

# IMMUNOLOGY (PHD)

## Overview

The doctoral program in Immunology at the University of Colorado Anschutz Medical Campus trains students in diverse areas of immunology that includes innate and adaptive immunity, host-pathogen interactions, tumor immunity, autoimmunity, immune deficiencies, and vaccine development.

The Immunology Graduate Program at the University of Colorado Anschutz Medical Campus is amongst the most prominent basic Immunology graduate research training Programs in the country. Since its founding in 1989, our Program has conferred over 150 PhD degrees to students from a variety of ethnic and cultural backgrounds. Our curriculum combines formal coursework with mentoring by an engaged faculty in a collaborative environment. The Program draws from the academic strengths of three institutions that contribute significant resources and house our training faculty and students – The CU Denver | Anschutz, National Jewish Health, and the Barbara Davis Center for Childhood Diabetes.

Students in the program receive comprehensive training in diverse areas of immunology and gain the intellectual foundation and technical expertise necessary for performing cutting-edge basic and translational research. Trainees also gain skills in data analysis, technical writing, and oral presentation to further prepare them for making impactful contributions throughout their careers – whether they pursue careers within or outside of academia.

## Admissions Requirements

Applicants with proven scientific ability, indicated through performance in a college level science program and/or in a research laboratory. Prior research laboratory experience ensures that students have basic skills and are familiar with the laboratory research environment. We strongly encourage applications from qualified underrepresented minorities. The Program and members of our training faculty have a strong commitment to inclusivity and a solid history of success in training minority and other under-represented student populations.

**Applications will open September 1.**

**DEADLINE FOR APPLICATIONS IS DECEMBER 1st.**

**There are 3 ways to enter the Immunology Program:**

- Apply directly to the Immunology Graduate Program.
- Apply to the Biomedical Sciences Umbrella Program and join the Immunology Graduate Program after your 1st year.
- Those interested in pursuing an MD/PhD with research interests in Immunology may apply to the Medical Scientist Training Program and complete their PhD portion through Immunology. Note: the MSTP follows a separate application process with different deadlines. Please visit the MSTP website for more information.

Applications will open September 1, and all application and supplemental materials are due no later than December 1. Applications received after December 1 may not be considered.

To apply for admission applicants must submit the following:

- **Online Graduate School application**
- A \$50.00 domestic and \$75.00 international non-refundable application fee.
- One (1) official transcript of all academic work completed to date. To be considered "official", the transcripts must come directly from the issuing institution.

Electronic Transcripts should be sent to [graduate.school@cuanschutz.edu](mailto:graduate.school@cuanschutz.edu)

**OR**

Mail a physical copy to:

University of Colorado Denver  
Graduate School  
Mail Stop C296  
13001 E. 17th Place  
Aurora, CO 80045

- Three to five (3-5) letters of recommendation. Letters should be from individuals such as college professors or faculty mentors who are familiar with your academic and/or laboratory achievements. Such letters should be submitted electronically through the on-line application.
- GRE scores are no longer required for admission.
- International Applicants only: Students whose native language is not English or who have completed their studies at an institution where English was not the language of instruction, must demonstrate English language proficiency by submitting scores of the Test of English as a Foreign Language (TOEFL) or its equivalent. **Visit International Admissions for more information.**

## Degree Requirements

### First Year

First Year		Hours
<b>Fall</b>		
IMMU 7650	Research in Immunology <sup>001</sup>	1-5
IMMU 7650	Research in Immunology <sup>002</sup>	1-5
BMSC 7806	Core I: Foundations in Biomedical Sciences	6
BMSC 7810	Core Topics in Biomedical Science (Topic A)	2
BMSC 7810	Core Topics in Biomedical Science (Topic B)	2
BIOS 6606	Statistics for the Basic Sciences	3
	<b>Hours</b>	<b>15-23</b>
<b>Spring</b>		
IMMU 7650	Research in Immunology <sup>001</sup>	1-5
IMMU 7662	Immunology	6
	<b>Hours</b>	<b>7-11</b>
<b>Summer</b>		
IMMU 8990	Doctoral Thesis	1-10
	<b>Hours</b>	<b>1-10</b>
	<b>Total Hours</b>	<b>23-44</b>

