- and pro-biotics • control of vectors and reservoir hosts • treatment • serological testing	CbD, DOPS

APPENDIX 4B - LARGE DOMESTIC ANIMALS

EXOTIC DISEASE

Diseases not currently present in the UK that pose a threat in imported animals

Knowledge and skills	Assessment Methods
Describe and explain the implication of international trade as a means of introducing exotic disease and the means of reducing the risk	CbD, DOPS
Show knowledge of SAPO regulations and diseases	CbD, DOPS
Describe and explain significant exotic diseases in all classes of farmed livestock including vesicular diseases Knowledge of recent and current threats • Bluetongue • Rabies • Contagious epididymitis and brucellosis • FMD • PPR • CSF • ASF • Aujeszky's disease • Anthrax • Bovine leucosis • Lumpy skin disease • Contagious agalactia • Contagious bovine pleuro-pneumonia • *Mycoplasma* spp. (*agalactiae, mycoides var capri, capricolum subsp capripneumoniae, Mycoides subspp mycoides* SC and LC vaients) • PPRS (genotype 2) • Sheep and goat pox • Swine vesicular disease • Viral encephalitis of horses • Teschen disease • Epizootic haemorrhagic disease • Glanders • Rift valley fever • Rinderpest • Equine infectious anaemia • Equine viral arteritis • Contagious equine metritis	CbD, DOPS

LARGE ANIMAL ANTIMICROBIAL CHEMOTHERAPY

Antibacterial drugs

Knowledge and skills	Assessment Methods
Describe and explain: • routes of administration and rates of absorption • distribution to the site of infection • excretion of antibacterial drugs • issues surrounding use in food producing animals • mechanism of action of major groups of antimicrobials	CbD, DOPS

Antibiotic resistance

Knowledge and skills	Assessment Methods
Describe and explain: • mechanisms • epidemiology • strategies to avoid development • alternatives to antibiotics	CbD, DOPS

Antifungal drugs

Knowledge and skills	Assessment Methods
Describe and explain: • classification of antifungal drugs • antifungal drugs given topically • antifungal drugs given systemically	CbD, DOPS

RESPIRATORY TRACT

Diseases of the upper and lower respiratory tract

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Pasteurella –(atrophic rhinitis, haemorrhagic septicaemia)* • *Bordetella* • *TB* • *RSV* • *Bovine herpesvirus (IBR)* • *Bovine respiratory syncytial virus (BRSV)* • *Mannheimia haemolytica* • *Histophilus somni* • *Mycoplasma* • *Influenza* • *Jaagsiekte sheep retrovirus* • *Pulmonary adenomatosis* • *Hemoplasma* • *Haemophilus parasuis*	CbD, DOPS

- *Actinobacillus pleuropneumoniae*

SKIN AND SOFT TISSUE

Bacterial skin disease

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Bluetongue* • *Bovine anaemia* • *Calf diphtheria* • *Digital dermatitis/foot rot* • *Epizootic haemorrhagic disease* • *Foot and mouth disease* • *New forest eye* • *Dermatophilus congolensis* • *Erysipelas* • *Caseous lymphadenitis* • *Clostridial toxaemias – Black leg etc.* • *Facial dermatitis (Greasy pig disease)*	CbD, DOPS

Fungal skin disease

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • Ringworm • Epizootic cutaneous pythiosis • Hyperkeratosis (Scopulariopsis)	CbD, DOPS

Viral skin disease

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • Viral papillomas • Orf	CbD, DOPS

ALIMENTARY TRACT

Oral cavity, pharynx, salivary glands

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by:	CbD, DOPS

- ASF
- CSF
- FMD
- *Actinobacillus – "wooden tongue"*
- *Fusobacterium necrophorum - (liver)*
- BTV
- *Actimomyces bovis*
- Bovine papular stomatitis
- Orf
- Mucormycosis
- Mucorales ruminitis

Oesophagus, stomach, intestine

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by:*Clostridium perfringens* • *Brachyspira* • *E. coli* • *Salmonella* • *Yersinia* • *Johne's disease* • *Rotavirus* • *Rift Valley fever* • *Orf*	CbD, DOPS

