

# **FOOD 5103 - Cellular Redox in Health and Disease**

**Instructor:** Apollo Tsopmo, Food Science and Nutrition, Department of Chemistry

**Office:** 207D Steacie

**Telephone:** 520-2600 Ext 3122

**Email:** apollinaire\_tsopmo@carleton.ca

## **Course outline**

### **Course Description:**

This course describes how oxidative stress that results from a disturbance in prooxidant-antioxidant balance induces changes in cellular oxidation-reduction (redox) events. The course connects crucial interactions of free radicals, and reactive species (oxygen, nitrogen, and sulfur) with biological molecules (e.g. DNA, proteins, lipids) in chemical processes of life. The importance of redox chemistry to the integrity of cells and its relationship to chronic diseases are discussed.

### **Learning Outcomes:**

- Know different reactive species and how they are produced in biological systems
- Describe cellular redox chemical reactions and their association to energy production and metabolisms.
- Oxidative modification of proteins and lipids
- Describe mechanisms that regulate biological processes
- Elucidate the relationship between reactive species and human health
- Relationship between reactive species and chronic diseases

### **Topics to be covered:**

1. Introduction
  - Definition
  - Redox metabolism
  - Origin of ROS
2. Cellular Generation of Oxidants: Relation to Oxidative Stress
3. Antioxidants molecules and redox cofactors
4. Antioxidants enzymes
5. The Chemical Basis of Biological Redox Control
6. Redox regulation physiological processes

7. Protein modification and its association with health
8. Pathological processes related to redox
  - Oxidative stress in the eye
  - Redox mechanism in cardiovascular diseases
  - Role of oxidative stress in cancer
  - Oxidative stress and aging

## **Evaluation**

- In class discussion on assigned papers 25%
- Presentation on a research paper 75%

## **Suggested Reading**

**Redox Biochemistry** 2007, Publisher Wiley-Blackwell

Ruma Banerjee (Editor), Donald Becker (Associate Editor), Martin Dickman (Associate Editor), Vadim Gladyshev (Associate Editor), Stephen Ragsdale (Associate Editor)

ISBN: 978-0-471-78624-5

**Redox Signaling and Regulation in Biology and Medicine, 2009** Publisher Wiley-Blackwell

Claus Jacob (Editor), Paul G. Winyard (Editor)

ISBN: 978-3-527-31925-1

**Oxidative / Nitrosative Stress and Disease**, August 2010, Wiley-Blackwell

Debra L. Laskin (Editor)

ISBN: 978-1-57331-784

**Oxidative Stress, Inflammation, and Health** (2005) CRC Taylor & Francis, Boca Raton  
Surh, Y.-J., and Packer, L. (eds).