Comparative Health Sciences Graduate Program
PhD and MS Student Handbook
2023 – 2024

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Comparative Health Sciences Graduate Program (PhD, MS)

Overview

The program of Comparative Health Sciences (CHS) is a multi-disciplinary program offering graduate training towards MS and PhD degrees. The program encourages applicants with interest in complex contemporaneous issues that require a multi-disciplinary approach to consider this program. Faculty involved in the program have interests including microbiology, ecology, immunology, nutrition, food science, bio-engineering, veterinary medicine, public health, human health, bioinformatics, mathematical modeling, microbiome, neuroscience, pharmaceutical sciences and others.

The program encourages co-mentorship from different disciplines, but also accepts students working in traditional fields. The program has a strong international component and diversity of ideas and innovation is encouraged and valued. This program allows students to customize their studies across many fields of science at OSU. Strong student involvement and participation in the program is sought.

The training involves classes, laboratory research, travel/presentations, outreach activities, teaching and direct participation in a seminar series. Students may be supported by graduate teaching assistantships, graduate research assistantships, or scholarships, depending on availability. The students' program is designed individually to support the needs of innovative research. Graduate students are expected to be major participants in the scientific output of the program and are given opportunities to publicly present findings. All students must enroll in a transcript-visible option (i.e. track) within the Comparative Health Sciences major.

The program includes three distinct options:

- Biomedical Sciences (MS, PhD)
- Clinical Sciences (MS, PhD)
- Veterinary Medicine (MS, PhD)

A Masters, Non-Thesis Masters and PhD can be earned by students in any of the options. The Biomedical Sciences option is available for all graduate students entering the Comparative Health Sciences program and is the default option. The Clinical Sciences option is only available for clinical residents earning a concurrent Masters or PhD with their veterinary specialty. The Veterinary Medicine option is only available to dual DVM/graduate students of the Carlson College of Veterinary Medicine. See the next page for a summary of course listings for each option. More details for each option are listed in Appendix A.

Research

In addition to coursework required in the student's program of study, MS thesis and PhD students will complete an interdisciplinary research project in comparative health sciences, under the support and direction of their major professor.

Primary Academic Contact: Stacy Semevolos, DVM, Director of Professional and Graduate Programs: stacy.semevolos@oregonstate.edu

Administrative Contact: Beth Chamblin, Dean's office: beth.chamblin@oregonstate.edu

Summary of Coursework for Comparative Health Sciences major:

Course Title	Course number	Number of credits
Methods of Data Analysis or Introduction to Biostatistics	ST 511, H524 or similar	4
Responsible Conduct of Research	GRAD 520 or equivalent	2
Introduction to Grant Proposal Writing	VMB 669 or equivalent	2
Seminar	VMB 507/607	1
Thesis	VMB/VMC 503(MS), VMB/VMC 603 (PhD)	12 (MS), 36 (PhD) Not required for non-thesis MS (see research credits below)
Research	VMB/VMC 601 (PhD) VMB/VMC 501 (non-thesis MS)	3 (PhD-only used for lab rotations if no lab previously selected) 12 (non-thesis MS only)
Electives (including required electives chosen below, additional thesis credits (PhD only), and other)	Various (see below)	12 (MS), 51 (PhD)
Option specific coursework	Various (see next page)	12

Required Electives: must include at least 2 of the following courses (or similar courses approved by student's graduate committee)

Course Title	Course number	Instructor/term
Zoonoses (3)	VMB 523	Sarker/Hase - Spring
Disease Ecology (3)	IB 595	Jolles -
Introduction to Systems Biology (3)	VMB 670/PHAR 670	Shulzhenko – Spring
Comparative Immunology (3)	VMB 673	Dolan/Shulzhenko - Spring
Mechanisms of Disease (3)	VMB 630	Bermudez - Winter
Antibiotic Stewardship (1)	VMB 624	Bermudez – Fall
Mathematical Modeling (3)	VMB 631	Medlock - Spring
Cancer Systems Biology (3)	VMB 651	Ramsey – Winter
Vaccines and New Therapies (3)	VMB 674	Danelishvili – Fall
Outreach for Scientists-ONE HEALTH (3)	VMB 512	Schubiger/Beechler - Fall

Option specific coursework:

Biomedical Sciences Option:

Course Title	Course number	Number of credits
Molecular Tools	VMB 671	3
Electives	Various	9 (in addition to electives for major)

Clinical Sciences Option:

Course Title	Course number	Number of credits
Topics in Medicine, Surgery, or other clinical specialty	VMC 682, VMC 684, VMB 665, or similar	6
Postgraduate Medicine, Surgery or other clinical specialty	VMC 632, VMC 634, VMB 663, or similar	6

Veterinary Medicine Option:

Students select 12 credits from the following graduate courses that have a DVM program equivalent:

Course Title	Course number	Number of credits
Veterinary Gross Anatomy	VMB 611	4
Veterinary Gross Anatomy	VMB 612	4
Veterinary Microscopic Anatomy	VMB 614	4
Veterinary Physiology	VMB 517	5
Veterinary Physiology	VMB 518	5
Veterinary Physiology	VMB 519	4
Veterinary Immunology	VMB 620	5
Veterinary Pathology	VMB 621	4
Ornamental Fish Medicine	VMB 627	2
Veterinary Virology	VMB 653	4
Veterinary Bacteriology & Mycology	VMB 659	5
Veterinary Parasitology	VMB 660	5
Epidemiology and Public Health	VMB 666	3

Resources

The Graduate School serves as an official source of information related to graduate education across all programs at the university. The Graduate School website is a great resource complete with checklists, forms and resources for all OSU graduate students. Keep in mind that our Comparative Health Sciences program may have different requirements, not only for admission to the program but throughout. The Graduate School also offers an array of professional development opportunities specific to the success of graduate students. Please see Appendix B for additional resources.

How to Apply:

Deadline

The Graduate School deadline for applications is December 10th for the start of the following academic year (Fall Term for consideration of available scholarships/fellowships).

Online Application

Required materials for the online applications include:

- Statement of objectives
- Three letters of recommendation
- Curriculum Vitae (CV)
- Official transcripts
- English language test scores (if applicable)

APPLY ONLINE HERE

Admissions Requirements

Admit Term

Fall term

Grade Point Average (GPA)

A minimum GPA of 3.00 is required.

Required Tests

International students: English Language Requirements

English language requirements for international applicants to this program are the same as the standard Test of English as a Foreign Language (TOEFL scores) of the Graduate School.

If you are an international student and not sure of your English skills or which graduate program you are interested in, please see Appendix C to learn about the INTO Graduate Pathway program.

Comparative Health Sciences Criteria

No single criterion will serve as a basis for admission or denial to the Comparative Health Sciences Graduate Program.

Evidence of excellent scholarship and **research potential** from previous academic records and

letters of recommendation.

Professional goals compatible with a graduate degree in Comparative Health Sciences.

Scholarship interest compatible with one or more of the faculty who are active in the degree program.

NOTE: If you meet OSU requirements, we encourage you to contact participating faculty whose research coincides with your interest (see Appendix H). Individual faculty members can provide information on their research programs with possible positions for graduate students in their laboratory. Research summaries for all faculty are located here.

Significance of Temporary Advisor

At the time of admission to the program the student may be assigned a temporary faculty advisor or the student may elect to go on a rotation of research programs. If at the end of the first year rotations no faculty advisor has been selected, a temporary advisor will be assigned to the student.

Degree Program Components

45 credit hour program (M.S. – Thesis and M.S. Non-Thesis); 108 credit hour program (Ph.D.)

Criteria to Define Satisfactory Progress

A graduate student will:

1. Maintain good academic performance, GPA of 3.0 or higher.
2. Participate in the academic activities of the Department/College/or important activities as directed by the mentor.
3. Demonstrate interest in the project by keeping abreast of the literature.
4. Communicate data generated in the project, either/or in meetings and publications.
5. Keep a good level of collegiality with peers and faculty.

Enrolled students will undergo annual review by the student's Graduate Committee, the mentor and the College Graduate Committee. If appropriate progress has not been made, the College Graduate Committee will make recommendations to the mentor and the student. See Annual Forms to print the forms and complete each year.

Admission via INTO Program

The Comparative Health Science Graduate Program has a component associated with OSU INTO (International Students).

Guidelines for pursuing a degree through the INTO Graduate Pathway program can be found here: INTO pathway .
An undergraduate GPA of 2.5 is required for admission.

Key facts	
Course length:	1 - 3 Terms
Start dates:	2019: September, December 2020: March, June, September, December 2021: March
Fees:	From $11,845
Academic requirements:	1 Term: 3.0 GPA, No GRE Required, Undergraduate degree in a relevant discipline. 2 Terms: 2.5 GPA, Undergraduate degree in a relevant discipline.
English language requirements:	From: TOEFL 70 or IELTS 6.0 or equivalent
Award:	Leads to the Comparative Health Sciences master's or PhD degree program at Oregon State University.
Course options:	• 3-Term • 1-Term Pathway • 2-Term • 2-Term Pathway

Students who complete the year with good academic record of 3.0 GPA may pursue their choice of MS, Non-Thesis MS or PhD graduate programs in Comparative Health Sciences. Please see Appendix C for more detail regarding the INTO Graduate Pathway Program courses.

Please keep in mind that 0 credit hours apply from the Pathway program once admitted to the Comparative Health Sciences graduate program.

Support for Graduate Students

Student Loans, Scholarships and Fellowships

Graduate students are often eligible for financial assistance in the form of student loans or limited university-wide scholarships. Financial Aid and Scholarships can provide more information.

Graduate Assistantships

Graduate Research Assistantships (GRAs)

Students may receive GRA support directly from the grant of their major professor. The program has a limited number of highly competitive scholarships that range from 1 to 2 years for a PhD program.

Graduate Teaching Assistantships (GTAs)

Students in the Comparative Health Sciences program are encouraged to serve at least one term as a Graduate Teaching Assistant depending on GTA availability in their respective department.

Office Space

It is the intent of the program to provide desk space for graduate students during their studies at OSU. This responsibility generally falls upon your major professor or their department. If your major professor is unable to find desk space for you, please let us know and we will see if something can be found.

Lab Coats

As soon as you start working in a lab, you are welcome to try on lab coats located in conference room Dryden 212b or in Magruder 274. These are the locations they are stored in once they are laundered by our contractor, Cintas. They come in two different styles and you can find the size and style that fits you. If a new one needs to ordered, please see our office staff. They typically take 2-3 weeks to arrive. Once you start working in the lab, you should see laundry baskets near one of the doors in which you deposit your dirty lab coat. You are allotted two lab coats.

Travel to Professional Meetings

Graduate students who plan to present a paper or poster, or otherwise participate in a professional meeting, can apply for a small grant from their department. Approval from the Major Professor and the Department/Unit Head is required.

Deadline for application is two months prior to the meeting. Funds may be used for registration fees or for reimbursement of allowed travel expenses. If granted for registration fees and then the trip is subsequently cancelled, it is expected that the program will be reimbursed for this expense. Students who apply for support from the Graduate School will receive priority.

The Graduate School also offers a Graduate Student Travel Award for which students can apply. The travel funds from this program are designed to provide graduate students with financial support to cover part of the cost of attending and presenting their scholarly achievements at prestigious conferences and venues. Award details and student eligibility can be found on the Graduate School website Travel Grants. The awards are intended to cover up

to half of the full cost of attending a conference (air and/or ground transportation, hotel, meals, and meeting registration). The maximum award is $500 for domestic travel and international travel. The award applications need to be submitted by the CHS program administrator.

Graduate school resources

Information and resources offered by the Graduate School are available on their website. In addition, appendices at the end of this handbook are provided for your reference. Appendix E contains forms required by the Graduate School throughout your graduate education and degree. Appendix F contains information on graduate program deadlines. Appendix G contains Graduate School policies important throughout your graduate program.

Master of Science (M.S.) Program Guidelines

Committee and Program Meeting

The M.S. Thesis Committee consists of 3 or 4 members of the OSU graduate faculty plus a Graduate Council Representative, who serves as advocate for appropriate process. A Program Meeting will be held no later than the end of the **second term** of coursework. The Program meeting will cover two aspects: the proposed coursework (Program of Study) and the proposed research (Thesis Outline). This meeting will include all members of the committee. A Program of Study form should be completed during this meeting.

Program of Study (45 graduate credits required; i.e., 500 or 600 level, half the credits to come from 600 level):

- Coursework credits consisting of:
  - Required core sequence of courses [9 credits]
  - Elective courses relevant to the thesis research agreed to by the student's committee [12 credits]
  - Option specific courses [12 credits]
  - 12 Thesis credits (VMB 503 or VMC 503)
- *Note: 23 of the 45 credits must be graduate stand-alone courses (500/600 level) that are not derived from the 500 component of 400/500 courses.*
- *Note: No more than 9 credits of blanket-numbered courses, other than thesis (or research-in-lieu-of-thesis for nonthesis programs), may be applied toward the minimum 45-credit master's degree. Blanket courses have numbers with a zero in the middle of them, for example "503." Please refer to the OSU Catalog to learn more about blanket course types and the limits of their use on a program of study.*
- *Note: Full time enrollment is 12 credits per term in the academic year and 9 in the summer. Students receiving graduate assistantships must maintain full time enrollment.*

Before meeting with your Committee, make sure you have completed and submittted a Transfer credit request PDF form (if applicable) to the Graduate School.

When meeting with your Committee to create a Program of Study, have them advise you to prepare the Digital Program of Study to collect signatures and submit to the Graduate School. This is accessed here to drag and drop courses from four sources:

- Approved Transfer Credits
- OSU Transcript
- Course Catalog
- Course Schedule

Master's of Science Quick Reference Guide

Year one:

1. Application to the Graduate School by the student before December 10 for Fall quarter. Acceptance of the student by the CCVM Graduate Committee, and notification to the Graduate School.
2. All incoming first year students must complete an online module in Canvas, "Creating an Inclusive Environment" prior to start of fall term. Complete 6 hours of training annually related to social justice, diversity, and inclusion.
3. Begin coursework in Fall quarter. Selection of major professor and student graduate committee by the end of the second quarter, initiation of thesis research project.
4. Development of Program of Study by major professor and student before completing 18 credits of coursework (before end of second quarter). Student's graduate committee should meet and approve Program of Study (plan for completing degree). Program of Study must be signed by major professor, minor professor (only if taking minor) and Program Director. Submit signed Program of Study to the Graduate School.
5. Complete and submit first Self-Evaluation Form (see Appendix D) by July 1 (end of first year). Major Advisor must submit annual review form (see Appendix D) by July 15 (signed by committee members).

Year two and three:

1. Complete approved coursework and continue thesis research. Complete 6 hours of training annually related to social justice, diversity, and inclusion.
2. Meet with student's graduate committee for annual progress report. Complete and submit Annual Self-Evaluation Forms each year by July 1. Major Advisor must submit annual review form by July 15 (signed by committee members).

Year three:

1. Finish thesis research and write Thesis/Dissertation (see Thesis Guide).
2. At least 15 weeks before your final oral exam (thesis defense), submit final approved Program of Study to the Graduate School and select Graduate Council Representative if you have not already done this.
3. At least 2 weeks before your oral defense: 1) schedule your final oral exam online, 2) distribute a defendable copy of your thesis to your committee, 3) deliver or email pretext pages of your thesis/dissertation to the Graduate School, and 4) submit a diploma application to Graduate School.
4. Defend Thesis/Dissertation in a public seminar, followed by an oral exam by the student's graduate committee. Schedule thesis defense before end of spring quarter, so additional fees for summer quarter are not incurred. Submit final revised Thesis/Dissertation to Graduate School for approval within 6 weeks of oral defense.

Annual Meeting Requirements

Students are required to meet yearly with their committee to evaluate their progress. Every year, the student and major professor(s) must complete the Annual Graduate Student Progress Report form, located in Appendix D, have it signed by **all** members of the student's graduate committee, and return it to the assistant to the program by the July deadlines.

Other Requirements

Students must maintain an overall GPA of 3.0 and will be notified by the Graduate School if their GPA falls below 3.0 for any term. The cumulative GPA must be at or above 3.0 before the final exam can be taken. Grades C (=2.0) or below cannot be used as graduate credit.

Students must complete 6 hours of training annually related to social justice, diversity, and inclusion or complete a DPD (Difference, Power, and Discrimination) graduate level course. In addition, all incoming first year students must complete an online module in Canvas, "Creating an Inclusive Environment."

Students in the Clinical Sciences option must fulfill clinical residency program requirements of their respective veterinary specialty college. This is assessed by annual evaluations by their Resident Advisor and/or specialty section, completion of residency training log (ACVS only) and/or specialty board examination(s).

Final Defense

The student's graduate committee will conduct the final examination. Substitutions may be made if approved by the Program and Graduate School.

The student must contact members of the committee to arrange the date, time, and place of the defense, and then schedule the exam with the Graduate School not less than two weeks before the examination. One copy of the pre-text pages of the thesis must be submitted to the Graduate School. Copies of the thesis should be distributed to **all** committee members, two weeks prior to the exam. All members of the graduate committee should be physically present at the required graduate exam (for exceptions, see Remote Participation requirements).

The first part of the exam is the thesis presentation portion and is open to all members of the public. After the thesis seminar and open questions, the committee and student will continue in closed session with the oral examination of the thesis work.

- The decision on the outcome of the exam will be based on a Scoring Guide rubric. The committee will use this form to evaluate the student's performance (with specific reference to rubric items) at the conclusion of the defense.
- A copy of the scoring sheet needs to be returned to Beth Chamblin and the Graduate School.

Scoring Guide (Rubric) for Graduate Learning Outcome Assessment

MS DEFENSE EXAM in Comparative Health Sciences

Candidate Name: _____ Date: _____

Title of Thesis: _____

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition:**	☐ Research problem not clearly stated or statement not carefully considered or hypothesis driven	☐ Stated the research problem clearly, provided rationale for undertaking the research	☐ Research problem fully considered and hypotheses behind all research questions clearly enunciated
2. **Literature and Previous Work:**	☐ Incomplete knowledge of literature in the area and of prior work on specific research problem	☐ Demonstrated sound knowledge of most literature in the area, and of prior work on the specific research problem	☐ Excellent knowledge of literature in the area, able to synthesize prior work and apply to research problem, complete literature review
3. **Impact of Research:**	☐ Unable to connect how solving the research problem will impact advancement of knowledge in area of study	☐ Demonstrated the potential value of solution to the research problem in advancing knowledge within the area of study	☐ Clearly defines the value of solving their research problem and how it advances knowledge within the area of study
4. **Solution Approach:**	☐ Research methods and tools incompletely described, lack of understanding of research methods and limitations	☐ Has applied sound research methods/tools to solve the defined problem and has described the methods/tools effectively; some understanding of study limitations	☐ Clear understanding of research methods and tools used to solve the defined problem, thoroughly describes methods and tools, novel approach, clear understanding of study limitations
5. **Results:**	☐ Incomplete analysis of research results, interpretations do not match results, overinterpretation of results	☐ Analyzed and interpreted research results/data effectively, appropriate statistical analysis	☐ Thorough analysis of results and accurate interpretation of research findings, appropriate statistical analysis
6. **Quality of Written Communication:**	☐ Writing style is immature. Grammatical errors, poor sentence construction making it difficult to read	☐ Writing is academic and flows by presenting information in concise manner. Minor grammatical or spelling errors.	☐ Writing is scholarly, flows naturally and is clear and professional. No grammar or spelling errors.
7. **Quality of Oral Communication:**	☐ Disorganized presentation, poor communication skills, answers to questions show	☐ Adequately organized presentation, concepts flow logically, adequate communication skills	☐ Highly engaging conference quality presentation, excellent communication skills,

	lack of knowledge in subject area	and answers to questions in subject area	answers to questions show thorough knowledge in subject area
Evaluation/Guidance	**Does not meet Expectations**	**Meets Expectations**	**Exemplary Performance**
8. **Critical Thinking:**	☐ Unable to answer questions clearly as relates to current and future research in subject area, poor critical thinking skills	☐ Able to answer some questions related to current and future research, adequate critical thinking skills	☐ Clearly answers questions related to current and future research, demonstrates capability for independent research in the area of study and expertise
9. **Broader Impact:**	☐ Not aware of broader impact research may have for social, economic, technical, ethical, business, or other aspects	☐ Demonstrated awareness of broader implications of the concluded research (may include social, economic, technical, ethical, business, other aspects)	☐ Thorough awareness of broad implications that concluded research may have on social, economic, technical, ethical, business, or other aspects
10. **Publications:**	☐ No publications or conference proceedings resulted from this research	☐ Conference proceedings or journal publications anticipated from this research	☐ Journal publications and conference publications resulted from this research

Overall Assessment: The assessment of the overall performance of the candidate based on the evidence provided in items 1 – 10 above.

