

I Love Microbiology and I Love Food—How Do I Mix the Two to Produce a Delectable Combination?

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Introduction

In January 2000, I was approached by a respected colleague to become part of the Great Plains Institute of Food Safety (GPIFS) at North Dakota State University (NDSU), which was initially funded by a United States Department of Agriculture (USDA) higher education program fund. By joining the institute, I became part of a multidisciplinary team of experts working to develop a food safety curriculum to complement the baccalaureate degree in microbiology and other majors. It was to be the first of its kind in the United States, and to date, I know of no other food safety minor program in the United States (I apologize beforehand if this information is incorrect). In two years, over fifty students have enhanced their degree programs at NDSU with courses in food safety. Of this group, 22 were microbiology majors. Although the curriculum I describe below is unique to NDSU, it may be possible to prepare students at other colleges and universities for similar positions in the food safety arena by crafting a similar, individual curriculum based on existing courses at that institution.

How Do I Get a Minor in Food Safety?

What is the first thing that comes to your mind when you hear “summer in Fargo, North Dakota”? “How can the words ‘summer’ and ‘Fargo’ be mentioned in the same sentence, does it ever get above freezing there?” “Isn’t there a Coen brothers’ movie by that name?” For 17 faculty members from three colleges representing the GPIFS at NDSU, “summer in Fargo” means welcoming 26 bright, shining faces eager to begin an eight-week session in food safety. Although the group is diverse, the faces are familiar to many of us because they are the faces of our best and brightest students. While some students represent the Departments of Food Science, Agricultural Economics, and Agricultural Engineering, the majority of the students represent the Department of Veterinary and Microbiological Sciences. Over half of the class consists of microbiology majors with junior standing. They have been encouraged by enthusiastic and visionary faculty to pursue a minor in food safety.

Prior to their “summer in Fargo,” the students took the same required course work as all microbiology majors: General Microbiology and Lab I and II; Pathogenic Microbiology and Lab; Immunology and Lab; Bacterial Physiology and Genetics; and enough Chemistry and Physics to last a lifetime. In addition, they took courses in Communications and Statistics, which are prerequisites for the Food Safety courses.

A number of students in the program prepared themselves for a career in food safety by working in the field. It gave them the chance to apply their educational experiences to “real world” situations. Last summer, Molly was a summer intern with General Mills in Minneapolis, Greg streaked plates at the local creamery, and Chad worked part-time at American Crystal Sugar. Pam and Lisa spent the past school year doing undergraduate research on the food-borne pathogen *Campylobacter jejuni* with Dr. Catherine Logue. Some of the students have no food safety experience other than frequenting a local fast food chain. All of the students understand the importance of a safe food supply, know that 76 million Americans suffer from food-borne illnesses yearly, and recognize the commitment of the federal government to food safety through its support of the National Food Safety Initiative.

The Food Safety Curriculum

It is 8 a.m., June 12, day one of the eight-week Food Safety Minor Program (Fig. 1). The first of three required, three-credit courses is SAFE 450, *Food Safety for the Food Industry and Consumers*. This course involves an overview of food safety hazards; discussion of sanitation, handling, processing, and serving food; and the explanation of Quality Assurance programs at the farm and Hazard Analysis Critical Control Point in food processing and food service. Immediately following SAFE 450 is SAFE 460, *Etiology of Food-borne Illness*, a study of the etiology, prevention, pathogenesis, and disease manifestations of food-borne illnesses. The morning coursework is completed with SAFE 470, *Economic, Epidemiological, and Regulatory Issues in Food Safety*. Students break for lunch and dine outside under the warm, sunny skies of Fargo. Three days per week, the students spend the afternoon attending SAFE 480, *Food Safety Practicum*. This is a two-credit course, which involves everything from laboratory experiments identifying an unknown food-borne pathogen to listening intently to dynamic speakers from the USDA, North Dakota State Health Department, and the Centers for Disease Control and Prevention. All the speakers reiterate what the students want to hear—that food safety is an important and growing health concern and that personnel possessing expertise in this area are in great demand. Because the curriculum is based on the “farm to fork” theory, one of the many field trips is visiting a turkey farm, a turkey processing plant, and a restaurant! The entire food safety course curriculum is a fully integrated, problem-based learning experience, and by the end of the session, students are confident that they can observe, analyze, and problem-solve many food safety issues.

