**Food safety – Biological Safety**

Prof. Daniela Bassi

 ***COURSE AIM AND INTENDED LEARNING OUTCOMES***

 A food business operator must be able to guarantee healthy and safe food by avoiding the risks that are mostly of biological origin (bacteria, viruses, fungi, toxins, parasites). The aim of the course is to provide students with the basic principles of food hygiene, the ecology and physiology of food-associated spoilage microbes and food-borne human pathogens and the control measures to avoid microbial contamination of foodstuffs that can be spread throughout the production chain. Principles of risk analysis, predictive microbiology and good manufacturing practices will also be discussed.

At the end of the course, students are expected to develop the following skills:

 **Knowledge ability**

* Understand the main principles of risk analysis;
* Know the main biological factors that can affect food safety;
* Acquire the basic principles of hygienic measures during the food production chain;
* Distinguish between pathogenic and alterative microorganisms and related foodborne diseases;
* Compare effects of control measures and relative technological applications on microbes;
* Determine the role of microorganisms in food.

 **Know-how applications**

* Assess the seriousness of biological risks associated with products of animal and vegetable origin;
* Apply the correct criteria for microorganisms control during the food production chains;
* Understand how to guarantee the organoleptic characteristics of the product together with the safety and the microbiological quality, thanks to practical examples and laboratory exercises.

**Autonomy in self-assessment**

* Evaluate autonomously the level of biological risk associated to foodstuffs and decide how to apply the proper control measures.

**Communications skills**

* Demonstrate, both through oral or written communication, the main issues related to food safety and biological risks by using a correct technical vocabulary.

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| ***CONTENTS*** | ***CFU*** |
| Food safety and biological risks; principles of risk analysis associated with food; general principles of food hygiene; main sources of microbial food contamination; pre-requisites and good hygiene practices; HACCP system; GMP manuals for food productions. | 1.0 |
| Microbial growth: control strategies of microorganisms in food, chemical, physical and biological factors. Barrier theory. *Shelf-life* and predictive microbiology. | 1.0 |
| Infections, intoxications and toxinfections. Alterative and pathogenic bacteria, yeasts, molds, viruses and bacteriophages. Bacterial toxins and their mechanism of action; bio-contaminants and biogenic amines; EC Reg. 2073/2005; genetically modified organisms; prions; antibiotic resistance; risks of food fraud along the production chain. | 2.0 |
| Laboratory classes | 1.0 |

***READING LIST***

* Food safety: the science of keeping food safe. Ian C. Shaw. Second Edition. Wiley Blackwell.
* Food Safety for the 21st Century. Managing HACCP and Food Safety throughout the Global Supply Chain. Wallace, Sperber, Mortimore. 2nd Edition, Wiley Blackwell.

Slides and additional materials will be provided by the lecturer.

***TEACHING METHOD***

The teaching activities will consist of:

* formal lectures by the use of power point presentations with several practical examples aimed to stimulate the overall discussion;
* laboratory classes in which students will set up practical experiences, performing the application of microbiological techniques for microorganisms detection in food;
* working groups where students learn to share opinions, collect data and discuss the final outcomes on food safety topics;
* a guided tour at European Food Safety Authority (EFSA) to understand the main activities of this institution and collect information about future work opportunities in the field.

***ASSESSMENT METHOD AND CRITERIA***

The first assessment will be done at the end of lessons through a written test (“intermediate test”) made by open and multiple-choice questions on the whole program (5.0 CFU). The final score of the test will be expressed in 30ths, where open questions weight from 1 to 3 points and multiple-choice questions have a score ranging from 0.5 to 2. In addition, the student is required to participate to working group activities concerning the topics performed during lessons and practical sessions (1.0 CFU) that represents a 10% of the final assessment.

Alternatively, students will be assessed through an oral exam on the whole course contents in the official dates. The exam, which consists of questions related to the course credits, will be aimed at verifying the candidate's learning of the contents and practical tests. The student must demonstrate the ability to use correctly the language and scientific terminology of the discipline.

The score of the Biological Safety module will take into account the grade obtained in the Chemical Safety module through a balanced mean value. The final score will be expressed in 30ths.