LIVER, PANCREAS AND SPLEEN

Liver

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Clostridium* • *Salmonella* • *E. coli* • *Fusobacterium necrophorum*	CbD, DOPS

MUSCULO-SKELETAL

Bacterial arthritis

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Haemophilus parasuis* • *Streptococcus suis* • *Erysipelas* *Mycoplasma spp*. • *Actinomyces* – lumpy jaw	CbD, DOPS

Osteomyelitis

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Salmonella* • *Corynebacterium pyogenes* • *Staphylococcus aureus* • *Mycoplasma (avian)*	CbD, DOPS

NERVOUS SYSTEM

Bacterial and viral diseases
TSEs

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • BSE • Scrapie • *Leptospira* • *Listeria* • Tetanus • Rabies • Botulism • *Streptococcus suis* • Louping ill	CbD, DOPS

GENITOURINARY TRACT INFECTION AND THE NEONATE

Urinary tract infections

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *E. coli* • *Klebsiella*	CbD, DOPS

Renal infections

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • *Corynebacterium renale* • *E. coli* • *Klebsiella* • *Eubacterium*	CbD, DOPS

Female reproductive tract

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • causes of abortion or early embryonic loss • teratogenic infections (vertical transmission) • *Brucellosis* • *Bovine viral diarrhoea virus* • Leptospirosis • Campylobacteriosis • Schmallenberg • *Chlamydophila abotus* • *E. coli* • *Salmonella* • *Streptococcus zoopeidemicus* • *Corynebacterium* • *Pseudomonas aeruginosa* • Bovine herpes virus • *Mycoplasma* • *Listeria* • Mycosis • Bluetongue • Schmallenberg virus • Akabane • Enzootic bovine leukosis	CbD, DOPS

Mastitis – Common causes

- *E. coli*
- *Streptococcus*
- *Staphylococcus*
- *Klebsiella*
- *Enterococcus*
- *Enterobacter*

Male Reproductive tract

Knowledge and skills	Assessment Methods
Describe and explain the history and clinical features, diagnosis, causes and treatment of significant diseases in all classes of farmed livestock caused by: • persistence of viruses in the testes • *Brucella* • *Blue tongue virus* • *Campylobacter*	CbD, DOPS

Neonate

Knowledge and skills	Assessment Methods
Describe and explain: • septicaemia • viral infections • bacterial infections • fungal infections • teratogenic infections	CbD, DOPS

CONTROL OF DISEASES OF THE HERD OR FLOCK

Basic knowledge

Knowledge and skills	Assessment Methods
Describe and explain: • biosecurity • factors determining the extent of disease • 'prevention is better than cure' • investigating outbreaks of infectious diseases	CbD, DOPS

Common infectious organisms

Knowledge and skills	Assessment Methods
Describe and explain: • the multifactorial nature of disease • method of dissemination	CbD, DOPS

Facilities

Knowledge and skills	Assessment Methods
Describe and explain: • construction • facilities • disinfection	CbD, DOPS

Management of facilities

Knowledge and skills	Assessment Methods
Describe and explain the influence of: • numbers of animals • grouping animals • hygiene measures	CbD, DOPS

VACCINATION

Types of vaccine

Knowledge and skills	Assessment Methods
Describe and explain: • modified live including GMO • autogenous • non-living (inactivated, recombinant or vectored, subunit) • adjuvants • routes of administration • knowledge of how vaccines are developed, assessed and licenced • multiple doses • licensing	CbD, DOPS

Factors influencing vaccine efficiency

Knowledge and skills	Assessment Methods
Describe and explain: • revaccination • maternal antibodies • pre-existing infections • immune system function • human factors • environmental factors • vaccine matching / serotype	CbD, DOPS

Risks of vaccination	
Knowledge and skills	**Assessment Methods**
Describe and explain: • adverse reactions • lack of efficacy • investigation of suspected vaccine breakdowns	CbD, DOPS

Alternatives to vaccination	
Knowledge and skills	**Assessment Methods**
Describe and explain: • isolation • movement controls • control of vectors and reservoir hosts • treatment • serological testing • slaughter/disposal	CbD, DOPS

