I. Catalog Information

BIOL 45 Introduction to Human Nutrition 4 Unit(s)

Prerequisites: Biology 40C.
Advisory: English Writing 1A or English as a Second Language 5.

Four hours lecture.

Biological function and chemical classification of nutrients. Effects of nutritional deficiencies and excesses. Recommended nutrient intakes and the role of diet in the development of chronic disease.

II. Course Objectives

A. Define different types of human nutrition research studies including epidemiological/population, case controlled, prospective, cohort, cross sectional, intervention.

B. Explain the rationale for the development of various food and nutrient guides including the Recommended Dietary Allowances.

C. Outline the basic steps used in an evaluation of nutritional status and discuss the limitations of the various techniques.

D. Describe the chemical structure and the biological functions of macronutrients and list major food sources from a variety of cultural groups for each.

E. Outline the steps of the metabolism of glucose, amino acids, and fatty acids to yield energy.

F. Describe the major roles of vitamins and minerals and relate the effects of deficiencies and excesses to their metabolic function.

G. Critically analyze the role of diet in chronic disease.

H. Explain the approach of "alternative nutrition" and list the factors that influence the merits and risks of such therapies.

III. Essential Student Materials

None

IV. Essential College Facilities

Overhead, videotapes, access to PC computers

V. Expanded Description: Content and Form

A. Define different types of human nutrition research studies: epidemiological/population, case controlled, prospective, cohort, cross sectional, and intervention.

1. Criteria that must be met for each type of study to be considered valid

2. Role of control group, placebo effect, investigator bias, confounding variables in experimental studies

3. Strengths and limitations of each types of study; what information each provides; correlations vs "cause and effect" relationship

4. Standards of research for adding to the knowledge of human nutrition

B. Explain the scientific basis for the development of various food and nutrient guides including the Recommended Dietary Allowances

1. Review of chemistry including methodologies used to detect nutrients

2. Criteria for and use of the Recommended Dietary Allowances

3. The role and use of food based guides including exchange lists, US Dietary Guidelines and Food Guide Pyramid. Examine the different pyramids: USDA, Asian Diet, Mediterranean Diet, Vegetarian, etc.

C. Outline the basic steps used in an evaluation of nutritional status and discuss the limitations of the various techniques.

1. Various methods for determining food intake for populations and for individuals: disappearance data, 24-hour recall,
food records and food frequency
  a. Advantages and limitations for each method
  b. How beliefs, attitude, culture, "the media", age, gender and education influence life styles that impact health: food choices, exercise, smoking, etc.

2. Description of nutrient assessment techniques such as anthropometric techniques, physical examination and biochemical tests; including advantages and limitations for each technique.

D. Describe the chemical structure and the biological functions of macronutrients and list major food sources from a variety of cultural groups for each.
  1. List the specific enzymes and location in the digestion of the macronutrients and describe the mechanisms of absorption from the intestines into the bloodstream for each macronutrient
  2. Diagram the major steps in the anabolic and catabolic metabolism of glucose, fatty acids and amino acids and discuss the role that hormones play in the metabolism of carbohydrates and lipids
    a. Carbohydrates
       1. Chemical structures and food sources from a variety of cultures
       2. Digestion and absorption including the risk for lactose intolerance
       3. Major steps in anabolism and catabolism
       4. Role of insulin and glucagons on blood glucose regulation
       5. Suggested health effects of fiber
    b. Lipids
       1. Chemical structures and food sources from a variety of cultures
       2. Digestion and absorption
       3. Major steps in anabolism and catabolism including the roles of insulin and glucagons in fatty acid synthesis and oxidation
       4. Suggested cholesterol metabolism in the development of atherosclerosis and dietary recommendations to reduce the risk of the CHD disease
    c. Proteins
       1. Chemical structures and food sources from a variety of cultures
       2. Digestion and absorption including sources of portal vein amino acids
       3. Major steps in anabolism and catabolism including protein synthesis
       4. Protein RDA and methods for evaluation of protein quality
       5. Health effects of protein excesses and deficiencies

