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.

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