APPENDIX 4C - LABORATORY ANIMALS

ANIMAL EXPERIMENTATION

Animal experimentation

Knowledge and skills	Assessment Methods
Describe and explain legislation (ASAP, 1986 and EU regulations), licensing, ethics, statistical validity, need for controls, use of model systems, for animal experimentation used in research or diagnosis, principles of 3Rs, relevance/ limitations of results in non-target species.	CbD, DOPS

NECROPSY AND DIAGNOSTIC TECHNIQUES

History and symptoms

Necropsy techniques and sampling

Blood sampling

Knowledge and skills	Assessment Methods
Describe and explain: • history taking in commercial and non-commercial settings • assessment of ante-mortem signs • humane end points • collection of necropsy material • methods for bacterial or viral culture of internal organs	CbD, DOPS

INFECTIOUS DISEASE IN LABORATORY COLONIES

Surveillance and disease control

Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • appropriate methodology for disease surveillance • appropriate methodology for disease control • quarantine • cleansing and disinfection • antimicrobial therapy	CbD, DOPS

ZOONOSIS

Risk to laboratory and animal handling staff

Knowledge and skills	Assessment Methods
Describe and explain the epidemiology, diagnosis and control of significant disease caused by: • Lymphocytic choriomeningitis virus • Hantaviruses • Salmonellosis • *Streptobacillus moniliformis*	CbD, DOPS

VIRAL INFECTIONS

DNA-viruses

Knowledge and skills	Assessment Methods
Describe and explain the epidemiology, diagnosis and control of significant disease caused by: • Parvoviruses • Adenoviruses • Poxviruses • Herpesviruses • Mouse cytomegalovirus	CbD, DOPS

RNA viruses

Knowledge and skills	Assessment Methods
Describe and explain epidemiology, diagnosis and control of significant disease caused by: • Coronaviruses • Mouse hepatitis virus • Sialodacryoadenitis virus • Rat coronavirus	CbD, DOPS

BACTERIAL INFECTIONS

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain the epidemiology, diagnosis and control of significant disease caused by: • *Pasteurellaceae* • *Clostridium piliforme* • *Helicobacter* • *Bordetella bronchiseptica* • *Cilia associated respiratory bacillus* • *Corynebacterium kutscheri* • *Citrobacter rodentium* • *Streptococcus spp* • *Staphylococci spp* • *Pseudomonas spp* • *Mycoplasma spp*	CbD, DOPS

APPENDIX 4D - POULTRY

NECROPSY AND DIAGNOSTIC TECHNIQUES

History and Symptoms
Necropsy techniques and sampling
Blood sampling

Knowledge and skills	Assessment Methods
Describe and explain: • history taking in commercial and non-commercial settings • assessment of *ante-mortem* signs • collection of necropsy material • methods for bacterial or viral culture of internal organs	CbD, DOPS

INFECTIOUS DISEASE IN FLOCKS

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • appropriate methodology for disease surveillance • appropriate methodology for disease control • quarantine • cleansing and disinfection • antimicrobial therapy • the role of wildlife in transmission	CbD, DOPS

VIRAL DISEASE

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • Avian polyomavirus • Duck viral enteritis • Turkey viral hepatitis • Corona virus enteritis • Cloacal papillomatosis • Psittacine beak and feather disease • Pacheco's disease • Proventricular dilatation disease • Poxvirus infections • Newcastle disease • Avian influenza • Infectious bronchitis • Infectious laryngotracheitis • Infectious leukosis virus • Marek’s disease	CbD, DOPS

BACTERIAL DISEASE

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • *Campylobacter* • *Salmonella* • *E. coli* • *Pasteurella spp* • *Mycoplasma spp* • *Mycobacterium avium* • *Staphylococcus aureus* • *Clostridial spp.* • *Brachyspira* • *ErysipelasCoryza* • *Chlamydophila*	CbD, DOPS

FUNGAL DISEASE

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • *Candida albicans* • *Apergillus* • *Cryptococcus* • *Rhodotorula mucilaginosa* • *Mucor, Absidia* and *Rhizopus*	CbD, DOPS