CRITERIA	**PERFORMANCE RATINGS for THESIS EXAM**		
	Does NOT PASS Exam	***PASSES Exam***	
OVERALL, my rating of the MS Thesis defense indicates that it:	**Does not meet expectations**	**Meets expectations**	**Exemplary performance**
	☐	☐	☐

Name of the Examining Committee Member: _____

Signature of the Examining Committee Member: _____

Comments:

Non-Thesis Master of Science (M.S.) Program Reference Sheet

Committee and Program Meeting

The M.S. Committee consists of 3 or 4 members of the OSU graduate faculty, plus a Graduate Council Representative, who serves as advocate for appropriate process. A Program Meeting will be held no later than the end of the second term of course work. The Program meeting will cover two aspects: the proposed coursework (Program of Study) and the proposed topic of research for written paper. This meeting will include all members of the committee. A Program of Study form should be completed during this meeting.

Program of Study (45 graduate credits required; i.e., 500 or 600 level, half the credits to come from 600 level):

- Coursework credits consisting of:
    - Required core sequence of courses [9 credits]
    - Elective courses relevant to research project agreed to by the student's committee [12 credits]
    - Option specific courses [12 credits]
    - 12 Research credits (VMB 501 or VMC 501)
- *Note: 23 of the 45 credits must be graduate stand-alone courses (500/600 level) that are not derived from the 500 component of 400/500 courses.*
- *No more than 9 credits of blanket-numbered courses, other than thesis (or research-in-lieu-of-thesis for nonthesis programs), may be applied toward the minimum 45-credit master's degree. Blanket courses have numbers with a zero in the middle of them, for example "503." Please refer to the OSU Catalog to learn more about blanket course types and the limits of their use on a program of study.*
- *Note: Full time enrollment is 12 credits per term in the academic year and 9 in the summer. Students receiving graduate assistantships must maintain full time enrollment.*

Before meeting with your Committee, make sure you have completed and submittted a  Transfer credit request PDF form (if applicable) to the Graduate School.

When meeting with your Committee to create a Program of Study, have them advise you to prepare the Digital Program of Study to collect signatures and submit to the Graduate School. This is accessed here to drag and drop courses from four sources:

- Approved Transfer Credits
- OSU Transcript
- Course Catalog
- Course Schedule

Annual Meeting Requirements

Students are required to meet yearly with their committee to evaluate their progress. Every year, the student and major professor(s) must complete the Annual Graduate Student Progress Report form, located in Appendix D, have it signed by **all** members of the student's graduate committee, and return it to the assistant to the program by the July deadlines.

Other Requirements

Students must maintain an overall GPA of 3.0 and will be notified by the Graduate School if their GPA falls below 3.0 for any term. The cumulative GPA must be at or above 3.0 before the final exam can be taken. Grades C (=2.0) or below cannot be used as graduate credit.

Students must complete 6 hours of training annually related to social justice, diversity, and inclusion or complete a DPD (Difference, Power, and Discrimination) graduate level course. In addition, all incoming first year students must complete an online module in Canvas, "Creating an Inclusive Environment."

Final Presentation

In working with the Graduate Committee on an approved topic for written paper, the candidate completes the paper and prepares for presentation.

The student must contact members of the committee to arrange the date, time, and place of the presentation, and then schedule with the Graduate School not less than two weeks before the paper presentation. One copy of the presentation must be submitted to the Graduate School. Copies should be distributed to **all** committee members, two weeks prior. All members of the graduate committee should be physically present at the required graduate exam (for exceptions, see Remote Participation requirements).

- The decision on the outcome of the presentation will be based on a Scoring Guide rubric. The committee will use this form to evaluate the student's performance (with specific reference to rubric items) at the conclusion of the defense.
- A copy of the scoring sheet needs to be returned to Beth Chamblin and the Graduate School.

Doctor of Philosophy (PhD) Program

Thesis Committee Program Meeting

The Ph.D. Graduate Committee consists of 5 members of the OSU graduate faculty. A Graduate Council Representative is included to serve as advocate for appropriate process. A Program Meeting will be held no later than the end of the first year of graduate enrollment. The Program Meeting will cover two aspects: the proposed coursework (Program of Study) and the proposed research (Thesis Outline). This meeting will include all members of the committee. A Program of Study form should be completed during the meeting.

Program of Study (108 graduate credits required, i.e., 500 or 600 level with at least 50% of the credits from the 600 level):

- Coursework credits consisting of:
    - Required core sequence of courses [9 credits]
    - Elective courses relevant to research project agreed to by the student's committee, [51 credits]-may include additional thesis credits
    - Option specific courses [12 credits]
    - Thesis credits (VMB 603 or VMC 603) [at least 36 credits required]
    - Research credits-only if rotate through labs first year (VMB 601 or VMC 601) [3 credits]

At least 27 coursework credits consisting of required core courses, option specific courses, and electives should be taken during Year 1. Option specific courses and electives should be relevant to the thesis research and must be agreed to by the thesis committee. At least 36 Thesis credits are required and additional Thesis credits can be taken to reach the 108 total graduate credits for the degree.

Note: 54 of the 108 credits must be graduate stand-alone courses (500 or 600 level) that are not derived from the 500 component of 400/500 slash courses.

Note: A minimum of 27 regular, non-blanket credits must be included on program of study. (Courses without a zero in the middle, for example 501). No more than 15 credits of blanket-numbered courses, other than thesis, may be included in the minimum 108-credit program.

Note: Full time enrollment is 12 credits per term in the academic year and 9 in the summer. Students receiving graduate assistantships must maintain full time enrollment.

Thesis Outline

Students must prepare and submit to their committee an outline of the thesis project. This outline must be sufficiently detailed to enable the committee to evaluate the progress of the student on a yearly basis.

Annual Meeting Requirements

Students are required to meet yearly with their Graduate Committee to evaluate their progress. Every year, the Annual Graduate Student Progress Report Form, located in Appendix D, must be completed by the student and major professor, signed by **all** members of the student's graduate committee, and returned to the assistant to the program by the July deadlines.

Other Requirements

Students must maintain an overall GPA of 3.0 and will be notified by the Graduate School if their GPA falls below 3.0 for any term. The cumulative GPA must be at or above 3.0 before the final exam can be taken. Grades C (=2.0) or below cannot be used as graduate credit.

Students must complete 6 hours of training annually related to social justice, diversity, and inclusion or complete a DPD (Difference, Power, and Discrimination) graduate level course. In addition, all incoming first year students must complete an online module in Canvas, "Creating an Inclusive Environment."

Students in the Clinical Sciences option must fulfill clinical residency program requirements of their respective veterinary specialty college. This is assessed by annual evaluations by their Resident Advisor and/or specialty section, completion of residency training log (ACVS only) and/or specialty board examination(s).

Preliminary Qualifying Examination

As outlined by the Graduate School, to be admitted for the doctoral degree, students must pass a comprehensive Preliminary Examination conducted by the Graduate Committee. The purpose of this exam is to determine the student's understanding of their major and minor fields and to assess their capability for research. It involves a written research proposal on a topic that is or not from the student's thesis research, followed by an oral examination that features a presentation and then questions on the proposal topic. There will also be questions on more general topics drawn from the student's coursework and/or general area of thesis research. The Preliminary Examination is best taken after two years, near the completion of the coursework on the Program of Study.

Scheduling the Preliminary Exam

The committee is contacted for:

(1) Agreement on the research proposal topic
(2) Setting the target date for completion of the written proposal
(3) Acceptance of written proposal
(4) Arrangement of a date, time, and place for the exam

Written Proposal
Students must write a proposal on an approved topic.

- The student will provide the committee with a brief summary of the topic.
- The topic may be on anything including a topic close to the student's thesis project and is at

the discretion of the student's committee.

- The committee must approve the topic with no more than 1 dissenting vote (email votes are acceptable).

Unless otherwise specified by the committee, the proposal shall be based on the format of an NSF or NIH postdoctoral proposal. The format and length should be discussed with the committee; a general guideline follows.

- The length shall be 5-7 pages (single-spaced, not including references).
- The proposal should include the following sections:

Specific aims
Background and Significance
Research Design and Methods
Literature cited (not included in the page limit)

- Within these sections, the committee will be looking for the following components:

Clearly stated research problem
Clearly developed, testable hypothesis
Focused experimental aims
Contingency plans for aims/objectives
Appropriate experimental design
Appropriate data analysis methods
Justification for, and impact of, the proposed research
A realistic project timeline

The proposal should be submitted to the committee within the specified period after the committee has approved the topic. The individual committee members must review the proposal and determine if the written proposal is acceptable for an oral exam defense. This review should take place within 2 weeks of submission.

- In the event revisions are required (i.e., the proposal is judged as being insufficiently developed to proceed with the oral exam), the student will have 4 weeks to modify and re-submit the proposal to the committee for a second decision.
- Once there is a decision to accept the proposal, the student must schedule the oral exam.

Preliminary Oral Examination

The exam is scheduled with the Graduate School using the Exam Scheduling Form .

- The oral exam must be at least 2 hours in length and is typically up to 3 hours long. The oral exam covering the thesis proposal should constitute about half of the exam time.
- All members of the graduate committee should be physically present at the required graduate exam (for exceptions, see Remote Participation requirements).
- The defense of the proposal should include a presentation of the proposal by the student (30 minutes), followed by questions from the committee members that are answered by

the student.

Approximately half of the exam will be devoted to open questions

(a) The open questions may include anything related to science or the training of the student that the committee members deem relevant.

(b) It is recommended that the candidate practice answering questions with their advisor(s), committee members and/or other students.

- The decision to pass the individual is subject to the rules of the Graduate School, which gives the committee the options (i) to pass, (ii) not to pass and to terminate the student's work, (iii) not to pass and to allow a re-examination, or (iv) to recess and re-convene within two weeks.
- A copy of the scoring sheet needs to be returned to the office of Comparative Health Sciences.

Final Oral Examination Thesis Defense

The examination committee will consist of the same members as for the Preliminary Examination, although substitutions may be made if approved by the Program and the Graduate School. The student must contact members of the committee to arrange the date, time and place, **then schedule the exam with the Graduate School not less than two weeks before the examination**. One copy of the pre-text pages of the thesis must be submitted to the Graduate School when scheduling the exam. Examination copies must be distributed to **all** committee members two weeks prior to the examination. All members of the graduate committee should be physically present at all required graduate exam (for exceptions, see the Remote Participation requirements).

The first part of the exam is the thesis presentation portion, which is open to all interested parties, including the public. After the thesis seminar, the committee and student will continue in closed session to examine the thesis.

- The decision on the outcome of the exam will be based on a Scoring Guide/Rubric Sheet provided by the student and the major professor for the Ph.D. thesis defense. After the major professor explains how the guide will be used, each graduate committee member will be asked to use the form in documenting their assessment of the student. At the conclusion of the exam the committee will discuss the student's performance (per the Scoring Guide). The major professor will collect the completed forms for filing with the Graduate school and a copy sent to Beth Chamblin.

Scoring Guide (Rubric) for Graduate Learning Outcome Assessment

Ph.D. ORAL PRELIMINARY EXAM in Comparative Health Sciences

Candidate Name: _____ Date: _____

Title of Thesis: _____

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition:**	☐ Research problem not clearly stated or statement not carefully considered or hypothesis driven	☐ Stated the research problem clearly, provided rationale for undertaking the research	☐ Research problem fully considered and hypotheses behind all research questions clearly enunciated
2. **Literature and Previous Work:**	☐ Incomplete knowledge of literature in the area and of prior work on specific research problem	☐ Demonstrated sound knowledge of most literature in the area, and of prior work on the specific research problem	☐ Excellent knowledge of literature in the area, able to synthesize prior work and apply to research problem, complete literature review
3. **Impact of Research:**	☐ Unable to connect how solving the research problem will impact advancement of knowledge in area of study	☐ Demonstrated the potential value of solution to the research problem in advancing knowledge within the area of study	☐ Clearly defines the value of solving their research problem and how it advances knowledge within the area of study
4. **Solution Approach:**	☐ Plan inadequate, research methods and tools incompletely described, lack of understanding of research methods and limitations	☐ Provided a sound plan for research methods/tools to solve the defined problem and understanding of how to use methods/tools effectively; some understanding of study limitations	☐ Clear plan and understanding of research methods and tools used to solve the defined problem, thoroughly describes methods and tools, novel approach, clear understanding of study limitations
5. **Expected Results:**	☐ Incomplete plan for analysis of research results, inadequate plan for statistical analysis	☐ Provided sound plan for analyzing and interpreting research results/data effectively, demonstrated proficiency in statistical analysis	☐ Thorough plan for analysis of results and interpretation of research findings, advanced understanding of statistical analysis
6. **Quality of Written Communication:**	☐ Written research proposal is unclear. Writing style is immature. Grammatical errors, poor sentence construction making it difficult to read	☐ Communicated research proposal clearly and professionally in written form. Writing is academic and flows by presenting information in concise manner. Minor grammatical or spelling errors.	☐ Communicated research proposal clearly and professionally in written form. Writing is scholarly, flows naturally and is clear and professional. No grammar or spelling errors.

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
7. **Quality of Oral Communication:**	☐ Disorganized proposal presentation, poor communication skills, answers to questions show lack of knowledge in subject area	☐ Communicated research proposal clearly and professionally in oral form. Adequately organized presentation, concepts flow logically, adequate communication skills and answers to questions in subject area	☐ Communicated research proposal clearly and professionally in oral form. Highly engaging conference quality presentation, excellent communication skills, answers to questions show thorough knowledge in subject area
8. **Critical Thinking:**	☐ Unable to answer questions clearly as relates to current and future research in subject area, poor critical thinking skills, inadequate preparedness in core disciplines relevant to research, unable to complete proposed research	☐ Able to answer some questions related to current and future research, adequate critical thinking skills, adequate preparedness in core disciplines relevant to research, able to complete proposed research	☐ Clearly answers questions related to current and future research, demonstrates capability for independent research in the area of study and expertise, excellent preparedness in core disciplines relevant to research, able to complete proposed research
9. **Broader Impact:**	☐ Not aware of broader impact research may have for social, economic, technical, ethical, business, or other aspects	☐ Demonstrated awareness of broader implications of the proposed research (may include social, economic, technical, ethical, business, other aspects)	☐ Thorough awareness of broad implications that the proposed research may have on social, economic, technical, ethical, business, or other aspects

Overall Assessment: The assessment of the overall performance of the candidate based on the evidence provided in items 1 – 9 above.

CRITERIA	PERFORMANCE RATINGS for PRELIMINARY EXAM		
	Does NOT PASS Exam	***PASSES Exam***	
OVERALL, my rating of this preliminary exam indicates that it:	**Does not meet expectations**	**Meets expectations**	**Exemplary performance**
	☐	☐	☐

Name of the Examining Committee Member: _____

Signature of the Examining Committee Member: _____

Examiner: Please use the reverse side of this form for written commentary as needed.

Comments:

Scoring Guide (Rubric) for Graduate Learning Outcome Assessment

Ph.D. DISSERTATION DEFENSE EXAM in Comparative Health Sciences

Candidate Name: _____ Date: _____

Title of Thesis: _____

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition:**	☐ Research problem not clearly stated or statement not carefully considered or hypothesis driven	☐ Stated the research problem clearly, provided rationale for undertaking the research	☐ Research problem fully considered and hypotheses behind all research questions clearly enunciated
2. **Literature and Previous Work:**	☐ Incomplete knowledge of literature in the area and of prior work on specific research problem	☐ Demonstrated sound knowledge of most literature in the area, and of prior work on the specific research problem	☐ Excellent knowledge of literature in the area, able to synthesize prior work and apply to research problem, complete literature review
3. **Impact of Research:**	☐ Unable to connect how solving the research problem will impact advancement of knowledge in area of study	☐ Demonstrated the potential value of solution to the research problem in advancing knowledge within the area of study	☐ Clearly defines the value of solving their research problem and how it advances knowledge within the area of study
4. **Solution Approach:**	☐ Research methods and tools incompletely described, lack of understanding of research methods and limitations	☐ Has applied sound research methods/tools to solve the defined problem and has described the methods/tools effectively; some understanding of study limitations	☐ Clear understanding of research methods and tools used to solve the defined problem, thoroughly describes methods and tools, novel approach, clear understanding of study limitations
5. **Results:**	☐ Incomplete analysis of research results, interpretations do not match results, overinterpretation of results	☐ Analyzed and interpreted research results/data effectively, appropriate statistical analysis	☐ Thorough analysis of results and accurate interpretation of research findings, appropriate statistical analysis
6. **Quality of Written Communication:**	☐ Writing style is immature. Grammatical errors, poor sentence construction making it difficult to read	☐ Writing is academic and flows by presenting information in concise manner. Minor grammatical or spelling errors.	☐ Writing is scholarly, flows naturally and is clear and professional. No grammar or spelling errors.
7. **Quality of Oral Communication:**	☐ Disorganized presentation, poor communication skills, answers to questions show	☐ Adequately organized presentation, concepts flow logically, adequate communication skills	☐ Highly engaging conference quality presentation, excellent communication skills,

	lack of knowledge in subject area	and answers to questions in subject area	answers to questions show thorough knowledge in subject area
Evaluation/Guidance	**Does not meet Expectations**	**Meets Expectations**	**Exemplary Performance**
8. **Critical Thinking:**	☐ Unable to answer questions clearly as relates to current and future research in subject area, poor critical thinking skills	☐ Able to answer some questions related to current and future research, adequate critical thinking skills	☐ Clearly answers questions related to current and future research, demonstrates capability for independent research in the area of study and expertise
9. **Broader Impact:**	☐ Not aware of broader impact research may have for social, economic, technical, ethical, business, or other aspects	☐ Demonstrated awareness of broader implications of the concluded research (may include social, economic, technical, ethical, business, other aspects)	☐ Thorough awareness of broad implications that concluded research may have on social, economic, technical, ethical, business, or other aspects
10. **Publications:**	☐ No publications or conference proceedings resulted from this research	☐ Conference proceedings or journal publications anticipated from this research	☐ Journal publications and conference publications resulted from this research

Overall Assessment: The assessment of the overall performance of the candidate based on the evidence provided in items 1 – 10 above.

