Biology 1400
Fundamentals of Nutrition

Course Outcomes

1. Identify the six classes of nutrients and their relationship to health.
2. Indicate function and requirements of carbohydrates, lipids and proteins.
3. Identify the vitamins and minerals and give their role in nutrition.
4. List the major organs of digestion and give their function.
5. Understand the relationship between energy balance and weight control at different times in the life cycle.
6. Identify proper storage and handling of food and the ecology of the world's food supply.

Units

1. Introduction to Nutrition and Nutrition Tools
2. Overview of Body Systems and Digestion
3. Macronutrients
4. Water and Micronutrients
5. Alcohol and Eating Disorders
6. Energy Balance and Fitness
7. Life Cycle Nutrition
8. Food Safety

Unit 1 - Introduction to Nutrition and Nutrition Tools

On completion of this unit the student should be able to:

1. Differentiate between malnutrition, overnutrition and undernutrition.
2. Define diet, energy, nutrition, nutrient, essential nutrient and phytochemical.
3. Distinguish between hunger, appetite and satiety.
4. Distinguish between macronutrient and micronutrient.
5. Describe how factors such as early experience, customs, advertising and economics can affect our food choices.
6. List six classes of nutrients and identify food choices that represent each class.
7. Identify which of the classes of nutrients are considered organic and which are inorganic.
8. State the function(s) of each of the 6 classes of nutrients.
9. State the unit of energy associated with food and list the caloric yield from each class of nutrients.
10. State the nutritional information required on a food label.
11. State the health claims and label descriptions allowed by the FDA.
12. State the goal of the food pyramid and the groups that comprise it.
13. Identify the areas of focus in the Dietary Guidelines for Americans, 2010.
14. Discuss the importance of serving size.
15. Discuss ways nutrition can affect health.
16. Differentiate between nutrient-dense and energy-dense.
17. Describe the characteristics of a healthy diet.
18. Describe five methods of nutritional assessment.
19. Describe the MyPlate Plan.
20. Define anecdote, placebo, control, and variable.
21. Identify the steps of the scientific method.
22. Identify Dietary Reference Intakes (DRI), Daily Values (DV), Recommended Dietary Allowance (RDA), Adequate Intake (AI) and Tolerable Upper Intake Levels (UL).

Unit 2 - Overview of Body Systems and Digestion

On completion of this unit the student should be able to:

1. Identify the function of the following organelles: nucleus, endoplasmic reticulum (ER), Golgi complex, lysosome, mitochondria, peroxisome and ribosomes.
2. Distinguish between organelle, cell, tissue, organ and organ system.
3. Explain the function of enzymes and identify important enzymes of digestion.
4. Identify the organ systems of the body, as well as the major organs and/or structures of each system.
5. Describe the major functions of each organ system. Identify the organs and structures of the digestive (gastrointestinal) system.
6. Define absorption, bolus, chyme, digestion and motility.
7. Describe the mechanical and chemical processes that occur in digestion.
8. Describe the absorption and transport process for each of the nutrient groups.
9. Explain the function of mucus in the digestive system.
10. Explain the functions of gastrin, secretin, and cholecystokinin (CCK).
11. Describe the roles of the liver, gallbladder and pancreas in digestion.
12. Discuss the following digestive disorders:
    a. Ulcers
    b. Heartburn and Gastroesophageal reflux disease (GERD)
    c. Diarrhea and constipation
    d. Irritable bowel syndrome (IBS)
    e. Hiatal hernia

Unit 3 - Macronutrients

On completion of this unit the student should be able to:

1. Describe the digestion and absorption of carbohydrates.
2. Differentiate between complex and simple carbohydrates.
3. State three examples of the following carbohydrates:
   a. monosaccharides
   b. disaccharides
   c. polysaccharides
4. Define dietary fiber, functional fiber and whole grains.
5. State the function of each of these carbohydrates in human nutrition:
   a. glucose
   b. starch
   c. cellulose (fiber)
   d. glycogen
6. Define the soluble and insoluble fiber and discuss the health benefits of each.
7. Identify problems with inadequate fiber intake.
8. Identify nutritive sweeteners and alternative sweeteners.
9. Describe the body's use of glucose in ATP production and glycogen formation.
10. Describe the regulation of blood glucose levels, including the hormones involved and the stimulus for their release.
11. Discuss glycemic index and load, in regards to the effect on the blood glucose levels.
12. State the dietary guidelines for carbohydrates.
13. State the adequate intake of fiber for adults.
14. Discuss the following conditions:
   a. lactose intolerance/maldigestion
   b. diabetes mellitus (hyperglycemia)
   c. hypoglycemia
   d. metabolic syndrome
   e. insulin resistance
15. Differentiate between type 1 and type 2 diabetes mellitus, including causes, frequency, symptoms and treatment.
16. Name the 3 main classes of lipids.
17. List the functions of each class of lipids in the human body.
18. Differentiate between saturated and unsaturated fatty acids. Give examples of each type of fat in the diet.
19. Distinguish between monounsaturated and polyunsaturated fats and give examples of each.
20. Summarize the processes of lipid digestion, absorption, transport and utilization in the body.
21. Describe ketosis including how it develops and problems it may cause.
22. Discuss the problems of the digestion and absorption of lipids in the body.
23. Name the two essential fatty acids, explain why they are essential, and list two good sources for each essential fatty acid.
24. State the dietary guidelines for lipids.
25. Describe how hypertension develops and identify risk factors associated with the disease.
26. Identify the symptoms of cardiovascular disease (CVD) and risk factors for the development of the disease.
27. Explain the process of atherosclerosis and identify risk factors.

28. Identify the classes of lipoproteins (chylomicrons, VLDL, LDL, HDL) and explain their functions in the body.
29. Explain why manufacturers hydrogenate fats and the possible health implications of consuming trans fatty acids formed during hydrogenation.
30. Discuss how carbohydrates and proteins can be converted into fat.
31. Explain how the chemical composition of proteins differs from that of lipids and carbohydrates,
32. Describe how amino acids make up proteins.
33. Summarize the processes of protein digestion and absorption in the body.
34. Describe the denaturation of protein.
35. Distinguish between essential and non-essential amino acids.
36. Explain why adequate amounts of essential amino acids are required in the diet.
37. Explain the functions of protein in the body.
38. Distinguish between complete and incomplete proteins.
39. Explain nitrogen balance and situations which affect nitrogen balance in the body.
40. List the health risks associated with a diet too high or too low in protein.
41. Explain how it is possible for vegetarians to obtain their necessary protein.
42. Distinguish between vegan, lactovegetarian and lacto-ovovegetarian.
43. Explain protein-energy malnutrition (PEM) and distinguish between marasmus and kwashiorkor.

Unit 4 - Water and Micronutrients

On completion of this unit the student should be able to:

1. Identify factors that can affect the vitamin content of food.
2. List the major functions and deficiency symptoms for each vitamin.
3. List important food sources for each vitamin.
4. Describe the characteristics of fat-soluble and water-soluble vitamins and explain how they differ.
5. Define megadose, antioxidant, free radical, cofactor, coenzyme, bioavailability and electrolytes.
6. Evaluate the use of vitamin supplements with respect to their potential benefits and hazards to the body.
7. Identify vitamin deficiencies that may contribute to:
    a. Anemia
    b. Beriberi
    c. Macular degeneration
    d. Neural tube defect
    e. Night blindness
    f. Osteomalacia
    g. Pellagra
    h. Rickets
    i. Scurvy
    j. Xerophthalamia
8. Identify vitamins that are considered antioxidants.
9. Define diuretic, osmosis and solvent.
10. Discuss the major roles of water in the body and the amount of water needed by adults.
11. Describe how the body regulates water intake and excretion to maintain water balance.
12. Identify the hormone involved in water conservation.
13. Identify the symptoms of dehydration.
14. Explain the role of minerals in maintaining the body's fluid and electrolyte balance and acid-base balance.
15. List the major roles and important deficiency and toxicity symptoms for each major and trace mineral.
16. Explain the functions of water in the body.
17. Classify the minerals as major or trace.
18. List the major functions and deficiency symptoms for the minerals.
19. Identify factors that affect absorption, retention and availability of some minerals, e.g., iron, calcium.
20. Explain the regulation of calcium levels in the body, including the hormones involved.
21. Discuss osteoporosis, including risk factors and preventative measures.
22. Identify mineral deficiencies that may contribute to:
    a. Anemia
    b. Cretinism
    c. Goiter

Unit 5 - Alcohol and Eating Disorders

On completion of this unit the student should be able to:

1. Define moderate alcohol consumption and discuss possible benefits of moderate consumption.
2. Identify the organs damaged by alcohol abuse.
3. Describe the risks of binge drinking.
4. Outline the causes of, effects of, typical persons affected by and the treatment for anorexia nervosa and bulimia nervosa.