APPENDIX 4E - FISH (FARMED AND ORNAMENTAL)

IMMUNOLOGY OF FISH

Humoral immunity
Cell mediated immunity
Vaccination

Knowledge and skills	Assessment Methods
Describe and explain: • innate and adaptive immunity in different fish species • its implication for vaccine use	CbD, DOPS

NECROPSY AND DIAGNOSTIC TECHNIQUES

History and clinical signs and PME techniques and sampling
Blood sampling

Knowledge and skills	Assessment Methods
Describe and explain: • history taking in commercial and non-commercial settings • assessment of ante-mortem signs • collection of necropsy material • direct microscopic examination of fresh tissue smears and squash preparations • taking biopsy of gill, skin, and fin tissues • methods for bacterial or viral culture of internal organs	CbD, DOPS

INFECTIOUS DISEASE IN COMMERCIAL AQUACULTURE

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • appropriate methodology for disease • surveillance • appropriate methodology for disease control • quarantine • cleansing and disinfection • antimicrobial therapy	CbD, DOPS

INFECTIOUS DISEASE IN NON-COMMERCIAL AQUACULTURE

Surveillance and disease control
Treatment of infectious disease

Knowledge and skills	Assessment Methods
Describe and explain: • appropriate methodology for disease surveillance • appropriate methodology for disease control • quarantine • cleansing and disinfection • antimicrobial therapy	CbD, DOPS

Methods of delivering therapeutic treatment

Knowledge and skills	Assessment Methods
Describe and explain suitable methods of administering antibiotic and other treatments, including: • medicated food • injection • bath treatment	CbD, DOPS

BACTERIAL DISEASES

Surveillance, diagnosis and treatment

Knowledge and skills	Assessment Methods
Describe and explain: • goldfish ulcer disease and furunculosis in salmonids caused by *Aeromonas salmonicida* • vibriosis of cultured, aquarium, and wild marine fishes • yersiniosis (enteric redmouth disease) of intensively cultured salmonids caused by *Yersinia ruckeri* • enteric septicemia caused by *Edwardsiella ictaluri* • columnaris disease caused by *Flavobacterium columnarae* • coldwater (peduncle) disease in salmonids and other coldwater species caused by *Flavobacterium psychrophila* • bacterial gill disease in cultured salmonids and aquarium fish caused by *F. branchiophilum* • bacterial kidney disease caused by *Renibacterium salmoninarum* • gram-positive bacterial infections of aquarium fish caused by *Streptococcus* and related genera, *Lactococcus*, *Enterococcus*, and *Vagococcus* • mycobacteriosis of aquarium fish and cultured food fish • rickettsial diseases of salmonids, tilapia and sea bass	CbD, DOPS

VIRAL DISEASES

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain: • Carp pox caused by cyprinid herpesvirus-1 • Koi herpesvirus caused by cyprinid herpesvirus-1 • Channel catfish virus (CCV) disease caused by Ictalurid herpesvirus 1 • Infectious hematopoietic necrosis of salmonids caused by a novirhabdovirus • Viral haemorrhagic septicaemia of salmonids caused by a novirhabdovirus • Spring viraemia of carp caused by *Rhabdovirus carpio* in *Cyprinidae* • Lymphocystis disease of aquarium fish caused by an iridovirus known as Lymphocystivirus • Viral erythrocytic necrosis of marine fish and salmonids caused by erythrocytic necrosis virus • Epizootic erythropoietic necrosis (EHN) of redfin perch and rainbow trout caused by an iridovirus called epizootic haematopoietic necrosis virus • Largemouth bass virus caused by a ranavirus • Other iridovirus diseases of ornamental fish • Infectious salmon anaemia caused by an orthomyxovirus. • Infectious pancreatic necrosis virus of salmonid fry caused by a birnavirus	CbD, DOPS

FUNGAL DISEASES

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain: • Epizootic ulcer disease of freshwater and estuarine fish caused by the oomycete fungus, *Aphanomycetes invadens* • *Fusarium solani* infection in captive marine fish, particularly elasmobranchs • *Icthyophonus hoferi* infection of estuarine and marine fish, including ornamental species	CbD, DOPS

