

Course Outline

FOOD 4203/FOOD 5105. Functional Foods and Natural Health Products

Lecture time: Thursdays from 8.35 AM to 11.25 AM, Canal Bulg 3400

Instructor:

Farah Hossenian

farahhosseinian@cunet.carleton.ca

Course description

Study of the bioactive components of functional foods and natural health products, for the improvement of sustainable health and nutrition. The sources of bioactives, their chemistry, and mechanisms of actions, process technology, efficacy, safety and potential role of R&D in industry in food system sustainability and economy/commercialization of new products and social practices will be discussed. Lectures will be covered by instructor and student presentations.

Learning Outcomes: By the end of the course, the student should:

1. Learn and distinguish between phytochemicals in foods and natural health products.
2. Know the scientific basis and technologies improving sustainable functional foods and natural health products.
3. Identify and describe examples of functional foods and natural health products that discuss health benefits.
4. Become knowledgeable on the specific issues concerning functional foods and natural health products.
5. Become familiar role of R&D in functional foods and natural health in industry.
6. Be aware of current topics, terms and products in this emerging field (food system sustainability).
7. Learn to independently examine scientific proof of efficacy, safety, and effectiveness and communicate this information in oral and written forms.

Equity, Diversity, and Inclusion (EDI) Philosophy

An inclusive and equitable philosophy (EDI) in teaching a Functional Food & Natural Health Products course involves creating a diverse, accessible, and engaging learning environment. The course uses diverse examples and global perspectives to explore the role of food bioactives in human health. Key teaching strategies include problem-solving, ongoing assignments, and hypothesis exercises to develop students' strengths and leadership skills. Promoting inclusion, the course encourages group work, open dialogue, and active engagement while addressing unconscious biases. Small group presentations enhance scientific communication, leadership, and professional skills, preparing students for diverse careers, particularly in the food industry. Integrating EDI principles ensures success and broad learning for all students.

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Topics to be covered (by instructor and student presentations)

Lec 1: (LOs 1,2,3,4)

Overview of functional food and natural health products

1. Definition of functional food and natural health products
2. Value added products from food and natural health products
 - a. Identify sustainable bio-based resources
 - b. product development
 - c. functional ingredient characteristics
 - d. manufacturing and industry growth
 - e. commercializing high-quality functional foods and natural health products
3. Functional foods and natural health products: hype or reality
4. Regulatory-related testing requirements
 - a. need science-based evidence to support claims
 - b. clinical trails
 - c. product safety/toxicity
 - d. validating efficacy
 - e. role of GMP, HACCP and ISO as a process assessment
 - f. role of CIFA, AAFC, Natural Health Products (NHP) Program
 - g. Health Canada Approved Health Claims

Lec 2: (LOs: 1,2,3,5)

Bioactives with antioxidant and anti-inflammatory properties

1. Selected bioactives with antioxidant and anti-inflammatory properties in foods
 - a. cereals
 - b. oilseeds
 - c. fruits and vegetables
2. Selected bioactives with antioxidant and anti-inflammatory properties of natural health products (pills, capsules, powder...)
 - i. herbs
 - ii. vitamins & minerals
 - iii. homeopathics & traditional herbal medicine
 - iv. plant & animal
 - v. micro-organism
3. Potential role of GMP, HACCP and ISO in product development and as a process for the assessment of scientific support for health claims
4. Health Canada Approved Health Claims

Lec 3: (LOs: 1,2,3,5)

Bioactive polysaccharides:

1. Classifications and identification
2. Chemical properties, analytical approaches, characterization
3. Dietary Fibre and prebiotics activity of polysaccharides in:
 - a. regular plant foods (e.g. cereal, oilseeds, fruit and vegetable)

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- b. process foods
 - i. fermented food products, particularly in baked and dairy products
- c. natural health products (pills, capsules, powder...)
 - i. traditional herbal medicine (e.g. psyllium products)
- 4. Potential role of GMP, HACCP and ISO in product development and assessment of scientific support for health claims
- 5. Health Canada Approved Health Claims

