

## TWO-WEEK GIAN COURSE ON

# Functional Foods and Nutraceuticals: Fundamental and Mechanistic Approaches

(Sponsored by Ministry of Human Resource Development (MHRD) under the scheme  
Global Initiative for Academic Network)  
(11<sup>th</sup> December, 2017 - 22<sup>th</sup> December, 2017)

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## Overview

Food consumption has always been the main basis for human existence because of the necessity to provide nutrients that maintain the body's physical structure and ensure normal operation of metabolic pathways. For centuries, it has been recognized that foods can also play medicinal role by providing nutrients that prevent or treat metabolic disorders, which is separate from the normal role of providing nutrients for body building and maintenance. However, only recently (past 2 decades) has global research efforts been directed at unraveling the structure and function of food components as potential therapeutic products. These research efforts have created a new and rapidly growing natural health products industry that is estimated to be worth ~US\$60 billion worldwide. The increasing growth and expansion of the functional foods industry can be attributed to strong consumer demands for natural product alternatives with respect to the pharmaceutical industry. Functional foods have the advantage of lower risk of negative side effects, which means they can be used at higher doses and for longer periods as disease-preventive agents when compared to drugs. These functional foods generally contain components that act to enhance human health when consumed as part of a regular diet or after the specific compounds have been prepared into an extract. The extract can then be used for novel food formulations or packaged into pills/tablets to be sold as supplements. The foods and extracts that promote specific metabolic advantages after oral ingestion are termed 'bioactive'. Therefore, while the science and technology of functional foods continue to grow, there is the need for proper understanding of the structural properties of bioactive compounds and the relationships to physiological benefits (e.g. blood pressure reduction, cancer growth inhibition, immune modulation, etc). In order to further promote the national and global commercial relevance and strength of the Indian functional foods market, this course was designed as a tool for knowledge acquisition that will contribute to research & development excellence. Emphasis will be placed on fundamental knowledge of the structure-function properties of food components coupled with specific applications in health and disease conditions. The course will end with product development lectures to illustrate potential development of novel foods formulated with bioactive extracts.

## Objectives

The primary objectives are to:

- i) Transfer knowledge regarding fundamental food nutrients: structure and function perspectives
- ii) Discuss fundamental aspects of extraction, isolation and purification of bioactive compounds
- iii) Teach *in vitro* and *in vivo* methods used to evaluate bioactive properties of food components
- iv) Discuss the mechanistic basis for therapeutic effects of bioactive compounds
- v) Introduce basic aspects of food product formulation with bioactive agents
- vi) Provide insights into regulatory aspects based on countries and regions

<b>Modules</b>	<p><b>A: Isolation, structural characterization and functionality of bioactive food components: Dec 11-15, 2017</b></p> <p><b>B: Food product development and regulatory aspects: Dec 18-22, 2017</b></p>
<b>You Should Attend If you are...</b>	<ul style="list-style-type: none"> <li>▪ Senior Undergraduate Students</li> <li>▪ MSc/MTech &amp; PhD students</li> <li>▪ Faculty members with teaching and research interests in functional foods</li> <li>▪ Industry R&amp;D staff</li> <li>▪ Government Policy Analysts</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$300</b></p> <p><b>Industry Participants: INR 8000/-</b></p> <p><b>Faculty: INR 4000/-</b></p> <p><b>Students: INR 2000/- (UR/OBC); INR 1000/- (SC/ST); INR 0/- (PWD)</b></p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

## Course Details

<p><b>Course Structure</b> (December 11- December 22, 2017)</p>	<p><b><u>Module A: Isolation, structural characterization and functionality of bioactive food components</u></b></p> <p><b>December 11</b> Lecture 1 (10:30 – 11.30 AM): Brief overview of carbohydrates &amp; lipids</p> <p>Lecture 2 (2:00 – 4:00 PM): Proteins and peptides</p> <ul style="list-style-type: none"> <li>- Soybean proteins</li> <li>- Hempseed proteins</li> <li>- Resistant proteins</li> <li>- Antihypertensive peptides</li> <li>- Antioxidant peptides</li> <li>- Anticancer peptides</li> <li>- Immune-modulating peptides</li> </ul> <p><b>December 12</b> Lecture 3 (10:30 – 11.30 AM): Polyphenols-Phenolic acids &amp; Flavonoids</p> <p>Lecture 4 (11:45 – 12:45 PM): Polyphenols-Phytosterols &amp; Carotenoids</p> <p><b>December 13</b> Lecture 5 (10:30 – 11.30 AM): Isoflavones &amp; Probiotics</p> <p>Lecture 6 (11:45 – 12:45 PM): Extraction, isolation and purification methods</p> <ul style="list-style-type: none"> <li>- Aqueous</li> <li>- Solvent</li> <li>- Membrane ultrafiltration</li> <li>- Column chromatography</li> <li>- Mass spectrometry</li> </ul> <p><b>December 14</b> Lecture 7 (10:30 – 11.30 AM): In vitro assay methods</p> <ul style="list-style-type: none"> <li>- Fibre and prebiotics</li> <li>- Resistant starch</li> </ul>
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- Proteins and peptides
- Polyphenols
- Antioxidants
- Antihypertensive
- Anticancer

