

Elements of Good Training in Anatomic Pathology

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The American College of Veterinary Pathologists' (ACVP's) 2007–2012 strategic plan recognized the crisis confronting academic training programs and formed a task force to address these concerns. One area of concern identified by the ACVP Training Program Development Task Force was the lack of guidelines to make training more consistent across all programs and provide justification for maintaining or increasing faculty numbers and training resources. Training guidelines for clinical pathology have been outlined in three publications.^{1,2,4} The current document addresses the need for training guidelines in veterinary anatomic pathology.

Objectives of Anatomic Pathology Training

Anatomic pathology training programs strive to base the content of their programs on the knowledge and skills required to perform the tasks expected of pathologists in a diversity of careers. To define the current scope of these knowledge and skills, the ACVP conducted a role delineation study in 2007 to guide training program curricula and the content of the certifying examination. Detailed results from the 2008 Role Delineation Survey are available (<http://www.acvp.org/roledelin/index.php>; accessed June 21, 2010).³ Only those elements of practice that ACVP diplomates considered essential for a new diplomate to be proficient were deemed appropriate for training programs. Tasks considered critical were those frequently performed by most diplomates, as well as those for which competence was essential to prevent harm.

Based on the 2008 Role Delineation Study, the goals of anatomic pathology training are to (1) develop skills in examining, recognizing, and interpreting lesions at the gross, histological, and ultrastructural level; (2) interpret histochemical, immunohistochemical, and molecular test results; (3) understand the underlying disease process, from the molecular to the organism level; (4) correlate results with clinical findings and clinical laboratory data; (5) communicate pathology findings through written and verbal means; (6) acquire knowledge of diseases in domestic, laboratory, and wildlife species, as well as an appreciation for comparative pathology (One Medicine); and (7) learn appropriate approaches to disease investigations,

including an introduction to research methods. Table 1 lists the tasks identified through the role delineation that are expected of residents completing a training program.

During their program, trainees need to acquire knowledge and skills sufficient to assume increasing responsibility for a broad spectrum of assessments and interpretation of specimens, as well as problems and situations encountered by veterinary anatomic pathologists. These skills sets and knowledge also prepare them for the ACVP certifying examination and enable career-long learning and adaptability to changes in practice. These skills are essential for most careers in anatomic pathology whether in academia, industry, diagnostic laboratories, or government agencies. Accomplishing these objectives requires a combination of appropriate case material, strong mentoring, access to libraries and other training resources, as well as programmatic support.

Case-Based Mentored Learning

The skills of anatomic pathology are best learned through independent evaluation of spontaneous disease case material, then one-on-one gross and microscopic review with credentialed pathologists. Critical technical skills in anatomic pathology training follow: (1) performing a comprehensive

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Table 1. Critical Tasks Required of Veterinary Anatomic Pathologists

Review antemortem data and history to collect relevant samples
Guide sample collection by others
Perform necropsies
Collect gross morphometric data
Collect specimens to preserve sample integrity
Describe morphological observations
Photograph gross and microscopic observations
Select applicable assays
Evaluate tissue morphology
Use special microscopic techniques
Interpret immunohistochemistry, histochemistry, and in situ immunohistochemistry and hybridization
Integrate individual animal data
Interpret normal variations and spontaneous findings
Identify artifacts in tissue sections and other samples
Perform critical review of the literature
Communicate pathology findings and their significance to clinicians, regulators, and scientists
Design experiments and diagnostic investigations
Develop investigational techniques
Publish scientific findings in peer-reviewed literature
Disseminate knowledge through publications, abstracts, reports, and presentations
Promote personal and professional development

necropsy; (2) conducting thorough and appropriate tissue sampling for histopathology and ancillary procedures; (3) trimming necropsy and biopsy tissues for histology; and (4) documenting, measuring, and photographing gross and histological lesions. Scholarly skills include (1) recognizing, interpreting, and integrating gross and histological lesions; (2) correlating lesions with clinical parameters; (3) understanding the pathogenesis of lesions; (4) determining a diagnosis, prognosis, and cause of death; and (5) communicating findings through succinct, timely, and accurate descriptions, morphologic diagnoses, and comments. Trainees should demonstrate increasing competence, knowledge, and accountability for case management throughout the program and recognize the need to be actively involved in their training success through self-learning.

