

AMERICAN COLLEGE OF VETERINARY MICROBIOLOGISTS

PROCEDURE FOR CERTIFICATION

REQUIREMENTS FOR EXAMINATION

To qualify as a candidate for the ACVM Board Examination, an applicant must: (i) have satisfactory moral and ethical standing in the veterinary profession; (ii) have a D.V.M. or equivalent degree from a veterinary school or college accredited or approved by the American Veterinary Medical Association, or provide evidence of having successfully completed the examination administered by the American Veterinary Medical Association Commission for Foreign Veterinary Graduates, or have passed the National Board Examination in Veterinary Medicine, or be qualified to practice veterinary medicine in some state, province, territory or possession of the United States or Canada or some other country; and (iii) must be sponsored by two (2) Diplomates of the College.

In addition to having earned the D.V.M. degree, the candidate must satisfy the following requirements:

To be admitted by **Route 1**, the candidate must have earned the Ph.D. degree with major emphasis in veterinary microbiology. The latter is defined as a knowledge and mastery of veterinary microbiology, which includes the disciplines of bacteriology, mycology, virology and immunology as they apply to veterinary medical science. The science of microorganisms includes knowledge of molecular biology, structure, function, propagation and biological and ecological relationships of microbes and prions with animals, plants, humans, other microbes and the environment. Immunology includes knowledge of the components and functions of host defense mechanisms in both antigen-specific and non-specific responses, and applications of immunological processes in laboratory assays. Veterinary medical science includes knowledge of the etiology, pathogenesis, transmission, immunity/resistance, diagnosis, therapeutics, prevention and control of diseases of animals and zoonotic diseases as applied in the practice of teaching, research, clinical veterinary medicine, comparative medicine, or public health. Therefore, knowledge of veterinary microbiology is not to be narrowly defined as related only to microbial agents of disease in non-human animals or the laboratory characteristics of microbes. A major emphasis in veterinary microbiology means that in over half of the number of course credits for the degree (i) the candidate received a grade of at least a "B average" or a "Pass," and (ii) the courses which were graded at least a "B average" or a "Pass" were in subjects that, in the opinion of the Examinations Committee, were directly related to veterinary microbiology. Veterinary microbiology includes veterinary bacteriology, mycology, immunology, and virology, and (iii) the thesis was in an area directly related to veterinary microbiology (as defined above). The learning experience for a candidate who has not taken courses must, in the opinion of the Examinations Committee, be

equivalent to that required above as determined by a review of the applicant's description of the learning experience.

To be admitted by **Route 2**, the candidate must have earned the Master's degree with major emphasis in veterinary microbiology (as defined above) and have met either one of the following two criteria:

(1) gained sufficient additional experience relevant to veterinary microbiology (as defined above) to equal or exceed the experience of a candidate who has completed a Ph.D. degree. Experience relevant to veterinary microbiology may be obtained through teaching, research or service that concentrates on veterinary microbiology (as defined above). The experience should, in the opinion of the Examinations Committee, be sufficient to make the candidate proficient in the practice of veterinary microbiology (as defined above) and an expert in at least one of the specialties: bacteriology/mycology, immunology, and/or virology. Examples of acceptable experience are: (i) full-time practice in a diagnostic laboratory run by a university, state, or commercial organization; or (ii) full-time practice in research in a university, state, not-for-profit, federal or commercial organization; or (iii) full-time teaching at the undergraduate (baccalaureate) and graduate levels in a university (most of the courses taught should be in veterinary microbiology; and at least one course each year should be taught at the graduate level; and teaching at non-degree institutions does not qualify); or (iv) a combination of the above three points performed on a full-time basis.

(2) gained sufficient additional experience through full-time participation in a structured clinical training program with emphasis on multiple aspects of veterinary microbiology (as defined above). Such a training program must go beyond the coursework and research curriculum of a typical master's degree program. Examples of structured clinical training programs are designated residency programs in clinical veterinary microbiology. These programs will include all elements of a traditional master's degree program (i.e. coursework and research) plus clinical work involving cases and rounds. These programs will include coordinated and mentored study, preferably by an ACVM diplomate, in veterinary bacteriology/mycology, immunology, and/or virology, along with specialized laboratory training and experience.

