



# College of VETERINARY MEDICINE

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Lonnie J. King, DEAN

In 1907, recognizing that animal agriculture was a significant part of a healthy state economy, the Michigan legislature authorized a course of study leading to the Doctor of Veterinary Medicine degree. This program, inaugurated in 1910, was the beginning of the College of Veterinary Medicine. Since that time, society has come to value animals in additional roles beyond their role in agriculture. Pets are a source of companionship and comfort for people of all ages. And the pleasure that the general public enjoys from zoos and from nature depends in large part on the well being of the animals that are found there.

The present-day College of Veterinary Medicine is the only veterinary college in the state of Michigan and one of 27 nationally. It is organized in six departments — Large Animal Clinical Sciences, Microbiology and Molecular Genetics, Pathobiology and Diagnostic Investigation, Pharmacology and Toxicology, Physiology, and Small Animal Clinical Sciences — and includes the Animal Health Diagnostic Laboratory and The Veterinary Medical Center.

The College offers the programs that are listed below:

- a preveterinary program
- a professional program leading to the Doctor of Veterinary Medicine degree
- a certificate program in veterinary technology
- a Bachelor of Science degree program in veterinary technology
- graduate programs leading to the Master of Science and Doctor of Philosophy degrees
- a graduate specialization in food safety
- intern and residency training programs in various clinical specialties

## VETERINARY TECHNOLOGY

The American Veterinary Medical Association (AVMA) recognizes two levels of training for persons who serve as support staff for the veterinary medical profession: veterinary technician and veterinary technologist. It should be noted that the programs that are associated with the two levels of training are both described as **veterinary technology programs**. The programs that train veterinary technicians are two- or three-year programs, whereas the programs that train veterinary technologists are baccalaureate degree programs.

Veterinary technicians and veterinary technologists manage many aspects of patient care and perform diagnostic and treatment procedures as ordered by veterinarians. Their involvement enables veterinary hospitals and research or other animal care facilities to offer expanded services and to be more productive. The level of training of the veterinary technician is most appropriate for individuals who seek entry-level employment within privately owned veterinary practices. The level of training of the veterinary technologist is linked with employment in research facilities, vivariums, industry, educational institutions, pharmaceutical companies, and large-group or specialty veterinary practices.

### Certificate

MSU's Certificate program in veterinary technology articulates with the Associate in Applied Science Degree program in veterinary technology that is offered by Lansing Community College (LCC) and with MSU's Bachelor of Science degree program with

a major in veterinary technology. Students who are admitted to MSU's Certificate program in veterinary technology and to LCC's Associate in Applied Science Degree program in veterinary technology will complete the following courses through LCC: one 4-credit chemistry course, one 1-credit chemistry course, one 3-credit microbiology course, one 1-credit microbiology course, one 3-credit communication course, one 4-credit composition course, one 3 or 4 credit diversity course, one 4- or 5-credit college algebra course. Students who are admitted to the Certificate and the Associate in Applied Science Degree programs in veterinary technology will complete the following courses at MSU: didactic courses in veterinary technology and clinical clerkships. The didactic course material is based on an integrative approach to anatomy, physiology, pathophysiology, pharmacology, nutrition, nursing care, disease processes, and client education. Upon completion of the didactic courses, students will complete their clerkship training at the MSU Veterinary Teaching Hospital. Through clerkships, students will have the opportunity to apply their knowledge and problem-solving skills in a functional hospital setting.

Upon completion of the requirements for MSU's Certificate in veterinary technology, students will be awarded a Certificate from MSU. Upon completion of the requirements for LCC's Associate in Applied Science Degree in veterinary technology, students will be awarded an Associate in Applied Science degree from LCC. Students who have the Certificate or the Associate in Applied Science Degree in veterinary technology will be qualified to take the National and State Board Examinations for licensure as veterinary technicians.

Enrollments in the Certificate program in veterinary technology are limited. Students are admitted for **Spring semester only**. Applications for admission are accepted through May 15th of the year prior to the Spring semester for which the student is applying.

The Certificate program in veterinary technology has been accredited by the American Veterinary Medical Association. For a comprehensive brochure describing the program, write to: Veterinary Technology Program, A-55 Veterinary Medical Center, Michigan State University, East Lansing, MI 48824-1316.

## Bachelor of Science

### Admission

The number of students who can be admitted to the Bachelor of Science degree program in veterinary technology is limited. All persons who are interested in applying for admission to the bachelor's degree program in veterinary technology must request a special application form and detailed information regarding admission requirements and procedures from the Veterinary Technology Program, A-55 Veterinary Medical Center, Michigan State University, East Lansing, MI 48824-1316.

Applications for admission to the bachelor's degree program in veterinary technology are accepted and reviewed **only** during the **Spring** semester of each year. Persons who wish to be considered for admission to the program must submit their applications **by May 15** of the year that admission is sought.

Students who are enrolled in colleges and universities other than Michigan State University should contact MSU's Office of Admissions and Scholarships and the College of Veterinary Medicine regarding admission to the bachelor's degree program in veterinary technology as transfer students.

Minimal criteria for admission to the Bachelor of Science degree program in veterinary technology are:

1. Completion of at least 56 credits of the first two years of the bachelor's degree program in veterinary technology with a cumulative grade-point average of 2.00 or higher.

2. Completion of:
  - a. Mathematics 110 or 116.
  - b. Chemistry 141.
  - c. The University's Integrative Studies in General Science requirement.
  - d. Tier I writing course.

The final selection of students to be admitted to the baccalaureate degree program in veterinary technology is based on the cumulative grade-point average of all courses taken and a grade-point average calculated on all courses in mathematics, the physical and biological sciences, and veterinary technology. In addition, factors including the following ones may be considered: work experience, diversity, and residency.

## Requirements for the Bachelor of Science Degree in Veterinary Technology

1. The requirements for a bachelor's degree as specified in the *Undergraduate Education* section of the University catalog; 121 credits, including general elective credits, are required for the Bachelor of Science degree in Veterinary Technology.

The completion of Mathematics 110 or 116 that is referenced in item 2. b. below may also be used to satisfy the University mathematics requirement.

The University's Tier II writing requirement for the Veterinary Technology major is met by completing the following courses: Veterinary Medicine 300, 301, 302; Veterinary Medicine 403 or 404. Those courses are referenced in items 2. a. and 2. c. below.