CRITERIA	**PERFORMANCE RATINGS for THESIS EXAM**		
	Does NOT PASS Exam	***PASSES Exam***	
OVERALL, my rating of the PhD dissertation defense indicates that it:	**Does not meet expectations**	**Meets expectations**	**Exemplary performance**
	☐	☐	☐

Name of the Examining Committee Member: _____

Signature of the Examining Committee Member: _____

Comments:

Appendix A – Comparative Health Sciences Courses and Option requirements

Required core courses

- ST 511 Methods of Data Analysis (4)
  Graphical, parametric and nonparametric methods for comparing two samples; one-way and two-way analysis of variance; simple linear regression. Lec/lab.
  or
  H 524 Introduction to Biostatistics (4)
  Quantitative analysis and interpretation of health data including probability distributions, estimation of effects, and hypothesis-tests such as Chi-square, one-way ANOVA, and simple linear regression. Lec/lab.

- GRAD 520 Responsible Conduct of Research (2)
  Covers 10 topics in responsible conduct of research: ethical decision making; human subjects; animal welfare; data acquisition; sharing and ownership; research misconduct; conflicts of interest; authorship; peer review; mentor/trainee responsibilities; and collaborative science. Useful to all students who conduct scholarly activity.
  or
  MCB 557 or TOX 557 Scientific Skills and Ethics (3)
  Offers instruction, guest lectures and case-study based discussions of ethical issues relevant to scientists on topics such as mentoring, best practices of conducting research, research misconduct and compliance, intellectual property, peer review, ethical use of animal and human subjects and managing conflicts of interest. Training in the preparation and presentation of scientific seminars and grant writing.

- VMB 669 Introduction to Grant Proposal Writing (2)
  This course introduces the fundamentals of writing grant proposals with an emphasis on applications to the National Institute of Health (NIH). The sections of the grant proposal that cover Specific Aims, Innovation, and Significance are reviewed and discussed in detail. Students practice writing these parts and their proposals are submitted for reading and evaluation by both instructors and peers. The final review sessions allow the students to evaluate their revised proposals in a group setting.

  or

  GRAD 514 Introduction to Graduate Writing (3)

  This course covers the expectations for writing at the graduate level. Examines features of successful, graduate-level academic writing to produce documents for program, courses, advisors, and colleagues. Explores topics related to information literacy, proposal and grant writing, and general graduate writing strategies.

- VMB 507 or 607 Seminar (1)
  Weekly seminars are given throughout the term by different colleges and departments (Biomedical Sciences, Pharmacy, Integrative Biology, Microbiology, Agriculture Sciences, Environmental Science, etc). Attendance is required at 10 seminars per seminar credit

taken. A paper with at least one paragraph per seminar documenting topic covered must be turned in by student during finals week.

- VMB 601 or VMC 601 Research Rotations (3) (PhD only, if major professor not identified prior to admission taken as a lab rotation by grad students)
  A short paper is delivered at end of term documenting what was learned in student's research.
  VMB/VMC 501 Research credits (variable) (Non-thesis MS only-12 credits required in lieu of thesis credits)

Elective Courses

Elective courses relevant to the thesis research from the VMB/VMC listing or other programs agreed by the student's committee.

- VMB 523 Zoonoses (3)
  This course will cover the basics of zoonotic diseases, mechanism of transmission, epidemiology of diseases, and will allow for interactive examinations of the molecular basis of diseases that are transmissible between animals to humans. The course will cover bacterial, viral and parasitic pathogens, including the Genomic and Public Health aspects of zoonotic diseases. Students will better understand the diseases in nature and thereby be better able to investigate reported cases and to conduct appropriate disease control and prevention activities.

- IB 595 Disease Ecology (3)
  An introduction to disease ecology--the study of disease processes in natural populations and communities. The course focuses on (I) the role parasites play in the ecology and evolution of animal populations, including humans; and (II) the relevance of ecological and evolutionary considerations in managing infectious diseases.

- VMB 670 Introduction to Systems Biology (3)
  Students will gain a high-level overview of systems biology and bioinformatics, with an emphasis on biomedical applications, integration of "-omics" approaches, biological networks, and pharmacogenomics

- VMB 673 Comparative Immunology (3)
  This course is for students interested in studying immune responses in animals beyond mice and men. A prerequisite in Immunology is not necessary. Most topics in immunology are covered with attention to different strategies used by different animals. Methods of studying the immune status of different animals are also discussed. Students are required to write a review article and construct a grant proposal on a topic of their choice, ideally related to their thesis work.

- VMB 630 Mechanisms of Disease (3)
  The course addresses the interactions between the host immune system and pathogens, as well as normal biota. A brief introduction is provided about the known functions of different aspects of the immune response and current or classical papers are discussed about mechanisms used by pathogens to circumvent the host immune response.

- VMB 624 Antibiotic Stewardship (1)
  This course aims to give students a broad view of the problem of antimicrobial resistance and antimicrobial stewardship. Many faculty and students are going to discuss their expertise and experience during the course. The topics range from environmental influence and role on antibiotic resistance to animal and human health.
- VMB 631 Mathematical Modeling (3)
  The course introduces students to mathematical modeling to advance biological sciences. We will examine outstanding examples from the research literature across a broad range of biological disciplines. We will focus both on the contribution the modeling makes to the scientific application and on the modeling methods themselves. Substantial time will be devoted to implementing the models in the Python programming language. Each student is expected to bring a laptop computer to each class. During the last week of class, each student will give a short presentation of a paper from the literature that illustrates the use of mathematical modeling in biological sciences.
- VMB 651 Cancer Systems Biology (3)
  This course provides an overview of systems biology approaches that are being used to study cancer, with an emphasis on omics techniques and fundamental mechanisms in the origination and progression of cancer. The course will be discussion-based, with each class session focused on a contemporary research article in the field of cancer systems biology.
- VMB 674 Vaccines and New Therapies (3)
  This course is designed to provide students with a cohesive understanding of the basic research behind the discovery of new therapeutic targets and scientific advancements used in development of vaccines and new therapies.
- VMB 512 Outreach for Scientists-ONE HEALTH (3)
  Present, discuss and communicate current research papers and ongoing projects in concise, audience appropriate formats using techniques from entrepreneurism, grant proposal writing and Hollywood storytelling.

Option specific courses

- VMB 671 Molecular Tools (3) (required in Biomedical Sciences option, may be taken as elective in other options)
  This course focuses on the many available tools to study molecular biology and provides the non-specialist with the fundamental principles for understanding various molecular biology techniques. The “nitty gritty” of the techniques are explained by experts in the field, wherein examples of the applications to some biological problems are presented by the students to put these techniques into real life context.
- VMC 632 Post Graduate Medicine (3-7) (Clinical Sciences option only)
  An interactive, practical course on the role of scholarship in clinical medicine, including techniques to develop and conduct research in a clinical setting.

- VMC 634 Post Graduate Surgery (3-7) (Clinical Sciences option only)
  An interactive, practical course on the role of scholarship in clinical surgery, including techniques to develop and conduct research in a clinical setting.

- VMC 684 Topics in Surgery (2-4) (Clinical Sciences option only)
  In-depth investigation of important topics in physiology, pathophysiology, treatment, diagnosis, and other aspects of surgery through investigation of primary literature and recent reviews.

- VMC 682 Topics in Internal Medicine (2-4) (Clinical Sciences option only)
  In-depth investigation of important topics in physiology, pathophysiology, treatment, diagnosis, and other aspects of internal medicine through investigation of primary literature and recent reviews.

Blanket courses

- VMB or VMC 503/603 Thesis (beyond capstone credits)
- VMB or VMC 501/601 Research
- VMB 607 Reading & Conference or Seminar/Colloquium

  A short paper is delivered at end of term documenting what was learned in student's reading and/or conferences attendance.
- Other courses with '0' in middle of course number

Coursework Requirements for Comparative Health Sciences Major (MS, PhD): Biomedical Sciences Option

Students enrolled in the MS degree in Comparative Health Sciences will complete a total of 45 graduate credits, including 12 thesis credits.

Students enrolled in the PhD degree will complete a total of 108 graduate credits, including 36 credits of non-blanket coursework.

Core coursework:

Course Title	Course number	Number of credits
Research	VMB 501/601	3 (1 per quarter) (PhD-if no lab previously selected) 12 (non-thesis MS only)
Methods of Data Analysis or Introduction to Biostatistics	ST 511, H524 or similar	4
Responsible Conduct of Research	GRAD 520 or equivalent	2
Introduction to Grant Proposal Writing (Moulton-instructor)	VMB 669	2 (Fall)
Seminar	VMB 507/607	1
Molecular Tools (Hase-instructor)	VMB 671	3 (Fall)
Thesis	VMB 503(MS), VMB 603 (PhD)	12 (MS), 36 (PhD) Not required for non-thesis MS (see research credits above)
Electives (including required electives chosen below, additional thesis credits (PhD only), and other)	Various	22 credits (MS), 60 credits (PhD)

Required electives must include at least 2 of the following courses (or similar courses approved by student's graduate committee):

Course Title	Course number	Instructor/term
Zoonoses (3)	VMB 523	Sarker/Hase - Spring
Disease Ecology (3)	IB 595	Jolles -
Introduction to Systems Biology (3)	VMB 670/PHAR 670	Shulzhenko – Spring
Comparative Immunology (3)	VMB 673	Dolan/Shulzhenko - Spring
Mechanisms of Disease (3)	VMB 630	Bermudez - Winter
Antibiotic Stewardship (1)	VMB 624	Bermudez – Fall
Mathematical Modeling (3)	VMB 631	Medlock - Spring
Cancer Systems Biology (3)	VMB 651	Ramsey – Winter
Vaccines and New Therapies (3)	VMB 674	Danelishvili – Fall
Outreach for Scientists-ONE HEALTH (3)	VMB 512	Schubiger/Beechler - Fall

Clinical Science Option Program Requirements

This option will be available only to dual clinical residents/graduate students of the Carlson College of Veterinary Medicine, in conjunction with 2-, 3- or 4-year residencies in a veterinary specialty. These residency programs are structured according to the guidelines defined by the individual Specialty Colleges (e.g. American College of Veterinary Surgeons, etc.). Dual clinical residents/graduate students enrolled in the Clinical Sciences option must fulfill programmatic requirements of their individual specialty college residencies including satisfactory annual performance evaluations, in addition to graduate degree requirements for successful completion of their concurrent MS or PhD degree.

Residency training programs provide in-depth knowledge of veterinary clinical specialties and supporting disciplines under the guidance and supervision of Diplomates of specialty colleges. The objectives of these programs are to promote aptitude and clinical proficiency in the diagnosis, treatment, and management of animals with specific issues (dependent on specialty), as well as to instruct the resident in the science and practice of veterinary specialties, and to provide the resident with the opportunity to pursue career goals in teaching, research, clinical service, and/or specialty practice. Clinical skills and judgment are built through clinical experience, teaching of professional students, and participation in veterinary specialty rounds and seminars.

Dual clinical residents/graduate students on a clinical specialty service shall be responsible for receiving clinic appointments and obtaining history and pertinent information from clients, supervising daily management of hospitalized animals, participating in clinical teaching, and providing optimal clinical service and prompt professional communications. Duties will also include a limited number of didactic lectures and participation in laboratory and continuing education courses.

Responsibilities will include night and weekend emergency duty in the hospital. These assignments are rotated among the residents, clinical fellows, and interns. These responsibilities are integral to residency training and required coursework for the Clinical Sciences option, including Postgraduate Medicine, Surgery or other specialty (VMC 632, VMC 634, or similar) and Topics in Medicine, Surgery, or other specialty (VMC 682, VMC 684, or similar courses).

Coursework Requirements for Comparative Health Sciences Major (MS, PhD): Clinical Sciences Option

Students enrolled in the MS degree in Comparative Health Sciences will complete a total of 45 graduate credits, including 12 thesis credits.

Students enrolled in the PhD degree will complete a total of 108 graduate credits, including 36 credits of non-blanket coursework.

The following tables list the courses required to obtain the Clinical Sciences option in Comparative Health Sciences. Highlighted courses are option-specific, while the remaining courses are required for the major.

Course Title	Course number	Number of credits
Topics in Medicine, Surgery, or other clinical specialty	VMC 682, VMC 684, or similar	6
Postgraduate Medicine, Surgery or other clinical specialty	VMC 632, VMC 634, or similar	6
Research	VMC 501/601 or VMB 501/601 (PhD only)	3 (1 per quarter) (PhD- if no lab previously selected)
Methods of Data Analysis or Introduction to Biostatistics	ST 511, H524 or similar	4
Responsible Conduct of Research	GRAD 520 or equivalent	2
Introduction to Grant Proposal Writing (Moulton-Instructor)	VMB 669	2 (Fall)
Seminar	VMB 507	1
Thesis	VMC 503(MS), VMC 603 (PhD)	12 (MS), 36 (PhD)
Electives (including required electives chosen below, additional thesis credits (PhD only), and other)	Various	12 (MS), 51 (PhD)

Elective Courses – Clinical Sciences option

Required Electives must include at least 2 of the following courses (or similar courses approved by student's graduate committee):

Course Title	**Course number**	
Course Title (credits)	**Course number**	**Instructor/term**
Zoonoses (3)	VMB 523	Sarker/Hase - Spring
Disease Ecology (3)	IB 595	Jolles -
Introduction to Systems Biology (3)	VMB 670/PHAR 670	Shulzhenko – Spring
Comparative Immunology (3)	VMB 673	Dolan/Shulzhenko - Spring
Mechanisms of Disease (3)	VMB 630	Bermudez - Winter
Antibiotic Stewardship (1)	VMB 624	Bermudez – Fall
Mathematical Modeling (3)	VMB 631	Medlock - Spring
Cancer Systems Biology (3)	VMB 651	Ramsey – Winter
Vaccines and New Therapies (3)	VMB 674	Danelishvili – Fall
Outreach for Scientists-ONE HEALTH (3)	VMB 512	Schubiger/Beechler - Fall
Molecular Tools (3)	VMB 671	Hase - Fall

Veterinary Medicine Option Requirements

The Veterinary Medicine option reflects the unique program of dual DVM/graduate degree-seeking students. The purpose of this option is to educate veterinarians in the conduct of research in an interdisciplinary environment, consistent with the overall goals of comparative veterinary medicine. This graduate option provides a mechanism for DVM students interested in a research career to optimize their coursework and provide an accelerated platform for reaching a concurrent graduate degree.

This option within the Comparative Health Sciences program is available only to dual DVM/graduate students of the Carlson College of Veterinary Medicine. Students enrolled in the MS degree in Comparative Health Sciences will complete a total of 45 graduate credits, including 12 thesis credits. Students enrolled in the PhD degree will complete a total of 108 graduate credits, including 36 thesis credits. The following tables list the courses required to obtain the Veterinary Medicine option in Comparative Health Sciences. Courses highlighted in yellow are option-specific, while the remaining courses are required for the major.

Coursework for Comparative Health Sciences (major):

Course Title	**Course number**	**Number of credits**
Methods of Data Analysis or Introduction to Biostatistics	ST 511, H524 or similar	4
Responsible Conduct of Research	GRAD 520 or equivalent	2
Introduction to Grant Proposal Writing	VMB 669 or equivalent	2
Seminar	VMB 507/607	1
Thesis	VMB/VMC 503(MS), VMB/VMC 603 (PhD)	12 (MS), 36 (PhD) Not required for non-thesis MS (see research credits below)
Research	VMB 501/601 or VMC 501/601	3 (PhD-only if no lab previously selected) 12 (non-thesis MS only)
Electives-including electives chosen below, additional thesis credits (PhD only), and other courses approved by the student's graduate committee	Various (see below)	12 (MS), 48-51 (PhD)
Option specific coursework	Various (see next page)	12

Electives (include at least 2 of the following courses or other courses approved by student's graduate committee):

Course Title	Course number	Number of Credits
Zoonoses	VMB 523	3
Disease Ecology	IB 595	3
Introduction to Systems Biology	VMB 670/PHAR 670	3
Comparative Immunology	VMB 673	3
Mechanisms of Disease	VMB 630	3
Antibiotic Stewardship	VMB 624	1
Mathematical Modeling	VMB 631	3
Cancer Systems Biology	VMB 651	3
Vaccines and New Therapies	VMB 674	3
Outreach for Scientists-ONE HEALTH	VMB 512	3
Molecular Tools	VMB 671	3

Veterinary Medicine Option coursework:

Students select 12 credits from the following graduate courses that have a DVM program equivalent:

Course Title	Course number	Number of Credits
Veterinary Gross Anatomy	VMB 611	4
Veterinary Gross Anatomy	VMB 612	4
Veterinary Microscopic Anatomy	VMB 614	4
Veterinary Physiology	VMB 517	5
Veterinary Physiology	VMB 518	5
Veterinary Physiology	VMB 519	4
Veterinary Immunology	VMB 620	5
Veterinary Pathology	VMB 621	4
Ornamental Fish Medicine	VMB 627	2
Veterinary Virology	VMB 653	4
Veterinary Bacteriology & Mycology	VMB 659	5
Veterinary Parasitology	VMB 660	5
Epidemiology and Public Health	VMB 666	3

Research

In addition to coursework required in the student's program of study, MS thesis and PhD students will complete an interdisciplinary research project in comparative health sciences, under the support and direction of their major professor. The Comparative Health Sciences program encourages co-mentorship from different disciplines and allows students to customize their studies across many fields of science. The student's program is designed individually to support the needs of innovative research. Graduate students are expected to be major participants in the scientific output of the program and must fulfill the learning outcomes expected in their respective degrees (see the next page).

Comparative Health Sciences Major-Learning Outcomes and Assessment

MS

1. Conduct research or produce some other form of creative work
    - Assessed by annual evaluation (major professor and committee completes), production and evaluation of written thesis, and final oral exam
2. Demonstrate mastery of subject material
    - Assessed by annual evaluation (major professor and committee completes) and final oral exam
3. Conduct scholarly or professional activities in an ethical manner
    - Assessed by successful completion of GRAD 520 or equivalent research ethics training, annual evaluation by major professor and committee
4. Demonstrate inclusivity and cultural competence
    - Assessed by successful completion of GRAD 542 or equivalent DPD course or attend minimum of 6 hours per year of continuing education related to social justice, diversity, and inclusion and submit a summary of each, annual evaluation by major professor and committee

PhD

1. Produce and defend an original significant contribution to knowledge
    - Assessed by annual evaluation (major professor and committee completes), production and evaluation of written dissertation, and during final oral exam
2. Demonstrate mastery of subject material
    - Assessed by annual evaluation (major professor and committee completes), preliminary exam, and final oral exam
3. Conduct scholarly or professional activities in an ethical manner
    - Assessed by successful completion of GRAD 520 or equivalent research ethics training, annual evaluation by major professor and committee
4. Demonstrate inclusivity and cultural competence
    - Assessed by successful completion of GRAD 542 or equivalent DPD course or attend minimum of 6 hours per year of continuing education related to social justice, diversity, and inclusion and submit a summary of each, annual evaluation by major professor and committee

Admissions Process-Veterinary Medicine option (dual DVM/MS or PhD)

Applications to the dual DVM/PhD or DVM/MS programs are reviewed by two separate admissions committees. The college DVM Admissions Committee reviews the applicants to determine admissibility to the DVM Program. The college Graduate Committee reviews applications for admissibility to the PhD or MS program. Both committees must agree to admit the student before the offer of acceptance is made into the dual program. Admissions decisions are typically made by January 31 by both committees.

Students interested in applying to the dual DVM/PhD or DVM/MS program will need to submit separate applications to the DVM and Graduate programs. Students submit their DVM application through the Veterinary Medical College Application Service (VMCAS) system by the published due date (currently September 15). Students submit their PhD or MS applications through the Oregon State University Graduate School online application site by December 10.

DVM students can also apply to the Comparative Health Sciences MS or PhD program subsequent to their admission into the DVM program or during their first year of the DVM program. The college Graduate Committee will review any off-cycle applications and determine acceptance into the program. Students accepted into the dual DVM/MS or DVM/PhD prior to the start of the DVM program can choose to begin both programs at the same time or defer the start of the DVM program for one year in order to initiate graduate degree coursework.