Necropsy and biopsy cases from a variety of species are essential training tools. The complexity and ambiguity of natural cases provide important challenges to lesion interpretation and to becoming competent in case management—challenges that cannot be replaced by teaching sets of classic lesions. The learning environment is enhanced when trainees are mentored by several pathologists who provide different perspectives. Consultations with specialty pathologists further enhance interpretative skills. Access to ancillary procedures, such as immunohistochemistry, microbial diagnostics, and electron microscopy, also are necessary for the learning experience. Clinical pathology training should be integrated into biopsy and necropsy cases but should also include additional hematology, clinical chemistry, endocrinology, and cytology cases, as mentored by clinical pathologists.

Literature Review and Rounds

Successful trainees demonstrate a high level of self-motivated learning that extends from the case material into the literature throughout the program. Case-based learning requires trainees to read literature relevant to their cases and then summarize their findings in their reports. Case-based learning alone does not usually provide the breadth and depth of knowledge needed for a career in pathology, because case diversity is limited in many programs. Building a solid foundation of knowledge from textbooks and peer-reviewed literature can begin from reading cases, but it should then expand to cover topics not encountered during the program. Access to searchable databases of scientific literature (eg, PubMed), a variety of textbooks, and other reference materials are essential for training in anatomic pathology. Table 2 lists recommended textbooks, and Table 3 lists useful websites. A journal club mentored by pathologists, provides the venue for learning the critical review of the literature and the structure for lifelong learning. Table 4 offers a suggested list of journals for training programs.

In addition to a journal club, other rounds and seminars are an essential part of training. Gross rounds with fresh tissues from necropsy cases are an excellent venue for demonstrating the diversity of lesions, for discussing disease pathogenesis, and for integrating clinical history with necropsy findings. Gross pathology reviews with projected images can supplement necropsy case material, especially for lesions or species not routinely seen at the training site. Histopathology rounds based on biopsy or necropsy cases and/or the Armed Forces Institute of Pathology's Wednesday slide conferences are crucial for learning microscopic descriptive skills; they provide the venue for discussing the evaluation and interpretation of lesions, from the experience of numerous pathologists. Also useful are rounds focused on systems (ophthalmic pathology, neuropathology, etc) or species (zoo/wildlife, laboratory animal, aquatic animal, etc), especially when there is terminology particular to a specialty. Clinical pathology rounds, including cytology, hematology, and clinical chemistry case reviews, are invaluable. General pathology group reviews, practice exercises, and didactic lectures are also beneficial.

The pathology of species or topics not adequately covered by case material alone can be studied with nationally available resources, such as NOAA's Archive, Cornell's Necropsy Show and Tell, and Charles Louis Davis DVM Foundation, and the Armed Forces Institute of Pathology's slide sets. Programs should provide training resources for all the species identified by the 2008 ACVP Role Delineation Study as those most frequently encountered by veterinary anatomic pathologists, including rodents, dogs, primates, cats, rabbits, horses, cows, small ruminants, and pigs. Access to training materials should also be provided from the less frequently encountered species, such as birds, wildlife, zoo animals, pocket pets, reptiles, amphibians, poultry, fish, and marine mammals. Trainees in programs with limited case numbers or species diversity should consider externships in complementary programs.

