### Module: Food Toxicology

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<th>Content</th>
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<tr>
<td>Food Safety</td>
<td>Food Toxicology</td>
<td>3rd</td>
<td>2nd</td>
<td>6</td>
<td>Compulsory</td>
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#### Lecturers
- PABLO OLMEDO PALMA (AD)
- ANTONIO PLA MARTINEZ (CU)

#### Degree within which the subject is taught
Degree in Science and Food Technology

#### Prerequisites and/or Recommendations (if necessary)
It is recommended to have previously studied the subjects of Basic Training Module and be completed prior or simultaneously the subjects covered by the Food Science Module.

#### Brief Account of the Subject Programme (According to the Degree ??)
- Abiotic pollution in food. Chemical hazards (toxic and contaminants). Types and causes, origin and prevention.

#### General and Particular Abilities

A. General skills
- Ability to express themselves correctly in Spanish in their disciplinary field
- Troubleshooting
- Teamwork
- Ability to apply theoretical knowledge in practice
- Capacity for analysis and synthesis
- Critical Thinking
- Ability to manage information
B. Specific skills

- Analyze the biological, chemical and physical hazards in food chain in order to protect public health.
- Inform, train and give legal advice, scientifically and technically to the public, the food industry and consumers to design intervention strategies and training in the field of science and food technology.
- Implement the principles and methodologies that define the professional profile of the scientist and food technologist, demonstrating an integrated acquisition of skills and competencies provided by the degree.

**OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)**

- Knowledge of the fundamentals and basic principles of toxicology.
- Ability to relate knowledge about food hazards in the development of food risk analysis and food safety management
- Ability to evaluate the toxicity, interpret the results and formulate opinions on the hygienic and sanitary quality of foods analyzed

**DETAILED SUBJECT SYLLABUS**

**THEORETICAL SYLLABUS:**

**I. TOXICOLOGY BASIC OR FUNDAMENTAL**

Item 1. ORIGINS AND SCOPE OF TOXICOLOGY: Concept of Toxicology, poisoning and toxic. Historic milestones (1h)

Item 2. INTRODUCTION TO TOXICOLOGY: Forms of intoxication. General etiology of poisoning. Subdivisions of Toxicology. Food Toxicology: framework and concept (1h).


Item 5. TOXICOKINETICS (II): Distribution and elimination of toxics. Toxicological concern of distribution and elimination of toxics (1h)

Item 6. TOXICOKINETICS (III): The metabolism as the main determinant of toxicity. Types of metabolic reactions. Factors affecting the biotransformation of toxics. Metabolism-toxicity relationships (1 h).

Item 7. MECHANISM OF ACTION OF TOXICS (I): General. Selective toxicity. Classification. (1 h)

Item 8. MECHANISM OF ACTION OF TOXIC (II): Main mechanisms of toxicity (1 h)

**II. EVALUATION OF TOXICITY AND RISKS**
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<td>9</td>
<td>INTRODUCTION TO THE EVALUATION OF TOXICITY AND RISKS. Concept of evaluation of toxicity and risk assessment. Fundamental principles of toxicity testing. General variables in the toxicological evaluation. Regulations of toxicity evaluation and international agencies involved. Classification of toxicity tests (1 h)</td>
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<td>10</td>
<td>TOXICITY TESTS. Providing information, methods and limitations. (2 h)</td>
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<td>11</td>
<td>TOXICITY CRITERIA (I). Toxicity parameters obtained in the toxicological evaluation. Indices of acute, subchronic and chronic toxicity. Calculations. (1 h).</td>
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<td>12</td>
<td>TOXICITY CRITERIA (II). Extrapolation to humans: tolerable limits of exposure and maximum concentration allowed. Calculations and practical application (1 h).</td>
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<td>13</td>
<td>INTRODUCTION TO RISK EVALUATION. Methodological issues and policy. Current situation in the European Union. Risk Assessment Methodology (1h)</td>
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<td>14</td>
<td>NATURAL TOXIC SUBSTANCES IN FOODS (I). Main natural toxics that may be present in food. Toxicological significance. Antinutritional agents. Substances with polyvalent activity. (1 h)</td>
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<td>15</td>
<td>NATURAL TOXIC SUBSTANCES IN FOODS (II): Alkaloids. Glycosides. Xanthines. (1 h)</td>
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<td>NATURAL TOXIC SUBSTANCES IN FOODS (III). Xenoestrogens. Carcinogens. Favisim. Lathyism. Lectins. (1 h)</td>
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<td>NATURAL TOXIC SUBSTANCES IN FOODS (IV). Biotoxins of animal origin. (1 h)</td>
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<td>18</td>
<td>TECHNOLOGICAL INGREDIENTS (I): Additives. Toxicological and food safety problems. (1 h).</td>
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<tr>
<td>19</td>
<td>TECHNOLOGICAL INGREDIENTS (II): Additives. Toxicological and food safety problems. (1 h).</td>
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<td>20</td>
<td>CHEMICAL CONTAMINATION OF FOOD. Definition. Origin of pollution. Major chemical contaminants in food. Toxicological problems arising from chemical contamination. (1 h)</td>
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<td>21</td>
<td>AGRICULTURAL POLLUTANTS (I): nitrates and nitrates. Origin of pollution. Toxicological problems. (1 h)</td>
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<td>24</td>
<td>TOXICS PRODUCED DURING FOOD PROCESSING (I): Polycyclic aromatic hydrocarbons. Food contamination and toxic effects. (1 h)</td>
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<td>25</td>
<td>TOXICS PRODUCED DURING FOOD PROCESSING (II): Heterocyclic amines. Compounds derived from the oxidation of fats and oils. Food contamination and toxic effects. (1 h)</td>
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<tr>
<td>26</td>
<td>TOXICS PRODUCED DURING FOOD PROCESSING (III): Compounds derived from the Maillard reaction: Premelanoids and melanoids. Acrylamide. Food contamination and toxic effects. (1 h)</td>
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Item 26. OTHER TOXICS PRODUCED DURING FOOD PROCESSING (IV): Furan. 3-MCPD. Food contamination and toxic effects. (1 h)