Lecture 8 (11:45 – 12:45 PM): Determination of in vivo bioactive effects I

- Fibre and prebiotics
- Resistant starch
- Resistant proteins

Tutorial 1: 2:00 – 3.00 PM

**December 15**

Lecture 9 (10:30 – 11.30 AM): Determination of in vivo bioactive effects II

- Antioxidants
- Antihypertensive
- Anticancer

Break/Examination I: 2:00 – 4.00 PM

**Module B: Food product development and regulatory aspects**

**December 18**

Lecture 10 (10:30 – 12.30 AM): Wheat-based baked products

- Fibre and prebiotics
- Resistant starch
- Proteins and peptides
- Polyphenols

Lecture 11 (2:00 – 3:00 PM): Snack products

- Granola bars
- Others

**December 19**

Lecture 12 (10:30 – 12.30 AM): Beverages

- Dairy products
- Fruit juices
- Fortified water

Lecture 13 (2:00 – 3:00 PM): United States and Canada

**December 20**

Lecture 14 (10:30 – 12.30 AM): Canada

Lecture 15 (2:00 – 3:00 PM): Japan

**December 21**

Lecture 16 (10:30 – 11.30 AM): European Union

Tutorial 2 (11:45 – 12:45 PM): Review of course materials and problem solving

**December 22**

Examination II (Final): 10:30 – 12:30 PM

## The Faculty



**Prof. Rotimi Aluko** is a Professor in the Department of Human Nutritional Sciences at the University of Manitoba, Winnipeg, Canada. He is a world-renowned scientific leader in the functional foods and nutraceuticals research field with over 140 journal research publications. He is the author of the very popular textbook titled “Functional Foods and Nutraceuticals”. His research program focuses on structure-function properties of food

proteins as well as development of natural food protein-derived bioactive peptides, especially for the prevention and/or management of hypertension, kidney disease and oxidative stress. Dr. Aluko holds 3 patents on the antihypertensive properties of plant seed peptides and is heavily involved in technology transfer to the food and nutrition industry. Dr. Aluko has served as the National President of the Canadian Institute of Food Science and Technology (CIFST), Chair of the Nutraceuticals and Functional Foods Division of the Institute of Food Technologists (IFT) as well as Chair of the Protein and Co-Products Division of the American Oil Chemists’ Society. He is a recipient of the CIFST William J. Eva Award for outstanding research and service contributions to the Food Industry. In 2016, he was elected a CIFST Fellow for his exemplary contributions to the advancement of Canadian Food Science and Technology. In 2017 he was also elected an IFT Fellow in recognition of his exceptional accomplishments as a Food Scientist. He currently serves as the Editor-in-Chief for the *Journal of Food Biochemistry* in addition to serving as an Associate Editor for *Journal of Functional Foods* as well as *Current Topics in Nutraceutical Research*.



**Dr. Ashwani Kumar** is working as Assistant Professor & Teacher In-Charge in the Department of Nutrition Biology, Central University of Haryana, Mahendergarh. He has a broad experience in teaching and research in the area of Biotechnology. Dr. Kumar has published 25 papers in the field of gene cloning & expression, probiotics and molecular diagnostics in various national and international journals, besides 14 book chapters, 01 edited book and 05 Gen Bank Submissions. Dr. Kumar

has guided several students (UG/PG) for their research work. He has successfully completed one DST (Govt. of India) sponsored project and also presently handling one more project. He is an invited reviewer for more than dozens esteemed journals and research projects submitted under ECR/EMR category of Science and Engineering Research Board (Department of Science & Technology, Govt. of India, New Delhi). He also acts as editorial board member of International Journal of Plant Physiology and Biochemistry.

## Course Coordinator

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## Local Coordinator

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