Course Description

Course Description: Microbial Food Quality and Safety- analytical methods

Tailored Courses under the DFC Scholarship Programme 2020

1. Overall description of course

Course title: Microbial Food Quality and Safety - analytical methods
Format, language, level: Four-weeks English laboratory-based MSC-level course.
Schedule and course capacity: June 2-26 2020; 25 participants.
Course responsible and contracting department: Jørgen Leisner (jjl@sund.ku.dk), Department of Veterinary and Animal Sciences (IVH), University of Copenhagen.
Teachers: staff at IVH; invited guests and speakers from the Danish Veterinary and Food Administration, State Serum Institute, food industry and others.
Teaching and learning methods: The course will be a mix of lectures/seminars/peer-learning and laboratory exercises with emphasis on the latter. Problem-based learning will be applied to selected food safety hazards. External contributions from public institutions, industry bodies etc. Exposure visits will be arranged to two or three Danish food laboratories.
Exam: Pass/non-pass with diploma based on 100% participation in course activities.

The overall focus of this course is for the participants to acquire in-depth knowledge about application of appropriate analytical methods when solving national, regional and global challenges in relation to microbial food quality and safety.

2. Learning goals

As a result of the course, participants will have acquired knowledge and skills in order to:

- Understand the concepts of methodologies of microbial food quality and microbial food safety. This include purpose of analyses and selection of analytical methods including classical cultivation based methods as well as molecular and chemical methods. It also include how to exert quality control of analytical work including traceability and monitoring of equipment and procedures.
- Carry out, supervise and monitor essential methodologies of key analyses in a food microbiological laboratory. These include quantitative cultivation-based or molecular methods to assess either overall bacterial numbers or specific numbers of bacterial groups, species or types in food matrices. They also include cultivation-based, molecular (PCR) and other methods (e.g. MALDI-TOF) for isolation, identification and characterization including assessment of virulence of foodborne bacterial pathogens. Finally, they include disc susceptibility and MIC methods to assess bacterial phenotypic antibiotic resistance.
- Acquire understanding and analytical (bioinformatical) knowhow of molecular epidemiology of bacterial pathogens including use of whole genome sequence data.
- Understand the concept of food control. Obtain the ability to participate in monitoring of pathogenic and/or antibiotic resistant bacteria in a food related context including sources, e.g. animals, foods and food handlers and consumers.
- Understand the principles and methodologies of selected chemical methods including analyses of mycotoxins in foods

3. Approach to mandatory learning elements

- **Learning by seeing** (Exposure visits): The course will include two to three visits to relevant laboratories.
- **Learning by doing/applying:** The course will have a strong focus on active participation in laboratory exercises.
- **Learning by example (Peer learning):** Participants will present and discuss challenges they are facing in their home countries and solutions to these.
- **Translate learning into action (Action Plan):** In relation to learning by examples sessions participants will have guided sessions in which they apply and relate themes and concepts from lectures and exercises to their own case.
- **Passing on learning:** After course completion, participants will be able to instruct colleagues at their institutions.

4. Tentative course programme

Week 1: Culture based methods to assess microbial food quality and safety
Introduction, presentation of participants: learning objectives,
Exposure visit to the laboratory of the Danish Veterinary and Food Administration.
Lab exercises (learning by doing) on quantitative assessment of microbial contents of foods and feeds and detection of *Staphylococcus aureus* and MRSA from retail meat.
Theoretical exercise on predictive modelling of growth of bacterial pathogens in foods.

Week 2: Identification and characterization of foodborne bacterial pathogens
Infectious pathogens and zoonosis control; disease outbreak investigations.
Lab exercises (learning by doing): Cultivation-based, molecular (PCR) and other methods (e.g. MALDI-TOF) for isolation and identification of bacterial pathogens in food matrices. Assessment of bacterial virulence in selected pathogens. Real time PCR to monitor presence of bacterial pathogens ion foods. SDS-PAGE electrophoresis to analyse bacterial phenotypic virulence profiles.
Exposure visit to a food microbiology laboratory based in the meat industry.

Week 3: Antibiotic resistance; mycotoxins; outbreak investigations
Exposure visit to a laboratory that conduct analyses of mycotoxins.
Exposure visit to State Serum Institute that conduct outbreak investigations.
Lab exercises (learning by doing): Determination of antibiotic sensitivity.
Theoretical exercises in outbreak investigations.

Week 4: Bioinformatics
Exposure visit to State Serum Institute regarding bioinformatics of bacterial pathogens.
Theoretical exercises on molecular epidemiology and bioinformatics of bacterial pathogens including use of whole genome sequence data.