		CREDITS
2.	The following requirements for the major: . . . . .	91
a.	All of the following courses (69 credits):	
	CEM 141 General Chemistry . . . . .	4
	MMG 205 Allied Health Microbiology . . . . .	3
	MMG 206 Allied Health Microbiology Laboratory . . . . .	1
	VM 200 Veterinary Systems Biology and Medical Science I . . . . .	7
	VM 201 Veterinary Systems Biology and Medical Science II . . . . .	7
	VM 300 Veterinary Systems Biology and Medical Science III . . . . .	7
	VM 301 Veterinary Systems Biology and Medical Science IV . . . . .	7
	VM 302 Veterinary Systems Biology and Medical Science V . . . . .	7
	VM 303 Anesthesiology for Veterinary Technicians . . . . .	2
	VM 304 Radiology for Veterinary Technicians . . . . .	2
	VM 400 Laboratory Animal Technology . . . . .	2
	VM 401 Clinical and Anatomic Pathology for Veterinary Technologists . . . . .	2
	VM 402 Hospital Practice Management for Veterinary Technologists . . . . .	3
	VM 410 Veterinary Technology Clerkship in Anesthesiology . . . . .	3
	VM 411 Veterinary Technology Clerkship in Radiology . . . . .	3
	VM 412 Veterinary Technology Clerkship in Companion Animal Medicine . . . . .	3
	VM 413 Veterinary Technology Clerkship in Companion Animal Surgery . . . . .	3
	VM 414 Veterinary Technology Clerkship in Equine Medicine and Surgery . . . . .	3
b.	One of the following courses (5 credits):	
	MTH 110 College Algebra and Finite Mathematics . . . . .	5
	MTH 116 College Algebra and Trigonometry . . . . .	5
c.	One of the following courses (2 credits):	
	VM 403 Companion Animal Nutrition and Behavior for Veterinary Technologists . . . . .	2
	VM 404 Equine and Food Animal Nutrition and Husbandry . . . . .	2
d.	Five of the following courses approved by the student's academic adviser (15 credits):	
	VM 450 Veterinary Technology Clerkship in Emergency Medicine . . . . .	3
	VM 451 Veterinary Technology Clerkship in Cardiology . . . . .	3
	VM 452 Veterinary Technology Clerkship in Neurology . . . . .	3
	VM 453 Veterinary Technology Clerkship in Ophthalmology . . . . .	3
	VM 454 Veterinary Technology Clerkship in Critical Care . . . . .	3
	VM 460 Veterinary Technology Clerkship in Equine Anesthesiology . . . . .	3
	VM 461 Veterinary Technology Clerkship in Equine Field Service . . . . .	3
	VM 462 Veterinary Technology Clerkship in Advanced Equine Medicine and Surgery . . . . .	3
	VM 470 Veterinary Technology Clerkship in Food Animal Medicine . . . . .	3
	VM 471 Veterinary Technology Clerkship in Production Medicine . . . . .	3
	VM 472 Veterinary Technology Clerkship in Food Animal Anesthesiology . . . . .	3
	VM 480 Veterinary Technology Clerkship in . . . . .	3

**VETERINARY MEDICINE**  
**Veterinary Technology**

		Clinical Pathology . . . . .	3
VM	481	Veterinary Clerkship in Microbiology . . . . .	3
VM	482	Veterinary Technology Clerkship in Necropsy . . . . .	3
VM	483	Veterinary Technology Clerkship in Biomedical Research . . . . .	3 to 12
VM	484	Veterinary Technology Clerkship in Zoo and Wildlife Medicine . . . . .	3 to 12
VM	485	Veterinary Technology Clerkship in Special Problems . . . . .	3 to 12

CEM	255	Organic Chemistry Laboratory . . . . .	2
MTH	116	College Algebra and Trigonometry . . . . .	5
PHY	231	Introductory Physics I . . . . .	3
PHY	232	Introductory Physics II . . . . .	3
PHY	251	Introductory Physics Laboratory I . . . . .	1
PHY	252	Introductory Physics Laboratory II . . . . .	1

2. Students who are enrolled in the preveterinary program should complete the University requirements for bachelor's degrees as described in the *Undergraduate Education* section of the catalog.

The completion of Mathematics 116 referenced in item 1. above may also satisfy the University mathematics requirement.

Students who are enrolled in the Preveterinary Program in the College of Veterinary Medicine may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 110, 111, and 111L and Chemistry 141. The completion of Biological Science 110 and 111L satisfies the laboratory requirement. Biological Science 110, 111, and 111L and Chemistry 141 may be counted toward both the alternative track and the requirements for the preveterinary program referenced in item 1. above.

Students who are enrolled in the preveterinary program will be required to meet the Tier II writing requirement approved for the student's major leading to the bachelor's degree.

# PREPROFESSIONAL PROGRAM for VETERINARY MEDICINE

Students who meet the requirements for admission to the University as freshmen and sophomores, as shown in the *Undergraduate Education* section of the catalog, may select the preveterinary program in the College of Veterinary Medicine as their major preference. A strong high school preparation in science, including chemistry, biology, and physics, is highly desirable. Students who are enrolled in the preveterinary program are enrolled in the Undergraduate University Division, but receive academic advising in the College of Veterinary Medicine Preveterinary Advising Center.

The courses in mathematics and natural science that are required for admission to the Professional Program in Veterinary Medicine are included in the requirements for the preveterinary program. Students who are enrolled in the preveterinary program should complete the University requirements for bachelor's degrees. Courses that are used to satisfy University requirements may also be used to satisfy certain requirements for admission to the Professional Program in Veterinary Medicine.

University regulations require that a student who has arrived at junior standing must select a major leading to a baccalaureate degree. The College of Veterinary Medicine does *not* offer a bachelor's degree program for preveterinary students. Therefore, upon reaching junior standing, students who have been enrolled in the preveterinary program and who have not been admitted to the Professional Program in Veterinary Medicine must be admitted to a major in another college in order to complete the requirements for a bachelor's degree.

Enrollments in the preveterinary program are not limited. However, because of the limitation on the number of students admitted each year to the Professional Program in Veterinary Medicine, completion of the preveterinary program does not assure admission to the professional program.

Because admission to the Professional Program in Veterinary Medicine is competitive and the majority of successful applicants have completed at least three years of a bachelor's degree program, students who are enrolled in the preveterinary program are encouraged to plan toward a baccalaureate degree in a major consistent with their interests and alternative educational and career goals. Students in any major may apply for admission to the Professional Program. For additional information, refer to the **Professional Program in Veterinary Medicine** statement.

## Requirements for the Preveterinary Program

	CREDITS
1. All of the following courses: . . . . .	39
BMB 401 Basic Biochemistry . . . . .	4
BS 110 Organisms and Populations . . . . .	4
BS 111 Cells and Molecules . . . . .	3
BS 111L Cell and Molecular Biology Laboratory . . . . .	2
CEM 141 General Chemistry . . . . .	4
CEM 161 Chemistry Laboratory I . . . . .	1
CEM 251 Organic Chemistry I . . . . .	3
CEM 252 Organic Chemistry II . . . . .	3

# PROFESSIONAL PROGRAM in VETERINARY MEDICINE

The professional veterinary medicine program is designed to provide an excellent basic medical education as well as clinical training in the diagnosis, treatment, and prevention of animal diseases and injuries. Graduates may pursue a variety of careers in salaried positions or become licensed as private practitioners in any state.

About three-fourths of the veterinarians in the United States are engaged in private practice. These veterinarians may be in general practices that care for the needs of all of the species of domestic animals or in practices limited to companion animals, farm animals, horses, poultry, or some other specific aspect of veterinary medicine.

Many veterinarians are employed by the U.S. Department of Agriculture for important work in livestock disease control, meat and poultry inspection, development of biological products, and prevention of the entry of foreign animal diseases. Veterinarians also find rewarding positions in public health work for the U.S. Public Health Service, the U.S. Army and Air Force, and for state, county, and local health agencies.

Some of the most exciting opportunities for veterinarians are in biomedical research for the benefit of both animals and people. Excellent research opportunities are available with colleges and universities, government agencies, biological and pharmaceutical companies, and private medical research institutions.

The professional program leading to the Doctor of Veterinary Medicine degree has been accredited by the American Veterinary Medical Association.

## Admission to the Professional Program in Veterinary Medicine

A new class of students begins the four-year professional program each fall semester. Applications for admission and related materials (e.g., scores on the Medical College Admission Test or Graduate Record Examination) must be received by October 1.