Table 2. Recommended Textbooks for an Anatomic Pathology Training Reference Library

Title	Authors and Editors	Year, Edition	Publisher
General and Veterinary Pathology Texts			
<i>Color Atlas of Veterinary Histology</i>	Bacha and Bacha	2000, 2nd ed.	Lippincott Williams & Wilkins
<i>Color Atlas of Veterinary Pathology</i>	Van Dijk, Gruys, and Mouwen	2007, 2nd ed.	Saunders
<i>Histology for Pathologists</i>	Mills, ed.	2006, 3rd ed.	Lippincott Williams & Wilkins
<i>Jubb, Kennedy, and Palmer's Pathology of Domestic Animals</i>	Maxie, ed.	2007, 5th ed.	Saunders Elsevier
<i>Pathologic Basis of Veterinary Disease</i>	McGavin and Zachary, eds.	2006, 4th ed.	Mosby Elsevier
<i>Robbins and Cotran Pathologic Basis of Disease</i>	Kumar, Abbas, Fausto, and Aster, eds.	2010, 8th ed.	Elsevier Saunders
<i>Ultrastructural Pathology</i>	Cheville	2009, 2nd ed.	Iowa State Press
<i>Veterinary Pathology</i>	Jones, Hunt, and King, eds.	1997, 6th ed.	Williams & Wilkins
<i>Wheater's Functional Histology</i>	Young, Lowe, Stevens, and Heath	2006, 5th ed.	Churchill Livingstone
Surgical Pathology Texts			
<i>Color Atlas of Farm Animal Dermatology</i>	Scott	2007	Blackwell
<i>Equine Dermatology</i>	Scott and Miller	2003	Saunders
<i>Rosai and Ackerman's Surgical Pathology</i>	Rosai, ed.	2004, 9th ed.	Mosby
<i>Skin Diseases of the Dog and Cat</i>	Gross, Ihrke, Walder, and Affolter	2005, 2nd ed.	Blackwell
<i>Tumors in Domestic Animals</i>	Meuten, ed.	2002, 4th ed.	Iowa State Press
<i>World Health Organization Classification of Tumours</i>	Authors vary for each fascicle	2000-2008, 3rd or 4th edition	International Agency for Research on Cancer
<i>World Health Organization International Histologic Classification of Tumors in Domestic Animals</i>	Schulman, series ed.	Year varies with fascicle	Armed Forces Institute of Pathology
Special Pathology Texts			
<i>An Atlas of Alimentary Tract Pathology</i>	Buergelt, Chue, and Lee	1994	Wiley-Blackwell
<i>An Atlas of Metazoan Parasites in Animal Tissues</i>	Gardiner and Poynton	1999	C.L. Davis
<i>An Atlas of Protozoan Parasites in Animal Tissues</i>	Gardiner, Fayer, and Dubey	1988	C.L. Davis
<i>Caserett and Doull's Toxicology</i>	Klaassen	2008, 7th ed.	McGraw-Hill
<i>Diseases of Poultry</i>	Saif et al., eds.	2008, 12th ed.	Wiley-Blackwell
<i>Diseases of Swine</i>	Straw, Zimmerman, D'Allaire, and Taylor	2006, 9th ed.	Blackwell
<i>Fish Disease: Diagnosis and Treatment</i>	Noga	2010, 2nd ed.	Wiley-Blackwell
<i>Fundamentals of Toxicologic Pathology</i>	Haschek, Wallig, and Rousseaux	2009, 2nd ed.	Academic Press
<i>Histopathology of Preclinical Toxicity Studies</i>	Greaves	2007, 3rd ed.	Academic Press
<i>Infectious Diseases and Pathology of Reptiles</i>	Jacobson	2007	CRC Press
<i>Infectious Diseases of the Dog and Cat</i>	Greene	2006, 3rd ed.	Saunders Elsevier
<i>Infectious Diseases of Wild Birds</i>	Thomas, Hunter, and Atkinson, eds.	2007	Blackwell
<i>Infectious Diseases of Wild Mammals</i>	Williams and Barker, eds.	2001, 3rd ed.	Iowa State Press
<i>Parasitic Diseases of Wild Birds</i>	Atkinson, Thomas, and Hunter, eds.	2008	Wiley-Blackwell
<i>Pathology of Laboratory Rodents and Rabbits</i>	Percy and Barthold	2007, 3rd ed.	Blackwell
<i>Systemic Pathology of Fish</i>	Ferguson, ed.	2006, 2nd ed.	Scotian Press
<i>Veterinary Comparative Hematopathology</i>	Valli	2007	Blackwell
<i>Veterinary Forensics: Animal Cruelty Investigations</i>	Merck	2007	Blackwell
Clinical Pathology Texts			
<i>Duncan and Prasse's Veterinary Laboratory Medicine</i>	Latimer, Mahaffey, and Prasse	2003, 4th ed.	Iowa State Press
<i>Fundamentals of Veterinary Clinical Pathology</i>	Stockham and Scott	2008, 2nd ed.	Blackwell
<i>Schalm's Veterinary Hematology</i>	Weiss and Wardrop	2010, 6th ed.	Wiley-Blackwell