Lec 4: (LOs: 1,2,3,5)

Bioactive lipids:

1. Classifications and identification
2. Chemical properties, analytical approaches, characterization
 - a. Phenolic lipids, sterols and waxes in plant foods
 - b. Omega-3 fats in animal and vegetable sources
 - c. natural health products (pills, capsules, powder...)
 - i. traditional herbal medicine (e.g. omega-3 products)
 - ii. essential oils (flowers)
 - iii. cosmetic products (herbs, tubers, stem and leaves)
3. potential role of GMP, HACCP and ISO in product development
4. Health Canada Approved Health Claims

Lec 5: (LOs: 5,6,7)

Efficacy and safety of functional foods and natural health products:

1. Relationship between bioactive compounds and inhibition or induction of diseases
2. Mechanism of action
3. Identification of appropriate biomarkers
4. Interactions/adverse effect and toxicity of bioactive compounds with nutrients and medications
 - a. (e.g. cyanogenic compounds in flaxseed, anti-trypsin in soybean, naringin in grapefruit)
5. Adulteration in the market place
 - a. adding hazardous natural products (e.g. steroids, ephedrine alkaloids)
 - b. contaminants (e.g. pesticides in ginseng)
 - c. fillers and stabilizers with allergy concerns (e.g. adding lactose to pills and capsules)

Lec 6: (LOs: 5,6,7)

Safety and health claim of functional foods and natural health products

1. Regulatory assessment support
 - a. examine scientific proof of efficacy and safety
 - i. understand the mechanisms in order to construct hypotheses for testing on volunteers
 - ii. intervention trials in human subjects
 - iii. randomized, placebo-controlled scientific evidence
 - iv. application of proper biological markers as a process for the assessment of scientific support for health claims

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2. Reduce risk of further regulation
 - a. improve quality
 - i. controlling the entire value chain
 - ii. consumer responds
 - iii. authenticity and validation
 - iv. reduce potential legal liabilities

Lec 7:

Product development: (LOs: 4,5,6,7)

1. Market value and future trend for product developments.
2. role of industry and government
 - a. R&D in development of functional foods and natural health products in industry
 - b. role of GMP, HACCP and ISO as a process for the assessment of scientific support for health claims
3. Role of government agencies
 - a. roles of Health Canada, Office of Natural Health Products, CFIA, Agriculture and Agri-Food Canada
 - i. products driving regulators to act
 - ii. increase Canada's global reputation for quality and safety
 - iii. help to develop right industries with right products
 - iv. help to distinguish sustainable functional foods and natural health products
 - v. provide required regulatory guidelines for acceptability or non-acceptability of functional foods and natural health products

Evaluation:

COURSE EVALUATIONS

***Project 1: Total 30%**

Presentation/Paper critique 20%
Participation in class 10%
discussion and other
students' presentations

***Project 2: Total 30%**

Presentation/FF and NHP sustainability on safety and efficacy 20%
Participation in class 10%
discussion and other
students' presentations

****Take home exam Total 40%**

3 to 5 challenging questions relevant to topics in the course. The exam includes guest lecturer presentations.

*Two extra questions for graduate students (FOOD 5105)!

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Details:

Presentation 1/ Paper critique (20%) plus (10%) contribution in class.

TOTAL=30%

- Students will read and discuss in class scientific articles selected by them (relevant to course materials). Each week, one group (in pair) will lead the discussion and other students will have an opportunity to talk about the paper. This is related to each student's contribution (10%) in class.

Expectations:

First, describe each section in the paper (tell the whole story) and then discuss/highlight specific issues concerning the critique part. It is important to be knowledgeable on the topic and terms in order to perform a worthy knowledge transfer to the audiences. For example, if the sources of bioactives, their chemistry, and mechanisms of actions, process technology, efficacy, safety are included in the paper, you need to understand them in order to transfer the knowledge to others. You act as an educator!!

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Expectation & Assessment:

Breakdown marks for Student Performance on Presentation 1 (out of 20%).

