
Graduate Certificate in Nutrition and Inflammation

Nutritional Biochemistry

Nutritional Biochemistry is a field that combines the principles of biochemistry and nutrition to understand how nutrients in food are processed, stored, and utilized by the body. In the Graduate Certificate in Nutrition and Inflammation, students will delve into the intricate biochemical processes that underlie the relationship between nutrition and inflammation in the body.

Key Terms and Vocabulary:

- Nutrients:** Substances found in food that are essential for growth, development, and maintenance of health. Nutrients can be classified into macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, minerals).
- Biochemistry:** The branch of science that explores the chemical processes and substances that occur within living organisms. In the context of nutritional biochemistry, this involves studying how nutrients are metabolized in the body.
- Metabolism:** The chemical reactions that take place in the body to convert food into energy and building blocks for cells. Metabolism can be divided into catabolism (breakdown of molecules) and anabolism (synthesis of molecules).
- Nutrient Absorption:** The process by which nutrients from food are taken up by the body, typically occurring in the gastrointestinal tract. Absorption is crucial for nutrients to be utilized by cells for various functions.
- Digestion:** The mechanical and chemical breakdown of food into smaller molecules that can be absorbed by the body. Digestion begins in the mouth with chewing and continues in the stomach and small intestine.
- Gastrointestinal Tract:** The series of organs through which food passes during digestion, including the mouth, esophagus, stomach, and intestines. Nutrient absorption primarily occurs in the small intestine.
- Enzymes:** Proteins that catalyze biochemical reactions in the body. Enzymes are essential for processes such as digestion, metabolism, and nutrient absorption.
- Macronutrients:** Nutrients that are required in large amounts by the body for energy production and growth. Macronutrients include carbohydrates, proteins, and fats.
- Micronutrients:** Nutrients that are needed in smaller quantities but are essential for various physiological functions. Micronutrients include vitamins and minerals.
- Vitamins:** Organic compounds that are essential for normal metabolism and physiological functions. Vitamins are classified into fat-soluble (A, D, E, K) and water-soluble (B vitamins, vitamin C).

11. **Minerals**: Inorganic elements that are necessary for various physiological processes in the body. Minerals play important roles in bone health, nerve function, and fluid balance.
12. **Antioxidants**: Compounds that help neutralize harmful molecules called free radicals, which can damage cells and contribute to inflammation. Antioxidants are found in many fruits, vegetables, and nuts.
13. **Inflammation**: The body's immune response to injury, infection, or stress. Chronic inflammation has been linked to various health conditions, including cardiovascular disease, diabetes, and autoimmune disorders.
14. **Omega-3 Fatty Acids**: Essential fatty acids found in certain foods like fatty fish, flaxseeds, and walnuts. Omega-3 fatty acids have anti-inflammatory properties and are important for brain health and cardiovascular function.
15. **Probiotics**: Beneficial bacteria that promote a healthy balance of gut microbiota. Probiotics can help improve digestion, strengthen the immune system, and reduce inflammation in the gut.
16. **Prebiotics**: Non-digestible fibers that serve as food for probiotics and help promote the growth of beneficial bacteria in the gut. Prebiotics are found in foods like whole grains, fruits, and vegetables.
17. **Glycemic Index**: A measure of how quickly carbohydrates in food raise blood sugar levels. Foods with a high glycemic index can lead to rapid spikes in blood sugar and insulin levels, which may contribute to inflammation.
18. **Insulin Resistance**: A condition in which cells become less responsive to the hormone insulin, leading to elevated blood sugar levels. Insulin resistance is a hallmark of type 2 diabetes and is associated with chronic inflammation.
19. **Dietary Fiber**: Indigestible plant material that helps promote healthy digestion, regulate blood sugar levels, and reduce inflammation. Dietary fiber is found in fruits, vegetables, whole grains, and legumes.
20. **Polyphenols**: Plant compounds with antioxidant and anti-inflammatory properties. Polyphenols are abundant in foods like berries, green tea, cocoa, and red wine.
21. **Nutrigenomics**: The study of how nutrients interact with genes to influence health and disease risk. Nutrigenomics explores how individual genetic variations can impact responses to dietary factors.
22. **Nutrient-Dense Foods**: Foods that provide a high amount of nutrients relative to their calorie content. Nutrient-dense foods include fruits, vegetables, lean proteins, whole grains, and healthy fats.
23. **Metabolic Syndrome**: A cluster of conditions, including high blood pressure, elevated blood sugar, abnormal cholesterol levels, and excess abdominal fat, that increase the risk of heart disease and diabetes. Metabolic syndrome is associated with chronic inflammation.
24. **Adipose Tissue**: Body fat that serves as a storage site for energy and plays a role in hormone regulation. Excess adipose tissue, especially visceral fat around organs, can contribute to inflammation and metabolic dysfunction.