(continued)

Table 2 (continued)

Title	Authors and Editors	Year, Edition	Publisher
<i>Veterinary Hematology and Clinical Chemistry</i> Valuable texts currently out of print	Thrall et al	2006	Blackwell
<i>Avian Histopathology</i>	Riddell, ed.	1996, 2nd ed.	American Association of Avian Pathologist
<i>Color Atlas of Reproductive Pathology of Domestic Animals</i>	Buerget	1997	Mosby
<i>Diagnostic Ultrastructural Pathology: A Self-Evaluation and Self-Teaching Manual</i>	Ghadjialy	1998, 2nd ed.	Butterworth-Heinemann
<i>Fish Pathology</i>	Roberts, ed.	2001, 3rd ed.	WB Saunders
<i>Handbook of Diagnostic Electron Microscopy for Pathologists-in-Training</i>	Society for Ultrastructural Pathology	1996	Igaku-Shoin Medical Publishers, Inc, and Society for Ultrastructural Pathology
<i>Handbook of Toxicologic Pathology</i>	Haschek-Hock, Rousseaux, and Wallig	2002, 2nd ed.	Academic Press
<i>Parasitic Diseases of Wild Mammals</i>	Samuel, Pybus, and Kocan	2001, 2nd ed.	Iowa State University Press
<i>Pathology of Pet and Aviary Birds</i>	Schmidt, Reavill, and Phalen	2003	Iowa State Press
<i>Reproductive Pathology of Domestic Mammals</i>	McEntee	1990	Academic Press
<i>Veterinary Neuropathology</i>	Summers, Cummings, and de Lahunta	1995	Mosby

Table 3. Useful Websites for Anatomic Pathology Training

Description	Site
American College of Veterinary Pathologists Certifying Exam Information	http://acvp.org/exam/
Armed Forces Institute of Pathology	http://www.afip.org/consultation/vetpath/index.html
Atlas of Fish Histopathology	http://www.afip.org/consultation/vetpath/histfish/
Atlas of Veterinary Neuropathology (Cornell)	http://web.vet.cornell.edu/public/oed/neuropathology/index.asp
Canine Histiocytosis Site (University of California, Davis)	http://www.histiocytosis.ucdavis.edu/
Clinical Pathology Modules (Cornell)	http://diaglab.vet.cornell.edu/clinpath/modules/
Comparative Mammalian Brain Sections	http://www.brainmuseum.org/sections/index.html
Comparative Placentation	http://placentation.ucsd.edu/index.html
Histology (University of Pennsylvania)	http://cal.vet.upenn.edu/projects/histo/Index.htm
Histology (Virginia Tech)	http://education.vetmed.vt.edu/Curriculum/VM8054/Labs/labtoc.htm
Embryology Portal	http://isc.temple.edu/marino/embryo/defaultold.htm
Mouse Necropsy (National Institutes of Health)	http://www3.niaid.nih.gov/labs/aboutlabs/cmb/InfectiousDiseasePathogenesisSection/mouseNecropsy/
Necropsy Show and Tell (Cornell)	http://w3.vet.cornell.edu/nst/nst.asp
Ophthalmic Pathology (University of California, Davis)	http://www.vetmed.ucdavis.edu/courses/vet_eyes/
Placental Structure	http://www.vivo.colostate.edu/hbooks/pathphys/reprod/placenta/structure.html
Sheep Brain Atlas (Michigan State)	https://www.msu.edu/~brains/brains/sheep/index.html
Sheep Brain Dissection Guide	http://academic.uofs.edu/departments/psych/sheep/pge3.html
Standardized System of Nomenclature and Diagnostic Criteria Guides for the Rat (Society of Toxicologic Pathology)	http://www.toxpath.org/ssndc.asp
Veterinary Systemic Pathology Online	http://www.vspo.us/vspo/index.php
Virtual Slidebox Virtual Microscopy (University of Iowa)	http://www.path.uiowa.edu/virtualslidebox/index.html