APPENDIX 4F - WILDLIFE

IMPORTANCE OF INFECTIOUS DISEASES OF WILDLIFE

Wildlife as reservoirs of disease for domestic animals

Knowledge and skills	Assessment Methods
Describe and explain: • diseases presenting a hazard to farm and companion animals • surveillance • epidemiology • control measures	CbD, DOPS

Wildlife as reservoirs of disease for man

Knowledge and skills	Assessment Methods
Describe and explain: • diseases presenting a hazard to the human population • surveillance • epidemiology • control measures	CbD, DOPS

Wildlife as potential sources of new and emerging zoonoses

Knowledge and skills	Assessment Methods
Describe and explain: • examples of diseases affecting man that have emerged from wildlife • mechanisms enabling the transfer of wildlife disease to man • vectors and climate change • potential future threats • strategies for prevention, surveillance and control	CbD, DOPS

Importance of infectious diseases in conservation

Knowledge and skills	Assessment Methods
Describe and explain: • diseases causing wild population decline • surveillance • epidemiology • control measures	CbD, DOPS

Clinical presentations	
Knowledge and skills	**Assessment Methods**
Describe and explain important examples of a range of clinical presentations in different animal classes	CbD, DOPS

VIRAL INFECTIONS

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain significant diseases caused by: • Adenovirus • Avian paramyxovirus • Bunyavirus • Calicivirus • Circovirus • Coronavirus • Filovirus • Flavivirus • Herpesvirus • Influenza virus • Lyssavirus • Morbillivirus • Orbivirus • Papillomavirus and polyomavirus • Parvovirus • Pestivirus • Picornavirus • Poxvirus • Retrovirus	CbD, DOPS

TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHIES

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain prion diseases	CbD, DOPS

BACTERIAL INFECTIONS

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain significant diseases caused by: • *Mycobacteria* • *Yersinia* • *Tularaemia* • *Pasteurella* • *Brucella* • *Bacillus anthracis* • *Chlamydiaceae* • *Borrelia* • *Rickettsiales* • *Mycoplasma* • *Escherichia* • *Salmonella* • *Campylobacter* • *Leptospira* • *Coxiella burnetii* • *Listeria* • *Clostridium* species and botulism	CbD, DOPS

FUNGAL INFECTIONS

Surveillance, diagnosis and treatment	
Knowledge and skills	**Assessment Methods**
Describe and explain: • aspergillosis • mycotoxicosis • chytridiomycosis	CbD, DOPS

APPENDIX 4G - EQUINE

GENERALISED INFECTIONS

Pyrexia of unknown origin

Knowledge and skills	Assessment Methods
Describe and explain approaches to: • differential diagnosis • diagnostic plan	CbD, DOPS

EXOTIC DISEASE

Diseases not currently present in the UK that pose a threat in imported animals

Knowledge and skills	Assessment Methods
Describe and explain the implication of movement of animals and the infectious disease that might be imported including: • Equine Infectious Anaemia, Equine Viral Arteritis, Contagious Equine Metritis, Glanders, West Nile virus, Hendra virus, Eastern Equine Encephalitis, Japanese Encephalitis, Rabies and African Horse Sickness • implication of international trade as a means of introducing exotic disease and the means of reducing the risk • knowledge of SAPO regulations and diseases • knowledge of significant exotic diseases in all classes of farmed livestock including vesicular diseases • knowledge of recent and current threats	CbD, DOPS

EQUINE ANTIMICROBIAL THERAPY

Basic action

Knowledge and skills	Assessment Methods
Describe and explain: • their mode of action • selective toxicity • microbial killing and microbial growth inhibition • synergistic and antagonistic reactions • resistance	CbD, DOPS

Antibacterial drugs

Knowledge and skills	Assessment Methods
Describe and explain: • spectra of activity bacterial sensitivity testing • combinations	CbD, DOPS