E. Outline the steps of the metabolism of glucose, amino acids, and fatty acids to yield energy.
  1. Describe the chemical nature of ATP and explain the key role of ATP in energy metabolism
     a. Major steps of energy metabolism in the absorptive and post-absorptive state
     b. ATP as energy currency of the cell and how it is coupled with other energy requiring processes; brown fat and the uncoupling of ATP
  2. List the factors influencing energy balance and appraise the role that they play in the management of weight control
     a. Measurement of calories in the bomb calorimeter and the use of physiological fuel values
     b. Measurement and critical components of caloric expenditure; basal needs, food and adaptive thermogenesis, physical activity
     c. Definition of obesity, overweight and underweight
     d. Regulation of food intake
     e. Causes of obesity: physiological, hereditary, environmental, gender, age, social and culture factors.
     f. Laws of thermodynamics and suggested theories of energy use in obesity
     g. Current methods of measuring obesity and distribution of body fat
     h. Popular and recommended treatments for obesity
        1. Definition and characteristics of a “fad diet”
2. The physiological adaptation to caloric restriction
3. Weight loss surgery
4. OTC and prescription medications
5. Dietary supplements claimed to aid fat loss
6. Characteristics of a healthy weight loss diet or weight loss approach.

F. Describe the major roles of vitamins and minerals and relate the effects of deficiencies and excesses to their metabolic function.
   1. Coenzyme role of water-soluble vitamins
   2. Ascorbic acid and B-complex vitamins; food sources, biological function, deficiency symptoms and possible effects of excesses
   3. Vitamins A, D, E and K; food sources, biological function, deficiency symptoms and possible effects of excesses
   4. Interaction of drugs and vitamins with alcohol as a model
   5. Metabolic roles and food sources of electrolytes; suggested role of sodium and other risk factors in hypertension
   6. Metabolic roles and food sources of calcium
      a. Hormonal control of blood calcium
      b. Suggested risk factors in osteoporosis
   7. Metabolic roles, deficiency symptoms and food sources of trace minerals, emphasizing the mechanisms of absorption for iron and zinc

G. Critically analyze the role of diet in chronic disease.
   1. Assess the nutritional adequacy of a diet of a healthy person and propose specific changes that will reduce the possibility of chronic disease and malnutrition
      a. Review methodology of dietary assessment
      b. Review the assumptions underlying the Recommended Dietary Allowances
      c. Risk factors in the development of certain chronic diseases
         1. Review of the effect of diet in atherosclerosis, hypertension diabetes, and osteoporosis
         2. Specific dietary chemicals as initiators and promoters in cancer
         3. Role of ethnic origin and genetic influences on the risk of chronic disease
         4. Review impact of culture on life style pertaining to health
      d. Review the role and use of food-based guides including exchange lists, US Dietary Guidelines and Food Guide Pyramid

H. Explain the approach of "alternative nutrition" and list the factors that influence the merits and risks of such therapies.
   1. Define "alternative" nutrition therapies
      a. vitamin and minerals as medicines
      b. herbal supplements
      c. other chemical components sold as dietary supplements
   2. Criteria for evaluating alternative nutrition therapies
      a. question to ask: is there valid scientific evidence to support the claims?
      b. question to ask: are there any known risks?
   3. Tools to evaluate nutrition claims
      a. define unbiased source
      b. where to find them
   4. The role of the health care professional

VI. Assignments
A. Reading: assigned readings from the text
B. Writing
1. Write a comprehensive nutritional assessment of student's diet based on 3-day dietary analysis.
2. Write a report evaluating how their diet protects or increases the risk of chronic disease.

VII. Methods of Instruction

None

VIII. Methods of Evaluating Objectives

A. At least three objective exams used to test content from lecture and reading
B. Computer analysis of their own three-day dietary intake.
C. Calculations of energy needs used to evaluate application of critical components of caloric expenditure
D. Written assignments as described above

IX. Texts and Supporting References

A. Examples of Primary Texts and References

B. Examples of Supporting Texts and References