Research Skills

Research training can be acquired through case series investigations or hypothesis-based research discovering new mechanisms of disease. More extensive research training is usually acquired in doctoral degree programs or through postdoctoral research training. Skills acquired from research training include (1) hypothesis generation and experimental design, (2) cellular and molecular laboratory methods, (3) data interpretation and statistical analysis, and (4) scientific writing. Given the critical shortage of research-trained veterinary pathologists as principal investigators, collaborators, and mentors in biomedical research, trainees should be aware of the benefits of such training and should be strongly encouraged to pursue further training in research. The 2008 ACVP Demographic Survey indicated that more than one-third of employers considered research training an important requirement and that 22% of positions required a doctorate. Enhanced skills in rigorous scientific investigation benefit the trainee in the practice of academic, diagnostic, and research pathology. These skills enable him or her to be competitive in a variety of academic and industrial positions and flexible in assuming multiple roles, thus leading to more diverse career options. This competitive advantage will become more important as the practice of pathology embraces technologies that have the potential to reduce the need for routine tissue evaluation (eg, automated image analysis) and allow more in-depth investigation

of natural or drug-induced diseases at the molecular level. Recognizing (1) the importance of research training for veterinary anatomic and clinical pathologists, (2) the difficulty of integrating research into a 3-year residency program, and (3) the need to produce veterinary pathologists with doctoral-level research training, the ACVP Training Program Development Task Force is currently evaluating how best to address research training in more depth.

Communication Skills

Learning the communication skills necessary for professional success is a critical part of training. Clear and relevant communication of pathology findings to clinicians or other stakeholders should be learned during training. As trainees progress through their program and assume increasing responsibility for their cases, their appreciation for the importance of communication with clinicians and other services is enhanced. Scientific writing skills can be acquired through preparing manuscripts of research projects or case reports under the mentorship of a pathologist. Public speaking skills can be developed through presentation of cases in rounds, as well as presenting cases or research findings at regional and national meetings. Didactic teaching of professional veterinary students by pathology trainees is also encouraged, especially for those interested in careers in academia.

Table 4. Recommended Journals to Review During a Training Program

Veterinary pathology journals	<i>Journal of Comparative Pathology</i> <i>Toxicologic Pathology</i> <i>Veterinary Clinical Pathology</i> <i>Veterinary Pathology</i>
Veterinary journals with some articles relevant to pathology	<i>American Journal of Veterinary Research</i> <i>Avian Diseases</i> <i>Comparative Medicine</i> <i>Journal of the American Veterinary Medical Association</i> <i>Journal of Veterinary Diagnostic Investigation</i> <i>Journal of Veterinary Internal Medicine</i> <i>Journal of Wildlife Diseases</i> <i>Journal of Zoo and Wildlife Medicine</i> <i>Veterinary Dermatology</i> <i>Veterinary Record</i>
Medical or research journals with some articles relevant to veterinary pathology	<i>American Journal of Pathology</i> <i>Journal of Pathology</i> <i>Laboratory Investigation</i> <i>Nature Review Journals</i> <i>New England Journal of Medicine</i> <i>Science</i>

The Role of Mentors

Continuous active mentoring is an essential component of any training program. Mentoring of trainees should be provided by credentialed pathologists, as well as by senior trainees and graduate students. Areas of mentoring should include case management, one-on-one case review of gross and histopathologic findings, critical review of necropsy and biopsy reports, necropsy and tissue-trimming techniques, gross and microscopic photography, research project design and implementation, scientific writing, and creation of individualized study plans. Although all faculty should contribute to trainee mentoring, each trainee should be assigned (or should choose) a single faculty mentor to guide him or her through the program.