Pharmacokinetics

Knowledge and skills	Assessment Methods
Describe and explain: • routes of administration and rates of absorption • distribution to the site of infection • excretion of antibacterial drugs • dosing regimens • inhibitors of antibacterial drug action	CbD, DOPS

Adverse effects

Knowledge and skills	Assessment Methods
Describe and explain pharmacodynamic considerations in avoiding adverse reactions	CbD, DOPS

Antibiotic resistance

Knowledge and skills	Assessment Methods
Describe and explain: • mechanisms • epidemiology • strategies to avoid development	CbD, DOPS

Antiviral drugs

Knowledge and skills	Assessment Methods
Describe and explain: • anti-herpes drugs • antiretroviral drugs	CbD, DOPS

Antifungal drugs

Knowledge and skills	Assessment Methods
Describe and explain: • therapeutic classification of antifungal drugs • antifungal drugs given topically • antifungal drugs given systemically	CbD, DOPS

RESPIRATORY TRACT

Features	
Knowledge and skills	**Assessment Methods**
Describe and explain: • defence mechanisms • aetiology of respiratory tract disease • diagnosis	CbD, DOPS

Infections of the upper respiratory tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • equine herpesvirus • *Streptococcus equi* • *Streptococcus zooepidemicus* • *Streptococcus equisimilis* • equine viral arteritis • equine rhinovirus	CbD, DOPS

Infections of the lower respiratory tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • equine influenza virus • *Streptococcus zooepidemicus* • *Streptococcus pneumoniae* • *Rhodococcus equi*	CbD, DOPS

Pleural and mediastinal infections	
Knowledge and skills	**Assessment Methods**
Describe and explain equine pleuropneumonia	CbD, DOPS

SKIN AND SOFT TISSUE

Crusting/scaling dermatoses	
Knowledge and skills	**Assessment Methods**
Describe and explain: • bacterial disease • fungal disease • viral disease	CbD, DOPS

Papulonodular dermatoses	
Knowledge and skills	**Assessment Methods**
Describe and explain: • papillomavirus • bacterial causes	CbD, DOPS

Viral skin disease	
Knowledge and skills	**Assessment Methods**
Describe and explain papilloma virus	CbD, DOPS

CbD, DOPS

ALIMENTARY TRACT

Defence mechanisms	
Knowledge and skills	**Assessment Methods**
Describe and explain defence mechanisms in health and disease	CbD, DOPS

Oral cavity, pharynx, salivary glands	
Knowledge and skills	**Assessment Methods**
Describe and explain: • normal flora • infectious disorders	CbD, DOPS

Oesophagus	
Knowledge and skills	**Assessment Methods**
Describe and explain: • normal flora • infectious disorders	CbD, DOPS

Intestine	
Knowledge and skills	**Assessment Methods**
Describe and explain: • normal flora • infectious disorders • bacterial • viral	CbD, DOPS

PERITONEAL CAVITY

Basic features

Knowledge and skills	Assessment Methods
Describe and explain aetiology and clinical findings	CbD, DOPS

Septic peritonitis

Knowledge and skills	Assessment Methods
Describe and explain: • causes and treatment • history and clinical signs • diagnosis • treatment	CbD, DOPS

OCULAR INFECTIONS

Bacterial
Viral
Fungal

Knowledge and skills	Assessment Methods
Describe and explain: • conjunctivitis • keratitis • uveitis	CbD, DOPS

MUSCULO-SKELETAL

Infectious myositis
Cellulitis
Synovial Infections
Osteomyelitis

Knowledge and skills	Assessment Methods
Describe and explain: • aetiology • clinical findings • diagnosis • therapy	CbD, DOPS

HEART AND CIRCULATORY SYSTEM

Infectious conditions

Knowledge and skills	Assessment Methods
Describe and explain: • infective endocarditis • myocarditis • pericarditis	CbD, DOPS

HAEMOPOIETIC AND LYMPHORETICULAR SYSTEM

Neonatal sepsis

Knowledge and skills	Assessment Methods
Describe and explain: • predisposing factors • clinical signs • diagnosis • causative agents • therapy	CbD, DOPS

