Immunogenetics and Comparative Immunology (3 credit hours)

Course Number: VTPB 415 / VTMI 615 **Meets:** Tues/Thur 9:35-10:50am VMA 331

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Prerequisites: Jr/Sr classification for VTPB 415, graduate classification for VTMI 615, GENE 320 and VTPB 409 or equivalent, or permission of instructor

Textbook: *Veterinary Immunology: an Introduction* (9th edition) by Ian Tizard, *Janeway's Immunobiology* (8th edition) by Kenneth Murphy, *Cellular and Molecular Immunology* (7th Edition) by Abul Abbas, or other modern immunology text should be fine for the first third of the course, check with instructor. Pathology section will be taught from Geha and Notarangelo's *Case Studies in Immunology, A Clinical Companion* (to *Janeway's Immunobiology*, 6th Edition). I will post additional literature for the last (comparative) third of the class, but Flajnik's Chapter 3 of *Fundamental Immunology* (Ed Paul, 6th Edition) will provide a framework.

Grading:

Undergraduate (VTPB 415):

Exams (3, 30% each)	90%
Pop Quizzes (will drop lowest pop quiz, 1% each)	10%

Graduate (VTMI 615):

Exams (3, 25% each)	75%
Pop Quizzes (will drop lowest pop quiz, 1% each)	10%
Paper discussions	15%

*100-90=A, 80-89.9=B, 70-79.9=C, 60-69.9=D, <60=F

Course grades will be determined by the percent of total points earned during the semester. Exams will be comprised of multiple choice, short answer, and essay questions.

Attendance: Attendance at all scheduled examinations is required. Documentation from a physician is required for making up a missed examination. Attendance at all lectures is expected and strongly encouraged. Come to class on time. Entering or leaving the classroom during class is disruptive to your classmates. Every attempt will be made to begin and end each class on time. Students with an excused absence will be permitted to make up examinations and quizzes, though format may vary. Make-ups are to be arranged with the instructor as soon as possible after the absence. No make-up examination or quiz will be provided for a non-excused absence.

Assignments: Power points of lectures will be provided, and reading material will be assigned or handed out from literature. Exams will be multiple choice and short answer/essay. Graduate students will meet weekly for additional paper discussions and will be graded on participation (5%) and a paper presentation (10%). Short pop quizzes will be given approximately weekly to discourage students from falling behind.

Course Rationale: The purpose of this course is to provide an advanced immunology course for those who enjoyed the more molecular aspects of general immunology, have interests in comparative/veterinary immunology, or interests in applied immunology such as immunodiagnostics and vaccine development. Taken after general immunology, this course should prepare undergraduate students very well for graduate school and professional school immunology or host defense classes, and should be particularly useful for those pursuing careers in comparative biomedical basic or clinical sciences. Graduate students will benefit from the advanced immunology and evolution, especially relevant for those interested in engineering of immune repertoires or comparative host defense.

Course Goals and Learning Objectives: Students should come away from this course with a strong background in the unique genetic mechanisms operating in the vertebrate adaptive immune system, and to a lesser extent the immunogenetics of innate systems extant throughout organic life. These will be put into the context of their natural history, allowing students to gain an appreciation of distinctions in the immune

repertoires of other organisms compared to ours. Graduate students will benefit from weekly practice reading the primary molecular immunology literature, presenting and discussing publications with their peers in a setting of faculty guidance. The student can apply the literature critiquing skills gained to their own sub-fields and projects.

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

Course Outline and Schedule:

- Basic Concepts of Immunology (Janeway Ch1) — T 1/15, Th 1/17

- Adaptive receptor systems
  - Ag Recognition by B and T Cells (Janeway 4) — T 1/22, Th 1/24
  - Generation of Lymphocyte Ag Receptors (Janeway 5) — T 1/29, Th 1/31, T 2/5
  - Ag Presentation to T Lymphocytes (Janeway 6) — Th 2/7, T 2/12

Exam I: Th 2/14

  - Signaling Through Immune System Receptors (Janeway 7) — T 2/19, T 2/26, Th 2/28
  - Development and Survival of Lymphocytes (Janeway 8) — T 3/5, Th 3/7, T 3/19, Th 3/21

- Innate receptor systems (including NLRs and TLRs) (parts of Janeway 2) — T 3/26
  - Natural killer receptors (parts of Janeway 2) — T 3/26

Exam II: Th 3/28

- Immune pathology (with an eye towards genetics, all diseases TBA)
  - Type I diabetes mellitus — T 4/2
  - Multiple sclerosis — Th 4/4
  - T cell lymphoma — T 4/9
  - Toxic Shock Syndrome — Th 4/11

- Comparative immune systems: examples from an evolutionary survey
  - Phylogenetic overview: bacteria to plants, invertebrates to mammals — T 4/16
  - Bacterial CRISPR — T 4/16
  - Plant R genes — Th 4/18
  - Agnathan variable lymphocyte receptors — Th 4/18
  - TCR diversity in vertebrates — T 4/ 23
  - DSCAM — T 4/23
  - Diversity in B cell development in endothermic vertebrates — Th 4/25
  - Recurring themes in the evolution of immune mechanisms — Th 4/25

or…

  - Molluscan FREP and Echinoderm 185/333 — substituted for one of above?
  - Urochordate FuHC — substituted for one of above?

Exam III: F 5/3 12:30-2:30 pm

Graduate students enrolled in VTMI615 will be reading primary literature in the field and meeting for ~weekly paper presentations by students and discussions.