## Second Year

### Second Year

Fall		Hours
IMMU 6110	Introduction to Bioinformatics	3
IMMU 7607	Science as a Profession	1
IMMU 7650	Research in Immunology <sup>0V3</sup>	1-5
IMMU 7602	Special Topics in Cancer Immunology	1
IMMU 7604	Special Topics in Signal Transduction in the Immune System	1
IMMU 7608	Immunology of Infection	1
IMMU 7609	Immunology of Autoimmune Diseases	1
<b>Hours</b>		<b>9-13</b>
Spring		Hours
IMMU 7650	Research in Immunology <sup>0V3</sup>	1-5
IMMU 7605	Workshop in Scientific Writing	1
IMMU 7603	Special Topics-Immunologic Basis of Human Disease	1
<b>Hours</b>		<b>3-7</b>
Summer		Hours
IMMU 8990	Doctoral Thesis	1-10
<b>Hours</b>		<b>1-10</b>
<b>Total Hours</b>		<b>13-30</b>

## Courses

**BIOS 6606 - Statistics for the Basic Sciences (3 Credits)**  
This course is designed for those wishing to obtain a basic understanding of statistics and its application in biological research. Students will develop statistical literacy and an ability to perform basic statistical analyses, basic graphical statistics, data summarizations, and estimation and inference using statistical software. Restrictions: Enrollment in UCD-AMC graduate program or permission of the instructor. Grading Basis: Letter Grade  
A-PUBH1 Graduate students and public health certificate students only. Typically Offered: Fall.

**BMSC 7806 - Core I: Foundations in Biomedical Sciences (6 Credits)**  
Course will focus on the fundamental principles of biomedical sciences. Lectures and recitations/discussions will primarily address the basics of molecular biology, biochemistry, genetics, cell biology and energetic principles. Course is typically limited to biomedical science PhD and BSBT MS students. Previously offered as IDPT 7806  
Grading Basis: Letter Grade  
Repeatable. Max Credits: 6.  
Typically Offered: Fall.

**BMSC 7810 - Core Topics in Biomedical Science (2 Credits)**  
Sections focus on different core topics in biomedical science, and will address subject areas such as protein structure and function, neurobiology, embryology, stem cell research, and cancer biology. Students can enroll in multiple Core Topic Courses topics in one semester. Previously offered as IDPT 7810.  
Grading Basis: Letter Grade  
Repeatable. Max Credits: 20.  
AMC-PHD PhD Students only  
Typically Offered: Fall.

**IMMU 6110 - Introduction to Bioinformatics (3 Credits)**  
An intensive course aimed to introduce basic theory and concepts of commonly used bioinformatics workflows encountered in immunology and microbiology NGS data sets. This course is also designed as a workshop; all workflows will be directly applied to pre-existing datasets. Pre-requisite: At least one semester of any R programming.  
Grading Basis: Letter Grade  
Restricted to IMMU, MICB, MICR, BSBT students  
Typically Offered: Spring.

**IMMU 7602 - Special Topics in Cancer Immunology (1 Credit)**  
This interactive course aims to introduce important concepts, models and approaches in cancer immunology. The focuses are mechanisms relevant to the immune response in the context of cancer development and immunotherapy. Students are assessed via presentations, participation, and a paper.  
Grading Basis: Letter Grade  
A-GRAD Restricted to graduate students only.  
Typically Offered: Spring.

**IMMU 7603 - Special Topics-Immunologic Basis of Human Disease (1 Credit)**  
Perform translational studies, as they either test hypotheses established in mouse models or lead to new testable hypotheses that will advance understanding of pathogenesis of human disease. Greater understanding of disease pathogenesis will allow for development of new treatment options. Prereq: IMMU 7662.  
Grading Basis: Letter Grade  
Repeatable. Max Credits: 1.  
A-GRAD Restricted to graduate students only.  
Typically Offered: Spring.

**IMMU 7604 - Special Topics in Signal Transduction in the Immune System (1 Credit)**  
In-depth course, designed primarily for immunology graduate students in their second year, who have completed IMMU 7602. The course covers selected topics (8 in all) encompassing a wide range of topics in signal transduction through receptors important in the immune system. Prereq: IMMU 7662.  
Grading Basis: Letter Grade  
A-GRAD Restricted to graduate students only.  
Typically Offered: Fall.

**IMMU 7605 - Workshop in Scientific Writing (1 Credit)**  
This workshop will consist of one session weekly for students to be critiqued on writing assignments designed to provide basic training in writing grant proposals and manuscripts.  
Grading Basis: Letter Grade  
Typically Offered: Spring.