Infections associated with anaemia

Knowledge and skills	Assessment Methods
Describe and explain: • viral causes of anaemia • bacterial causes of anaemia • other infectious causes of anaemia	CbD, DOPS

Infections associated with immunosuppression

Knowledge and skills	Assessment Methods
Describe and explain: • physical and laboratory investigations • *S. zooepidemicus* • *Equine herpesvirus* • *Rhodococcus equi* • other infectious causes of immunosuppression	CbD, DOPS

Infections associated with immune mediated diseases

Knowledge and skills	Assessment Methods
Describe and explain: • physical and laboratory investigations • ehrlichiosis	CbD, DOPS

NERVOUS SYSTEM

Diagnostic techniques

Knowledge and skills	Assessment Methods
Describe and explain: • lesion localisation • clinical pathology • CSF analysis • therapy	CbD, DOPS

Infections	
Knowledge and skills	**Assessment Methods**
Describe and explain: • Equine protozoal myeloencephalitis • West Nile virus, Eastern equine encephalitis virus, Japanese Encephalitis virus and Hendra virus • Equine herpesvirus • Rabies	CbD, DOPS

GENITOURINARY TRACT INFECTION AND THE NEONATE

CbD, DOPS	
Knowledge and skills	**Assessment Methods**
Describe and explain: • contagious equine metritis • herpes virus	CbD, DOPS

Female reproductive tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • uterine infections • causes of abortion • bacterial (e.g. *Klebsiella/E. coli*) • viral • mastitis	CbD, DOPS

Male Reproductive tract	
Knowledge and skills	**Assessment Methods**
Describe and explain: • posthitis • orchitis • epididymitis • importance of equine viral arteritis virus	CbD, DOPS

Urinary Tract Infections	
Knowledge and skills	**Assessment Methods**
Describe and explain: • aetiology • pathogenesis • diagnosis • therapy	CbD, DOPS

MULTI-ANIMAL ENVIRONMENTS

Basic knowledge

Knowledge and skills	Assessment Methods
Describe and explain: • factors determining the extent of disease • 'prevention is better than cure' • biosecurity • investigating outbreaks of infectious diseases	CbD, DOPS

Common infectious organisms

Knowledge and skills	Assessment Methods
Describe and explain: • the multifactorial nature of disease • method of dissemination	CbD, DOPS

Facilities

Knowledge and skills	Assessment Methods
Describe and explain: • construction • facilities • disinfection	CbD, DOPS

Management of facilities

Knowledge and skills	Assessment Methods
Describe and explain the influence of: • numbers of animals • grouping animals • hygiene measures	CbD, DOPS

Breeding establishments

Knowledge and skills	Assessment Methods
Describe and explain special considerations	CbD, DOPS

Veterinary practice

Knowledge and skills	Assessment Methods
Describe and explain: • types and causes of nosocomial infections • veterinary factors predisposing to spread of nosocomial infections • preventing nosocomial infections	CbD, DOPS

VACCINATION

Types of vaccine

Knowledge and skills	Assessment Methods
Describe and explain: • modified live • non-living • adjuvants • DIVA • GMO • vector • routes of administration	CbD, DOPS

Factors influencing vaccine efficiency

Knowledge and skills	Assessment Methods
Describe and explain: • revaccination • maternal antibodies • pre-existing infections • i *Icthyophonus hoferi* infection of estuarine and marine fish, including ornamental species immune system function • human factors • environmental factors	CbD, DOPS

Risks of vaccination

Knowledge and skills	Assessment Methods
Describe and explain: • adverse reactions • lack of efficacy • investigation of suspected vaccine breakdowns	CbD, DOPS

Alternatives to vaccination

Knowledge and skills	Assessment Methods
Describe and explain: • isolation • control of vectors and reservoir hosts • treatment • serological testing	CbD, DOPS

APPENDIX 5: DIRECTED WORKPLACE-BASED ASSESSMENTS BY STAGES OF TRAINING AND OPTIONAL PACKAGES

The following are lists of examples of workplace-based assessments, from which should be selected appropriate examples to make up the 'directed' component of assessments during each stage of training. Each item in the lists is in fact a group of possible scenarios to be used, and each group may be used more than once as long as exact circumstances are not duplicated. Additionally, it can be seen that the lists are similar for each stage, but increase in complexity and/or depth as a trainee progresses through the stages of training.

