

COURSE: Methods for microbiological control in foods

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characteristic, Affine, Free choiche, Other) Curricular

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Language: Italian

ECTS: 6 (5 Lectures + 1 practicals)	n. of hours: 50 h lectures + 16 h practicals	Campus: Potenza Dept./School: School of Agriculture, Forest, Food and Environmental Sciences Program: MSc in Food Science and Technology	Semester: 2
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EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The main objective of this course is to provide food technologists the knowledge needed to identify the most useful methods for evaluating microbiological quality of foods in food and make student able to use innovative techniques to greatly reduce investigation time required by traditional methods.

- **knowledge and understanding:** Knowledge of the fundamental role of microbiological control of foods. Knowledge of parameters useful to assess the reliability of a microbiological analysis method. Knowledge of basics and applications in food microbiology of biochemical and immunological methods. Knowledge of culture-dependent and culture-independent biomolecular techniques for the identification and characterization of food microorganisms.
- **applying knowledge and understanding:** Ability to identify factors affecting the results obtained from a food microbiological analysis. Ability to identify the critical points and strengths of the different microbiological analysis techniques. Ability to perform a microbiological analysis of foods, starting from the correct sampling of the matrix and following all procedures useful to safeguard the microbiological quality of the foods. Ability to critically interpret the results of analyses for the determination of food microbiological quality.
- **making judgements:** Ability to identify the most appropriate microbiological analysis technique, taking into account mainly food characteristics and the limits of the different available techniques.
- **communication skills:** Ability to communicate the role of food microbiological control to both non-technical and technical audiences. Ability to communicate to entrepreneurs and technicians the health and economic risks caused by an incorrect implementation of the microbiological analysis of foods. Ability to communicate to technical staff the role of proper food sample management.
- **learning skill:** Ability to access documentation and information sources on the application of new methodologies for microbiological control in food, using technical and scientific literature. Ability to interpret the data obtained from different methodologies in order to identify the most useful one.

PRE-REQUIREMENTS

To understand the material presented in this course, the following knowledge and skills are needed:

- general microbiology, in particular structure and physiology of microorganisms, microbial growth, genetics, microbial taxonomy;
- food microbiology and hygiene, in particular basic food microbial ecology; effect of intrinsic, extrinsic and implicit factors on the growth and survival of microorganisms in foods, influence of microorganisms on food quality, microorganisms involved in food-borne diseases.

SYLLABUS

The course is divided in 5 teaching blocks.

Block 1. The microbiological control in foods (8h, lectures). Introduction to the course. Importance of

microbiological control of food and food handling environments. Sampling planes at two and three classes. Parameters for assessing the reliability of a microbiological analysis method. Classification of the most diffused methods for microbiological analysis of foods. Recall of traditional microbial counting methods.

Block 2. Biochemical and immunological methods: principles and examples of conventional and innovative tests. methods (8 h, lectures). Basic principle of the two techniques. Examples of application of traditional and advanced biochemical tests for detection of microorganisms in foods. Main typologies of immunological methods, characteristics and classification of immunoenzymatic methods. Applications for food microbiological analysis.

Block 3. Biomolecular methods (16 h lectures). PCR-based techniques; description and potential of PCR techniques in food microbiology. Main culture-dependent and culture-independent techniques, used for the identification and characterization of food-related microorganisms; Real-time PCR: basic principle of the technique and advantages over traditional PCR; Examples of application of molecular technique for the microbiological analysis of foods.

Block 4. Innovative techniques for the microbiological analysis of foods (8 h, lectures). Principles and application to food microbiological analysis of methods based on biosensors, microarrays, flow cytometry

Block 5. Microbiological analysis of foods. (16 h, practical). Laboratory practices for knowledge of conventional molecular techniques useful for identification and characterization of food microorganisms .

TEACHING METHODS

The course includes 56 h, subdivided in 40 h lectures and 16 h practical (laboratory). During practices, students will be encouraged to apply theoretical knowledge in practice by simulating all the phases required for microbiological analysis of food and will also have to demonstrate full capacity for interpretation of results obtained, based on comparisons with reference data.

EVALUATION METHODS

The objective of the exam is to check the level of achievement of learning outcomes previously indicated. Learning will be verified during an oral exam at the end of the course, comprising at least three questions, by which the student will have to demonstrate knowledge of the theory and to be able to link together the topics covered in class. Furthermore, the knowledge and skills learned during laboratory exercises will be evaluated. To obtain top grades (>27), the students, will have to prepare a report outlining all the methodologies useful to assess the microbiological quality of a food (chosen by the student); this report will be presented as oral report in order to assess the communication skills.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

The teacher will provide the course material and handouts to the student. The students are also encouraged to widen their knowledge using textbooks available in the library:

- A. Galli Volonterio (2005) Microbiologia degli alimenti. Casa Editrice Ambrosiana. Milano.
- James M. Jay, Martin J. Loessner, and David A. Golden 2009 Microbiologia degli alimenti, Springer-Verlag Italia

INTERACTION WITH STUDENTS

During the first lecture, the structure and organization of the course and the evaluation procedure will be presented. The teaching material will be made available to students using a cloud storage system (Dropbox) or made available on a pen drive. The lecturer will be available for receiving students at least 2 h a week (on Monday and Thursday, approximately). Furthermore, the lecturer is available at any time for a contact with the students, after appointment by e-mail.

EXAMINATION SESSIONS (TENTATIVE)¹

13/07/2020, 14/09/2020, 12/10/2020, 09/11/2020, 14/12/2020, 11/01/2021, 08/02/2021, 08/03/2021, 12/04/2021, 10/05/2021, 14/06/2021, 12/07/2021, 13/09/2021

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.



**SCUOLA DI SCIENZE
AGRARIE, FORESTALI,
ALIMENTARI
ED AMBIENTALI**

EVALUATION COMMITTEE

Prof. Angela Capece (president), Prof. Annamaria Ricciardi (member), Prof. Eugenio Parente (replacement member),
Prof. Giovanni Salzano (replacement member)

SEMINARS BY EXTERNAL EXPERTS YES X NO

FURTHER INFORMATION