To be admitted by **Route 3**, the candidate must have, subsequent to earning the DVM, VMD, or equivalent professional degree, have sufficient professional experience (as defined above) relevant to veterinary microbiology (as defined above), with increasing responsibility over this time period to equate with a candidate who qualifies by the Routes 1 and 2.

The applicant shall submit to the Board complete and full details of qualifications, including a list of all publications and any other evidences of professional experience, competence and achievements as a veterinary microbiologist.

A candidate for Diplomate status must have capabilities extending over the broad area encompassed by microbiology as applied to veterinary medical science. A candidate must be well informed in bacteriology, mycology, virology and immunology, and must be qualified to assume responsibility for the basic and/or applied aspects of veterinary microbiology in research and teaching, or clinical and diagnostic microbiology. A candidate must have knowledge of infectious disease (including the zoonoses) of animals with emphasis in etiology, pathogenesis, transmission, immunity, diagnosis, prevention and control, and is expected to know current literature and modern laboratory techniques.

EXAMINATION PROCESS

The official requirements for examination and certification are described in Article V of the ACVM Constitution. The following explanation is provided as a convenience but does not supersede any requirement of the constitution.

The Board of Examination in Veterinary Microbiology consists of two (2) parts; namely, a **general veterinary microbiology (Part I) examination** and a **specialty (Part II) examination**. The general veterinary microbiology (part I) qualifying examination includes: (a) material of a fundamental or general nature in bacteriology, mycology, virology, immunology and serology, and (b) material of an applied or specialized nature pertinent or applicable to veterinary microbiology, including ecological relationships relating to animal and human exposure and methods of prevention and control. The general veterinary microbiology (Part I) examination consists of 240 multiple choice questions and must be completed in four (4) hours. The "**blueprint**" for the general veterinary microbiology examination is: bacteriology (30%), virology (30%), immunology (30%), mycology (5%) and molecular biology/technology (5%). The pass mark for the general veterinary microbiology (Part I) examination is 60%. The general veterinary microbiology (Part I) examination is administered in November or December on the Friday preceding the Conference of Research Workers in Animal Diseases (CRWAD) meeting at the location of meeting.

The specialty (Part II) examination is offered in three areas: **(a) Bacteriology and Mycology, (b) Virology, and (c) Immunology**. The examination includes material of (a) a fundamental or generalized nature, including molecular biology, biochemistry and history; and (b) an applied and specialized nature pertinent or applicable to the specialty area. The specialty certifying examination is an **advanced-level and practical examination** utilizing visual aids and involving both a test of theoretical knowledge and an ability to solve problems. A candidate is asked to recognize, interpret and analyze the material presented, as if in a real world, clinical/diagnostic/research situation. A candidate will be expected to interpret photographic slides (gross or microscopic lesions, cultures, diagnostic test results, tables etc.) to provide information necessary to answer the questions correctly. Questions are in a multiple choice format and each specialty examination consists of 100 questions. The pass mark for each specialty examination is 75%. The specialty (Part II) examination is administered in November or December on the Saturday preceding the Conference of Research Workers in Animal Diseases (CRWAD) meeting at the location of the meeting.

A candidate may sit one, two or all three of the specialty examinations. A candidate must pass at least one specialty examination and the general veterinary microbiology examination to be certified. A candidate may elect to take the examinations in any order within the 5-year period and is not required to pass the general veterinary microbiology examination before attempting the

specialty examinations. A candidate will be certified in each specialty area for which competence is demonstrated. Candidates will be informed of the results during the CRWAD meeting and successful candidates will be received into membership as a Diplomate while at that meeting.

After successfully completing the general veterinary microbiology examination and a specialty examination and before receiving the certificate, each candidate must prepare and submit to the Secretary-Treasurer a minimum of **ten (10) questions, including five (5) questions with slides**, in their area of specialty. The questions and slides must meet a minimum standard, but are not graded. At the discretion of the Examinations Committee, suitable questions may be added to the question bank for future examinations. Certificates, mounted on plaques, will be mailed shortly after questions are provided for the examination bank.