Stage A

Directly Observed Practical Skills (DOPS):

Collection of samples for diagnosis

- Collect specimens from straightforward cases using appropriate techniques and equipment
- Transport to the laboratory using the correct transport media and methods of transport depending on the level of hazard

Staining and culture techniques

- Process routine specimens in preparation for further testing
- carry out tests necessary for full identification of common pathogens using microscopy, culture, tissue culture and identification techniques for common pathogens

Evaluation of Clinical Events (ECE):

- Present a series of cases from collection of samples through to diagnosis which involved a range of techniques and methods
- Presentation to trainer or clinicians of findings in straightforward cases
- Presentation of poster at relevant meeting or conference

Case-Based Discussions (CBDs):

- Present a report of a straightforward infectious disease investigation fully describing presenting signs, diagnostic plan, investigations, treatment or intervention and follow up.
- Write an appropriate microbiological report of a case of a common infectious disease including the identification of the pathogen, and recommendations for treatment or intervention.
- Write a report concerning the detailed identification of a common pathogen or a detailed investigation of antimicrobial susceptibility and treatment options.

Stage B and C

Directly Observed Practical Skills (DOPS):

Collection of samples for diagnosis

- Collect specimens from complex cases using appropriate techniques and equipment
- Transport to the laboratory using the correct transport media and methods of transport depending on the level of hazard.

Staining and culture techniques

- Process specimens in preparation for further testing
- Carry out tests necessary for full identification of pathogens using a full range of microscopy, culture, tissue-culture and identification techniques for rare or uncommon pathogens.

Evaluation of Clinical Events (ECE)

- Present a series of complex cases from collection of samples through to diagnosis which involved a full range of techniques and methods
- Presentation to trainer or clinicians of findings in complex cases
- Presentation of poster at relevant meeting or conference
- Give a lecture to students or demonstration of an interesting case to other trainees
- Show evidence of involvement in laboratory management and decision making
- Critically review a microbiology research paper.

Case-Based Discussions (CBDs)

- Present a report of a complex infectious disease investigation fully describing presenting signs, diagnostic plan, investigations, treatment or intervention and follow up
- Write an appropriate microbiological report of a complex case of infectious disease including the identification of the pathogen, and recommendations for treatment or intervention
- Write a report concerning the detailed identification of a pathogen or a detailed investigation of antimicrobial susceptibility and treatment options or a case involving antimicrobial resistance (AMR).

APPENDIX 6: ACRONYMS

ACDP	Advisory Committee on Dangerous Pathogens
AGID	Agar Gel Immunodiffusion Test
AMR	Antimicrobial Resistance
ASF	African Swine Fever
BSE	Bovine Spongiform Encephalopathy
CbD	Case-based Discussion
CFT	Complete Fixation Test
CNS	Central Nervous System
CPD	Continuing Professional Development
CSF	Classical Swine Fever
DIVA	Differentiating Infected from Vaccinated Animals
DOPS	Directly Observed Practical Skills
ECE	Evaluation of Clinical Events
ELISA	Enzyme-linked Immunosorbent Assay
EMD	Epidemiology of Microbial Diseases
FELV	Feline Leukaemia Virus
FHV	Feline Herpesvirus
FIV	Feline Immunodeficiency Virus
FRCPath	Fellowship of the Royal College of Pathologists
HI	Haemagglutination Inhibition
LC	Large Colony
MRCVS	Members of the College of Veterinary Surgeons
MRSP	Methicillin-Resistant *Staphylococcus pseudintermedius*
PCR	Polymerase Chain Reaction
PhD	Doctor of Philosophy
QC	Quality Control
QA	Quality Assurance
RCVS	Royal College of Veterinary Surgeons
RT	Reverse Transcriptase
SAC	Specialty Advisory Committee
SAPO	Specified Animal Pathogen Order
SOP	Standard Operating Procedure
TAC	Trainees Advisory Committee