Factors considered by the Admissions Committee in determining an applicant's relative competitive position are: (1) cumulative grade-point average; (2) grade-point average for required preveterinary science courses in Biochemistry, General Biology, Chemistry, Mathematics, and Physics; (3) scores on the Medical College Admission Test (MCAT) or Graduate Record Examination (GRE); (4) average credit-load per semester; (5) total credits completed; (6) an interview; (7) veterinary exposure; (8) animal exposure; (9) activities and achievements; and (10) ability to

communicate through a written essay. The admission process includes a procedure that attempts to reflect the diversity of society among candidates admitted to the professional program.

Applications, regular or transfer, are reviewed by the Admissions Committee. Applicants are considered for admission in the following order of priority:

1. Residents of the state of Michigan, as defined by Michigan State University. (Since MSU is a public, tax-assisted institution, admission priority is granted to residents of Michigan.)
2. Residents of states other than Michigan, including U.S. Territories and Trust Possessions.
3. All others.

Students should complete the following requirements prior to enrollment:

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|-------------------------------------|---|
| 1. Chemistry                        | — 3 semester or equivalent term credits in general inorganic with laboratory; 6 semester or equivalent term credits in organic with laboratories; 4 semester or equivalent term credits in biochemistry.                                  |
| 2. General Physics                  | — 8 semester or equivalent term credits, including laboratory work.   |
| 3. General Biology                  | — 6 semester or equivalent term credits, to include principles of biological regulation, integration, and diversity; genetics; development; selected physiological topics; taxonomy and systematics; comparative physiology; and ecology. |
| 4. College Algebra and Trigonometry | — 3 semester or equivalent term credits; may substitute equivalent entry-level course, e.g., calculus.  |
| 5. Arts and Humanities              | — 8 semester or equivalent term credits that may include two or more of the following subject areas: history, literature, music or art history or appreciation, philosophy, religion.   |
| 6. Social Science                   | — 8 semester or equivalent term credits that may include two or more of the following subject areas: cultural anthropology, economics, human geography, political science, psychology, sociology.   |
| 7. English                          | — 4 semester or equivalent term credits that may include composition, reading, speech, and other communication skills.  |

### **VETERINARY SCHOLARS ADMISSION OPTION**

This option has been established by the College of Veterinary Medicine in cooperation with the Honors College at Michigan State University in order to provide an admission avenue for students who wish to complete a bachelor's degree consisting of advanced, scholarly studies in concert with their entry to the four-year professional veterinary medical degree program. All MSU preveterinary students who are members of the Honors College may choose to participate in this program. Up to ten MSU students may be chosen each year to be granted admission to the

veterinary medical program contingent upon completion of a bachelor's degree in a major of the student's choice.

The following components will be considered in selecting candidates for this admission option:

1. Completion of at least 75 percent of the required preveterinary science courses.
2. Minimum 3.20 cumulative and preveterinary science grade-point averages.
3. Bachelor's degree program proposal planned in consultation with the Honors College advising staff and a departmental honors adviser and demonstrating enriched, advanced, and scholarly work in a major of the student's choice.
4. Minimum 240 hours of veterinary exposure.
5. Completion of at least 10 credits in advanced or diverse course work beyond the minimum preveterinary requirements.
6. Performance in the regular veterinary admission criteria including grade-point averages, GRE/MCAT scores, interview, veterinary exposure, extracurricular activities and achievements.
7. Personal statement describing the scholarly content of the proposed bachelor's degree program and its relevance to the individual's career and personal goals.
8. Evaluations from the honors adviser in the student's degree program, a veterinarian, and an individual of the applicant's choice.

Students who wish to enter the professional veterinary medical program before earning a bachelor's degree may apply through the regular veterinary admission process.

The college of Veterinary Medicine's Committee on Student Admissions selects the candidates for this option and reserves the right to modify the criteria and process.

### **Additional Information**

For additional information concerning admission to the professional program, contact the Admissions Office, College of Veterinary Medicine, A-128 East Fee Hall, Michigan State University, East Lansing, Michigan 48824-1316. **Note:** Prospective applicants should maintain contact with the College's Admissions Office for current information.

### **Statement on Advanced Status**

Rarely will students be considered for admission to the program with advanced standing.

### **Requirements for the Bachelor of Science Degree**

1. The University requirements for the bachelor's degree as described in the *Undergraduate Education* section of this catalog.
2. Preveterinary program requirements.
3. At least 56 credits of the professional program in Veterinary Medicine.

### **Health Requirements for Students in the Professional Program in Veterinary Medicine**

1. The student must be covered by a personal health insurance policy throughout enrollment in the program.
2. The student's tetanus vaccination must be current throughout enrollment in the program.
3. The student must have a rabies vaccination prior to participation in senior clerkships. Rabies vaccination is recommended for entering students.

**VETERINARY MEDICINE**  
**Professional Program in Veterinary Medicine**

**Curriculum**

The curriculum leading to the D.V.M. degree is primarily the responsibility of the faculty of the College. Student input to curriculum matters is through student representation on the Curriculum Committee. Continuing development of new information in health-related fields and changes within the profession demand ongoing curricular evaluation and modification. Development of the knowledge, skills, and attitudes required of a veterinarian remains the major goal of this curriculum. Efficiency in obtaining this goal requires a dynamic program that can respond through instituting newly developed concepts and techniques. For these reasons, particulars of the curriculum described herein may change in subsequent years in accordance with established College and University policies and procedures.

**Requirements for the Doctor of Veterinary Medicine Degree in Veterinary Medicine**

Completion of the following 163-credit, four-year professional program with a grade-point average of at least 2.00.

CREDITS

**SEMESTER 1 (Fall)**

ANS 511	Animal Science for Veterinarians	2
ANT 515	Comparative Veterinary Gross Anatomy	6
ANT 516	Veterinary Histology and Cell Biology	4
MMG 561	Veterinary Immunology	2
SCS 511	Veterinary Radiology	1
VM 511	Veterinary Perspectives I	2
VM 512	Veterinary Integrative Problem Solving I	1
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**SEMESTER 2 (Spring)**

ANS 513	Animal Nutrition for Veterinarians	2
ANT 517	Veterinary Neuroanatomy	1
MMG 563	Medical Bacteriology, Mycology, Parasitology and Virology	4
PSL 511	Veterinary Physiology	5
PTH 551	General Pathology	3
VM 521	Veterinary Perspectives II	2
VM 522	Veterinary Integrative Problem Solving II	3
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**SEMESTER 3 (Fall)**

MMG 565	Bacterial, Mycotic, Parasitic and Viral Diseases	6
PHM 556	Veterinary Pharmacology	5
PTH 553	Clinical and Systemic Pathology	5
VM 532	Veterinary Integrative Problem Solving III	3
VM 533	Veterinary Epidemiology	3
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**SEMESTER 4 (Spring)**

PHM 557	Veterinary Toxicology	2
VM 541	Veterinary Perspectives III	2
VM 542	Veterinary Integrative Problem Solving IV	3
VM 543	Cardiovascular Diseases	2
VM 544	Veterinary Public Health	2
VM 545	Principles of Anesthesia and Surgery	4
VM 546	Musculoskeletal Diseases	5
VM 547	Respiratory Diseases	2
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**SEMESTER 5 (Fall)**

VM 552	Veterinary Integrative Problem Solving V	3
VM 553	Theriogenology and Urinary Diseases	5
VM 554	Hematological, Oncological and Dermatological Diseases	3
VM 555	Neurological and Ophthalmological Diseases	3
VM 556	Digestive, Metabolic and Endocrinological Diseases	5
VM 557	Operative Surgery	2
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**SEMESTERS 6 (Spring), 7 (Summer), 8 (Fall), 9 (Spring)**

Students will be required to complete 60 clerkship credits. Satisfactory completion of semesters one through five of the professional curriculum is required for enrollment in any of the listed clerkships.