Item 27. PERSISTENT ORGANIC POLLUTANTS (POPs). Dioxins. Furans. PCBs. Origin of pollution. Toxicological problems. (1 h)

Item 28. MATERIALS IN CONTACT WITH FOOD: Wood, glass, ceramics, elastomers and polymeric material, metal packaging. Food contamination and toxic effects (1 h)

Item 29. TOXICITY OF PESTICIDE RESIDUES (I). Pesticide residues in food. Classification. Mechanism of action and major toxic effects (1 h)

Item 30. TOXICITY OF PESTICIDE RESIDUES (II). Pesticide residues in food. Classification. Mechanism of action and major toxic effects (1 h)

Item 31. METAL TOXICITY (I): Causes of food contamination by metals. Lead. Food contamination. Mechanism of action and major toxic effects. (1 h)

Item 32. METAL TOXICITY (II): Cadmium and mercury. Food contamination. Mechanism of action and major toxic effects (1 h)

Item 33. METAL TOXICITY (III): Arsenic, tin and aluminum. Food contamination. Mechanism of action and major toxic effects (1 h)

Item 34. DRUG RESIDUES IN FOODS (I). Concept of residue. Origin of drug residues in food. Types of drugs used. Problems posed by the residues. Suspension or withdrawal time (1 h)

Item 35. DRUG RESIDUES IN FOOD (II). Toxicological significance of drug residues in food. The short and long-term effects (1 h).

PRACTICAL SYLLABUS:

Seminars/ Practice

1) BIBLIOGRAPHIC RESOURCES IN FOOD TOXICOLOGY. Major databases in Food Toxicology. Making practical cases.

2) SYSTEMATIC analytical in food toxicology. Types and sample preparation in the analysis of toxic substances in food. Extraction of toxic food samples. Analytical techniques.

3) TOXICITY EVALUATION AND RISKS. Resolution of practical cases.
**READING**

**KEY REFERENCES:**


**FURTHER READING:**

TOXICOLOGÍA AVANZADA. Repetto M.. Díaz de Santos, Madrid, 1995


**RECOMMENDED INTERNET LINKS**

Basic Toxicology.
http://www.ugr.es/~ajerez/project

Laboratory Practice:
http://www.ugr.es/~fgil/project/index.php

Regulation about notification of new substances and classification, packaging and labeling of dangerous substances. 30.06.1998 OM. Annex B.
http://www.consumo-inc.es/Seguridad/normativa/363_95/home.htm

Spanish Food Safety Agency (AECOSAN)
http://www.aesan.msc.es/AECOSAN

Codex Alimentarius (FAO / WHO)
http://www.codexalimentarius.net

European Food Safety Authority (EFSA)
http://www.efsa.europa.eu

OECD (www.oecd.org/document)

European Chemicals Bureau (http://ecb.jrc.it/testing-methods)