A candidate has **five (5) years (five consecutive examination periods)** after the application is accepted to complete all phases of the examination successfully. A limit of two (2) attempts during one five year period will be granted for the general veterinary microbiology examination and two attempts for each specialty examination. Any candidate who has not successfully completed all phases of the examination within five years after application will be permitted to re-apply after a waiting period of one (1) year. Such candidates will be required to submit new applications and examination fees and must take the entire examination.

FEES AND APPLICATION PROCEDURE

Application for Examination. The **deadline** for the receipt by the Secretary-Treasurer of **completed application forms, letters from two (2) sponsoring Diplomates** of the ACVM (the sponsor need only indicate that the sponsor knows that the applicant is a microbiologist who is a serious candidate for examination and need not evaluate the candidate's ability to pass the examination) and the non-refundable **fee of \$300** (in US currency payable to ACVM) is **April 30th**. You should receive an acknowledgment of receipt of your application from the Secretary-Treasurer. If you do not receive an acknowledgment within 3 weeks, please take the initiative and contact the Secretary-Treasurer. The applicant must arrange for the sponsors to send letters of recommendation to the Secretary-Treasurer. The application will be evaluated by the Examinations Committee. Assuming satisfaction of the prerequisites, the Board of Governors, prior to or at the time of the annual meeting of the American Veterinary Medical Association (usually late in July) will approve the application for candidacy and you will be informed thereof within ten (10) days of the meeting. If you do not receive an acknowledgment within 3 weeks, please take the initiative and contact the Secretary-Treasurer.

Examinations. Approved candidates must **declare the selection of examinations** to be taken and **submit** the appropriate **examination fees** to the

Secretary-Treasurer before **September 30th**. The **general veterinary microbiology examination fee is \$100.00**. The **specialty examination fee is \$100.00** for each attempt of each specialty examination. A candidate may elect to take the examinations in any order within the 5-year period.

STUDY GUIDE

Nature of Examination. The comprehensive nature of the qualifying examination requires a thorough and systematic review of relevant materials. Some sort of structured study regime is strongly recommended. It must be individually tailored to suit the candidate's own specific needs.

Development of a Study Plan. It is suggested that the candidate devise a suitable study plan, which should include a timetable, with dates, for completion of each part of the plan. It is suggested by some that the study plan cover a two-year period. This is probably a realistic time frame. Others indicate that a shorter study period is sufficient. It is strongly recommended that time be set aside each and every day for some aspect of study. Candidates are free to contact Diplomates on any aspects of study. Candidates will find Diplomates most eager to help.

Subject Areas Covered. Subject areas covered in the general veterinary microbiology (Part I) and specialty (Part II) examinations include the following topics within each specialty area.

A. Bacteriology

1. Principles of animal bacteriology
 - Structure and morphology
 - Classification and nomenclature
 - Propagation, isolation, and identification
 - Pathogenesis of bacterial infections
 - Bacterial genetics
 - Molecular biology of bacteria and bacteriophages
 - Immunization, disinfectants, and chemotherapeutics
 - Bacterial-host interactions
2. Conduct and interpretation of laboratory procedures
 - Serology
 - Biochemical reactions
 - Antibiotic susceptibility testing
 - DNA/RNA manipulation
3. Bacterial diseases of domestic animals (including lab animals and fish)

- Pathogenesis
- Clinical presentation
- Pathology
- Diagnosis

B. Virology

1. Principles of animal virology
 - Structure and morphology
 - Classification and nomenclature
 - Cultivation and assay of viruses
 - Viral replication strategies
 - Pathogenesis of viral infections
 - Immunization, disinfectants and chemotherapeutics
2. Conduct and interpretation of laboratory procedures
 - Serology
 - Viral cytopathology
 - Electron microscopy
 - Immunohistochemistry
 - Pathology
 - Molecular detection methods, primarily for nucleic acid products
3. Viral diseases of domestic animals (including lab animals and fish)
 - Pathogenesis
 - Clinical presentation
 - Pathology
 - Diagnosis

C. Immunology

1. Basic cellular and molecular immunology
 - Ontogeny of the immune response
 - Genetics of the immune response
 - Histocompatibility
2. Cellular interactions in the immune system
 - Cytokines
3. Immunity to infectious agents

