Universitat Autònoma de Barcelona

**2018/2019**

# Biomolecular Chemistry

Code: 100878
ECTS Credits: 6

| Degree | Type | Year | Semester |
|---|---|---|---|
| 2500252 Biochemistry | OT | 4 | 0 |

## Contact

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## Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

## Teachers

Rosa Maria Ortuño Mingarro

## Prerequisites

The courses Fundamentals of General Chemistry and Organic Chemistry of Biochemical Processes must have been passed

## Objectives and Contextualisation

The overall objective of the course Biomolecular Chemistry is to provide the students with an overview of natural products (biosynthesis, structural and ecological features, applications as source of bioactive compounds). Basic understanding about the chemical structures and biosynthesis of natural products will be provided, as well as their functiona and utility as pharmaceuticals or agrochemical agents.

The objectives of the course can be summarized as follows:

1. To Understand and know the structures of natural products of secondary metabolism and their biosynthesis.
2. To Understand the importance of natural products for their biological and pharmacological activities
3. To Know the ecological, pharmacological and agrochemical importance of natural products
4. To be able to propose reasonable biosynthetic pathways for natural products

## Content

### Contents

#### Biosynthetic pathways

Primary and secondary metabolism. Main biosynthetic pathways: shikimate, acetate, mevalonate. Determination of biogenetic sequences. Detection of biologically active metabolites. Bioassays. Isolation and separation. Summary of reactions.

#### Fatty acids and polyketides

Carbohydrates. The acetate hypothesis. Saturated fatty acids. Unsaturated fatty acids. Prostaglandins. Aromatic polyketides. Macrolides.

**Terpenoids**

Structural classification. The route acetate-mevalonate. Monoterpenes. Sesquiterpenes. Diterpenes. Steroids. Carotenoids.

**Derivatives of shikimic acid**

Phenolic compounds. Aromatic amino acids (tryptophan, phenylalanine, tyrosine) and derivatives. Transamination, NIH shift. Cinnamic acids and derivatives. Pharmacological applications: L-DOPA, chloramphenicol, salicin as a model of aspirin. Lignans and lignin. Flavonoids.

**Semiochemicals**

Ecological chemistry. Classification of semiochemicals. Plant-insect interactions. Allelopathy. Phytoalexin. Pheromones. Types of Pheromones. Structural diversity. Isolation. Practical applications of insect pheromones.

**Secondary metabolism of amino acids**

Prebiotic formation of amino acids. Beta-lactamic antibiotics. Penicillins. Cephalosporins; biogenesis and synthetic approaches.

**Alkaloids I**

Alkalois derived from ornithine, lysine and nicotinic acid. Alkaloids derived from the shikimate pathway (from phenylalanine and tyrosine). Physiological effects and pharmacological applications of alkaloids such as cocaine, nicotine, hyoscyamine, hyoscine, atropine, ephedrine, mescaline.

**Alkaloids II**

Alkaloids of type benzylisoquinoline: papaverine,tubocurarin (curare). Alkaloids of modified benzylisoquinoline: opium alkaloids or morfinans (thebaine, morphine, codeine), biosynthesis and physiological effects. Simple alkaloids derived from tryptophan (serotonin). Alkaloids derived from tryptophan: the ergot alkaloids (lysergic acid). Alkaloids derived from tryptophan of type indole-terpenoid (brucine, strychnine). Alkaloids derived from tryptophan of type quinoline (quinine against malaria). Purine alkaloids: caffeine. Alkaloids derived from anthranilic acid. Alkaloids derived from histidine.