

## 63011 - Methodology for study of inactivation and microbial survival

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 63011 - Methodology for study of inactivation and microbial survival

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 566 - Master's in Food Quality, Safety and Technology

**ECTS:** 3.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

This module is organized into 10 lectures and 20 hours of practice sessions. Practice sessions are aimed towards acquisition of basic microbiological laboratorial skills, and towards design, execution and presentation of a small research project that will require 25 hours of additional student autonomous work.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

#### 4.2.Learning tasks

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

Practice sessions will be divided into 5 sessions of 3-5 hours each. During the first three sessions, the students will acquire the skills that they will need in the future to prepare 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 practice session.

Finally, they will make an oral presentation based on the project to be evaluated.

#### 4.3.Syllabus

The course will address the following topics:

##### Lectures

##### Topic 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 homeostasis maintenance: examples.

### **Topic 2. Microbial inactivation**

- Alive and dead cell. Methods to detect cellular 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.

### **Topic 3. Sublethal damage and repair**

- Sublethally damaged cell: definition and relevance for the food industry.
- Types of damage, detection techniques, culture media. Examples.

### **Topic 4. Strategies for studying mechanisms of bacterial inactivation**

- Common experimental approaches.
- Cellular targets in inactivation by several agents. Examples.

### **Topic 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.

### **Practice session**

- 1. Microbiology laboratory. Media preparation, materials, sterilization.
- 2. Determination of survival of *E. coli* against a physical (heat) and a chemical agent (acetic acid). Study of the occurrence of sublethal damage in the cytoplasmic and in the outer membrane.
- 3. Obtention of survival curves: plate counts, data representation and analysis.
- 4. Research project.
- 5. Oral presentation and evaluation activity.

## **4.4.Course planning and calendar**

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the [http://veterinaria.unizar.es/mastercta/horarios1.php?COD\\_TITULACION=8](http://veterinaria.unizar.es/mastercta/horarios1.php?COD_TITULACION=8)

## **4.5.Bibliography and recommended resources**

The recommended bibliography can be consulted on the university library website (<http://biblioteca.unizar.es/>).