***Assumed knowledge on:*** applied agri-food microbiology.

In case the current Covid-19 health emergency does not allow frontal teaching, remote teaching will be carried out through synchronous or asynchronous procedures that will be promptly notified to students.

Professor Daniela Bassi is available to meet students after class at DiSTAS (Dipartimento di Scienze e Tecnologie Alimentari per una filiera agro-alimentare Sostenibile) at times to be agreed or by appointment mailing at daniela.bassi@unicatt.it .

**Food safety – Chemical Safety**

Prof. Nicoleta Alina Suciu

 ***COURSE AIM AND INTENDED LEARNING OUTCOMES***

 Chemical substances can play an important role in food production and preservation. The food business operator must be aware of chemical contaminants and residues that may be in food throughout the food chain (additives, pesticides, veterinary drugs, heavy metals, persistent organic pollutants, etc.). The aim of the course is to provide students with the basic principles of chemical food safety that deals with all aspects of chemical risks in the food chain, predominantly with the biologically active components of food, additives, contaminants and their toxicology. Legislation and risk assessment of chemical contaminants in food will also be discussed.

At the end of the course, students are expected to develop the following skills.

 **Knowledge ability**

* Understand the main principles of chemical food safety;
* Know the main chemicals that may affect food safety;
* Identify and risk assess the possible source(s)/formation of chemical hazards in food
* Examine different uses of chemical additives;
* Learn how foods can be tested for the presence of chemical residues;
* Evaluate the use of different food preservation techniques intended to improve chemical food safety

 **Know-how application**

* Identify and risk assess the chemical hazards associated with each food operation;
* Control the possible sources of chemical hazards in each food operation or along the food chain;
* Implement the control measures to mitigate possible sources of chemical contamination.

**Autonomy in self-assessment**

* Students are assessed on their ability to use scientific evidence and identify trade-offs when making a decision.

**Communications skills**

* Demonstrate, both through oral or written communication, the main issues related to chemical food safety and chemical risks, by using a correct technical vocabulary.

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| ***CONTENTS*** | ***CFU*** |
| Natural toxins: plants, fish, animals, fungus. Residues of pesticides, veterinary drugs and other compounds. Chemical contaminants. Toxic compounds formed during processing and storage. | 1.5 |
| Fats autooxidations and browning. Food additives: concepts, classification, toxicological assessment, use guidelines. | 0.5 |
| Legislation, risk assessment and analytical aspects regarding chemical contaminants in foods. | 1.0 |

***LITERATURE***

-Brimer, L., Chemical Food Safety. Cabi:2011.

-Halagarda, M.; Kędzior, W.; Pyrzyńska, E., Nutritional Value and Potential Chemical Food Safety Hazards of Selected Polish Sausages as Influenced by Their Traditionality. Elsevier Science: 2018.

- Yu, L.; Wang, s.; Sun, B.G. Food Safety Chemistry: Toxicant, Ocurrence, Analytis and Migration. CRC Press: 2014.

Slides and additional materials will be provided by the lecturer.

***TEACHING METHOD***

The teaching activities will consist of:

* formal lectures by the use of power point presentations with several practical examples aimed to stimulate the overall discussion
* working groups where students learn to share opinions, collect data and discuss the final outcomes on food safety topics

***ASSESSMENT METHOD AND CRITERIA***

Learning by the student will be assessed through a final exam, to be held in oral form. The students will be asked to choose a chemical contaminant and to discuss its characteristics, its occurrence in the food chain and legislation aspects related to its chemical risk and present it through PowerPoint presentation (15 minutes maximum). Three additional theoretical questions, based on the topics discussed during the lessons, will be made.

The score of the Chemical Safety module will take into account the grade obtained in the Biological Safety module. The student must demonstrate the ability to correctly use the language and scientific terminology of the discipline. The final score will be expressed in 30ths.

***Assumed knowledge on:*** food chemistry and nutrition

Prof. Nicoleta Alina Suciu will be available in her office for consultations by appointment.

In case the current Covid-19 health emergency does not allow frontal teaching, remote teaching will be carried out through synchronous or asynchronous procedures that will be promptly notified to students