**REQUIRED CLERKSHIPS**

SCS 611	Diagnostic Imaging Clerkship	3
SCS 648	Anesthesiology Clerkship	3
PTH 630	Diagnostic Pathology Clerkship	3
One Equine Clerkship (Large Animal Clinical Sciences 620 or 621)		3
One Food Animal Clerkship (Large Animal Clinical Sciences 630 or 631)		3
One Small Animal Medicine Clerkship (Small Animal Clinical Sciences 625 or 647)		3
One Small Animal Surgery Clerkship (Small Animal Clinical Sciences 626 or 646)		3
Elective Clerkships		9
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**ELECTIVE CLERKSHIPS**

ANT 610	Veterinary Gross Anatomy Dissection	3
ANT 611	Research Problems in Veterinary Anatomy	3
LCS 610	Problems in Large Animal Clinical Sciences	3
LCS 611	Research Problems in Large Animal Clinical Sciences	3
LCS 612	Problems in Production Medicine	3
LCS 620	Equine Medicine and Surgery Clerkship	3
LCS 621	Equine Field Service Clerkship	3
LCS 622	Advanced Equine Medicine and Surgery Clerkship	3
LCS 623	Equine Musculoskeletal Diseases Clerkship	3
LCS 624	Equine Theriogenology Clerkship	3
LCS 625	Equine Herd Health Clerkship	3
LCS 630	Food Animal Medicine and Surgery Clerkship	3
LCS 631	Introductory Food Animal Production Medicine Clerkship	3
LCS 632	Advanced Food Animal Medicine and Surgery Clerkship	3
LCS 633	Dairy Production Medicine Clerkship	3
LCS 634	Swine Production Medicine Clerkship	3
LCS 640	Large Animal Anesthesia Clerkship	3
LCS 677	Veterinary Preceptorship	3
MMG 690	Veterinary Microbiology Clerkship	3
PHM 658	Research Problems in Pharmacology and Toxicology	3
PTH 631	Necropsy Clerkship	3
PTH 632	Problems in Veterinary Pathology	3
PTH 633	Transfusion Medicine	3
SCS 612	Problems in Diagnostic Imaging Clerkship	3
SCS 625	Small Animal General Medicine Clerkship	3
SCS 626	Small Animal Soft Tissue Surgery Clerkship	3
SCS 636	Problems in Soft Tissue Surgery Clerkship	3
SCS 640	Cardiology Clerkship	3
SCS 641	Ophthalmology Clerkship	3
SCS 642	Zoo and Wildlife Clerkship	3
SCS 643	Neurology Clerkship	3
SCS 644	Dermatology Clerkship	3
SCS 645	Intensive Care Unit Clerkship	3
SCS 646	Small Animal Orthopedic Clerkship	3
SCS 647	Small Animal Internal Medicine Clerkship	3
SCS 650	Advanced Cardiology	3
SCS 651	Problems in Ophthalmology Clerkship	3
SCS 653	Problems in Neurology Clerkship	3
SCS 656	Problems in Orthopedic Surgery Clerkship	3
SCS 657	Problems in Internal Medicine Clerkship	3
SCS 658	Problems in Anesthesiology Clerkship	3
SCS 690	Veterinary Molecular Biology Clerkship	3
SCS 693	Problems in Small Animal Clinical Sciences Clerkship	3
VM 611	Veterinary Externship	3
VM 690	Special Problems in Veterinary Medicine	3

## Student Performance

The Committee on Student Performance monitors student performance in accordance with established College standards and offers assistance to students experiencing difficulties in the professional curriculum. An important function of this committee is to determine the reasons for student difficulties and recommend study schedules, counseling, and other means of helping the student perform in a satisfactory manner. The Committee on Student Performance may take appropriate academic disciplinary action consistent with the academic standards of the College and the **Medical Student Rights and Responsibilities** document.

## Student Rights and Responsibilities

Refer to the statement on *Student Rights and Responsibilities* in the *General Information* section of this catalog.

## GRADUATE STUDY

The College of Veterinary Medicine offers graduate programs in each of six departments: Large Animal Clinical Sciences, Microbiology and Molecular Genetics, Pathology, Pharmacology and Toxicology, Physiology, and Small Animal Clinical Sciences. All of these departments are authorized to offer master's degree programs. Doctor of Philosophy degree programs are offered in all departments except Small Animal Clinical Sciences. These programs are designed primarily for those preparing themselves for positions in teaching or research. In addition, other programs, including residencies for post-D.V.M. training in recognized clinical specialties, are available. In addition, there is a college-based graduate program in Comparative Medicine and Integrative Biology offering the Master of Science and Doctor of Philosophy degree.

The Department of Microbiology and Molecular Genetics is affiliated with the Doctor of Philosophy degree program with a major in ecology, evolutionary biology and behavior. For information about a Doctor of Philosophy degree program that involves ecology, evolutionary biology and behavior and a major in the Department of Microbiology and Molecular Genetics, refer to the statement on the doctoral program in ecology, evolutionary biology and behavior in the *College of Natural Science* section of this catalog.

The College of Agriculture and Natural Resources, the College of Communication Arts and Sciences, the College of Engineering, the College of Human Ecology, the College of Human Medicine, the College of Natural Science, the College of Social Science, and the College of Veterinary Medicine participate in the graduate specialization in food safety. The College of Veterinary Medicine is the primary administrative unit. For more information, refer to the *Graduate Specialization in Food Safety* statement.

The College of Veterinary Medicine, the College of Agriculture and Natural Resources, the College of Engineering, and the College of Natural Science administer the graduate specialization in environmental toxicology. The College of Agriculture and Natural Resources is the primary administrative unit. For additional information, refer to the *Graduate Specialization in Environmental Toxicology* statement in the *College of Agriculture and Natural Resources* section of this catalog.

Students who are enrolled in master's degree programs in the College of Veterinary Medicine may elect the master's specialization in agribusiness. For additional information, refer to the *Master's Specialization in Agribusiness Management* statement in the *Department of Agricultural Economics* statement in the *College of Agriculture and Natural Resources* section of this catalog.

Several colleges and departments within Michigan State University cooperate in offering the interdepartmental Doctor of Philosophy degree program with a major in neuroscience, which is administered by the College of Natural Science. For additional information, refer to the statement on the doctoral program in neuroscience in the *College of Natural Science* section of this catalog.

Students who are enrolled in the Master of Science degree program in the Department of Microbiology and Molecular Genetics may elect a specialization in ecology, evolutionary biology and behavior. For additional information, refer to the statement on the specialization in the *College of Natural Science* section of this catalog.

## GRADUATE SPECIALIZATION IN FOOD SAFETY

The College of Agriculture and Natural Resources, the College of Communication Arts and Sciences, the College of Engineering, the College of Human Ecology, the College of Human Medicine, the College of Natural Science, the College of Social Science, and the College of Veterinary Medicine participate in the graduate specialization in food safety. The College of Veterinary Medicine is the primary administrative unit.

The specialization is available as an elective to students who are enrolled in a master's degree program in the departments of Agricultural Economics, Agricultural Engineering, Animal Science, Communication, Entomology, Epidemiology, Food Science and Human Nutrition, Horticulture, Large Animal Clinical Sciences, Microbiology and Molecular Genetics, Packaging, Pathobiology and Diagnostic Investigation, Pharmacology and Toxicology, Plant Pathology, and Sociology.