Performance	Mark	Student name	Student name
Ability to understand the topic	2		
Clearly talking about objectives	2		
Contribution to discussion	3		
Promote others to be involve in the discussion	3		
Speaking audibly and clearly	2		
Beginning and ending properly	2		
Ability to make conclusion	2		
Answering questions	2		
Timing	2		
Overall ranking			

Comments:

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Presentation 2: (20%): Sustainability, Evaluation of safety and efficacy of food functional foods and Natural Health Products plus (10%) contribution in class. TOTAL=30%

Direction & framework:

First, describe the topic (using different resources/examples are below) telling the whole story and then discuss/highlight sustainability. It is important to be knowledgeable on the topic and terms in order to perform a worthy knowledge transfer to the audiences. Here is an outline:

1. Select 1 food, or major ingredient, or supplement and discuss about functionality, efficacy, and metabolism of selected ingredients
2. Discuss market values
3. Discuss new/emerging food systems to improve sustainability (e.g new technology to increase stability, AI application, vertical farming, better accessibility...etc).
4. Future trend should be discussed as well.
5. Role of government agencies need to be discussed.

Each student will prepare its finding in the form of PowerPoint presentation.

Resources: Example of journals & others:

Journal of sustainable food production

Applied Food Research

Journal Sensors

Journal of Agriculture and Food Research

Journal of Sustainable Agriculture and Environment

Computers and Electronics in Agriculture

<https://www.twobears.ca/blogs/the-den/creating-oat-milk-an-environmentally-friendly-process>

https://earthsown.com/products/oat/?gclid=CjwKCAjwh4ObBhAzEiwAHzZYU2uwkQd3IDREIy12UWhk53q5ddQMGwUwqc-Rkipp-twFdZ3Lau8yBRoCYJwQAvD_BwE

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Expectation & Assessment:

Breakdown marks for Student Performance on Presentation 2 (out of 20%).

Performance	Mark	Student name	Student name
Ability to understand the topic	2		
Clearly talking about objectives	2		
Contribution to discussion	3		
Promote others to be involve in the discussion	3		
Speaking audibly and clearly	2		
Beginning and ending properly	2		
Ability to make conclusion	2		
Answering questions	2		
Timing	2		
Overall ranking			

Comments:

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Suggested reading

Texts/References:

- Handbook of Fermented Functional Foods, (2003) E.F. Farnworth ISBN 0-8493-1372-4
- Functional Foods - Biochemical and Processing Aspects (Vol 2) (2002) J. Shi, G. Mazza and M. Le Maguer ISBN 1-56676-902-7
- Herbs, Botanicals & Teas, (2000) G. Mazza, and B.D. Oomah. ISBN: 1-56676-851-9
- Professional's Handbook of Complimentary & Alternative Medicine, 3rd Edition. Febrow, C.W. & Avila, J.R. 2004.
- Handbook of Nutraceuticals and Functional Foods (2001). Robert E.C. Wilman ISBN 0-8493- 8734-5 Herbs, Botanicals & Teas, (2000) G. Mazza, B.D. Oomah ISBN: 1-56676-851-9.

Journals and websites:

- Natural Health
- Functional Foods and Nutraceuticals
- Journal of Agricultural Food Chemistry
- Food Technology
- American Journal of Clinical Nutrition
- European Journal of Clinical Nutrition
- Journal of Nutritional Biochemistry
- <http://www.hc-sc.gc.ca/fn-an/label-etiquet/claims-reclam/assess-evalu/index-eng.php>
- <http://www.hc-sc.gc.ca/ahc-asc/branch-dirigen/hpfb-dgpsa/index-eng.php>
- <http://www.hc-sc.gc.ca/ahc-asc/branch-dirigen/hpfb-dgpsa/nhpd-dpsn/index-eng.php>

PLEASE REFER TO CARLETON UNIVERSITY ACADEMIC REGULATIONS REGARDING ACADEMIC INTEGRITY, EXAMINATION POLICIES, ETC.

<http://www.carleton.ca/cuuc/regulations/acadregsuniv14.html>