Faculty pathologists should periodically evaluate the trainees' progress. Annual evaluations are essential, and biannual evaluations are recommended, especially during the first year of training. Multiple pathologists should be involved in the evaluation of each trainee. Areas to evaluate include pathology knowledge, diagnostic ability and investigative skills, descriptive skills, communication skills, and workplace interaction. Progress on accepting responsibility for cases should also be assessed. Table 5 shows a sample evaluation form. The training coordinator and/or faculty mentor should personally meet with the trainee to discuss evaluations, make plans for improvement, and set specific goals. Study plan adjustments can be based on the evaluation results. Because mentoring is an interaction and all parties have responsibilities for its success, it can be valuable to have the trainees provide periodic evaluation of the program.

Preparation for the ACVP Exam

Although training programs should not focus exclusively on preparation for the ACVP certifying examination, certification

Table 5. Sample Trainee Evaluation Form^a

Pathology knowledge base	General pathology Gross pathology Histopathology Clinical pathology Veterinary diseases
Diagnostic ability	Gross pathology Histopathology Correlation of gross and histopathologic findings Correlation of clinical and pathologic findings
Necropsy service	Dissection skills Timely completion of cases Appropriate use of ancillary tests Appropriate use of literature
Biopsy service	Timely completion of cases Appropriate use of ancillary tests Appropriate use of literature
Communication skills	Writing ability Oral presentations Teaching ability Participation in rounds/seminars Quality of photography
Research project evaluation (if applicable)	Skills in critical investigative thinking Ability to work independently Verbal and written skills in data presentation Timely completion of project
Workplace effectiveness	Attitude Professionalism Work ethic and reliability Ability to accept constructive criticism Interaction with fellow trainees Interaction with pathology faculty Interaction with students Interaction with staff Interaction with clinicians Ability to function independently

^a This sample form can be modified to fit different training programs. Most programs use a 5-point scale and include room for comments in each category.

is the immediate goal of most trainees. The 2008 ACVP Role Delineation Study determined the skills and knowledge needed by current pathologists, and the 2009 ACVP Test Plan aligns the exam with these parameters. Thus, the ACVP exam is structured to test the entry-level knowledge and skills needed to be a competent anatomic pathologist. Imparting this knowledge and skills should be the goal of training programs regardless of the exam. Trainees often view preparation for the examination as a task that is independent of their training program, yet the extensive reading and practice of pathology performed in preparation for the examination make the trainee a better pathologist and thus are essential activities in any training program.

Individualized study plans depend on the backgrounds of the trainees, including quality of veterinary medical education, time spent in practice or research since DVM degree, and learning style. Study plans should include preparation for all four sections of the certifying examination through recommended textbook reading, journal article review, gross pathology review,