Timeline

Dual DVM/PhD is a 7-year program designed in two formats (1+4+2 or 4+3), which must be defined prior to the start of the program by the student, major professor (if identified) and program director (see examples in Appendices 1-4). Students selecting the 1+4+2 format must submit a deferral for the start of the DVM program for one year in order to initiate graduate degree coursework. Summer terms are used for completing research and graduate coursework, including the summer term prior to the start of the DVM program, between Y1-Y2, and between Y2-Y3 of the DVM program. Selecting the Non-traditional Focus Path in Y4 of the DVM program allows more flexibility to complete PhD research and elective coursework requirements. Graduate program electives taken at the 600-level can also be applied toward the DVM electives requirement. Students are expected to complete both degrees within 7 years. If necessary, students can extend their timeline for the PhD program, with a limit of 9 years.

Dual DVM/MS is a 5-year program designed in two formats (1+4 or 4+1). The student and major professor must define the format prior to the start of the program (see examples in Appendices 5-8). Students selecting the 1+4 format must submit a deferral for the start of the DVM program for one year in order to initiate graduate degree coursework. Summer terms between Y1-Y2 and Y2-Y3 of the DVM program are used for completing research and graduate coursework. Selecting the Non-traditional Focus Path in Y4 of the DVM program allows more flexibility to complete MS research and elective coursework requirements. Graduate program electives taken at the 600-level can also be applied toward the DVM electives requirement.

Students are expected to complete both degrees within 5 years. If necessary, students can extend their timeline for the MS program, with a limit of 7 years.

Financial Considerations

Students enrolled in the dual DVM/MS or DVM/PhD program will pay DVM program tuition rates and fees for all terms included in the 4-year DVM program (except the summer terms-between Y1-Y2 and Y2-Y3), according to their residency status. In addition, students will be responsible for paying tuition associated with any E-campus graduate courses taken. All other terms, in which students are enrolled solely in graduate courses, students will be charged OSU graduate tuition rates and fees, according to their residency status. This includes any terms prior to starting the DVM program, summer terms between Y1-Y2 and Y2-Y3 of the DVM program, and any term following completion of the DVM degree.

Graduate students may be eligible for financial assistance in the form of student loans (via OSU Financial Aid office) or limited university-wide or program scholarships. For terms that students are enrolled solely in graduate coursework, students may receive graduate assistantships, fellowships or scholarship support. Graduate assistantships include Graduate Research Assistantship (GRA) support directly from the grant of their major professor or Graduate Teaching Assistantships (GTAs) within their respective department. The program also has a limited number of highly competitive fellowships and scholarships.

Appendix 1. **Timeline: DVM/PhD in 1+4+2 format**

Year 1:

Summer Research rotation	Fall Grad courses/ Research Rotation	Winter Grad courses/ Research Rotation	Spring Grad courses

Year 2:

Summer Thesis Research	Fall DVM Program (Y1)	Winter DVM Program (Y1)	Spring DVM Program (Y1)

Year 3:

Summer Thesis Research	Fall DVM Program (Y2)	Winter DVM Program (Y2)	Spring DVM Program (Y2)

Year 4:

Summer Thesis Research	Fall DVM Program (Y3)	Winter DVM Program (Y3)	Spring DVM Program (Y3)

Year 5:

Summer DVM Program (Y4)	Fall DVM Program (Y4)	Winter DVM Program (Y4)	Spring Graduate DVM

Year 6:

Summer Thesis Research/ Prelim Exam*	Fall Thesis Research/ Prelim Exam*	Winter Thesis Research	Spring Thesis Research

Year 7:

Summer Thesis Research	Fall Thesis Research	Winter Thesis Research	Spring Defend & graduate

Appendix 2. Example of 1+4+2 timeline and coursework for dual DVM/PhD

<u>Year one</u>:

Summer-

VMB 601 or VMC 601 Research rotations (3 credits)

Fall-

VMB 669 Introduction to Grant Proposal Writing (2 credits)
GRAD 520 Responsible Conduct of Research (2 credits)
VMB 607 Seminar (1 credit)
VMB 601 or VMC 601 Research rotation (1 credit)
VMB 674 Vaccines and New Therapies (3 credits) or other elective
VMB 671 Molecular Tools (3 credits) or other elective

Winter-

ST 511 Methods of Data Analysis (4 credits)
VMB 601 or VMC 601 Research Rotation (1 credit)
VMB 630 Mechanisms of Disease (3 credits) or other elective
VMB 651 Cancer Systems Biology (3 credits) or other elective
VMB 607 Seminar (1 credit)

Spring-

VMB 603 or VMC 603 Thesis Research (1 credit)
VMB 670 Introduction to Systems Biology (3 credits) or other elective
VMB 673 Comparative Immunology (3 credits) or other elective
VMB 631 Mathematical Modeling (3 credits) or other elective
VMB 607 Seminar (2 credits) or other elective

****Milestones-**

- Select major professor and graduate committee
- Schedule first committee meeting
- File Program of Study by end of spring term

<u>Year two</u>:

Summer-

VMB 603 or VMC 603 Thesis Research (3-9 credits)

Fall-

BEGIN DVM PROGRAM (Y1)

Winter-

DVM PROGRAM (Y1)

Spring-

DVM PROGRAM (Y1)

<u>Year three</u>:

Summer-

VMB 603 or VMC 603 Thesis Research (3-9 credits)

Fall-

DVM PROGRAM (Y2)

Winter-

DVM PROGRAM (Y2)

Spring-

DVM PROGRAM (Y2)

Year four:

Summer-

VMB 603 or VMC 603 Thesis Research (3-9 credits)

Fall-

DVM PROGRAM (Y3)

Winter-

DVM PROGRAM (Y3)

Spring-

DVM PROGRAM (Y3)

Year five:

Summer-

DVM PROGRAM (Y4)

Fall-

DVM PROGRAM (Y4)

Winter-

DVM PROGRAM (Y4)

Spring-

DVM PROGRAM (Y4)

***GRADUATION DVM PROGRAM

Year six:

Summer-

VMB 603 or VMC 603 Thesis (9 credits)

Fall-

VMB 603 or VMC 603 Thesis (12 credits)

****Milestones-**

- Pass Preliminary Exam by this term

Winter-

VMB 603 or VMC 603 Thesis (12 credits)

Spring-

VMB 603 or VMC 603 Thesis (12 credits)

Year seven:

Summer-

VMB 603 or VMC 603 Thesis (9 credits)

Fall-

VMB 603 or VMC 603 Thesis (12 credits)

Winter-

VMB 603 or VMC 603 Thesis (12 credits)

Spring-

VMB 603 or VMC 603 Thesis (12 credits)

****Milestones-**

- Defend Dissertation

**GRADUATION PHD PROGRAM

Appendix 3. **Timeline: DVM/PhD in 4+3 format**

Year 1:

Summer Research rotations	Fall DVM Program (Y1)	Winter DVM Program (Y1)	Spring DVM Program (Y1)

Year 2:

Summer Research rotations	Fall DVM Program (Y2)	Winter DVM Program (Y2)	Spring DVM Program (Y2)

Year 3:

Summer Thesis Research	Fall DVM Program (Y3)	Winter DVM Program (Y3)	Spring DVM Program (Y3)

Year 4:

Summer DVM Program (Y4)	Fall DVM Program (Y4)	Winter DVM Program (Y4)	Spring Graduate DVM

Year 5:

Summer Thesis Research	Fall Grad courses	Winter Grad courses	Spring Grad courses

Year 6:

Summer Thesis Research	Fall Thesis Research/ Prelim Exam*	Winter Thesis Research/ Prelim Exam*	Spring Thesis Research

Year 7:

Summer Thesis Research	Fall Thesis Research	Winter Thesis Research	Spring Defend & graduate

Appendix 4. Example of 4+3 timeline and coursework for dual DVM/PhD

Year one:
Summer-
VMB 601 or VMC 601 Research Rotations (3-9 credits)
Fall-
BEGIN DVM PROGRAM (Y1)
Winter-
DVM PROGRAM (Y1)
Spring-
DVM PROGRAM (Y1)

Year two:
Summer-
VMB 601 or VMC 601 Research Rotations (3-9 credits)
****Milestones-**
- Select major professor and graduate committee
- Schedule first committee meeting
- File Program of Study by end of summer term

Fall-
DVM PROGRAM (Y2)
Winter-
DVM PROGRAM (Y2)
Spring-
DVM PROGRAM (Y2)

Year three:
Summer-
VMB 603 or VMC 603 Thesis Research (3-9 credits)
Fall-
DVM PROGRAM (Y3)
Winter-
DVM PROGRAM (Y3)
Spring-
DVM PROGRAM (Y3)

Year four:
Summer-
DVM PROGRAM (Y4)
Fall-
DVM PROGRAM (Y4)
Winter-
DVM PROGRAM (Y4)
Spring-
DVM PROGRAM (Y4)
***GRADUATION DVM PROGRAM

Year five:

Summer-

VMB 603 or VMC 603 Thesis Research (9 credits)

Fall-

VMB 669 Introduction to Grant Proposal Writing (2 credits)
GRAD 520 Responsible Conduct of Research (2 credits)
VMB 607 Seminar (1 credit)
VMB 674 Vaccines and New Therapies (3 credits) or other elective
VMB 671 Molecular Tools (3 credits) or other elective
VMB 603 or VMC 603 Thesis Research (1 credit)

Winter-

ST 511 Methods of Data Analysis (4 credits)
VMB 630 Mechanisms of Disease (3 credits) or other elective
VMB 651 Cancer Systems Biology (3 credits) or other elective
VMB 603 or VMC 603 Thesis Research (2 credits)

Spring-

VMB 670 Introduction to Systems Biology (3 credits) or other elective
VMB 673 Comparative Immunology (3 credits) or other elective
VMB 631 Mathematical Modeling (3 credits) or other elective
VMB 603 or VMC 603 Thesis Research (3 credits)

Year six:

Summer-

VMB 603 or VMC 603 Thesis (9 credits)

Fall-

VMB 603 or VMC 603 Thesis (12 credits)

****Milestones-**

- Pass Preliminary Exam by this term

Winter-

VMB 603 or VMC 603 Thesis (12 credits)

Spring-

VMB 603 or VMC 603 Thesis (12 credits)

Year seven:

Summer-

VMB 603 or VMC 603 Thesis (9 credits)

Fall-

VMB 603 or VMC 603 Thesis (12 credits)

Winter-

VMB 603 or VMC 603 Thesis (12 credits)

Spring-

VMB 603 or VMC 603 Thesis (12 credits)

****Milestones-**

- Defend Dissertation

**GRADUATION PHD PROGRAM

Appendix 5. **Timeline: DVM/MS in 1+4 format**

Year 1:

Summer Research (opt.)	Fall Grad courses/Res	Winter Grad courses/Res	Spring Grad courses/Res

Year 2:

Summer Thesis Research	Fall DVM Program (Y1)	Winter DVM Program (Y1)	Spring DVM Program (Y1)

Year 3:

Summer Thesis Research	Fall DVM Program (Y2)	Winter DVM Program (Y2)	Spring DVM Program (Y2)

Year 4:

Summer Thesis Research/ Defense	Fall DVM Program (Y3)	Winter DVM Program (Y3)	Spring DVM Program (Y3)

Year 5:

Summer DVM Program (Y4)	Fall DVM Program (Y4)	Winter DVM Program (Y4)	Spring Graduate DVM

Appendix 6. Example of 1+4 timeline and coursework for dual DVM/MS

<u>Year one</u>:

Summer-

VMB 501 or VMC 501 Research (3 credits) (optional)

Fall-

VMB 669 Introduction to Grant Proposal Writing (2 credits)
GRAD 520 Responsible Conduct of Research (2 credits)
VMB 607 Seminar (1 credit)
VMB 503 or VMC 503 Thesis Research (1 credit)
VMB 674 Vaccines and New Therapies (3 credits) or other elective
VMB 671 Molecular Tools (3 credits) or other elective

****Milestones-**

- Select major professor and graduate committee
- Schedule first committee meeting
- File Program of Study by end of fall term

Winter-

ST 511 Methods of Data Analysis (4 credits)
VMB 503 or VMC 503 Thesis Research (2 credits)
VMB 630 Mechanisms of Disease (3 credits) or other elective
VMB 651 Cancer Systems Biology (3 credits) or other elective

Spring-

VMB 503 or VMC 503 Thesis Research (3 credits)
VMB 670 Introduction to Systems Biology (3 credits) or other elective
VMB 673 Comparative Immunology (3 credits) or other elective
VMB 631 Mathematical Modeling (3 credits) or other elective

<u>Year two</u>:

Summer-

VMB 503 or VMC 503 Thesis (3 credits)

Fall-

BEGIN DVM PROGRAM (Y1)

Winter-

DVM PROGRAM (Y1)

Spring-

DVM PROGRAM (Y1)

<u>Year three</u>:

Summer-

VMB 503 or VMC 503 Thesis (3 credits)

Fall-

DVM PROGRAM (Y2)

Winter-

DVM PROGRAM (Y2)

Spring-

DVM PROGRAM (Y2)

<u>Year four</u>:
Summer-
VMB 503 or VMC 503 Thesis (3 credits)
****Milestones-**
- Defend Thesis, Oral Final Exam

***GRADUATION MS PROGRAM

Fall-
DVM PROGRAM (Y3)
Winter-
DVM PROGRAM (Y3)
Spring-
DVM PROGRAM (Y3)

<u>Year five</u>:
Summer-
DVM PROGRAM (Y4)
Fall-
DVM PROGRAM (Y4)
Winter-
DVM PROGRAM (Y4)
Spring-
DVM PROGRAM (Y4)
***GRADUATION DVM PROGRAM

Appendix 7. **Timeline DVM/MS 4+1 format**

Year 1:

Summer Research (opt.)	Fall DVM Program (Y1)	Winter DVM Program (Y1)	Spring DVM Program (Y1)

Year 2:

Summer Thesis Research	Fall DVM Program (Y2)	Winter DVM Program (Y2)	Spring DVM Program (Y2)

Year 3:

Summer Thesis Research	Fall DVM Program (Y3)	Winter DVM Program (Y3)	Spring DVM Program (Y3)

Year 4:

Summer DVM Program (Y4)	Fall DVM Program (Y4)	Winter DVM Program (Y4)	Spring Graduate DVM

Year 5:

Summer Thesis Research	Fall Grad courses/Res	Winter Grad courses/Res	Spring Defend Thesis

Appendix 8. Example of 4+1 timeline and coursework for dual DVM/MS

Year one:
Summer-
VMB 501 or VMC 501 Research (3 credits) (Optional)
Fall-
BEGIN DVM PROGRAM (Y1)
Winter-
DVM PROGRAM (Y1)
Spring-
DVM PROGRAM (Y1)

Year two:
Summer-
VMB 503 or VMC 503 Thesis (3 credits)
****Milestones-**
- Select major professor and graduate committee
- Schedule first committee meeting
- File Program of Study by end of fall term

Fall-
DVM PROGRAM (Y2)
Winter-
DVM PROGRAM (Y2)
Spring-
DVM PROGRAM (Y2)

Year three:
Summer-
VMB 503 or VMC 503 Thesis (3 credits)
Fall-
DVM PROGRAM (Y3)
Winter-
DVM PROGRAM (Y3)
Spring-
DVM PROGRAM (Y3)

Year four:
Summer-
DVM PROGRAM (Y4)
Fall-
DVM PROGRAM (Y4)
Winter-
DVM PROGRAM (Y4)
Spring-
DVM PROGRAM (Y4)
***GRADUATION DVM PROGRAM

Year five:

Summer-

VMB 503 or VMC 503 Thesis (3 credits)

Fall-

VMB 669 Introduction to Grant Proposal Writing (2 credits)
GRAD 520 Responsible Conduct of Research (2 credits)
VMB 607 Seminar (1 credit)
VMB 503 or VMC 503 Thesis (1 credit)
VMB 674 Vaccines and New Therapies (3 credits) or other elective
VMB 671 Molecular Tools (3 credits) or other elective

Winter-

ST 511 Methods of Data Analysis (4 credits)
VMB 503 or VMC 503 Thesis (2 credits)
VMB 630 Mechanisms of Disease (3 credits) or other elective
VMB 651 Cancer Systems Biology (3 credits) or other elective

Spring-

VMB 503 or VMC 503 Thesis (3 credits)
VMB 670 Introduction to Systems Biology (3 credits) or other elective
VMB 673 Comparative Immunology (3 credits) or other elective
VMB 631 Mathematical Modeling (3 credits) or other elective

****Milestones-**

- Defend Thesis, Oral Final Exam

***GRADUATION MS PROGRAM

Appendix B – Resources at OSU

Arrival in Corvallis

Corvallis is a small town with nearly 60,000 residents. It lies in the heart of the Willamette Valley, between the Cascade Mountains and the Coast Range, 80 miles south of Portland and 55 miles east of the Pacific coast. The climate is mild, with rainfall averaging about 40 inches annually. The main employers in Corvallis are Oregon State University, Good Samaritan Hospital, and Hewlett-Packard. Major performing arts facilities are found in Portland and Eugene (45 miles south).

Academic and Support Resources

The Graduate School website is a great resource and provides a lot of information. Graduate Student Success Page .

OSU offers a wide array of academic and support resources designed to meet graduate student needs. Some of the more commonly used resources are included below. For a more complete list, please visit the Graduate School's Student Resources web page.

This is a great resource for students new to Oregon State University and includes information on getting an ID card, transportation, housing, health and wellness, student life, and Grad School policies.

Campus Safety – Emergency phone numbers, university alerts

Career Development Center – Resume/CV, networking, job search strategies

Childcare and Family Resources – University childcare centers, child care assistance

Counseling and Psychological Services (CAPS) – Individual and group counseling

Cultural Resource Centers – Cultural based community centers, social support

Disability Access Services (DAS) – Academic accommodations

Equal Opportunity and Access (EOA) – Employment accommodations, discrimination or bias response

Financing your education – Funding options and information, graduate awards

Graduate Writing Center – Writing workshops, groups, and 1:1 writing coaching

Health Insurance – Plans for graduate students and graduate employees

Human Services Resource Center (HSRC) – Food pantry, housing and food stamp assistance

Institutional Review Board (IRB) – Review for human subjects research

Office of International Services (OIS) – Visa and immigration advising

Ombuds Conflict Management Services – Informal, impartial conflict resolution advising

Recreational Sports – Dixon Recreation Center, intramural sports

Statistics Consulting Service – Graduate student research statistical advising

Student Health Services (SHS) – Clinic and pharmacy

Student Multimedia Services (SMS) – Poster printing, equipment and laptop loans

Transportation and Parking Services (TAPS) – Parking permits, maps

Biking on Campus Click on this link for biking on campus, then other options for bus, SafeRide, etc. on appropriate topics near top page

Valley Library – Reference and research assistance, study spaces, research tools

Appendix C – INTO Graduate Pathway

Understand the Pathway Program

OSU Graduate Pathway programs are the most supported and non-competitive route to a graduate program in an American Tier 1 research university. Joining this program will assure admission to their graduate program upon successful completion of the progression requirements. These programs will give students the academic foundation, essential language skills and GMAT/GRE test preparation to successfully move on to a master's or doctoral degree.