The specialization is designed for students who are interested in enhancing the focus of their study on food safety so they can apply their knowledge from basic disciplines to solve problems in the area of food safety.

A faculty member who is in the department that administers the student's degree program will serve as the student's academic adviser for the specialization. The academic adviser will assist the student in planning a program of study that is related to the student's interests, capabilities, and professional goals. With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the requirements for the specialization may also be used to satisfy the requirements for the master's degree.

## Requirements for the Graduate Specialization in Food Safety

The student's program of study must be approved by the student's academic adviser for the specialization. To qualify for this graduate specialization, the student must meet the requirements specified below:

	CREDITS
1. Maintain a grade-point average of at least 3.0 in the courses that are used to satisfy the requirements for the specialization.	
2. Complete both of the following seminar courses (2 credits):	
VM 828 Food Safety Seminar Series . . . . .	1
VM 829 Problems in Food Safety . . . . .	1
3. Complete one course from each of the following topic areas in food safety (9 credits):	
<b>Risk/Public Health</b>	
LCS 830 Epidemiology, Risk Assessment and Public Health Impact of Food-borne Diseases . . . . .	3
<b>Human Dimensions</b>	
FSC 421 Food Laws and Regulations . . . . .	3
PKG 480 Packaging Laws and Regulations . . . . .	3
SOC 950 Topics in Rural and Environmental Studies . . . . .	3
<b>Food</b>	
FSC 440 Food Microbiology . . . . .	3
FSC 840 Advanced Food Microbiology . . . . .	3
FSC 842 Foodborne Disease . . . . .	3

A list of supporting electives for the graduate specialization in food safety, depending on the student's individual focus of study in food safety is available from the student's academic adviser.

## VETERINARY MEDICINE

### Graduate Study

Upon completion of the requirements for the master's degree and the requirements for the specialization in food safety, the student should contact the chairperson of the department that administers the student's degree program and request certification for the completion of the specialization. After the certification is approved by the chairperson of the department, the Director of the National Food Safety and Toxicology Center, and the Dean of the College of Veterinary Medicine, the Office of the Registrar will enter on the student's academic record the name of the specialization and the date that it was completed. This certification will appear on the student's transcript.

### Master of Science

For the master's degree, departments of the College of Veterinary Medicine recommend Plan A with thesis unless otherwise specified.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

### Admission

A bachelor's degree is required of all applicants for graduate study. Admission must be approved by the department in which the applicant proposes to do the major work. Scholastic record, experience, personal qualifications, and area of subject-matter interest are considered by the department in determining the applicant's acceptability.

Upon admission, the master's student is classified in one of two categories:

1. **Regular status:** for those who have an undergraduate grade-point average of 3.00 or above and are otherwise qualified to undertake a master's program.
2. **Provisional status:** for those who have some remediable inadequacy of qualifications or subject-matter preparation.

### Requirements for the Master of Science Degree

Up to 10 credits may be allowed for thesis research (course number 899). The distribution of credits among major and minor areas is determined by the student's major department.

### Residence

A minimum of 9 credits must be earned in residence on campus unless a department specifies more than 9 credits.

### Time Limit

For the master's degree, the student must complete all requirements within six calendar years from the beginning of the first semester in which credit was earned toward the degree.

### Doctor of Philosophy

Doctor of Philosophy degree programs are offered in anatomy, large animal clinical sciences, microbiology, pathology, pharmacology, and physiology.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

### Admission

Admission to a doctoral program requires the approval of the department in which the applicant's major work is to be done.

The doctoral student is classified in one of two categories:

1. **Regular status:** for those who have a grade-point average in prior graduate work of 3.00 or above and who are otherwise qualified to undertake a doctoral program.

2. **Provisional status:** for those who have some remediable inadequacy of qualifications.

### Dual Degree Programs in the College of Veterinary Medicine

Students who are enrolled in the Doctor of Veterinary Medicine degree program may be granted approval to pursue simultaneously either a research-focused Master of Science degree or a Doctor of Philosophy degree. For additional information, interested students should refer to the *Requirements for a Joint Master's Degree and Medical Degree* or *Special Programs* statements in the *Graduate Education* section of this catalog. They should also contact the Associate Dean for Academic Programs and the Associate Dean for Research and Graduate Studies in the College.

### Dual Degree Medical Scientist Training Program

The Dual Degree Medical Scientist Training Program is a special program for students who want to earn both a professional veterinary doctoral degree (Doctor of Veterinary Medicine) and a graduate research doctoral degree (Doctor of Philosophy). The program seeks to meet a national need for veterinarians who are proficient in research as well as in veterinary medicine, and who will pursue careers as faculty members in veterinary medical school and research institutions.

The program is designed to select, educate, and train highly motivated students having outstanding research and academic qualifications. Trainees pursue veterinary medical and graduate studies in parallel, meet regularly with peers in seminars, and engage in veterinary medical-level and graduate-level courses and clerkships, as well as in research with highly qualified mentors.

A student who is interested in this program should contact the Office of the Associate Dean for Research and Graduate Studies in the College of Veterinary Medicine.

For additional information, refer to the statement on *Special Programs* in the *Graduate Education* section of this catalog.

### Post-D.V.M. Clinical Education Programs

**Internships.** The Department of Small Animal Clinical Sciences offers 13-month rotating internships designed to provide general clinical training for the post-D.V.M. student and a basis for further education in a specialty area.

**Residencies.** Residencies designed to meet the training requirement for board certification are offered in a variety of clinical specialties by the departments of Small Animal Clinical Sciences, Large Animal Clinical Sciences, and Pathology. Concurrent work toward an advanced degree is possible.

### COMPARATIVE MEDICINE AND INTEGRATIVE BIOLOGY

Nationwide, there is a need for scientists who understand modern molecular biology in the context of integrated systems and can apply this understanding to human and animal health. Addressing this national need with an interdepartmental graduate program in Comparative Medicine and Integrative Biology will offer graduates the understanding of how molecular and cellular events integrate into whole-animal systems, knowledge of how appropriate animal models can be used to study human and animal disease, and understanding of how species differences and similarities can be used to investigate basic biology and disease.

Graduates of the master's and/or the doctoral program in comparative medicine and integrative biology will find employment in

academia, governmental research and regulatory agencies, and in pharmaceutical industry research. They will become leaders in discovery and problem-solving research in medical science and will play an instrumental role in the translation of new knowledge to address current issues in human and animal health and well-being. The overall program is designed to develop an integrative approach to research in clinical, cellular, and molecular problems in comparative medicine and integrative biology. It emphasizes development of a firm scientific background in clinical and basic biomedical sciences and the conduct of original research.

### Admission

To be considered for admission, applicants must hold a bachelor's or higher degree in life sciences or related fields and have achieved a grade-point average of at least 3.0. As biological sciences interface more and more with disciplines such as bioinformatics, mathematics, and engineering, it is possible that students holding degrees in fields other than life sciences may contribute to and benefit from training in comparative medicine and integrative biology. The admissions committee may recommend that degree holders in other fields be admitted if their background is deemed appropriate to a particular research area in the college. The committee is chaired by the associate dean for research and graduate studies of the College of Veterinary Medicine and has representatives from each department, as appointed by the chair of each department. An applicant's acceptance will be based on the academic record including grade-point average, quality of previous training, performance on standard tests such as the GRE, and proficiency in English as demonstrated by standard tests such as the TOEFL or equivalents; statement of professional goals, three letters of reference, and availability of appropriate mentors.