-
25. **Ketogenic Diet**: A high-fat, low-carbohydrate diet that induces a metabolic state called ketosis, in which the body burns fat for fuel. The ketogenic diet has been studied for its potential anti-inflammatory effects.
 26. **Gluten**: A protein found in wheat, barley, and rye that can trigger an immune response in individuals with celiac disease or gluten sensitivity. Gluten consumption has been linked to inflammation in susceptible individuals.
 27. **Leaky Gut Syndrome**: A condition in which the lining of the intestines becomes permeable, allowing undigested food particles, toxins, and bacteria to leak into the bloodstream. Leaky gut can trigger inflammation and contribute to various health issues.
 28. **Nutrient Partitioning**: The process by which nutrients are allocated to different tissues in the body for energy production, storage, or repair. Nutrient partitioning can be influenced by factors like diet, exercise, and metabolic health.
 29. **Amino Acids**: The building blocks of proteins that are essential for growth, repair, and maintenance of tissues in the body. There are 20 different amino acids, nine of which are considered essential because they must be obtained from the diet.
 30. **Glycogen**: A form of stored carbohydrate found in the liver and muscles. Glycogen serves as a readily available source of energy that can be quickly mobilized during times of increased energy demand.
 31. **Hormones**: Chemical messengers produced by glands in the body that regulate various physiological processes, including metabolism, growth, and stress response. Hormones play a key role in nutrient metabolism and inflammation.
 32. **Thermogenesis**: The process by which the body generates heat to maintain body temperature and support metabolic functions. Thermogenesis can be influenced by factors like diet, physical activity, and environmental conditions.
 33. **Nutrient Timing**: The strategic consumption of nutrients at specific times to optimize performance, recovery, and metabolic outcomes. Nutrient timing is often used in sports nutrition to enhance athletic performance and muscle growth.
 34. **Caloric Restriction**: A dietary strategy that involves reducing overall calorie intake while maintaining adequate nutrient intake. Caloric restriction has been shown to promote longevity, improve metabolic health, and reduce inflammation.
 35. **Mitochondria**: Organelles within cells that are responsible for producing energy in the form of adenosine triphosphate (ATP) through a process called cellular respiration. Mitochondria play a crucial role in nutrient metabolism and inflammation.
 36. **Nutritional Immunology**: The study of how nutrients and dietary factors influence the immune system's response to infections, inflammation, and chronic diseases. Nutritional immunology explores the role of nutrition in immune function and inflammation.

-
37. **Gut-Brain Axis**: The bidirectional communication pathway between the gut and the brain, involving the nervous system, hormones, and immune factors. The gut-brain axis plays a key role in regulating appetite, mood, and inflammation.
38. **Inflammatory Bowel Disease (IBD)**: A group of chronic inflammatory conditions of the gastrointestinal tract, including Crohn's disease and ulcerative colitis. IBD is characterized by inflammation, abdominal pain, diarrhea, and nutrient malabsorption.
39. **Nutrient Deficiency**: A condition that occurs when the body does not receive an adequate amount of essential nutrients, leading to impaired physiological function, growth, and overall health. Nutrient deficiencies can result from poor diet, malabsorption, or certain medical conditions.
40. **Bioavailability**: The extent to which nutrients from food are absorbed and utilized by the body. Factors like nutrient form, food matrix, and individual physiology can influence the bioavailability of nutrients.
41. **Genetic Polymorphism**: Natural variations in genes that can affect an individual's response to nutrients, drugs, and environmental factors. Genetic polymorphisms can influence nutrient metabolism, absorption, and inflammatory pathways.
42. **Dietary Supplements**: Products that contain vitamins, minerals, herbs, or other bioactive compounds intended to supplement the diet. Dietary supplements are used to fill nutrient gaps, support health goals, and manage certain health conditions.
43. **Nutraceuticals**: Food or food components that provide health benefits beyond basic nutrition. Nutraceuticals may have bioactive compounds with antioxidant, anti-inflammatory, or other physiological effects.
44. **Phytochemicals**: Bioactive compounds found in plants that have potential health benefits, including antioxidant and anti-inflammatory properties. Phytochemicals are abundant in fruits, vegetables, herbs, and spices.
45. **Food Allergy**: An abnormal immune response to certain proteins in food that can trigger allergic symptoms, such as hives, swelling, difficulty breathing, and gastrointestinal distress. Food allergies can lead to inflammation and serious health consequences.
46. **Food Intolerance**: Difficulty digesting certain foods due to enzyme deficiencies, sensitivities, or other factors. Food intolerance can cause symptoms like bloating, gas, diarrhea, and abdominal pain, but does not involve an immune response.
47. **Nutrigenetics**: The study of how genetic variations influence individual responses to nutrients in the diet. Nutrigenetics seeks to personalize nutrition recommendations based on an individual's genetic profile.
48. **Nutrient Interactions**: The ways in which nutrients in the diet can interact with each other to modify their absorption, metabolism, or biological effects. Nutrient interactions can have synergistic, antagonistic, or additive effects on health outcomes.
-

49. **Essential Nutrients**: Nutrients that must be obtained from the diet because the body cannot produce an adequate amount on its own. Essential nutrients are necessary for normal growth, development, and physiological functions.

50. **Malnutrition**: A condition characterized by an inadequate or excessive intake of nutrients, leading to deficiencies, imbalances, or toxicities that can impair health. Malnutrition can result from poor diet, disease, or other factors affecting nutrient intake or absorption.

In the Graduate Certificate in Nutrition and Inflammation, students will explore these key terms and vocabulary to gain a comprehensive understanding of the intricate connections between nutrition, biochemistry, and inflammation in the body. By studying how nutrients are metabolized, absorbed, and utilized, students will be equipped to evaluate the impact of diet on inflammatory processes and develop evidence-based strategies to promote optimal health and well-being.