



YALE NATIONAL INITIATIVE

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Curriculum Units by Fellows of the National Initiative
2008 Volume VIII: Nutrition, Metabolism, and Diabetes

Introduction

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Humans eat, drink, and breathe to bring into their bodies the raw materials for growth, repair and generation of the energy necessary for life and the actions that bring pleasure to life. In most cases, the adult body achieves a dynamic state of homeostasis, in which the amount of nutritional input balances the energy needs, so the weight of the individual remains constant with time. Issues of food intake, nutrition, and human health are becoming increasingly important in the U.S. The Center for Disease Control (CDC) reports a dramatic increase in obesity in the U.S. over the period from 1985 to 2005. And disorders of metabolism, such as diabetes, create tremendous challenges for many individuals in the U.S. and other nations. This seminar provided an overview of human nutrition from the perspective of biomedical engineering. From a mechanical viewpoint, the human body is an elegant machine that requires inputs for sustained operation. What are the processes responsible for input of nutrients and raw materials? How are molecular nutrients extracted from ingested materials? How are these processes controlled?

Specifically, the seminar covered the following topics:

1. Healthy diets
2. Fats, carbohydrates, and proteins
3. Nutritionism (or the industrialization of nutritional information)
4. Diabetes — the chemical and anatomical changes that result from this disease, as well as ways to treat the disease
5. Carbohydrate metabolism
6. Protein metabolism
7. Fat metabolism
8. The Western diet and disease
9. Drinking and water
10. Micronutrients
11. Food allergies

The discussions were enhanced by our reading of two books: *In Defense of Food* by Michael Pollan and *Eat, Drink and Be Healthy* by Walter Willett.

The Fellows prepared curriculum units that covered a breadth of information on diet and metabolism and health. The range of material was impressive, as well as the range of grade levels that the seminar produced units to satisfy.

Several of the units focused on material that was appropriate for high school students. **Emily Betts** prepared

a unit called "Eat to Live" that uses hands-on activities to introduce the chemistry and function of the important classes of biological macromolecules. **Aruna Kailasa** prepared a unit called "Stoichiometry — A Necessary Tool in Chemistry," which uses food chemistry to illustrate the principles of chemical reaction stoichiometry. **Kristin Peterson** wrote a unit called "The Way Food Works" that focuses on the short- and long-term effects of ingested food on body metabolism and health. **Sara Thomas** prepared a unit called "School Lunch: How Healthy is It?" that explores the use of graphic design in the presentation of nutritional information, and encourages students to test the health value of the foods provided in their own schools.

Many of the units were addressed to the elementary school classrooms. **Karen Brinkley** wrote "Fast Food, Fast Track... To Nowhere," which describes some of the problems with obtaining our nutrients from fast food. **Brian Coons** prepared a unit called "Healthy Choices Lead to Healthy Bodies" exploring the use of hands-on activities related to food to teach science concepts. **Kathleen Gormley** prepared a unit called "Getting A Healthy Start on Life" which focuses on the relationship between food, the process of digestion, and exercise. **Lori Paderewski** prepared a unit called "Food Allergies Beware: We Know Your Secret" which provides information to help elementary school teachers and students keep their classrooms safe for students with food allergies. **Christina Pavlak** produced a unit called "Feeding our Bodies, Fueling our Minds" that presents information on digestion, healthy eating, and improved academic performance. **Huwerl Thornton** wrote a unit called "High Fructose Corn Syrup: What is it good for?" that discusses the prominence of high fructose syrup from corn in our national diet. **Cindy Woolery** prepared a unit called "Developing Student Leaders Through Nutritional Empowerment" that uses service learning projects to teach nutritional information and leadership skills.

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