Upon admission to the program, the admissions committee will appoint a temporary adviser. Within six months after entrance into the program, a major adviser will be selected by mutual agreement between the student and the proposed major adviser, after consultation with the associate dean for research and graduate studies and the department chair from the home department of the proposed major adviser.

The major adviser will be required to submit a student's progress report to the admissions committee by December 30 of each year. The committee will conduct an individual interview with each graduate student annually to assess progress in the program. Assessment of the student's progress will be reported to the major adviser, chairperson of the adviser's department, and the Associate Dean of Research and Graduate Studies.

### Master of Science

The College of Veterinary Medicine offers a master of science program in comparative medicine and integrative biology to develop an understanding of major concepts in comparative medicine and integrative biology as well as to acquire comprehensive knowledge of a major field and related subjects. **Plan A** consists of prescribed course work, original research of an important problem in human and animal health or biology, a thesis, and a final oral examination. **Plan B** consists of prescribed course work and a final research paper.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine, students must meet the requirements specified below.

### Requirements for the Master of Science Degree in Comparative Medicine and Integrative Biology

The student must complete a total of 30 credits for the degree under Plan A (with thesis) or Plan B (without thesis), with at least 12 of those non-research credits in courses at the 800-900 level. Student's who lack sufficient background in certain areas may be asked to take collateral courses at the 400-500 level. These collateral courses are not counted toward degree requirements. The student's program of study must be approved by the student's major adviser and must meet the requirements specified below:

CREDITS  
30

#### Requirements for Both Plan A and Plan B:

- Both of the following courses:
 

EPI 827	The Nature and Practice of Scientific Integrity	3
VM 820	Current Topics in Comparative Medicine and Integrative Biology	2
- One of the following courses:
 

STT 421	Statistics I	3
STT 422	Statistics II	3
PHM 980	Problems	3

#### Additional Requirements for Plan A:

- One course from *two* of the following three major areas: Molecular Life Sciences, Integrative Biology, and Pathology. A list of approved courses is available from your academic adviser.
- Complete 10 credits of 899 Master's Thesis Research from one of the following departments: Large Animal Clinical Sciences, Microbiology and Molecular Genetics, Pathology, Pharmacology and Toxicology, Physiology and Small Animal Clinical Sciences.
- Elective credits including non-research and seminar courses as determined by the academic adviser.
- Pass an oral examination in defense of the thesis.

#### Additional Requirements for Plan B:

- One course from *each* of the following three major areas: Molecular Life Sciences, Integrative Biology, and Pathology. A list of approved courses is available from your academic adviser.
- Elective credits including non-research and seminar courses as determined by the academic adviser.
- Submit a satisfactory research paper.

### FOOD SAFETY

#### Master of Science

The Master of Science in Food Safety is primarily an online program designed for students who want to enhance their study of food safety.

The Master of Science is offered by the College of Veterinary Medicine, the lead college for the National Food Safety and Toxicology Center (NFSTC) at Michigan State University. This integrated multi-disciplinary program is designed for students with various disciplinary interests and experiences. It is particularly relevant for students whose professional careers are at the interface of research, regulatory affairs, production, marketing, finance, and management.

#### Admission

Applicants will be accepted after review by an admissions committee of faculty jointly appointed to the National Food Safety and Toxicology Center. A faculty member in the NFSTC will serve as the student's academic adviser and will assist the student in planning a program of study that is related to the student's interests and professional goals and that fulfills college and university requirements.

Applicants must have completed a bachelor's degree from an accredited and recognized college or university. The applicant must have completed at least 6 credits of college-level course work in biological sciences, including 3 credits in microbiology. The applicant must prove or demonstrate proficiency in written and spoken English and submit a professional letter of intent and two letters of recommendation.

Applicants who do not meet all of the requirements listed above may be admitted provisionally and permitted to enroll for collateral course work, not to count toward the degree. This course work must be approved beforehand by the program director.

**VETERINARY MEDICINE**  
**Graduate Study**

**Requirements for the Master of Science Degree in Food Safety**

The student must complete 30 credits under Plan B (without thesis). The specific program of study must be approved by the student's academic adviser.

	CREDITS
1. One of the following courses ( 3 credits):	
ANR 810 International Food Laws and Regulations . . . . .	3
ANR 811 U.S. Food Laws and Regulations . . . . .	3
2. All of the following courses (17 or 18 credits):	
LCS 830 Epidemiology of Foodborne Diseases and Food Safety: An Overview . . . . .	3
VM 810 Food Safety Introduction and Professional Management . . . . .	2 or 3
VM 811 Evolution and Ecology of Foodborne Pathogens . . . . .	3
VM 812 Food Safety Toxicology . . . . .	3
VM 815 Applied Special Project in Food Safety . . . . .	6
3. Additional credits in electives approved by the student's academic adviser.	
4. Pass a final oral examination.	

**Doctor of Philosophy**

The College also offers the Doctor of Philosophy degree focused on depth of understanding across disciplines, acquisition of research skills and the conducting of original research.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine, students must meet the requirements specified below.

**Requirements for the Doctor of Philosophy Degree in Comparative Medicine and Integrative Biology**

The student must complete a minimum of 18 credits of non-research courses, with at least 12 credits in courses at the 800 level and above. All students are required to take the following courses, with at least two enrollments in Veterinary Medicine 820:

	CREDITS
EPI 827 The Nature and Practice of Scientific Integrity . . . . .	3
VM 820 Current Topics in Comparative Medicine and Integrative Biology . . . . .	2

All students are required to take at least one course from each of four major areas: molecular life sciences, integrative biology, pathology, and statistics and epidemiology. A list of approved courses is available from the major adviser. In rare cases, a student may lack sufficient background in certain areas and may be asked to complete collateral courses at the 400 or 500 level. Credits earned in such collateral courses are not counted towards the degree.

The doctor of philosophy degree program in comparative medicine and integrative biology is conducted in two phases:

Phase I consists of acquiring and/or documenting a high degree of competence in fundamental and basic biomedical sciences and developing research skills. Phase I culminates with a comprehensive examination, submission of a research proposal, and presentation of a research seminar outlining the research proposal including preliminary data. Students may elect to take their comprehensive exam after completion of at least 12 credit hours of course work.

Phase II consists of conducting research, continuing to expand knowledge by taking additional courses and seminars as necessary, and completing 24 credits in and successfully defending the Ph.D. Dissertation.

**MULTIDEPARTMENTAL DOCTORAL DEGREE PROGRAMS IN ENVIRONMENTAL TOXICOLOGY**

The College of Veterinary Medicine offers Doctor of Philosophy degree programs with majors in Microbiology—Environmental Toxicology, Pathology—Environmental Toxicology, Pharmacology and Toxicology—Environmental Toxicology, and Physiology—Environmental Toxicology. For additional information about these programs, refer to the statement on *Multidepartmental Doctoral Programs in Environmental Toxicology* in the *Graduate Education* section of this catalog.

**DEPARTMENT of LARGE ANIMAL CLINICAL SCIENCES**

**Thomas H. Herdt, Chairperson**

The Department of Large Animal Clinical Sciences offers courses for students in the professional program in Veterinary Medicine. Post-D.V.M. programs are offered which lead to the Master of Science degree in large animal clinical sciences and provide training in AVMA-recognized specialty areas. The department also offers a Doctor of Philosophy degree program with a major in large animal clinical sciences.

