

Vaccinology

Vaccinology Minor

Vaccines are substances used to stimulate the immune system to produce antibodies and develop memory cells to provide immunity against diseases and infections. Vaccines can be proteins, small molecules, and even DNA. While traditional vaccines were killed or weakened versions of microbes that caused disease, the development and production of vaccines today applies a wide variety of molecular, biochemical, and cellular techniques to create both prophylactic and therapeutic vaccines. This new generation of vaccines has the potential to dramatically improve human health throughout the world. Current vaccines can be used to treat existing and prevent future infections, prevent cancer, and hold the potential to fight disease.

The Program

The Vaccinology minor at North Dakota State University represents a unique opportunity for students in a range of science and health-related majors to expand their experiences and enhance their marketability. It provides students a curriculum to prepare for a career in the development and production of vaccines. Participation in the minor will help students prepare for biopharmaceutical industry careers, biomedical graduate school, and a broad range of health profession careers. The curriculum is designed to provide students with a broad range of experience in biochemistry, cell biology, and immunology while introducing students to the discipline of vaccinology through introductory and senior seminar courses as well as introducing students to aspects of working in a regulated industry environment and vaccinology research and development.

The Tri-College University (<http://bulletin.ndsu.edu/past-bulletin-archive/2014-15/undergraduate/academic-policies/tri-college-university>) established a Vaccinology minor on all three Tri-College campuses. The effort at NDSU was coordinated by the College of Pharmacy, Nursing, and Allied Sciences; The Department of Pharmaceutical Sciences; and the Center for Biopharmaceutical Research and Production.

Career Opportunities

The career opportunities open to individuals with training in the areas of biochemistry, cell biology, and immunology have never been greater. Employment in the bioscience industry in the United States grew 15.8% from 2001 to 2008 and is expected to continue to grow at this rapid pace over the next decade. Additionally, the average salary for an employee working in the bioscience industry in the United States is currently over \$77,000 per year. This is \$32,000 per year more than the combined average salary in all private industries.

Minor Requirements

Vaccinology Minor

Minor Requirements

Required Credits: 22

Requirements

BIOC 460 & 460L	Foundations of Biochemistry and Molecular Biology I and Foundations of Biochemistry I Laboratory	4
MICR 470	Basic Immunology	3

MICR 471 or MICR 445	Immunology and Serology Laboratory Animal Cell Culture Techniques	2
STAT 330	Introductory Statistics	3
PSCI 291	Seminar	1
PSCI 400	Vaccinology Research Experience	1
PSCI 491	Seminar	1
ZOO 370	Cell Biology	3
Select one of the following courses offered at MSUM:		4
BCBT 420	Intro to Working in a Reg Biochem & Biotech Industry	
BCBT 425	Intro to Validation in the Biochem & Biotech Industry	
BCBT 430	Intro to Quality Assurance and Quality Control in the Biochem & Biotech Ind	
BCBT 469	Biochemistry & Biotechnology Internship	
Total Credits		22

Minor Requirements and Notes

- For more information on the Vaccinology minor, contact Dr. Eugene Berry at 701-231-7520 or eugene.berry@ndsu.edu (eugene.berry@ndsu.edu)
- A minimum of 8 credits must be taken at NDSU.