THE GRADUATE PATHWAY PROGRAM IS IDEAL FOR INTERNATIONAL STUDENTS WHO:

- Desire to earn a US graduate degree
- May need to improve English language skills and still earn credits toward their degree program
- Desire additional academic, language and cultural support in order to succeed during the first year at a US university
- May not be eligible for direct entry
- May need additional preparation for GMAT/GRE

Program Benefits

- Up to 40 hours of TOEFL test preparation and GMAT/GRE preparation
- Dedicated academic advisor and progression advisor to help facilitate transition to the university
- Pathway peer tutors available to provide additional academic support
- Assured and non-competitive progression to masters program when the student successfully complete the Graduate Pathway

TOEFL, GMAT AND GRE PREP

TOEFL, GMAT and GRE test preparation are built into the Graduate Pathway program curriculum. Students will receive up to 40 hours of test preparation throughout the duration of the program. Our test preparation courses are taught by experienced OSU instructors and focus on skills-based language development and test-taking skills which include the use of practice tests and individual feedback on performance. We also provide self-study materials, available in our learning center.

For complete information, go to the Graduate Pathway INTO program.

Mission Statement

The Graduate Pathway Programs provide international students with highly structured, full university credit courses of study at the pre-master level, empowering students to succeed through language, cultural and academic support.

Contact Details

For more information, please email: Richard.Hahn@oregonstate.edu

Courses included in the Graduate Pathway Program:

Program grid

Graduate Pathway in Comparative Health Sciences

Program Length

3 Terms
September 18, 2019
June 16, 2020

Degree Program Components

45 credit hour program
15 credit hours apply from Pathway
30 credit hours remaining toward degree

Program Information

Entry Requirements

Academic Requirements

- 2.5 GPA, Undergraduate degree in a relevant discipline.

Language Requirements

3 Terms:

- TOEFL 70, IELTS 6.0, Academic English Level 5 with C or higher (or Pass grades), Password 7, IELA 169, or Duolingo 95.

Term 1	Course Title	Credit Hours
ALS 165	Writing/Research Methods for International Grad Students *	3
ALS 166	Technical Communication for International Grad Students *	3
BI 314	Cell and Molecular Biology	4
BB 331	Introduction to Molecular Biology	3
	Total 13	

Progression Requirements

- 3.0 GPA cumulative and B or higher grades in all graduate level classes. B or higher grade in all English language classes OR TOEFL 91 (18 subscores) OR IELTS 7.0.

Progression requirements for some majors may vary. See below for full details.

Term 2	Course Title	Credit Hours
COMM 111	Public Speaking	3
ALS 176	Advanced STEM Reading/Writing	3
ALS 145	Graduate STEM Success *	2
VMB 5XX	Graduate course in area of concentration	1
MCB 5XX	Mollecular and Cellular Biology Techniques	4
		Total 13

Notes

COMM 111 Public Speaking: COMM 111 is delivered through the Department of Communication but are INTO OSU student-only sections.

* These courses are generally delivered through the INTO Center and are for Pathway students only.

Term 3	Course Title	Credit Hours
COMM 218	Interpersonal Communication	3
WR 599	Academic Writing for Graduate Students *	3
VMB 5XX	Graduate course in area of concentration	4
VMB 5XX	Graduate course in area of concentration	4
		Total 14

P = Placement option available A = Study abroad option available

Degree subject	Final Level %	English Level %	Additional Requirements
Comparative Health Science-M.S./Ph.D.	3.0 GPA cumulative and B or higher grades in all graduate level classes	B or higher grade in all English language classes OR TOEFL 91 (18 subscores) OR IELTS 7.0	

P = Placement option available A = Study abroad option available

Appendix D: Annual evaluation forms

Graduate Student Annual Self-Evaluation

NOTE: Each year confirm with the Graduate School that your courses are on-track for graduation.

Fill out this form (items 1-10) and have it evaluated by your Major Advisor. Write the self-evaluation based on the criteria listed in "Criteria to Define Satisfactory Progress" document.

Today's Date:

Name of student: Degree being earned/Program:

Program start date: Total years in the program:

Name of Major Advisor: Expected graduation date:

Names and affiliations of Graduate Committee members:

Program milestones:

MASTERS	**PhD**
SELECT COMMITTEE MEMBERS/GCR	**SELECT COMMITTEE MEMBERS/GCR**
SUBMIT PROGRAM OF STUDY	**SUBMIT PROGRAM OF STUDY**
SCHEDULE FINAL ORAL EXAM	**ORAL PRELIMINARY EXAM**
SUBMIT DIPLOMA APPLICATION	**SUBMIT DIPLOMA APPLICATION**
DELIVER PRE-TEXT THESIS TO GRAD	**SCHEDULE FINAL ORAL DEFENSE**
DISTRIBUTE THESIS	**DELIVER PRE-TEXT DISSERTATION TO GRAD**
FINAL EXAM	**FINAL ORAL EXAM**

NON-THESIS MASTERS
SELECT COMMITTEE MEMBERS/GCR ☐
SUBMIT PROGRAM OF STUDY ☐

WORK WITH COMMITTEE TO SELECT TOPIC FOR WRITTEN PAPER ☐
SUBMIT DIPLOMA APPLICATION ☐
SCHEDULE PRESENTATION OF PAPER ☐

Research project:

Progress to date/self-evaluation:

Plan for the coming year:

Publications, presentations, abstracts:

Additional information (awards, scholarships, etc.):

Annual social justice, diversity and inclusion training (6 hours) or completion of DPD course:

Signature of student: _____

Signature of Major Advisor: _____

Major Advisor Review

Instructions: Annual Review Form to be completed by Major Advisor and Student's Graduate Committee.

Student Name: Major Advisor Name:

Degree/Program/Concentration

Year Program Began: Current Year:

N/A = Not Applicable

Check list	Does not meet expectations	Meets expectations	Exemplary performance	N/A
Problem definition				
Literature knowledge				
Approach				
Results				
Quality of written communication				
Quality of oral presentation				
Critical thinking				
Publications				
Ethical conduct			----------	
Social Justice, Diversity, Inclusion			----------	

Comments:

Student Signature	Date	Advisor Signature	Date
Print Committee Member Name	Date	Signature	
Print Committee Member Name	Date	Signature	
Print Committee Member Name	Date	Signature	
Print Committee Member Name	Date	Signature	

Comparative Health Sciences

Rubric for Annual Major Advisor Review

Check list	Does not meet expectations	Meets expectations	Exemplary performance	N/A
1. Problem definition	☐ Research problem not clearly stated or statement not carefully considered or hypothesis driven	☐ Research problem clear, understands rationale for undertaking the research	☐ Research problem fully considered and hypotheses behind all research questions clearly enunciated	☐
2. Literature knowledge	☐ Incomplete knowledge of literature in the area and of prior work on specific research problem	☐ Sound knowledge of most literature in the area, and of prior work on the specific research problem	☐ Excellent knowledge of literature in the area, able to synthesize prior work and apply to research problem, complete literature review	☐
3. Approach	☐ Research methods and tools incompletely understood, lack of understanding of study limitations	☐ Sound research methods/tools to solve the defined problem, some understanding of study limitations	☐ Clear understanding of research methods and tools used to solve the defined problem, novel approach, clear understanding of study limitations	☐
4. Results	☐ Incomplete analysis of research results, research not proceeding as planned	☐ Research plan proceeding on schedule, research results analyzed effectively, appropriate statistical analysis	☐ Research plan proceeding ahead of schedule, thorough analysis of results, appropriate statistical analysis	☐
5. Quality of written communication	☐ Writing style is immature. Grammatical errors, poor sentence construction making it difficult to read	☐ Writing is academic and flows by presenting information in concise manner. Minor grammatical or spelling errors	☐ Writing is scholarly, flows naturally and is clear and professional. No grammar or spelling errors	☐

Check list	Does not meet expectations	Meets expectations	Exemplary performance	N/A
6. Quality of oral presentation	☐ Disorganized presentation, poor communication skills, answers to questions show lack of knowledge in subject area	☐ Adequately organized presentation, concepts flow logically, adequate communication skills and answers to questions in subject area	☐ Highly engaging conference quality presentation, excellent communication skills, answers to questions show thorough knowledge in subject area	☐
7. Critical thinking	☐ Unable to answer questions clearly as relates to current and future research in subject area, poor critical thinking skills	☐ Able to answer some questions related to current and future research, adequate critical thinking skills	☐ Clearly answers questions related to current and future research, demonstrates capability for independent research in the area of study and expertise	☐
8. Publications	☐ No publications or conference proceedings resulted from this research	☐ Conference proceedings or journal publications anticipated from this research	☐ Journal publications and conference publications resulted from this research	☐
9. Ethical conduct	☐ Did not complete GRAD 520 or equivalent research ethics training, does not conduct scholarly activities in an ethical manner	☐ Completed GRAD 520 or equivalent research ethics training, conducts scholarly activities in an ethical manner	No exceeds for this category	☐
10. Social Justice, Diversity, Inclusion	☐ Did not complete required 6 hours/year of DEI training or DPD course	☐ Completed required 6 hours/year of DEI training or DPD course, demonstrated commitment to DEI	No exceeds for this category	☐

Appendix E – Graduate School Forms

Graduate School Online Forms

Graduate Council Representative (GCR) List

All Doctoral students and Master's students who are writing a thesis are required to include a Graduate Council Representative on their committee. The Graduate Council Representative (GCR) serves in the role of impartial committee member who advocates for the student and ensures that all rules governing committee procedures are followed. He or she must be present at your final defense of your thesis.

You must select a GCR from the list generated by the online GCR list generation tool. After you have identified a representative, indicate on the list the faculty member serving in that role. You must then return the list to Graduate School by emailing it to graduate.school@ oregonstate.edu, dropping it off in person to Heckart Lodge, or sending it through campus mail.

Policy on non-OSU committee membership

Your committee guides your course work and research and serves as your final examining committee. It is expected that all committee members or approved substitutes must be present for all formal meetings with the student (e.g. final oral exams). If you have a special case in which a committee member may need to participate remotely, you and your committee must assure that all the conditions for remote participation are met.

If the faculty member is not a member of the Graduate Faculty or is not approved for the role proposed, your major department/program will need to nominate the proposed member to act in those roles.

Changing Your Committee Membership

Graduate Committee Change

If it becomes necessary to replace one of your committee members after your committee has been established or to substitute a committee member for a particular meeting, refer to your committee composition requirements. Ensure that your replacement member is a member of the Graduate Faculty and approved for his or her proposed role. If the faculty member is not a member of the Graduate Faculty or is not approved for the role proposed, your major department/program will need to nominate the proposed member to act in those roles.

Committee structure is evaluated when your program of study is received by the Graduate School and when you schedule your formal examination(s).

The digital version of the Program of Study form became a requirement the 2019-20 academic year. As a regular graduate student, you must file a Program of Study Form with the Graduate School. Students who do not file a Program within the specified deadline for their degree will not be allowed to register for the next term. General guidelines are as follows:

Before completing 18 credits of coursework:

Develop a Program of Study *with your program.* This is your plan for completing your degree. Your advisor, department chair, or departmental graduate coordinator will help you. [***This should take place before the end of winter quarter in the FIRST year of the program for CVM Residents]

A registration hold will also be placed on graduate students whose Programs of Study are not approved after

initial evaluation by the Graduate School. You must submit your Program of Study on a form provided by the Graduate School.

Use the manual hard copy Program of Study form to meet with your Committee. You are required to submit a digital copy, accessible by clicking the “Program of Study Form” title above. Hard copy will be phased out by the end of 2019 calendar year.

Electronic Thesis and Dissertation (ETD) Submission Approval Form

Approval Form

This form is submitted to the Graduate School along with a copy of the title page once the final thesis/dissertation is approved and uploaded to ScholarsArchive .

Exam Scheduling Form

Please note: This form must be completed and submitted at least two weeks prior to your exam or alternative summative assessment date. The purpose of this form is to start a Graduate School audit of your Program of Study to determine if you are qualified to proceed with your requested exam. The Graduate School will confirm the eligibility of your committee members, completed course work and grades among other things. When all has been verified, your exam documents will be distributed.

Thesis Submission Deadline

The final, corrected, and signed copy of your thesis or dissertation must be submitted to the Graduate School within 6 weeks after your Exam or before the first day of the following term, whichever comes first, to avoid having to register for a minimum of three graduate credits the next term.

Note: Continuous Enrollment Policy Applies. You must be registered for a minimum of three graduate credits until all degree requirements are completed. To avoid registering for the term following your defense, submit the final corrected and signed thesis or dissertation to the Graduate School before the first day of the term following the term in which you defend. For details on this policy see "Continuous Enrollment, I. Minimum Registration" in the Graduate Catalog,

Students must register for a minimum of 3 credits and pay fees if they will be using university resources (e.g. facilities, equipment, computing and library services, or faculty or staff time) during any given term, regardless of the student’s location. If degree requirements are completed between terms, the student must have been registered during the preceding term.

Graduate students who have successfully completed all course and non-course requirements in accordance with diploma deadlines are not required to register during the subsequent term.

Diploma Application

Diplomas are issued four times a year, at the end of each term. You must complete a diploma application form to receive your diploma. Diplomas are available from the Registrar's Office approximately three weeks after the end of the term. Diplomas earned during Spring term are available at Commencement. Your diploma will reflect the degree awarded. Your transcript will reflect the academic major and degree awarded.

If you are pursuing more than one degree at the time you submit your diploma app, and if it defaults to the higher degree please email the Graduate School and we will manually change it for you.

To fill out the form, login to MyOregonState. First, check your profile page to make Graduate Student is checked under "Affiliations." Next, navigate to the resources page and search the resources for "apply to

graduate." Follow the link and fill out the form.

Commencement forms

Please review commencement information for spring and summer completing students.

If you are completing during Summer, please submit the appropriate form to Julie Kurtz in the Grad School:

Commencement Forms

At the end of each academic year, you and your major advisor must complete these forms.

As Needed

Transfer Credit Request

Transfer Request Form
Students may be able to transfer selected graduate credits from a previously attended institution if all university guidelines on transfer credits are met (see Policies Governing All Graduate Programs, Transfer Credit in the OSU General Catalog) and if the student's graduate program decides the courses are applicable to the proposed OSU degree. Students may submit the Request for Transfer Credit form if they wish to determine whether the courses might be eligible for transfer credit and available for use on an OSU graduate program of study.

Late Add/Change of Registration

Late Change Registration Form

Change of Degree/Major/Certificate Request Form

Change of Degree Form

Equivalence of Thesis/Non-Thesis Credit

If you are a current OSU graduate student and are changing your master's degree from a thesis degree to a non-thesis degree, please submit to the Graduate School, the Equivalence of Thesis form

Change of Address/Email Address

Use this online form to change your mailing address if you have applied for admission but have not registered for any classes yet. If you have already registered for classes you can change your address yourself in MyOregonState and do not need to submit the online form.

Change of Address Form

Leave of Absence

The completed Leave of Absence Form (with signatures) must be received by the Graduate School at least two weeks prior to the first day of the term involved.

Unless on approved leave of absence, all graduate students in degree and certificate programs must register continuously for a minimum of 3 graduate credits, excluding summer session, until their degree or certificate is granted or until their status as a credential-seeking graduate student is terminated.

See the catalog for more information on registration requirements. Approved leave of absence include, but are not limited to, *Family and Medical Leave*, as defined by the Graduate School's Family and Medical Leave Policy for Graduate Students. The Graduate School's form is not used for Family and Medical Leaves.

Please review the Leave of Absence and Family Medical Leave eligibility comparison tool for questions about the differences between the standard leave of absence and FML. Leave of Absence Form

Appendix F – Graduate Deadlines

Masters Students

Master's students must complete all degree requirements within seven years.

Program of Study

Students are urged to complete the program of study after completion of the first 18 credits, but are required to submit the program to the Graduate School at least 15 weeks before any final exam or alternative summative assessment.

Completing the Master's Degree

At the beginning of the final term of study:

Submit a diploma application.

At least two weeks prior to the final exam or alternative summative assessment:

- Use online form to schedule the final oral examination or alternative summative assessment.
- Distribute a defendable copy of the thesis to the full committee (if completing a thesis). For Non-Thesis, distribute your final written paper to the full committee and schedule your paper presentation.
- Deliver or email pretext pages of the thesis to the Graduate School (if applicable).

Thesis Submission

Upload the final copy of the thesis (if required for degree) to ScholarsArchive within 6 weeks after the exam or before the first day of the following term, whichever comes first, to avoid having to register for a minimum of three graduate credits the next term.

Doctoral Students

Time to degree

Doctoral students beginning their program in Fall 2016, or later, have 9 years to complete all degree requirements, including course work, thesis, and examinations.

Program of Study

Before completing 5 terms, meet with the program committee to create a Program of Study. 2019-20 is the last year the hard copy program of study is available. The transition to the digital version starts this year. Use the hard copy when meeting with your program committee, then enter using the digital version for signatures via DocuSign. The completed and signed program of study must be submitted to the Graduate School before the end of the fifth term of enrollment.

Preliminary Oral Exam

Schedule the Preliminary Oral Exam at least 2 weeks in advance by submitting the

Exam Scheduling Form. The Graduate School must have an approved program of study on file before the exam scheduling form is submitted.

Completing the Doctoral Degree

At least 2 weeks before the Final Oral Defense of Dissertation:

- Submit a diploma application (For Spring Term, earlier deadlines apply.
  See Diploma Application Information for spring exam and commencement deadlines.
- Schedule the Final Exam by submitting the online Exam Scheduling Form to the Graduate School.
- Deliver or email pretext pages of the thesis to the Graduate School.
- Distribute dissertation to the entire committee.

Thesis Submission

A final and corrected copy of the thesis or dissertation must be uploaded to ScholarsArchive within 6 weeks after the exam or before the first day of the following term, whichever comes first, to avoid having to register for a minimum of three graduate credits the next term.

Appendix G - Graduate School Policies

Health Insurance

Health insurance is mandatory for all graduate students. GRA employment includes a contribution of 85% of the cost More information is available at Student Health Services.

Insurance Coverage

OSU recommends that all students maintain adequate health insurance coverage. International students are currently required to enroll in the OSU insurance plan. Graduate assistants and graduate fellows have a separate mandatory health insurance plan through their graduate appointment. You can read more about the insurance plans available to students at the Student Health Services webpage.

ASOSU Insurance Subsidy: All students who enroll in the OSU International or Domestic plans qualify to apply for the need-based insurance subsidy offered by ASOSU (Associated Students of OSU - student government). The insurance office does not run this subsidy but we feel it is important for students to know that it is available. The deadline to apply for this subsidy is the third Friday of the term, and the insurance charge must be paid in full by the deadline for students to be eligible. **ASOSU information.**

Minimum Course Loads

Course load requirements for graduate students are established by the Registrar and the Graduate School. You are considered a "full-time" graduate student if you are registered for 9–16 credits in a given academic term. You are considered a "part-time" graduate student if you have less than nine credits. If you are a degree-seeking student, you must be registered for a minimum of three graduate credits in any term you wish to be enrolled and access university resources, including the term of the final defense. Students are responsible for staying current on course load requirements that may supersede the Graduate School requirements (i.e., international, financial aid, veteran's).

Continuous Graduate Enrollment

The policy for Continuous Graduate Enrollment is found on the Grad School website under "Policies Governing All Graduate Programs".

All graduate students enrolled in a degree program must register continuously for a minimum of 3 graduate credits each term (fall, winter, and spring terms) until all degree requirements are met, regardless of student's location. Students on approved leave are exempt from the continuous enrollment policy for the term(s) they are on leave.

Graduate students who use facilities or faculty/staff time during summer session are required to register for a minimum of 3 credits during the summer session. Students defending in the summer term are required to register for a minimum of 3 graduate credits.

Students may appeal the provisions of the continuous graduate enrollment policy if extraordinary circumstances arise by submitting a detailed request in writing to the Dean of the Graduate School. Scheduling difficulties related to the preliminary oral exam or the final oral exam are not considered an extraordinary circumstance.