Students who are enrolled in Master of Science degree programs in the Department of Large Animal Clinical Sciences may elect a specialization in food safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

**GRADUATE STUDY**

**Master of Science**

The principal objectives of the Master of Science program are to introduce candidates to research and to prepare them for positions requiring advanced education. Opportunities are available in veterinary and medical colleges, animal and veterinary science departments, industrial research and development, U. S. Public Health Service, U. S. Food and Drug Administration, U. S. Department of Agriculture, and private business organizations or practices.

The master's degree student is usually required to develop a course of study which requires writing a thesis based upon original research (Plan A). In rare instances, a student may be permitted to elect a non-thesis (Plan B) course of study upon recommendation of the guidance committee and the approval of the department's faculty.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine, students must meet the requirements specified below.

### Admission

The candidate must possess a Doctor of Veterinary Medicine degree or an equivalent degree and be accepted by the graduate faculty of the department.

### Requirements for the Master of Science Degree in Large Animal Clinical Sciences

The student must complete 30 credits under either Plan A (with thesis) or Plan B (without thesis).

Students majoring in large animal clinical sciences may elect to support the major field with courses in two or three additional areas. Supporting and minor courses may be in anatomy, pathology, physiology, pharmacology, bacteriology, virology, immunology, mycology, parasitology, nutrition, animal science, statistics, chemistry, genetics, or education.

### Academic Standards

A second semester of grades averaging below 3.00 constitutes cause for withdrawal from the program.

### Doctor of Philosophy

The Doctor of Philosophy degree program is designed to provide veterinary medical graduates the experience and training necessary to develop an integrative approach to animal disease research. The program emphasizes the development of a firm scientific background in fundamental and basic biomedical sciences, in-depth knowledge in an area of veterinary science, and the conduct of in-depth original research.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine, students must meet the requirements specified below.

### Admission

Applicants for admission must hold a Doctor of Veterinary Medicine degree or another medical degree and have a grade-point average of at least 3.00 in two previous years of graduate or professional study. At least one year of clinical experience is recommended. A Master of Science degree is not required.

Applicants must submit an autobiographical sketch, a statement of interest and objectives, and three letters of recommendation from individuals capable of judging their academic capabilities and accomplishments. The department's Graduate Postgraduate Training Committee reviews applications for admission and recommends persons for admission to the department chairperson. The admissions decision is based upon the applicant's academic record and professional goals, the letters of recommendation, and space and faculty availability.

### Requirements for the Doctor of Philosophy Degree in Large Animal Clinical Sciences

The doctoral program is divided into three phases: Phase I culminating with a qualifying examination, Phase II culminating with a comprehensive examination, and Phase III culminating with the completion and defense of the dissertation. There is no foreign language requirement.

**Phase I** consists of fundamental and basic biomedical sciences courses in which the student must demonstrate a high degree of competence. The student must complete 15 credits of inorganic chemistry, organic chemistry, biochemistry, and physiologic chemistry. No fewer than 3 credits must be in biochemistry.

The student must also complete no fewer than 3 credits of statistics and no fewer than 6 credits in courses emphasizing mechanisms of animal disease. In order to continue in the doctoral program, the student must pass a qualifying examination formulated and conducted by the qualifying examination committee.

**Phase II** consists of at least 13 credits in an area of veterinary science chosen by the student. The 13 credits must be in courses at the 400 level or above. At least 8 of the 13 credits must be in courses at the 800 level or above, and it is recommended that these credits be from one of the following departments: anatomy, physiology, pharmacology and toxicology, microbiology, pathology, statistics and probability, or community health science. With the agreement of the department that administers the courses, the 8 credits may contribute to a minor from that department, but a minor is not required for the program.

The comprehensive examination is given by the student's guidance committee toward the end of Phase II when the student has completed most of the required courses. The examination consists of two parts: an oral examination and the presentation of a dissertation proposal. The oral examination is designed to evaluate the student's depth of knowledge in his or her chosen area of veterinary science and includes, but is not limited to, material from the required courses. The student must pass the oral examination before he or she may present the dissertation proposal. The proposal must be presented no earlier than 15 days, and no later than 45 days, after the student has passed the oral examination.

**Phase III** consists of conducting animal disease research, completing the dissertation, and defending the dissertation.

### Academic Standards

A candidate may not receive more than three grades below 3.0 in courses required for the degree.

## DEPARTMENT of MICROBIOLOGY and MOLECULAR GENETICS

*Jerry B. Dodgson, Chairperson*

### GRADUATE STUDY

The Department of Microbiology and Molecular Genetics is administered jointly by the colleges of Veterinary Medicine, Human Medicine, Natural Science, and Osteopathic Medicine. All four of these colleges offer a Master of Science degree in microbiology and a Doctor of Philosophy degree in microbiology and molecular genetics. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in microbiology—environmental toxicology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Microbiology and Molecular Genetics* in the *College of Natural Science* section of this catalog.

Students who are enrolled in Master of Science degree programs in the Department of Microbiology and Molecular Genetics may elect a specialization in food safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

# DEPARTMENT of PATHOBIOLOGY and DIAGNOSTIC INVESTIGATION

*Willie Reed, Chairperson*

## GRADUATE STUDY

Students who are enrolled in Master of Science degree programs in the Department of Pathobiology and Diagnostic Investigation may elect a specialization in food safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

## Residency Training in Veterinary Pathology

The veterinary residency program is designed to provide post-D.V.M. advanced training for proficiency in the practice of pathology. Scheduled rotational assignments are available in the areas of necropsy, clinical pathology, and surgical pathology. Residents also receive experience in teaching and are exposed to the research activities of the department. Residents must identify their area of interest in either clinical pathology or anatomic pathology. Appointments are for a 2 to 4 year period depending on the background and career objectives of the individual resident. Annual evaluations are conducted, and reappointments are contingent on the student's performance.

## Pathology for Graduate Students in Related Fields

Students majoring in related fields may elect to take supportive courses in pathology. Such students are expected to have an adequate background in biochemistry, microbiology, physiology, gross anatomy, and histology. Also, due to limited facilities, permission must be obtained from the department chairperson prior to enrollment.

## **PATHOLOGY**

Graduate education and research may be directed to either human or animal pathology. Major areas of research in pathology provide the basis for advanced degree programs. These areas include toxicologic pathology, oncology, neuropathology, hematology in a broad sense, immunopathology, pathology of infectious diseases, reproductive and cardiovascular pathology, and pathology of animal models for human disease. Comparative aspects of disease processes may encompass a variety of species, including humans and domestic or wild mammals and birds, and may emphasize anthroozoonoses dealing with diseases transmissible across species lines. An interdisciplinary approach to problem solving will be applied in all instances where indicated.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine students must meet the requirements specified below.

## **Admission**

With few exceptions, the graduate student majoring in pathology will have a professional degree in some branch of medicine. Students holding a bachelor's degree and seeking graduate training in pathology are advised to inquire about possible openings before going through the process of formal application. The doctoral candidate will usually have, in addition, a master's degree in a medical or paramedical science; however, possession of a master's degree does not guarantee admission to a doctoral program.

## **Academic Standards**

In all graduate study programs in pathology, the student is expected to assume much responsibility. In research, particularly, the qualified student must demonstrate ability to independently plan, initiate, and carry to completion the project which the student undertakes.

## **Master of Science**

### **Requirements for the Master of Science Degree in Pathology**

The student must complete 30 credits under Plan A (with thesis). The student is required to prepare a manuscript judged by the academic adviser and the director of thesis research as suitable to submit for publication in an appropriate scientific journal.

