Level: PhD

Course title: Biochemistry of free radicals and natural antioxidants, DSB705

Status: elective

ECTS: 15

Requirements: none

Learning objectives

The aim of this course is to: (1) provide integrated knowledge about the phenomenon of toxicity of free radicals, the ways of their production and the pathological changes caused by free radicals; (2) Introduce students to the latest scientific achievements in the field of biochemical and medical research related to oxidative stress and mechanisms of antioxidant protection, with special reference to natural antioxidants; (3) develop critical thinking about the application of antioxidants in the prevention of diseases and nutrition.

Learning outcomes

After completing the course, students should be able to: (1) demonstrate wide knowledge of the causes and consequences of the formation of free radical species in living organisms and foodstuffs; (2) understand the harmonized functioning of antioxidant protection systems at different cellular levels; (3) predict potential antioxidant activity of different natural compounds, based on the knowledge of structure/activity relationships; (4) critically analyze the application of natural compounds in the antioxidant protection; (5) independently set up and conduct the original experiment, based on acquired theoretical knowledge, critically interpret the results and present them in a scientifically acceptable way.

Syllabus

Theoretical instruction

The phenomenon of oxygen toxicity in aerobic organisms. Activation of oxygen and reactive oxygen species: superoxide anion radical, hydroxyl radical, singlet oxygen, organic peroxides and peroxy- and alkoxy radicals, nitrogen oxides. Cellular sources of free radicals. Mechanisms of free radical toxicity: lipid peroxidation, oxidative damage to proteins, DNA and carbohydrates. Free radicals and aging. Pathological changes in the cell and the organism as a result of oxidative stress. Antioxidant mechanisms of cells: antioxidant enzymes and non-enzymatic cellular antioxidants. Antioxidant plants. Instrumental techniques and protocols to determine the antioxidant activity of natural compounds and mixtures.

Practise (research project)

Independent student's laboratory work in the frame of scientific research project related to the evaluation of antioxidant capacity of selected natural products.

Weekly teaching load				Other: /
Lectures: 5	Exercises: /	Other forms of teaching: /	Student research: 5	