Graduate assistantship eligibility requires enrollment levels that supersede those contained in this continuous enrollment policy. Various agencies and offices maintain their own registration requirements that also may exceed those specified by this continuous enrollment policy (e.g., those of the Veterans Administration, Immigration and Naturalization Service for international students, and those required for federal financial aid programs). Therefore, it is the student's responsibility to register for the appropriate number of credits that may be required for funding eligibility and/or compliance as outlined by specific agency regulations under which they are governed.

NOTE: Students who are pursuing a certificate only are not subject to the continuous enrollment policy.

Leave of Absence

Leave of Absence status is available to eligible students who need to suspend their program of study for good cause. The time the student spends on approved leave will be included in any time limits prescribed by the university relevant to degree completion. Students on approved leave may not a) use any university facilities, b) make demands upon faculty time, c) receive a fellowship or financial aid, or d) take course work of any kind at Oregon State University. A Leave of Absence form must be received by the Graduate School at least 15 working days prior to the first day of the term involved. The Family Medical Leave Act (FMLA) may be granted at any point during a term. FMLA inquiries should be directed to medical.leave@oregonstate.edu.

NOTE: Students who are pursuing a certificate only are not subject to the Leave of Absence Policy.

Unauthorized Break in Registration

Degree seeking graduate students who take an unauthorized break in registration relinquish graduate standing at the University.

To have graduate standing reinstated after an unauthorized break, students are required to reapply to their program (complete the online graduate admission application, pay the application fee, and may be required to register for three graduate credits for each term of unauthorized break in registration). It is advisable that students in this situation state that they are applying for readmission in the application packet. A reapplication does not ensure admittance to the program.

Grievance Procedures for Graduate Students

Introduction

Policy

An important goal of Oregon State University is to maintain harmonious relations among students, faculty, and staff. To this end, candid and informal discussions between graduate students and others in the University are encouraged as a means of achieving harmony and of arriving at mutually satisfactory solutions to graduate student problems. Graduate education is based upon a mutuality of interests and respect among faculty and students. It is important

that this mutual concern for the quality of education and the persons involved be fostered and preserved.

If the informal discussions of a grievance between a graduate student and his or her supervisor break down, the use of or participation in a grievance procedure shall not subject the graduate student, any witness, or any graduate student's representative to reprisal in any way by the supervisor, the department, the major professor, the student's graduate committee, or the University. Nor shall participation in the grievance procedure be reflected in any way in efficiency ratings, grades, evaluations, promotion opportunities, or graduate student employment relations.

All students desiring to appeal matters relating to their graduate degree should follow the Grievance Procedures for Graduate Students. These procedures are available at the link at the top of this section. Graduate assistants, whose terms and conditions of employment are prescribed by the collective bargaining agreement between OSU and the Coalition of Graduate Employees, American Federation of Teachers Local 6069, should also refer to that document and seek guidance from OSU's Office of Human Resources.

Scope

This statement of policy encompasses all facets of graduate education and employment of graduate students at Oregon State University except for those that are explicitly noted in this statement.

Decisions in Writing

A reasonable effort should be made to resolve any grievance at the lowest level possible. Any decision rendered at or above the level of the departmental administrator shall be in writing.

Academic Grievance Procedures

Scope

Issues that may involve complaints on academic matters fall into four general categories: (1) those items that derive from University-wide regulations and which are not unique to graduate students. Examples are grades, attendance, and academic dishonesty. (2) those items that derive from rules and regulations of the Graduate School and which apply specifically to graduate students (3) those items that derive from rules or regulations of a department or comparable administrative unit. (4) other grievances related to a graduate student's academic work and progress toward degree.

Grievance Procedures Related to University-Wide Academic Regulations

Grievances related to academic regulations for all students as adopted by the Faculty Senate (see the Introduction to the Academic Regulations) have the same channel of appeal for the graduate students as for undergraduates, except for the addition of the graduate dean.

The order of appeal will be (1) instructor, (2) administrator of department or comparable administrative unit, (3) academic dean, (4) graduate dean, (5) provost. The appeal procedures are in576-022-0010.

Grievance Procedures Related to Graduate School Policies and Regulations

Graduate School policies and regulations may be found in the Graduate Bulletin, which is published annually. Appeals relative to the application or execution of these policies and regulations will have the following route: (1) major professor, (2) administrator of major department or comparable administrative unit, (3) graduate dean, (4) provost.

The graduate dean may refer a case to the Graduate Council or a committee of the Council prior to rendering a decision. If the graduate student is not satisfied with the decision of the graduate dean, and if the graduate dean has not referred the case to the Graduate Council or a committee of the Council, the student may ask that the case be referred to the Graduate Council or a committee of the Council prior to the appeal to the Provost and Executive Vice President.

Grievance Procedures Involving Departmental Policies, Procedures, and Regulations

All OSU students holding a baccalaureate degree and not enrolled as postbaccalaureate or professional degree students are enrolled in the Graduate School. This is in contrast to undergraduate students who are enrolled in an academic school or college. Graduate students typically work for advanced degrees, which are administered through academic departments or comparable administrative units. The graduate faculty members have appointments in these academic units and these units have a direct influence on the quality of graduate education at OSU.

When grievances arise relative to the application of the rules, procedures or policies of a department or comparable academic unit, the order of appeal will be: (1) major professor, (2) administrator of department or comparable academic unit, (3) graduate dean, (4) provost.

Grievance Procedures Related to Academic Work and Progress Toward Degree

When other grievances arise related to a graduate student's academic work and progress toward degree, the order of appeal will be: (1) major professor, (2) administrator of department or comparable academic unit, (3) graduate dean, (4) provost.

Grievance Procedures for Non-degree Graduate Students

Non-degree graduate students holding a baccalaureate degree will have the following order of appeal: (1) instructor, (2) graduate dean, (3) provost.

Use of Designee

At any step of review beyond the instructor, the appropriate administrator may appoint a designee to act on his or her behalf in considering the grievance.

Time Limits

A grievance shall first be presented orally within 60 calendar days from the time the graduate student knew or should have known of the facts giving rise to the alleged grievance. At the level of departmental administrator, or above, the grievance or appeal must be submitted in writing. The responsible administrator at each step below the graduate dean is required to respond in writing to the grievant within 15 calendar days from the time the grievance was

received. The graduate dean shall respond within 30 calendar days, including review and reporting by a Graduate Council committee. Any appeal on the part of the grievant to the next step in the grievance procedure must be made within 15 calendar days from the time the grievant was informed of the action at the prior step.

If at any step of the grievance procedure the University fails to issue a response within the times specified, the grievance shall be considered denied. The grievant may file the grievance at the next step. If the grievant fails to file the grievance at the subsequent step within the time specified, the grievance will be considered withdrawn and cannot be resubmitted.

The indicated time limits are provided to assure speedy response to a grievance. However, the time period may be waived by mutual consent of the graduate student and the administrator.

Appeal to Graduate Dean

For any grievance submitted to the dean of the Graduate School, the dean may, at his or her discretion, refer the grievance to a special advisory committee of three persons comprising two members of the Graduate Council and a graduate student majoring in a department other than the one with which the student has a grievance. The dean of the Graduate School will render a decision in writing based on the facts of the case and the advice of the special committee if one is established.

Grievance Procedures Related to Employment of Graduate Students

Grievance procedures concerning employment can be found on the Office of Human Resources Policies & Procedures page.

Incomplete Grades

An "I" (incomplete) grade is granted only at the discretion of the instructor. The incomplete that is filed by the instructor at the end of the term must include an alternate/default grade to which the incomplete grade defaults at the end of the specified time period. The time allocated to complete the required tasks for the course may be extended by petition to the University Academic Requirements Committee. You can obtain the form from the Registrar's Office. It is the student's responsibility to see that "I" grades are removed within the allotted time.

Student Conduct and Community Standards

Graduate students enrolled at Oregon State University are expected to conform to basic regulations and policies developed to govern the behavior of students as members of the university community. The Office of Student Conduct and Community Standards (SCCS) is the central coordinating office for student conduct-related matters at Oregon State University.

Choosing to join the Oregon State University community obligates each member to a code of responsible behavior which is outlined in the Code of Conduct. The assumption upon which this Code is based is that all persons must treat one another with dignity and respect in order for scholarship to thrive.

Violations of the regulations subject a student to appropriate disciplinary action.

Academic Misconduct

Prohibited Academic Misconduct

The Code of Student Conduct prohibits Academic Misconduct and defines it as:

Any action that misrepresents a student or group's work, knowledge, or achievement, provides a potential or actual inequitable advantage, or compromises the integrity of the educational process.

To support understanding of what can be included in this definition, the Code further classifies and describes examples of Academic Misconduct, as follows.

Prohibited behaviors include, but are not limited to doing or attempting the following actions:

1. **Cheating.** Unauthorized assistance, or access to or use of unauthorized materials, information, tools, or study aids. Examples include, but are not limited to, unauthorized collaboration or copying on a test or assignment, using prohibited materials and texts, unapproved use of cell phones, internet, or other electronic devices, etc.
2. **Plagiarism.** Representing the words or ideas of another person or presenting someone else's words, data, expressed ideas, or artistry as one's own. Examples include, but are not limited to, presenting someone else's opinions and theories as one's own, using another person's work or words (including unpublished material) without appropriate source documentation or citation, working jointly on a project and then submitting it as one's own, etc.
3. **Falsification.** Fabrication or invention of any information. Examples include, but are not limited to, falsifying research, inventing or falsely altering data, citing fictitious references, falsely recording or reporting attendance, hours, or engagement in activities such as internships, externships, field experiences, clinical activities, etc.
4. **Assisting.** Any action that helps another engage in academic misconduct. Examples include, but are not limited to, providing materials or assistance without approval, altering someone's work, grades or academic records, taking a test/doing an assignment for someone else, compelling acquisition, selling, bribing, paying or accepting payment for academic work or assistance that contributes to academic misconduct, etc.
5. **Tampering.** Interfering with an instructor's evaluation of work by altering materials or documents, tampering with evaluation tools, or other means of interfering.
6. **Multiple submissions of work.** Using or submitting work completed for another or previous class or requirement, without appropriate disclosure, citation, and instructor approval.
7. **Unauthorized recording and use.** Recording and/or dissemination of instructional content without the express permission of the instructor(s), or an approved accommodation coordinated via Disability Access Services.

Academic Misconduct cases are handled initially by the academic units, following the process outlined in the University's Academic Misconduct Report Form, and will also be referred to

SCCS for action under these rules.

Office of Equal Opportunity and Access

The OSU Office of Equal Opportunity and Access defines sexual harassment as the following:

- Unwelcome* sexual advances, requests for sexual favors and other verbal or physical conduct of a sexual nature when:
- Submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or education;
- Submission to or reject of such conduct by an individual is used as the basis for employment of education –related decisions affecting such an individual; or
- Such conduct is sufficiently severe or pervasive that is has the effect, intended or unintended, of unreasonably interfering with an individual's work or academic performance because it has created an intimidating, hostile, or offensive environment and would have such an effect on a reasonable person of that individual's status.

**Employee conduct directed towards a student – whether unwelcome or welcome – can constitute sexual harassment under OAR.*

The link to the Office of Equal Opportunity and Access is located in Appendix A.

There are two confidential resources to discuss reporting options: Center Against Rape and Domestic Violence (CARDV) provides 24/7 confidential crisis response at 541-754-0110 or 800-927-0197, and OSU Sexual Assault Support Services is available weekdays at 541-737-7604.

Student Records

Both federal and state laws permit Oregon State University staff to release directory information (e.g. name, address, degree program, birth date) to the general public without your consent. You can prohibit the release of directory information to the public by signing the Confidentiality Restriction form available from the Registrar's Office. It will not prohibit the release of directory information to entities of Oregon State University that have a "need to know" to accomplish their required tasks. It further will not prohibit Oregon State University departments from including your name on mailing lists for distribution of materials that are essential to your enrollment at Oregon State University.

Statement Regarding Students with Disabilities

"Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at (541) 737-4098."

Link to Statement of Expectations for Student Conduct, i.e. cheating policies

The document for "Oregon State University Code of Student Conduct" is located here.

Policy updates

Policies are constantly changing. For the latest updates on Graduate School policies, click here.

Appendix H – CHS Participating Faculty & Research Summaries

Comparative Health Sciences Degree Program
Participating Faculty

Carlson College of Veterinary Medicine

Brianna Beechler	Jennifer Johns	Dan Rockey
Luiz Bermudez	Anna Jolles	Carl Ruby
Chris Cebra	Lacy Kamm	Duncan Russell
Patrick Chappell	Michael Kent	Justin Sanders
Katie Curran	Christiane Löhr	Mahfuz Sarker
Lia Danelishvili	Kathy Magnusson	Kate Scollan
Helio de Morais	Erica McKenzie	Kelly Sears
Brian Dolan	Jan Medlock	Stacy Semevolos
Chuck Estill	Tim Miller-Morgan	Natalia Shulzhenko
Jana Gordon	Hong Moulton	Susanne Stieger-Vanegas
Elena Gorman	Lauren Newsom	Stacie Summers
Jean Hall	Tandi Ngwenyama	Susan Tornquist
Claudia Hase	Fikru Nigussie	Katy Townsend
Mike Huber	Ana Pacheco	Jennifer Warnock
Beth Ihms	Manoj Pastey	Bill Whitler
Ling Jin	Stephen Ramsey	Katja Zellmer

College of Pharmacy

Arup Indra	Chrissa Kioussi	Aleksandra Sikora
Gitali Indra	Mark Leid	Richard Van Breemen
Jane Ishmael	Andriy Morgun	

College of Public Health and Human Services

Sandi Cleveland-Phibbs	Urszula Iwaniec	Molly Kile
Marie Harvey	Donald Jump	Sarah Rothenberg

College of Agricultural Sciences

Cecily Bishop	Claire Couch	Si Hong Park
Gerd Bobe	Siva Kolluri	Joy Waite-Cusic
Susanne Brander	Michelle Kutzler	
Gita Cherian	Christopher Langdon	

College of Engineering

Elain Fu	Adams Higgins

College of Science

Itchung Cheung	Kenton Hokanson
Benjamin Dalziel	Tom Sharpton

College of Earth, Ocean & Atmospheric Sciences

George Waldbusser

Comparative Health Sciences Faculty Interest Summaries

Brianna Beechler

My research seeks to understand the role of host physiology and immunology in disease transmission, primarily in free-ranging wildlife species. I am also interested in identifying new parasite species in wildlife, understanding the impact of disease and parasites on wild hosts, as well as understanding interactions between parasites and diseases within these hosts. My work spans numerous species and landscapes, including bighorn sheep in California and Oregon, African buffalo in South Africa, sea lions in the Pacific Ocean, walrus in Alaska and marbled murrelets in Oregon. I also am interested in using eDNA to detect pathogens and parasite patterns in the aquatic landscapes. My eDNA work is primarily on the distribution of leptospirosis and giardia in the Willamette Valley, although is likely to expand in the future to other systems and other parasites and pathogens.

Luiz E. Bermudez

Mycobacterial pathogenesis and new therapies to mycobacterial infection. *Mycobacterium tuberculosis*, *Mycobacterium avium*, *Mycobacterium abscessus* and *Mycobacterium avium* subsp *paratuberculosis*. Infection of the human and animal host interaction with mucosal surface, survival mechanism in the host, biofilm and its role in disease. Macrophages, Natural Killer cells and T lymphocyte participation in host defense against mycobacterial infection.

Cecily Bishop

Cecily Bishop, Ph.D. conducts research into fertility/infertility of ruminants and primate species. Her research seeks to clarify molecular and cellular processes critical to ovarian and uterine function as well as animal models of human infertility/fertility preservation. Recent research in Dr. Bishop's lab has focused on the following projects:

- In vitro culture systems to support growth of ruminant follicles, and to discover critical factors for folliculogenesis
- Role of ovarian cell types in growth of follicles which may contribute to infertility in women and ruminants
- Animal models of ovarian cryopreservation as well as abnormal follicle growth and development leading to polycystic ovarian syndrome
- Impact of vitamin supplementation on fertilization and embryo development in cattle

Gerd Bobe

The focus of my research group is on dietary disease prevention using a "system biology" approach that integrates knowledge from nutrition & physiology, molecular & cellular biology, nutritional & molecular epidemiology, and biostatistics. (1) In ruminants, the focus of my research group is on optimal nutrition during periods of stress, in particular the time around calving and markers that predict risk of disease. Flaxseed, selenium, yeast fermentation product, and vitamin E are dietary compounds that we have looked at for improving health and performance of ruminants. (2) In humans, the focus of my research group is personalized

disease prevention using dietary flavonols and dry beans. Combining “omics” techniques in parallel human and animal model studies provides the opportunity to improve risk assessment, allowing the development of new prevention and treatment options, and an individually tailored approach to prevention and treatment in humans.

Susanne Brander

As an ecotoxicologist, my research integrates the responses of aquatic organisms to endocrine disrupting compounds (EDCs) and other environmental stressors, such as microplastics, across the biological hierarchy. My group focuses on discerning mechanisms of toxicity and linking the results of laboratory experiments to ecosystem responses. Current work examines the impact of EDCs on gene expression, development, reproductive behavior, sex ratio and population dynamics across multiple generations, with an emphasis on exposure during early life. Specific compounds of concern include endocrine active pesticides and pharmaceuticals.

Chris Cebra

Dr. Chris Cebra main lines of inquiry involve energy metabolism and gastrointestinal disorders. Regarding energy metabolism, he has primarily investigated the diabetes-like characteristics of llamas and alpacas, but has completed projects on cattle and horses as well. Regarding gastrointestinal diseases, he has concentrated on causes of colic, parasitic disorders, and other enteritides of camelids. He has also initiated or collaborated on projects in a number of other areas relevant to large animal internal medicine including equine and camelid peritoneal fluid analysis, diagnostic imaging, infectious diseases, and immunology.

Patrick Chappell

Work in my lab broadly focuses on basic mechanisms underlying endocrine control of reproduction, exploring the role of the molecular circadian clock in the brain’s timing of reproduction in female mammals, investigating how circadian disruption may initiate breast and prostate cancers, and how the hormonal control of reproduction evolved from more ancient species such as corals.

Gita Cherian

The long-term goal of my research program is to better understand lipid metabolism in chicks so as to enhance their post-hatch growth and health along with producing wholesome foods for human consumption. Specifically, lipid modification strategies to: (1) investigate fatty acid metabolism during pre and early post-hatch in poultry, (2) investigate the role of maternal dietary lipids in modulating metabolic and cardiovascular disorders in progeny birds, and (3) develop value-added wholesome functional poultry foods were undertaken (or are in progress) through an OAES hatch project, the USDA-NRICGP, through the Agricultural Research Foundation or other private sources.

Itchung Cheung

I am a marine scientist (biological oceanography), instructor and program developer with specializations in academic and outreach programs, online and experiential education, and student research training programs, respectively. My interests are in emerging technologies in teaching, experiential education, student research training and diversity in the sciences. Research specialties include undergraduate student research training, HPLC, field sampling

(estuary, coastal and open sea), microbiology, and plankton identification.

Sandi Cleveland Phibbs

Sandi supports the Oregon State University Center for Health Innovation's purpose to connect Oregon State University faculty and students with external community, industry, and government partners, in order to create new and expanded opportunities to partner on innovative public health workforce development, practice and research. To date, the OSU Center for Health Innovation has completed research and evaluation projects related to mental health promotion, substance use disorder prevention, overdose prevention activities, COVID-19 response activities, health impacts of wildfire, and health system innovation.

