Universidad Zaragoza

Academic Year/course: 2021/22

68760 - Methodology for study of inactivation and microbial survival

Syllabus Information

Academic Year: 2021/22
Subject: 68760 - Methodology for study of inactivation and microbial survival
Faculty / School: 105 - Facultad de Veterinaria
Degree: 631 -
ECTS: 3.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This module is divided into 10 lectures and 20 hours of practical sessions. Practical sessions are aimed towards the acquisition of basic microbiological laboratorial skills, and towards the design, execution and presentation of a small research project that will require 25 hours of additional autonomous work from the students.

4.2. Learning tasks

The visual presentations used in the lectures will be available in advance in the Moodle platform.

Practical classes will be divided into 5 sessions of 2-5 hours each. During the first three sessions, the students will acquire the skills that they will need in a later step, in order to execute their research project. Divided into small groups, they will suggest and discuss the project with their professor and they will put it into practice during the fourth practical session. Finally, they will make an oral presentation based on the project, to be evaluated.

4.3. Syllabus

Theoretical lessons

Unit 1. Introduction

? Importance of microorganisms in foods. Relevance of studying the mechanisms and factors leading to cell inactivation or survival.

? Physiological aspects of relevance in microorganisms in foods: composition and structure of cells, functions of cell structures, cellular envelopes, cellular homestasis maintenance: examples.

Unit 2. Microbial inactivation

? Alive and dead cell. Methods to detect celular viability: plate count *vs* viability indicators.

? Obtention of survival curves through plate count techniques. Number, fraction and percentage of survivors calculations. Practical examples and laboratorial considerations.

? Inactivation kinetics: typical survival curves obtained upon exposure to various types of agents. Deviations from linear kinetics: occurrence and interpretation. Methodological problems.

? Most important factors influencing microbial resistance against several agents. Example: inactivation by heat.

Unit 3. Sublethal damage and repair.

? Sublethally damaged cell: definition and relevance for the food industry.

? Types of damage, detection techniques, culture media. Examples.

Unit 4. Strategies for studying mechanisms of bacterial inactivation

? Common experimental approaches.

? Cellular targets in inactivation by several agents. Examples.

Unit 5. Resistance development

? Development of resistance responses: importance. Transient and permanent responses. Genetic regulation of resistance development. Heat shock, cold shock, acid shock, etc.

? Techniques used to study the development of microbial resistance.

Practical lessons

1. Microbiology laboratory. Media preparation, materials, sterilization.

2. Determination of survival of *E. coli* against a chemical agent (acetic acid).

3.- Determination of survival of *E. coli* to a physical agent (heat). Study of the occurrence of sublethal damage in the cytoplasmic and in the outer membrane.

4. Obtention of survival curves: plate counts, data representation and analysis.

5. Research project execution.

6. Oral presentation and evaluation exercise.

4.4. Course planning and calendar

Schedules of lectures and practical sessions will coincide with the officially established and will be available at: http://veterinaria.unizar.es/mastercta/horarios1.php?COD_TITULACION=8

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of modules at the beginning of academic year.

4.5. Bibliography and recommended resources

The recommended bibliography can be consulted at the university library webpage (http://biblioteca.unizar.es/).