Table 6. Sample Study Plan for a 3-Year Anatomic Pathology Training Program^a

Year 1	<p>Read and summarize (outline, highlight, flash cards, etc) one general pathology textbook:</p> <ul style="list-style-type: none"> • <i>Robbins and Cotran</i> (chapters 1–7) • McGavin and Zachary (section 1) <p>Read and summarize one veterinary pathology textbook:</p> <ul style="list-style-type: none"> • <i>Jubb, Kennedy, and Palmer's Pathology of Domestic Animals</i> • McGavin and Zachary's <i>Pathologic Basis of Veterinary Disease</i> (section 2) <p>Read and summarize pathology of disease agent chapters in Jones, Hunt, and King's <i>Veterinary Pathology</i> (chapters 8–16)</p> <p>Read and summarize journal articles</p> <ul style="list-style-type: none"> • File summaries by species, disease, organ system, or general pathology topic • Collect and compile electron micrographs from journal articles <p>Read and summarize Cheville's <i>Ultrastructural Pathology</i></p> <ul style="list-style-type: none"> • Collect and compile electron micrographs <p>Write weekly histological descriptions of previous Armed Forces Institute of Pathology cases</p> <ul style="list-style-type: none"> • Read and summarize the write-ups • Practice 10- to 12-minute descriptions • File summaries with journal articles by species, system, etc (as above) <p>Write 10- to 12-minute histological descriptions for current Armed Forces Institute of Pathology cases weekly</p> <p>Review gross images (Noah's Archive, Cornell website, etc) 1 hour weekly</p> <p>Read and summarize Duncan and Prasse's <i>Clinical Pathology</i></p> <ul style="list-style-type: none"> • Use case studies in the appendix as unknowns
Year 2	<p>Read and summarize</p> <ul style="list-style-type: none"> • The other general pathology textbook • The other veterinary pathology textbook • Percy and Barthold's <i>Pathology of Laboratory Animals</i> • A toxicologic pathology textbook • A second clinical pathology textbook • Journal articles <p>Write weekly histological descriptions of previous Armed Forces Institute of Pathology cases</p> <p>Write histological descriptions for current Armed Forces Institute of Pathology cases weekly</p> <p>Review gross images (Noah's Archive, Cornell website, etc) 1 hour weekly</p>
Year 3	<p>Finish anything not completed from years 1 and 2, giving enough time to review</p> <ul style="list-style-type: none"> • General pathology summaries repeatedly • Veterinary pathology textbook summaries • Compiled electron micrographs from Cheville and journal articles • Jones, Hunt, and King's <i>Veterinary Pathology</i> summary • Journal article summaries and Armed Forces Institute of Pathology cases • Clinical pathology textbook summaries • Toxicologic pathology textbook summary • Percy and Barthold summary <p>Finish reading and summarizing all current journal articles not already read</p> <p>Write weekly histological descriptions of previous Armed Forces Institute of Pathology cases (as above)</p> <p>Write histological descriptions for current Armed Forces Institute of Pathology cases weekly</p> <p>Practice timed histological descriptions monthly</p> <ul style="list-style-type: none"> • 5, 10, or 20 slides at 10 to 12 minutes per slide <p>Review gross images (Noah's Archive, Cornell website, etc) 1 hour weekly</p> <ul style="list-style-type: none"> • Take a practice gross exam monthly
6–8 weeks before the exam	<p>All primary reading should be completed</p> <p>Intensive review of notes and summaries should be initiated</p> <p>Practice gross, histopathology, and electron microscopy exams should be continued</p> <p>Practice multiple-choice and/or oral quizzes with other trainees preparing for the exam</p>

^a This plan can be modified depending on the background of the trainee, but regardless of the specifics, it is important to establish a plan early in training and keep on schedule.

and histopathology description and interpretation. A study plan schedule should also be developed to ensure timely completion of study plan goals. Regular meetings with fellow trainees and mentors aid in adherence to that plan. Table 6 offers an example of a study plan.

In addition to supplying a study plan to guide preparation, training programs should provide practice examinations for trainees. Practice examinations can reduce trainees' anxiety by acclimating them to the format and terminology of the certifying examination. Practice multiple-choice tests are especially valuable for trainees who were educated where multiple-choice questions were not frequently used in testing. Having trainees write board-style multiple-choice questions from current literature helps them understand how questions are structured, and it helps them learn to distill the important facts from each article. Timed handwritten practice microscopic examinations help trainees develop skills in efficient evaluation and description of lesions (handwritten because many trainees routinely write descriptions on word processors). Timed practice gross examinations prepare the trainees to be decisive and commit to an answer within a time limit. The examination instructions and sample questions listed on the ACVP website are helpful in this regard.

Summary

These recommended elements of training are the accumulated wisdom of individuals from multiple diverse programs, and

they align with the results of the 2008 Role Delineation Study. These recommendations are intended to guide the development of new programs and improve existing programs. These guidelines intentionally lack the specifics of ideal number of cases, species requirements, and minimum numbers of pathologists because the ACVP does not currently accredit programs. However, self-assessment and improvement to ensure that all training programs meet the minimum standards outlined above are essential to produce the highly skilled veterinary pathologists needed to fulfill the ACVP vision of being "innovative and integral contributors to global health solutions."

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