Claire Couch

I use genomic and other molecular tools to study the interactions between wildlife, commensal microbiota, and pathogens. I am particularly interested in understanding how anthropogenic changes in population structure, habitat, and climate are altering the relationships between hosts and microbes, and what the potential consequences are for fish and wildlife population health. Much of my past work has focused on how the gut microbiome associates with disease, environment, and stress in ungulates, marine mammals, and salmonids. My current work with the Epps Lab involves understanding how infection dynamics drive immunogenetic adaptation of desert bighorn sheep populations in the southwestern United States.

Katie Curran

Specializing in veterinary oncology, Dr. Curran appreciates providing owners with a comprehensive approach to diagnostic and therapeutic options. She studies ongoing advances in veterinary oncology.

Benjamin Dalziel

I have broad interests in ecological and evolutionary dynamics, particularly related to the health of human and animal populations, and to the maintenance of biodiversity. I am particularly interested in (i) the ecology and evolution of infectious diseases, especially the impact of host population structure on pathogen spread and diversification and (ii) how collective behavior affects trophic interactions and ecosystem stability. To address these questions I work with students and collaborators at the interface of mathematical models and empirical data.

Lia Danelishvili

I study the pathogenesis mechanisms of both non-tuberculous and tuberculosis causing mycobacterial pathogens. The non-tuberculous mycobacterial (NTMs) pathogens that my group investigates belong to Mycobacterium abscessus complex and Mycobacterium avium complex (prevalent in HIV patients and in individuals both with immunosuppression and chronic lung pathologies) and M. avium subsp. paratuberculosis (etiological agent of Johne's disease in ruminant animals). We investigate bacterial virulence mechanisms and host-pathogen interactions. I also have ongoing drug discovery projects to identify novel compounds that target a) virulence factors uniquely expressed by intracellular bacteria and b) host factors influencing the pathogen's survival, and c) the biofilm formation. In addition, we

isolate mycobacteriophages from environmental samples and characterize them to understand phage-bacteria interaction mechanisms and phage-mediated innate immune responses by macrophages in order to overcome bacterial drug resistance and advance the phage therapy. The multidisciplinary approaches employing microbiology and cell biology techniques, bacterial genetics, high throughput screening libraries, gene knockout systems, the high-resolution microscopy, bioinformatics and mass-spectrometric sequencing are used in the laboratory to understand many basic questions that will help in the development of new therapeutic strategies.

Helio De Morais

My focus is on vector-borne and emerging infectious disease of dogs and cats.

Brian Dolan

Research in my lab is focused on two main areas. The first is the biology of antigen presentation, the process by which the cells of the body alert the adaptive immune system to the presence of intracellular pathogens, such as viruses, or oncogenic transformation. We are trying to determine which cellular pathways are necessary to successfully present the foreign peptide on major histocompatibility complex class I (MHC I) proteins at the cell surface, which serve to flag down disease specific cytotoxic T cells. We are also interested in studying immune responses in wild animal populations as it relates to disease spread.

Charles Estill

Dr. Estill is a Theriogenologist in the Department of Clinical Sciences. Research areas of interest include corpus luteum physiology and control, nutritional influences on reproduction, and ontogeny of sexual development. Current projects include collaboration on studies of “A ram model of neuroendocrine determinants of sexual orientation” and “Role of Peroxisome Proliferator-Activated Receptor gamma on prevention/cure of Mastitis”.

Elain Fu

The goal of the Fu Lab is to advance the engineering of novel microfluidic tools and devices for field use through improving our understanding of the devices' underlying physicochemical processes. Research in the lab consists of three areas of focus: the investigation of molecular interactions and fluid transport in microfluidic systems, the development of tools and methods for use in high-performance microfluidic assays, and the implementation of microfluidic assays for clinically relevant analytes. Global health application domains of interest include human disease diagnosis, veterinary medicine, environmental monitoring, and agriculture.

Jana Gordon

Dr. Gordon’s research interests are in endocrinology and infectious disease.

Elena Gorman

In addition to cytologic diagnosis of disease and advancing diagnostic accuracy, I have a strong dedication to student teaching, particularly in the areas of clinical chemistry, including acid base physiology, and cytology, subjects which are particularly challenging to students. I work closely with student groups, e.g. the pathology club, in order to generate interest in these

subjects and to develop better teaching modalities in order to aid their ultimate grasp of these concepts.

Jean Hall

My research is concerned with how nutrition affects immunity. I am interested in nutrigenomic technology, or the study of how nutraceuticals affect the expression of genes involved in the immune response. My projects involve sheep and cows supplemented with selenium and its effects on immune responses, animal health, and animal production. In particular, we are interested in using selenium as a fertilizer to enhance forages fed to ruminants. I am also interested in the health benefits of dietary n-3 fatty acids and antioxidants in geriatric dog and cat foods. We are currently investigating these supplements in renoprotective foods used to slow the progression of chronic kidney disease in dogs and cats. In conjunction, we are assessing novel renal biomarkers used for monitoring disease progression and therapeutic interventions.

S. Marie Harvey

I am a public health researcher with 35 years of experience conducting research focused on the behavioral, contextual, and policy aspects of sexual and reproductive health (SRH) among diverse samples of young adults, including men, women, and couples. The overarching goal of my research program has been to reduce disparities in risky sexual behavior and increase well-being and access to sexual and reproductive health services. I have published widely in the area of prevention of unintended pregnancy and STIs and have been the recipient of numerous research grant awards. More recently, I have extended my research focus to examine the impact of new health policies and healthcare reforms on SRH. I served as PI on a six-year project funded by the Centers for Disease Control and Prevention to examine the impact of Medicaid expansion on the health of low-income women of reproductive age and infants in Oregon. In addition, I was PI on a study that investigated the impact of Oregon's Medicaid reforms on abortion access and utilization. I am dedicated to the use of research findings to inform policies and practices that improve the health of women, men, and families.

Claudia Häse

The genus *Vibrio* consists of a group of Gram-negative bacteria that naturally inhabitant aquatic environments worldwide. Among this diverse group of microorganisms are a few human pathogens, namely *Vibrio cholerae* and *Vibrio parahaemolyticus*. In addition, our lab studies some *Vibrio* species that cause disease in aquaculture (*Vibrio tubiashii*) and corals (*Vibrio coralliilyticus*). We are applying various modern molecular techniques to better-understand the virulence properties and environmental survival strategies of these pathogens. In addition, we are developing detection assays that can be used in aquaculture facilities to reduce the economic impact of vibriosis.

Adam Z. Higgins

Dr. Higgins' research activities fit within the broad theme of medical bioprocessing, with a particular emphasis on technologies for long-term stabilization of cell-based products (e.g., cryopreservation, freeze drying) and microfluidic devices for chemical processing of blood. Current research projects focus on mathematical modeling and optimization of

cryopreservation procedures, development of microfluidic cell washing methods to facilitate the use of frozen blood for transfusions and extracorporeal blood processing for treatment of sepsis.

Kenton Hokanson

All of the wonderful things our brains do, from visual perception, to coordinating our movements, to memorizing the lyrics of a new song, depend on the electrical activity of neurons. I study how these electrical signals are generated and transmitted, and how they drive communication between neurons connected by specialized structures called synapses. To do this, I use a technique called electrophysiology, which involves placing tiny electrodes near or inside individual neurons to record their behavior with remarkable sensitivity. As the Director of the Electrophysiology Core Facility, I am working to bring this technique to the many other neuroscience laboratories at OSU.

Michael Huber

Research projects included surgical manipulation of endometrial cups in mares to manage infertility associated with pregnancy loss, and the impact of bone fragments on joint health. Focusing on some innovative ideas for limiting reproduction in BLM and Tribal horse and burro populations and development of an instrument to facilitate a surgical procedure.

Beth Ihms

Arup Indra

Our laboratory is investigating into the mechanisms of spatio-temporal development of skin (largest organ in the body) from stem cells and the role of lipids in skin barrier formation, suppression of inflammation and preventing the onset of inflammatory skin disease (e.g. eczema) using mouse genetics, biochemical, cellular and molecular approaches. My group pioneered a simple, non-invasive way to extract and profile skin lipids from rodents and humans using both “un-targeted” and “targeted” lipidomic approach that has opened up a new field of research in predicating onset of inflammatory skin diseases (e.g. AD or psoriasis).

We are also focusing on the mechanisms underlying the crosstalk between the various skin cells and immune cells, and the role of microenvironment in the promotion and progression of “melanoma”, the deadliest and the most aggressive of all skin cancer types. Over the past 16 years, our laboratory has generated multiple novel pre-clinical models of human diseases with skin barrier defects, hair loss, atopic dermatitis ((highlighted by the Office of the NIH Director), delayed wound healing, skin pigmentation disorder and for invasive metastatic melanomas.

In alignment with the drug discovery program of the College of Pharmacy, we are preforming high throughput screening and evaluating anti-cancer properties of unique bioactive natural compounds and novel metabolites that are generated by collaborators Professors Taifo Mahmud and Fred stevens at OSU and external collaborators across the nation. We are establishing their role to regulate cancer cell metabolism and activate host-immune responses to pursue our goal to identify and characterize new molecules that could be effective for therapeutic interventions and control disease progression.

Gitali Indra

My group is studying tissue regeneration and wound-healing using mice-models and 3D-bioprinted human skin. We utilize biodegradable nanofibers loaded with growth-factors, anti-microbial peptides and exosomes for efficient healing of chronic wounds in diabetes and hypoxia. Anti-cancer, anti-aging and anti-oxidant effects of bioactive compounds isolated from hemp, hops and meadowfoam are being investigated.

Jane Ishmael

Our research focuses on understanding the functional relationship between autophagy ("self-eating") and cell death signaling in brain tumor cells. Glioblastoma multiforme is the most common malignant primary tumor of the central nervous system and remains very difficult to treat. These tumors arise from astrocytes and have many biological characteristics that allow them to evade cell death. We utilize a range of human cancer cell types and genetically modified mouse embryonic fibroblasts (MEFs) to determine how cells use autophagy as a survival response to stress. Our research interests are closely aligned with the drug discovery efforts in the College of Pharmacy and we study a number of unique compounds that have arisen in nature in diverse and unusual ecosystems. The main projects in the Ishmael laboratory are currently centered around structures with anticancer potential that were discovered by Drs. Kerry McPhail and Taifo Mahmud at collection sites in Panama, South Africa, Indonesia and the Red Sea. By working at the interface of Medicinal Chemistry and Pharmacology we seek to understand the potential of these naturally occurring structures to modulate autophagy, inhibit cellular proliferation and induce apoptotic or alternate modes of cancer cell death. Our long-term goal is to characterize new chemical entities with the potential to inspire drug development for and identify new cellular targets for cancer chemotherapy.

Urszula Iwaniec

Current research foci include: 1) Neuroendocrine regulation of body weight and bone metabolism. 2) Nutrition as a factor in tumor metastasis to bone. 3) Regulation of stromal (stem) cell differentiation into bone cells and fat cells.

Ling Jin

My lab is interested in understanding of the mechanism of viral diseases and virus evolution. Latency of herpesviruses is the main focus of research in my laboratory. My lab uses several different herpesviruses to study the mechanism of herpes virus latency-reactivation cycles, the pathogenesis of herpes viruses, such as Herpes Simplex Virus 1 (HSV-1), Herpes Simplex Virus 2 (HSV-2), Leporid herpesvirus 4 (LHV-4), Koi herpesvirus (KHV) and other animal herpes viruses, and host- virus interaction in central nervous system. In addition, my lab in interested in anti-viral drug development, new emerging viral disease diagnosis, such as deer pox virus, deer adenovirus, goldfish tumor virus. Currently, we have research projects on HSV, LHV-4, KHV, Bovine Herpes Virus 1 (BHV-1), goldfish tumor virus, and deer adenovirus.

Jennifer Johns

Research in our lab focuses on several areas:

1) Translational research utilizing canine mesenchymal stem cells (MSCs) and nanoparticles derived from the MSCs. We are specifically interested the potential for therapeutic use of the nanoparticles to delivery chemotherapy drugs in canine cancers such as osteosarcoma.

2) Immune-cell function in elephants, focusing particularly on monocyte responses to bacterial infection.

3) Research on tick-borne rickettsial infections, including granulocytic anaplasmosis and related obligate intracellular bacterial infections.

4) Veterinary diagnostic testing with an emphasis on laboratory animals and wildlife species, and hematopoietic disorders.

Anna Jolles

Dr. Anna Jolles is a disease ecologist and epidemiologist at Oregon State University, where she has appointments in the College of Veterinary Medicine and the Department of Zoology. The Jolles lab studies the ecology and eco-immunology of infectious diseases in wild mammals. Current study systems include infectious diseases of African buffalo, feline immunodeficiency virus in African lions and Hanta virus in small mammals in Oregon. We collaborate with Dolan's group on comparative immunology across a broad range of mammal species, and with Clint Epps (OSU Fisheries & Wildlife) on pneumonia in desert bighorn sheep.

Donald Jump

My colleagues and I, in the Molecular Nutrition and Diabetes Research lab, investigate the molecular and metabolic basis of complications associated with obesity and diabetes. Our current focus is on the role diet plays in the onset and progression of nonalcoholic fatty liver disease (NAFLD), a major global health problem.

The central theme of our research is that dietary fat plays a central role in the control of transcriptional regulatory networks regulating carbohydrate, lipid and protein metabolism. Consumption of high fat diets or diets with insufficient polyunsaturated fats (omega 6 and omega 3 fats) contribute to the complications associated with obesity and type 2 diabetes. Such changes in dietary fat content disrupts regulatory networks controlling cell function. These events lead to complications of diabetes, such as hyperglycemia, dyslipidemia, cardiovascular disease and fatty liver disease.

Lacy Kamm

Dr. Kamm's research interest is in repair of joint and soft tissue injuries through the use of mesenchymal stromal cells and other regenerative therapies. Her main focus is the understanding of immune reactions which occur when donor mesenchymal stromal cells are administered to a recipient.

Michael Kent

Dr. Kent's research focuses on diseases of fishes and parasitology. Currently he is leading projects investigating diseases of importance to zebrafish in research facilities as this fish is now a very important model in biomedical research. Two groups of pathogens that he is studying are mycobacteria and microsporidia that infect zebrafish. He also is investigating diseases of importance in wild salmonid fishes, and presently is studying multiple pathogens

associated with pre-spawning mortality in Chinook salmon.

Molly Kile

My major research interests are environmental, molecular epidemiology and global health. I am interested in understanding how exposure to chemicals in our environment influences maternal and child health. Specifically, I am interested in how chemical exposures in utero may alter epigenetic mechanisms that could contribute to chronic diseases later in life. I am also interested in how genetic and other individual factors such as nutritional factors may interact with chemical exposures to influences susceptibility to disease. I have a very strong background in exposure biology and developing cohorts for environmental epidemiological studies. I also have a very strong interest in international environmental health studies.

Chrissa Kioussi

The precision in formation of a developing embryo is the result of an intricate mechanism of morphogenetic events, which bring cell populations together for interactions to form three dimensional structures. Complex cascades of signal transduction pathways coupling with an overlapping array of transcription factors constitute the basis for interpreting the transient morphogenetic code. Chrissa Kioussi focuses on the molecular mechanisms by which transcription factors, such as the homeobox genes, mediate cardiovascular and muscle development. Using mouse model systems she searches for a better understanding of congenital heart diseases, muscular dystrophies and human syndromes.

Siva Kolluri

Our research efforts are directed toward discovering molecular targets that are selective for cancer, developing agents that are selectively toxic to cancer cells, and devising optimal combinations of therapeutic agents aimed at different molecular pathways for the prevention and treatment of cancer. We are currently focusing our efforts to (i) Develop small molecules to treat Bcl-2 overexpressing cancers and (ii) Therapeutic targeting of the Ah Receptor in cancer and autoimmune diseases.

Michelle Kutzler

My laboratory focuses on three areas related to animal reproduction.
Focus area #1: ***Role of luteinizing hormone in the long-term health problems following spaying and***
neutering in dogs. Background: Spaying and neutering dogs is commonly used to prevent the birth of unwanted animals
and eliminate the risk of reproductive diseases. However, removal of the gonads prevents the feedback of estrogen and testosterone on the pituitary and hypothalamus. As a result, luteinizing hormone (LH) is continuously elevated at supraphysiologic concentrations. Although the main role of LH is for reproductive function (e.g., ovulation), there are LH receptors present in several normal tissues including the thyroid and adrenal glands, gastrointestinal tract, cranial cruciate ligament and round ligament, and lymphocytes. In addition, there are LH receptors present in several neoplastic tissues (e.g., lymphoma, hemangiosarcoma, mastocytoma, transitional cell carcinoma, and osteosarcoma). The role of LH receptors in non-reproductive normal and neoplastic tissues is not known but may stimulate nitric oxide release and induce

cell division. The precise etiology of the increased incidence of several non-reproductive long-term health complications following spaying and neutering is not known but may be related to LH receptor activation in these non-reproductive target tissues. Alternative methods for sterilizing dogs that do not result in elevated LH concentrations should be considered.
Focus area #2: *Improving fertility in livestock.* Background: Livestock provide an important source of animal protein in the diets of humans. The success of livestock production is dependent upon many factors including female fertility. Genetic selection and a variety of treatment strategies can improve female fertility and production. The research projects listed below were designed to validate specific novel and innovative treatment strategies and improve on existing therapies.
Focus area #3: *Alternative methods for sterilizing horses.* Background: Free-roaming (wild) horse management is a complex issue incorporating social, economic, emotional, political, and environmental factors. When the Wild Free-Roaming Horses and Burros Act of 1971 was signed into law, the provisions assigned the Bureau of Land Management (BLM) and the Forest Service as responsible for the "management and protection" of these horses "in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands". With a lack of natural predation, the free-roaming horse and burro population increases annually by 20-25%. The current population stands at about 81,951 free-roaming horses and burros and is confined to 10 states. The BLM estimates that 26,690 individuals would be an appropriate population limit that would allow for conservation of the natural resources on the public lands. Reducing the free-roaming horse and burro numbers has become a priority by the BLM in order to conserve natural resources and ecological integrity. Surgical and nonsurgical sterilization methods need to be developed to reduce the number of foals born each year.

Christopher Langdon

Research Areas: Aquaculture; nutrition of oysters and other bivalves; microencapsulation; polyculture of abalone; genetic selection of oysters.

Chris's research is broadly interested in aquaculture of oysters and other bivalves, and of sea vegetables such as dulse. He also works with microencapsulation of nutrients to feed bivalves and other fishes in aquaculture operations. His work with the Molluscan Broodstock Program focuses on the genetic selection of oysters in order to improve all aspects of oyster production. Chris also studies ocean acidification and hypoxia and its effects on oyster production.

Mark Leid

The Leid laboratory is primarily focused on the in vivo role of the transcriptional regulatory protein known as Ctip2/Bcl11b. The laboratory discovered the protein and cloned the corresponding cDNA in 2000. The Leid group subsequently defined the molecular and cellular basis for the activity of this transcription factor, and demonstrated that the protein plays key roles in the development of several organ systems, including the immune system, teeth, craniofacial skeleton, and skin. We now work primarily on two projects, with the goals of which are: (1) determining the role of BCL11B in craniofacial development and craniosynostosis, and (2) defining the mechanisms by which post-translational modifications, such as phosphorylation, sumoylation, and ubiquitination, control the transcriptional regulatory activity of BCL11B in all cell types.