Table 1. Curriculum for the Food Safety Minor.

Core Courses	Credits
Safe. 450 - Food Safety for the Food Industry and Consumers	3
Safe. 460 - Etiology of Food-borne Illness	3
Safe. 470 - Economic, Epidemiologic, and Regulatory Issues in Food Safety	3
Safe. 480 - Food Safety Practicum	2
Total	11
Electives (5 credits required)	
ABEn. 458 - Food Processing Engineering	3
AgEc. 339 - Quantitative Methods and Decision Making	3
AgEc. 344 - Agriculture Price Analysis	3
AgEc. 375 - Applied Agricultural Law	3
AgEc. 380 - Public Policy Choices	1
AgEc. 470 - Agricultural Trade	2
AgEc. 484 - Agricultural Policy	3
ARSc. 340 - Meat Science and Technology	3
ARSc. 344 - Fundamentals of Meat Processing	2
ARSc. 482 - Sheep Production	2
ARSc. 484 - Swine Production	2
ARSc. 486 - Beef Production	2
ARSc. 488 - Dairy Production and Dairy Products	3
CFS 470 - Food Processing	3
CFS 471 - Food Processing Laboratory	1
F&N 141 - Food Sanitation	1
F&N 361 - Food Production Management	3
Micr. 350, 350L - General Microbiology and Lab	4
Micr. 453 - Food and Dairy Microbiology	3
Micr. 460, 460L - Pathogenic Microbiology and Laboratory	5
Micr. 470 - Basic Immunology	3
Micr. 471 - Immunology and Serology Laboratory	2
PPth. 460 - Fungal Biology	3
VetS. 365 - Fundamentals of Animal Disease	4
Curriculum Total	16

When the summer session is over, the majority of the students return to complete their baccalaureate degrees in microbiology. Eleven credits towards the Food Safety minor were completed in the summer and the remaining five credits, chosen from an extensive list of courses (Fig. 1), will be taken during the 2001-2002 fall and spring semesters.

Pending approval, students joining the program in Fall 2002 will have the option of a double major in microbiology and food safety. The two curricula are very similar, but the double major option requires approximately one year of additional course work in food safety, food science, and animal science.

Mom and Dad Say I Need to Get a Job

It is November, and although most of the students will not graduate until May, some of the students will complete their degree requirements in December. GPIFS faculty start receiving calls from industries such as ConAgra, Cargill, Land 'O' Lakes, and a number of small, local food companies (many previously unknown to most of the institute members) seeking graduates of the food safety program. The calls continue, and by May nine out of twelve graduates are employed by industry; by federal (USDA, Food and Drug Administration), state, and local health agencies; and by independent and academic research facilities. Two students choose to continue their academic careers in graduate programs in microbiology and food science. Basically, any student desiring a career in food safety can find employment.

What Will I Do and Will I Like What I Am Doing?

After the completion of her degree, Molly accepted a position with Pillsbury in Minneapolis, Minn. The company was very interested in the food safety program and in the academic and practical preparation Molly possessed in the fields of microbiology and food safety. She took an entry-level job to "get her foot in the door." Her responsibilities include media preparation and inoculation, interpretation of biochemical results, and quality control of equipment.

Julie is quality assurance manager at a local company that markets preproofed dough products throughout the United States. Thanks to her expertise in the areas of microbiology and food safety, she was hired to develop microbiology and sanitation programs for the company. She speaks enthusiastically about her new job which includes supervising technicians who analyze the quality of equipment used in processing; collect environmental samples from the air, water, and mixers; and monitor freezer and cooler temperatures. Technicians also analyze both the ingredients used for dough preparation, such as liquid egg and cream, and the finished product for potential food-borne pathogens.

Both Molly and Julie confirm emphatically that the microbiology major and food safety courses prepared them to communicate effectively and intelligently about food-borne pathogens with clients and consumers. Another benefit of their educational experiences is that they both convey a great deal of confidence in the laboratory. Molly says she would definitely repeat the same educational path. Julie remarks that her job in food safety is more rewarding than she ever dreamed possible. Other students who were interviewed agreed that the food safety minor was invaluable.

What If I Want More Information?

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