## **Residence**

A minimum of 10 semester credits must be acquired in residence.

## **Doctor of Philosophy**

### **Requirements for the Doctor of Philosophy Degree in Pathology**

The student is required to prepare a manuscript judged by the academic adviser and director of dissertation research as suitable to submit for publication in an appropriate scientific journal.

The minimum number of credits required for the degree depends principally upon the student's educational background and level of scholarly attainment. Those students who are well advanced in training or who have had considerable professional experience in pathology and can submit bona fide evidence of scholarship and attainment may not be required to take as many as the usual 40 credits of course work beyond the master's degree.

## **PATHOLOGY—ENVIRONMENTAL TOXICOLOGY**

### **Doctor of Philosophy**

For information about the Doctor of Philosophy degree program in pathology—environmental toxicology, refer to the statement on *Multidepartmental Doctoral Programs in Environmental Toxicology* in the *Graduate Education* section of this catalog.

## DEPARTMENT of PHARMACOLOGY and TOXICOLOGY

### **Jay I. Goodman, Acting Chairperson**

The Department of Pharmacology and Toxicology is administered jointly by the colleges of Veterinary Medicine, Human Medicine, and Osteopathic Medicine. All three of these colleges offer Master of Science and Doctor of Philosophy degree programs with majors in pharmacology and toxicology. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in pharmacology and toxicology—environmental toxicology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Pharmacology and Toxicology* in the *College of Osteopathic Medicine* section of this catalog.

Students who are enrolled in Master of Science degree programs in the Department of Pharmacology and Toxicology may elect a specialization in food safety. For additional information, refer to the statement on the specialization.

## DEPARTMENT of PHYSIOLOGY

### **William S. Spielman, Chairperson**

The Department of Physiology is administered jointly by the colleges of Veterinary Medicine, Human Medicine, Natural Science, and Osteopathic Medicine. All four of these colleges offer Master of Science and Doctor of Philosophy degree programs with majors in physiology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Physiology* in the *College of Natural Science* section of this catalog.

## DEPARTMENT of SMALL ANIMAL CLINICAL SCIENCES

### **Curtis W. Probst, Chairperson**

The Department of Small Animal Clinical Sciences offers courses designed to meet the needs of the professional program in veterinary medicine, the post-D.V.M. clinical training programs that provide the basis for specialty board certification, and the graduate program leading to the Master of Science degree.

### **GRADUATE STUDY**

#### **Master of Science**

The department offers advanced studies leading to the Master of Science degree. The program is designed primarily for graduate veterinarians in the residency training program in the department.

Emphasis in the program is placed on clinically oriented research which is well supported by the facilities available and the clinical case volume. Graduates of this program will find opportunities in all areas of practice, teaching, and research.

In addition to meeting the requirements of the University and of the College of Veterinary Medicine, students must meet the requirements specified below.

#### **Admission**

The candidate must possess a Doctor of Veterinary Medicine degree or its equivalent and have the potential qualifications for graduate study. Licensure to practice veterinary medicine in the State of Michigan is usually required.

#### **Requirements for the Master of Science Degree in Small Animal Clinical Sciences**

The student must complete 30 credits under Plan A (with thesis).

Supporting courses may be taken in such areas as anatomy, pathology, physiology, pharmacology, microbiology, immunology, nutrition, parasitology, statistics, virology, chemistry, and animal genetics.

#### **Academic Standards**

Three grades below a 3.0 in graduate courses will remove a student from degree candidacy.

#### **Transfer Credits**

As many as 9 semester credits of graduate work (excluding research and thesis credits) may be transferred from other institutions, upon approval of the department chairperson, the Associate Dean for Research and Graduate Studies, and the student's guidance committee.

#### **Post-D.V.M. Clinical Training Programs**

These programs are supported by the clinical service activities of a highly specialized faculty utilizing the facilities and support staff of The Veterinary Teaching Hospital.

#### **Internships**

The department offers thirteen-month rotating internships designed to provide general clinical training for the post-D.V.M. student as well as to provide a basis for further specialty training. Selection of trainees is normally made through the National Internship-Residency Matching Program.

#### **Residencies**

Residencies designed to meet the training requirements for specialty board certification are currently offered in dermatology, internal medicine, and surgery. The dermatology residency is two years in length and the others are three years in length with yearly evaluation of progress and continuance based on trainee performance. Concurrent work toward the Master of Science degree is encouraged. Selection of trainees is normally accomplished through the National Internship Residency Matching Program.

## INSTITUTE FOR ENVIRONMENTAL TOXICOLOGY

**Lawrence J. Fischer, Ph.D., Director**

The Institute for Environmental Toxicology was established to facilitate and coordinate the varied programs in departments and colleges across campus related to toxic substances. These programs address almost all aspects of environmental toxicology with particular focus on adverse effects of chemical contaminants on living organisms. Research spans a broad range from studies of biochemical mechanisms of toxicity to studies on the distribution and fate of chemicals in various environmental media.

The Institute serves as the MSU focal point for addressing questions relating to toxic substances in the environment. It initiates and supports multidisciplinary research, education, and training as well as provides information and technical assistance to the public.

Through its colleges, MSU makes study in the area of environmental toxicology available to graduate students.

## ANIMAL HEALTH DIAGNOSTIC LABORATORY

**Willie M. Reed, Director**

The Animal Health Diagnostic Laboratory was established to provide a complete animal disease diagnostic service for Michigan veterinarians and animal owners. The primary objective of the service is efficient food production and a safer food supply and environment.

Expertise is provided in the areas of endocrinology, bacteriology, mycology, nutrition, pathology, toxicology, and virology.

Faculty are jointly appointed with academic departments and participate in teaching and research programs.

The laboratory has been accredited by the American Association of Veterinary Laboratory Diagnosticians.

## NATIONAL FOOD SAFETY and TOXICOLOGY CENTER

The National Food Safety and Toxicology Center is home to staff, faculty and students from seven different colleges and sixteen different departments. The 115,000-square-foot building has laboratory and other experimental facilities for researchers with expertise in toxicology, carcinogenesis, pathology, biochemistry, microbiology, epidemiology and the social sciences. In addition, the three-story center is the location of food safety targeted outreach and education programs, seminars and workshops.

At the heart of the center lies its mission: to conduct research that will increase understanding of chemical and microbial hazards in foods and to use this knowledge to develop a safer food supply, well-founded public policy and a greater public understanding of food safety issues. It has also established national and international links to address the global reduction of foodborne disease.

MSU is blessed with strong expertise, and the center uniquely provides a focal point for experts throughout the University to use a multi-college, multidisciplinary approach to investigate food safety issues and generate new knowledge.

## VETERINARY TEACHING HOSPITAL

The Veterinary Teaching Hospital (VTH) provides the environment for the clinical instruction of veterinary technology and veterinary medicine students, as well as interns and residents. The VTH also provides facilities for the research activities of postdoctoral students, residents, and faculty. The VTH comprises nine sections (Anesthesiology, Clinical Pathology, Equine, Food Animal, Production Medicine, Radiology, Small Animal Medicine, Small Animal Surgery, and Intensive Care) and delivers care to over 18,000 hospitalized patients annually. Faculty in the VTH are appointed in the departments of Large Animal Clinical Sciences, Small Animal Clinical Sciences, Pathology, Physiology, Anatomy, or Microbiology and Molecular Genetics. The Hospital has been accredited by the American Animal Hospital Association.