Christiane Löhr

My research focuses on the molecular pathology as it applies to a wide range of diseases especially carcinogenesis, cancer prevention and treatment and infectious diseases. As a board certified anatomic veterinary pathologist with an appointment in the Veterinary Diagnostic Laboratory I encounter new or poorly understood disease conditions with regularity. Such cases provide excellent opportunities to identify specific, potentially novel, causes and mechanisms of disease processes. Much of my research is conducted in collaboration with colleagues in the College, on campus and outside the University. I find it very rewarding to provide critical input and data to large projects and to contribute to the training of researchers at all levels.

Kathy Magnusson

Our human population is aging. The percentage of the population in this country that is over the age of 65 is projected to increase from 12.6% in 2005 to 20% by 2030. With this increase will come a rising financial burden to both families and society, unless we can prevent the declines that are currently associated with aging. Declines in brain functions during aging, including memory and cognitive flexibility, affect almost half of the human population over 65 years of age. This interferes with people's quality of life as they get older. It also can become an economic burden, because they can no longer live independently. Pet animals can also experience these changes, which may limit their functional lifespan. These problems suggest that there is a decline in the optimal functioning of regions of the cerebral cortex and hippocampus. The N-methyl-D-aspartate receptor, a subtype of glutamate receptor, is highly expressed in these brain regions and plays a role in many of the functions that decline during aging. Our laboratory has found a selective vulnerability of the NMDA receptor to aging. This decline in NMDA receptors correlates with declines in memory function. We will be exploring the effects of drug or micronutrient intervention on these receptors during aging with the use of stereotaxic surgery, chronic drug administration, and/or behavioral testing using mice as our model system. We may also be examining the effects of interventions on receptor binding density, and subunit mRNA and protein expression with the use of receptor autoradiography, in situ hybridization and Western blots, respectively.

Erica McKenzie

Dr. Erica McKenzie is a specialist in large animal medicine and sports medicine and rehabilitation. Her research interests are largely related to exercise physiology and muscle function. Some of her projects have therefore included studying effective drugs for preventing muscle damage in horses, and the study of specific aspects of exercise physiology and disease in racing Alaskan sled dogs. As a large animal clinician, Dr. McKenzie occasionally performs research projects relevant to internal medicine in alpacas.

Jan Medlock

My primary research interests are in the epidemiology of infectious diseases. I also have broader interests in using quantitative and computational methods for questions in biological sciences. I am currently working on a variety of projects, including the epidemiology of foot-and-mouth disease virus in African buffalo and the ecology and epidemiology of pathogens in bighorn sheep. In the past, I have worked extensively on the epidemiology of HIV, influenza, dengue, and African sleeping sickness.

Tim Miller-Morgan

Dr. Tim Miller-Morgan is and extension veterinarian focusing on aquatic species and the ornamental fish industry. He leads the Oregon Sea Grant Aquatic Animal Health Program, which provides the ornamental fish industry, aquatic research laboratories, and public aquaria with cutting-edge, scientifically based, conservation minded disease management techniques, consultation and training. Our research focus is on applied research aimed at current and emerging animal health issues generally associated with the management of wild-caught ornamental fish species and the management of disease throughout the chain of custody from the collector/farmer to the end consumer the ornamental fish hobbyists.

Andriy Morgun

Our lab is focusing on health problems in which an unbalanced interaction between immune, other host systems and different microbes leads to pathology. Those diseases range from immunodeficiency- associated enteropathy to cervical cancer and acute rejection of heart and renal transplants. We employ multiple large-scale quantitative approaches (also called "omics" (http://en.wikipedia.org/wiki/Omics) to generate the data and use this data to make predictive statistical models and networks that allow us to address three major topics:

- Discover new or repurpose old drugs

- Generate diagnostic/predictive "omics" signatures for personalized medicine

- Validate experimental animal models for human research using "omics" approaches.

Hong Moulton

Morpholino oligomers are a class of steric-blocking antisense molecules that have been widely used to knock down gene expression, modify pre-mRNA splicing or inhibit miRNA maturation and activity. Injection of Morpholinos into single-celled embryos of many creatures results in specific knockdown of targeted genes with little toxicity. Morpholino oligomers have revolutionary potential for treatment of a broad range of human diseases, including viral, bacterial, age-related and genetic diseases, but they suffer from poor delivery into cells. My long term research interest has been in inventing and improving methods for enhancing *in vivo* delivery of Morpholinos in a tissue-specific manner for a giving disease by chemically modifying and/or formulating Morpholinos. My current research is 1) to develop and validate a high throughput *in vivo* model to assess the efficacy and toxicity of intracellular delivery methods for steric-blocking antisense oligos, and 2) to investigate how host factors affect influenza viral infection using the Morpholino-mediated gene knockdown approach.

Lauren Newsom

Dr. Newsom is interested in research that focuses on practical applications of computed tomography and ultrasound, specifically as it relates to diagnosis and prognosis of oncologic, surgical, and medical illnesses in small animal patients

Tandi Ngwenyama

Fikru Nigussie

My research interest is in adult hippocampal neurogenesis and its role in learning and

memory, regulation of stress and circadian rhythm using animal and cell culture models.

Ana Pacheco

Dr. Pacheco's research interest are in respiratory medicine, endocrinology and emergency and critical care.

Si Hong Park

My goal is developing a food safety program included genomics, metagenomics (microbiome and whole genome sequencing) and transcriptomics based on a next generation sequencing and bioinformatics. Research is focusing on the detection, identification and control of foodborne pathogens such as Salmonella, Listeria, Campylobacter and E. coli from farms to forks using various molecular techniques. Currently, I am working on microbiome sequencing in gastrointestinal tracts of humans, food animals (poultry and cattle), catfish and experimental animals to evaluate the microbial diversity in the presence of food and feed supplements (prebiotics, probiotics and antimicrobials) and/or foodborne pathogen challenge.

Manoj Pastey

Dr. Pastey's laboratory is conducting research work on the pathogenesis of influenza, HIV, and respiratory syncytial virus (RSV) and developing a new diagnostic method to detect Dengue virus, Bovine Herpes virus, and sexually transmitted infections in clinical samples.

HIV Research Study: Our laboratory is testing a poly herbal vaginal microbicide named "BASANT" that has been shown to inhibit a wide range of sexually transmitted pathogens including HIV. Preliminary studies have also shown safety and acceptability in Phase I (acceptability and toxicity study) human trials in India. Therefore, the next step is to verify the effectiveness of the BASANT in preventing HIV transmission *in vivo*. We are also working on a novel HIV protein that is required for replication in T cells. HIV sequestration in the CNS and the failure of antiretroviral drugs to penetrate through blood-brain barrier to eliminate latent CNS reservoir continues to be a major road block in AIDS therapy. Therefore, we are developing Nanotechnology based delivery systems to target the virus within different tissue compartments.

RSV Research Study: Respiratory Syncytial Virus (RSV) is a leading cause of bronchopneumonia in infants and the elderly. There are no vaccines or effective treatment available. Knowledge of viral and host protein interactions is important for better understanding of the viral pathogenesis and may lead to development of novel therapeutic drugs. In our lab, we have shown that Respiratory Syncytial Virus Matrix (M) protein interacts with cellular adaptor protein complex (AP)-3 and its medium (μ) subunit. We are also looking into the role played by Myeloid cell leukemia-1 (MCL-1), an anti-apoptotic member of the B-cell lymphoma-2 (Bcl-2) family, in Respiratory Syncytial virus pathogenesis.

New Diagnostic method: We are developing a new rapid diagnostic method to detect dengue virus, bovine herpes virus, and sexually transmitted infections at Point-of-Care within 30 mins at room temperature using recombinase polymerase amplification (RPA) technology without the need for sophisticated equipment.

Stephen Ramsey

My lab's aim is to use the tools of computational systems biology to advance precision medicine. Currently, we are working on projects in four areas: (1) electrochemical sensing of drug levels in saliva for therapeutic drug monitoring for epilepsy; (2) transcriptomics in comparative oncology (prostate cancer) and in immunology; (3) genomic approaches to study the biology of Chlamydia trachomatis; and (4) artificial intelligence for drug repurposing.

Dan Rockey

Interactions between chlamydiae and the mammalian host. All species of chlamydiae are obligate intracellular bacteria that cause disease in a wide variety of animal species. In humans, *Chlamydia trachomatis* and *C. pneumoniae* cause a variety of diseases of the eye, genital tract and lung. These conditions affect millions of people worldwide and lead to billions of dollars in medical expenses yearly in the U.S. alone. Additionally, chlamydial infection is associated with certain types of arthritis and, most surprisingly, arterial sclerosis. Very little is known about how chlamydiae interact with the host to cause a particular chlamydial condition, and why some infected people have serious disease and others are asymptomatic.

Sarah Rothernberg

Dr. Sarah Rothenberg is an Associate Professor in the OSU College of Health, in the Environmental and Occupational Health Program. She is a member of the Eastern Pacific Marine One Health Coalition (EPMOHC), which includes veterinarians, university faculty, state agencies, etc., focused on anthropogenic impacts to the marine ecosystem health. For this coalition, Dr. Rothenberg contributes her expertise on exposure to environmental pollutants (PFAS, heavy metals, PBDEs, etc.) and their impacts on marine mammal health. At OSU, Dr. Rothenberg is director of the Mercury Lab, which provides analyses of total mercury and methylmercury in biological matrices (blood, stool, whisker, fur, etc.) and environmental matrices (soil, surface water, etc.). Dr. Rothenberg is excited to collaborate on studies related to environmental pollutants and health.

Carl Ruby

My research interests include the assessment of tumor immunity in dogs with various types of cancer, including osteosarcoma and lymphoma. The involvement of immune cells in the natural history of these cancers can provide additional diagnostic information that complements existing readouts and guide therapeutic strategies. In addition, I am actively developing canine-specific cancer immune-based therapies that will provide clinicians and patient owners safe and effective options beyond the standard toxic chemotherapy regimens commonly available in the veterinary clinic.

Duncan Russell

My scholarly interests are applied clinical research, comparative pathology (particularly animal models of human disease and implant pathology), and educational science. I am especially interested in research questions that are directly applicable to clinical veterinary medicine. This has included histologic evaluation of surgical margins and descriptions of naturally occurring disease. My projects relating to educational science have evaluated the utility of alternative teaching strategies that enhance student learning and encourage metacognition.

Justin Sanders

My research is focused on host-parasite interactions and the impacts of ecological and evolutionary factors on these interactions. Current projects include:1. Production of monoclonal antibodies that recognize a number of zebrafish cytokines and characterization of the zebrafish immune response, 2. Development and characterization of an elevated temperature zebrafish model, primarily for the study of the apicomplexan parasite, *Toxoplasma gondii,* 3. Improvement of diagnostic techniques for the detection of important veterinary parasites such as *Giardia intestinalis* and the liver fluke, *Fasciola hepatica,* 4. Identification and characterization of the transmission dynamics of aquatic pathogens. This work is being performed with salmonid fishes in the wild as well as with laboratory zebrafish in order to determine the factors involved in prespawn mortality of salmonids and to guide diagnostic efforts aimed at improving the health of zebrafish in laboratory fish colonies.

Mahfuzar Sarker

The long-term goal of my research program is to develop strategies to inactivate *Clostridium* spores and to control *Clostridium*-mediated diseases. We mainly focus our work on spores of *C. perfringens* (*Cp*) causing *Cp* food poisoning, which currently ranks as the third most commonly reported food-borne disease in the USA. *Cp* also causes non-food-borne gastrointestinal (GI) diseases in humans and GI diseases in domestic animals. Specifically, we investigate the molecular mechanisms of *Cp*: i) spore heat resistance; ii) spore germination; iii) spore-host interactions; and iv) spore inactivation.

Katherine Scollan

My research in the field of veterinary cardiology is focused on three-dimensional imaging of the heart including 3D echocardiography and computed tomography (CT). I am investigating the use of these imaging modalities to assess size and function of the cardiac chambers in normal and diseased hearts. In addition, I perform research in pharmacokinetics and efficacy of antiarrhythmic medications used in dogs and have an interest in the congenital cardiac diseases of camelids.

Kelly Sears

Stacy Semevelos

Her research focuses on comparative orthopaedics, particularly postnatal cartilage development and osteochondrosis in horses. She has discovered molecular expression changes in osteochondrosis and has explored the quantitative and spatial alterations of matrix molecules, growth factors, and cell-to-cell signaling in this important disease. In addition, she has discovered age-related changes in gene and protein expression patterns of matrix molecules, growth factors and paracrine factors in articular cartilage of normal growing horses throughout postnatal development. She has also investigated musculoskeletal disorders of llamas and alpacas, using molecular, biochemical, and histological techniques to evaluate suspensory apparatus breakdown in these species.

Thomas Sharpton

Dr. Thomas Sharpton's research is broadly directed towards ascertaining how commensal microbiota and their genomic characteristics (*i.e.,* the microbiome) relate to health. His

laboratory specializes in the development and application of high-throughput computational and statistical tools that characterize microbiome biology, and investigates how microbiomes are distributed across space, time, and host physiology. The Sharpton lab aims to develop testable hypotheses about how hosts and their microbiome interact, and strives to understand the evolutionary and ecological processes that influence community assembly, maintenance, and function within a host. Ultimately, this knowledge will be used to discover disease mechanisms, identify predicative and diagnostic biomarkers of disease, and develop tools to treat disease through manipulation of the microbiome. All of the data resources and software that his lab develops are freely available.

Natalia Shulzhenko

My laboratory studies interactions between the immune system, metabolism and gut commensal microorganisms (microbiota) in mouse models and human diseases. Microbial cells exceed ten times the number of our own body cells and contribute to several physiological processes. With the advent of new genomic technologies, the role of microbiota in health and disease is a rapidly evolving field of research. We apply novel systems biology approaches such as network reconstruction to analyze host and microbiota simultaneously. Our recent work on chronic enteropathy in immune-deficient hosts revealed a crosstalk between the immune system, the microbiota, and the epithelial cells affecting both intestinal and systemic lipid metabolism. Using metagenomic sequencing, we plan to reveal the microbial players contributing to this disorder and to test them in a mouse model of this disease. In another project, we are studying adverse effects of antibiotics on the intestinal immune system and on microbiota and how this disruption contributes to metabolic syndrome and type 2 diabetes.

Aleksandra Sikora

The emergence and increasing occurrence of bacterial strains that are resistant to all classes of available antibiotics is a global problem. Current antimicrobials target a relatively small number of essential gene functions including: inhibition of cell wall biosynthesis, and synthesis of macromolecules (proteins, DNA and RNA). Treatment of infections caused by antibiotic resistant bacteria requires new approaches and agents with novel modes of action.
The bacterial extracellular proteome (cell envelope, membrane vesicles and secreted proteins) plays a fundamental role in establishing infection by enabling the microbes to adhere to and invade host cells, facilitating nutrient acquisition, host tissue destruction, and suppression of host immune responses. Hence the components of the extracellular proteome are promising targets for drugs/vaccines aimed at preventing bacterial infections. The long-term goal of our research is to enhance our understanding of the phenotypic plasticity of the bacterial extracellular proteome and utilize this information to identify attractive targets for development of new therapeutic interventions. Currently, our research focuses on the role of bacterial extracellular proteomes in colonization and circumvention or exploitation of host immune response using two model organisms *Vibrio cholerae* and *Neisseria gonorrhoeae*. We examine these issues using comprehensive proteomic studies, chemical genomics, and state of the art genetic, molecular and biochemical methods.

Susanne Stieger-Vanegas

My research interests focus broadly in computed tomography and ultrasound of

gastrointestinal, complex cardiac and musculoskeletal disease in dogs and New World Camelids. My interest not only includes the CT imaging of clinical patients, but establishing new imaging protocols to improve imaging of diseased veterinary patients using CT. Furthermore, my research focuses on 3D modeling and printing of complex disease processes with the goal to better understand complex disease processes, provide tools for enhanced student learning and improve patient outcomes by providing 3D models for individualized treatment planning and care.

Stacie Summers

Dr. Stacie Summers is board-certified in small animal internal medicine and has a special interest in feline medicine and urinary tract disease. Her PhD research evaluated novel causes of chronic kidney disease in cats with a focus on the fecal microbiome and role of microbial metabolites in the disease. Dr. Summers has expanded her research to dogs and cats with both intestinal and systemic disease. She evaluates therapies that have the potential to change the microbiome and its function to help treat dogs and cats with disease. She also has interest in the biological variation of biomarkers and investigation into novel biomarkers of disease diagnosis, treatment efficacy, and prognosis. She has collaborated on other projects relative to small animal internal medicine including infectious disease, nutrition, and primary gastrointestinal disease.

Sue Tornquist

My areas of research include hematology, metabolic disease and infectious diseases of camelids and use of immunocytochemistry in diagnosis and prognosis of neoplasia.

Katy Townsend

My research focuses on improving clinical outcomes for surgical patients, with a special focus on soft tissue surgery and oncologic surgery. My research focuses on clinical trials involving patients with naturally occurring tumors, accurately staging patients with advanced and novel sentinel lymph node mapping techniques. I am looking into emerging intraoperative modalities to accurately determine how cancer spreads throughout my patients' body with cancer. This will help guide what further treatment we should perform with my collaborators. My other research focus is on assessing and designing animal models to assess and test novel implants.

Richard Van Breemen

Aligned with the Linus Pauling Institute, research in the van Breemen laboratory concerns the discovery and development of natural products as chemoprevention agents and the investigation of mechanisms of action and safety of botanical dietary supplements. The goal is to identify micronutrients and natural products that may be used to maintain optimal health and prevent cancer and neurological degenerative diseases. This research integrates the analytical tool of mass spectrometry into all aspects of the drug discovery and development from screening of botanical extracts for the identification of active natural products, to studies of drug metabolism and disposition, and to quantitative analyses of the bioavailability and pharmacokinetics of pharmacologically active compounds. These translational studies extend from basic science to clinical trials.

Joy Waite-Cusic

Dr. Waite-Cusic's lab conducts applied research in four main themes: (1) pre-harvest food safety, (2) process validation, (3) prevalence of pathogens in food systems, and (4) microbiological quality indicators and spoilage.

George Waldbusser

Dr. Waldbusser's research interests include ocean acidification effects on bivalves, benthic ecology and sediment biogeochemistry, tidal flat ecology.

Jennifer Warnock

Dr. Warnock is a Small Animal Surgeon with a practice focus on orthopedic surgery. Her major area of basic science research is on in vitro meniscal tissue engineering, using waste tissue obtained during clinical arthroscopy. Meniscal injury and deficiency is a major cause of pain, disability and irreversible osteoarthritis in dogs and humans. As the menisci have minimal to absent healing responses, creating autologous fibrocartilages in vitro through tissue engineering may be a viable strategy for addressing the meniscal deficient stifle or knee. Her current work has focused on creating fibrocartilage-like tissue from synovial and meniscal cells cultured from clinical patients in need of engineered stifle tissues. Specifically, her lab has synthesized autologous, scaffold free, tensioned neotissues, to avoid the complications seen with use of synthetic, allogenous, and xenogenic scaffolds in meniscal tissue engineering applications. Her clinical research focuses on minimally invasive surgery and validation of surgical techniques. She has a long-term goal of bringing discoveries made in her laboratory (following efficacy and safety analysis) to the hospital to benefit of her patients.

Bill Whitler

Katja Zellmer

I am interested in pathophysiology, diagnosis and treatment of musculoskeletal diseases in equines, specifically in osteoarthritis and tendonitis. Currently, we are investigating the effects of botulinum toxin on osteoarthritic joints, as well as signaling changes that may be responsible for the development of osteochondrosis (a developmental joint disease) in foals. We are also interested in rehabilitative methodologies for musculoskeletal diseases/injuries in horses, such as therapeutic laser. We are also investigating the effects of therapeutic exercises on muscle activation in horses and hope that this research will improve our rehabilitation of equine athletes from injuries, and possibly allow us to prevent injuries in the future.