- Bacterial
 - Viral
 - Mycotic
4. Clinical Immunology (pathogenesis, diagnosis, and treatment)
 - Autoimmunity
 - Hypersensitivities (types I-IV)
 - Immunodeficiency
 5. Conduct and interpretation of laboratory procedures
 - Serology
 - Immunochemistry
 - Assays for cell-mediated immunity
 - Leukocyte function assays

EXAMINATION STUDY METHODS

Candidates are advised to review relevant and current veterinary medical curriculum notes, but are reminded that as specialty certification examinations, the expected level of preparation and knowledge is much higher than a review of veterinary medical curriculum. Candidates should plan to study advanced and graduate level information resources. Review particularly relevant subjects such as bacteriology, mycology, immunology, virology, infectious diseases, epidemiology, histology, pathology, therapeutics, statistics, and molecular biology and technology.

Review Texts. There are many excellent and useful textbooks available. Pay particular attention to the **most recent editions** of the listed examples. The figures, diagrams and photographs in texts are particularly useful in preparing for the specialty (Part II) examinations. The following are examples of some textbooks that will be helpful. The list is not all-inclusive, nor is it necessary to study all texts:

Veterinary Microbiology and Microbial Diseases, 2002, Quinn et al.

Essentials of Veterinary Microbiology, 5th ed., 1995, Carter et al.

Diagnostic Procedures in Veterinary Bacteriology and Mycology, 5th ed., 1990, Carter and Cole.

Immunology, 5th ed., 1998, Roitt et al.

Veterinary Immunology: An Introduction, 5th ed., 1997, Tizard and Kersey.

Basic and Clinical Immunology, 1997, Peakman et al.

Veterinary Virology, 3rd ed., 1999, Murphy et al.

Infectious Diseases of the Dog and Cat, 2nd ed., 1998, Greene.

Hsuing's Diagnostic Virology: As Illustrated by Light and Electron Microscopy, 4th ed., 1994, Fong et al.

Pathogenesis of Bacterial Infections in Animals, 2nd ed., 1993, Gyles and Thoen.

Virulence Mechanisms of Bacterial Pathogens, 3rd ed., 2000, Roth et al.

Microbial Diseases: A Veterinarian's Guide to Laboratory Diagnosis, 1993, Carter and Chengappa.

Veterinary Microbiology, 1999, Hirsh and Zee.

Advances in Veterinary Virology, 1990, Edwards.

Veterinary Mycology Laboratory Manual, 1998, Hungerford et al.

Clinical Veterinary Microbiology, 1994, Quinn et al.

ASM Manual of Clinical Microbiology, 7th ed., 1999, Murray et al.

Medically Important Fungi: A Guide to Identification, 4th ed., 2002, Larone.

Bacterial Pathogenesis: A Molecular Approach, 2nd ed., 2002, Salyers and Whitt.

Mims' Pathogenesis of Infectious Disease, 5th ed., 2001, Mims et al.

Sourcebook of Bacterial Protein Toxins, 2nd ed., 1999, Alouf and Freer.

Read current scientific literature. Read thoroughly and critically all journals you feel to be pertinent. This is a formidable, but not impossible task. Place greater emphasis on refereed journals. Figures and diagrams in journals are particularly useful for the specialty (Part II) examination.

Attend seminars, lectures, and courses. These are available through the AVMA, specialty interest groups, and national, state, and local groups. Good sources are veterinary schools, hospitals, and industry such as biologics manufacturers. Make a special effort to attend lectures or seminars given by ACVM Diplomates or sponsored by the ACVM. If you know you have a weak area, sign up for a

course in that area. Many universities will allow faculty to "audit" a course without charge.

Participate in AVMA tutorials. The AVMA has prepared a variety of videotape, slide, and film presentations of specific infectious diseases which may be helpful. Join study groups. In some parts of the country, it will be possible to form study groups of 2 to 5 people. This system works well only for some.

Publish. Contribute to the literature. Reviews of the literature are fine learning tools and good publications require a good literature review.

INFORMATION SOURCES

Please keep this information as it outlines the entire examination process. If you wish to apply to take the examination, please print the application or request an application form from the Secretary-Treasurer. If you have questions please feel free to contact the Secretary-Treasurer, Dr. Chris Hayhow, 30705 West 84th Circle, DeSoto, Kansas 66018 or call (913) 585-1434, Buckeyeone@kc.rr.com.