Unit 6 - Energy Balance and Fitness

On completion of this unit the student should be able to:

1. Describe energy balance the consequences of energy imbalances.
2. List & define the three components of the body's energy needs.
3. Identify & explain the factors that affect the basal metabolic rate.
4. List the factors that affect BMR.
5. Describe the methods of determining percentage of body fat composition and explain the importance of the percentage of fat composition.
6. Discuss how body mass index (BMI) is calculate and used to determine if a person's weight is healthy.
7. Interpret BMI results.
8. Define obesity and outline the risks to health posed by obesity.
9. Describe how calorie intake, behavior modification and increased physical activity fit into a weight control plan.
10. Distinguish between upper body and lower body obesity.
11. Differentiate between visceral fat and subcutaneous fat and identify the effect on healthy of both.
12. Identify surgical options for severe obesity.
13. Explain the concept of set point.
14. Discuss the problems of too much or too little body fat.
15. Evaluate popular weight reduction diets.
16. Summarize the recommended strategies to promote weight control.
17. Explain the benefits of and guidelines for regular physical activity.
18. Identify energy sources used by the body during physical activity.
19. Explain carbohydrate loading.
20. Distinguish between muscle strength, muscle endurance, flexibility and cardiopulmonary endurance.
21. List the major signs and symptoms of heat related illnesses.
22. Differentiate between anaerobic and aerobic production of energy and identify the advantages and disadvantages of each.
23. Explain the importance of water and/or sports drinks during exercise.
24. Describe the role vitamins and minerals play in physical performance and indicate whether supplements are necessary to support the needs of active people.
25. List ergogenic aids and describe their effects, if any, on an athlete's performance.

Unit 7 - Life Cycle Nutrition

On completion of this unit the student should be able to:

1. Describe how maternal nutrition before and during pregnancy affects both the development of the fetus & growth of the infant after birth.
2. Explain why abstinence from smoking and drugs, avoiding dieting, and moderation in the use of caffeine are recommending during pregnancy.
3. Explain the effects of alcohol on the development of the fetus and describe fetal alcohol syndrome.
4. Discuss pregnancy-induced hypertension (pre-eclampsia) and gestational diabetes.
5. List the benefits of breastfeeding and indicate the changes a lactating woman needs to make in her diet to promote breastfeeding success.
6. Identify the hormones involved in the production and release of breast milk.
7. Define zygote, fetus, embryo, colostrum.
8. Identify diet guidelines to meet basic nutritional needs for normal growth and development of an infant and discuss the of the do's and don'ts associated with infant feeding.
9. Describe the nutrient needs of young children & appropriate feeding practices including issues of choking, portion sizes, and snacking.
10. Discuss nutrition-related concerns of children including the link between diet and behavior, the problem of lead, and the impact of television on nutrition.
11. Distinguish between food allergies, intolerances, and aversions.
12. Define anaphylactic shock.
13. Discuss the special nutrient needs and concerns of teenagers.
14. Describe the process by which a cancer develops and explain what is known about the effects of food constituents on cancer development.
15. Define carcinogen, metastasis and benign.
16. Describe special nutritional needs of older adults and the suspected connections between diet and disease.
17. List biological changes that occur during the aging process and discuss how these changes affect nutrient needs of older adults.

Unit 8 - Food Safety

On completion of this unit the student should be able to:

1. Discuss how microbial food poisoning can be prevented and indicate which foods are particularly troublesome.
2. Identify the common viruses and bacteria that can cause foodborne illnesses including:
   a. E. coli
   b. Listeria
   c. Hepatitis
   d. Salmonella
   e. Staphylococcus
   f. Clostridium botulinum
3. Identify the foods and symptoms associated with common foodborne illnesses.
4. Define parasite, fungi, bacteria and virus.
5. List four (4) major food processing techniques and explain the effect they have on the nutrient content of foods.
6. Discuss the regulations concerning food additives and identify the special roles of the major classes of additives.
7. Identify sources of toxic environmental contaminants in foods and the related complications of ingestion.