**IMMU 7607 - Science as a Profession (1 Credit)**  
This course discusses ethical issues, conflicts of interest, and regulations for working with humans or animals. It also includes instruction on writing papers and grants, giving effective presentations and advice on finding jobs in academia and industry.  
Grading Basis: Letter Grade  
A-GRAD Restricted to graduate students only.  
Typically Offered: Fall.

**IMMU 7608 - Immunology of Infection (1 Credit)**  
Students will discuss and present selections from the current literature on topics related to the interaction of the immune system with microbial causes of infectious diseases.  
Grading Basis: Letter Grade  
Typically Offered: Spring.

**IMMU 7609 - Immunology of Autoimmune Diseases (1 Credit)**

Following a brief introduction on autoimmune diseases by the instructor, the students will discuss and present assigned papers from the current literature on topics related to immune mechanisms and cell types leading to various autoimmune diseases.

Grading Basis: Letter Grade

Typically Offered: Spring.

**IMMU 7650 - Research in Immunology (1-5 Credits)**

Research work in immunology. Prereq: Consent of Instructor.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 99.

A-GRAD Restricted to graduate students only.

Typically Offered: Fall, Spring, Summer.

**IMMU 7662 - Immunology (6 Credits)**

This course covers the basic principles of the immune system. Included are discussions on (I) the innate and adaptive immune responses, (II) the molecular and cellular basis of immune specificity and (III) aspects of clinical immunology.

Grading Basis: Letter Grade

A-GRAD Restricted to graduate students only.

Typically Offered: Spring.

**IMMU 8990 - Doctoral Thesis (1-10 Credits)**

Doctoral thesis work in immunology. Prereq: Consent of Instructor.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 10.

A-GRAD Restricted to graduate students only.

Additional Information: Report as Full Time.

Typically Offered: Fall, Spring, Summer.

## Learning Objectives

**Graduate education in general** | Post-baccalaureate education is an essential component in the development of future leaders, academicians, and scientists. The influence of graduate education on society reaches essentially all aspects of our lives including our safety, economy, health, and overall quality of life.

**Immunology program in specific** | The immune system has evolved to defend host organisms against the vast number of foreign agents that may be encountered throughout life and that are capable of compromising health and leading to possible death. A doctoral education in Immunology specifically trains individuals to not only define the mechanisms by which the immune system accomplishes this task but also to establish possible interventions that preclude, attenuate or neutralize these threats.

**The PhD program in immunology trains graduate students to become proficient and successful investigators who are able to:**

- Demonstrate a basic knowledge of central concepts in the biomedical sciences.
- Understand the current concepts in immunology.
- Read and critically evaluate the scientific literature.
- Formulate hypotheses based on current concepts in the field and design, conduct, and interpret their own research projects.
- Present research results in peer-reviewed publications and in a dissertation.
- Communicate research results effectively through oral presentations at scientific seminars, conferences, and other venues.
- Write a competitive application for research funding.

- Develop ancillary skills, where necessary, to obtain positions outside of scientific research.

## Policies

Please refer to the Graduate School Policies page (<http://catalog.ucdenver.edu/cu-anschutz/schools-colleges-programs/graduate-school/#policies>).

## Program Calendar

August – Department of Immunology & Microbiology Scientific Conference & Retreat

October – Immunology Program & Microbiology Program Student (only) Retreat

October – MPID T-32 Mini-symposium

Weekly – Research in Progress Seminar with the Microbiology Program

Weekly- Immunology Student Journal Club

Weekly – Speaker Series with Microbiology Program

Twice per year – Student Invited Speaker Seminar and meetings

## Contact Us

**Beth Tamburini, PhD**

Associate Professor

Co-Program Director

Beth.Tamburini@cuanschutz.edu (beth.tamburini@cuanschutz.edu)

**Ross Kedl, PhD**

Professor

Co-Program Director

Ross.Kedl@cuanschutz.edu

**Sabrina Heilman**

Program Administrator

Sabrina.Heilman@cuanschutz.edu (sabrena.heilman@cuanschutz.edu)

IMMU@cuanschutz.edu

**Immunology Graduate Program**

Mail Stop C290

13001 E. 17<sup>th</sup> Place

Aurora, CO 80045