

BIOLOGY 7 LAB: NUTRITION

Name: _____

Introduction: A Historical Perspective

We have come a long way in our health and fitness knowledge. We know that an apple a day doesn't necessarily keep the doctor away and that a walk around the block once a week is not enough to keep fit. Of course, an apple and a short walk are a great start, but there is much more to consider in pursuing good health.

Concerns about adult nutrition differ significantly from those of earlier years. Prior to World War II, Americans' main nutritional problems stemmed from a lack of sufficient food or variety of foods. Nutrition scientists of that era focused on defining essential nutrients, primarily vitamins, in order to outline the minimum food intake necessary for good health.

As American society became more affluent, however, nutritional concerns changed from the effects of too little food or nutrients, to an over-abundance of food or certain nutrients. Epidemiological and laboratory studies demonstrated a link between dietary excesses and chronic diseases such as coronary heart disease and cancer. These findings led to the development of dietary recommendations intended to reduce Americans' risk of chronic disease.

In the late 1970s, the Senate Select Committee on Nutrition and Human Needs issued the Dietary Goals for the United States. Since then, various federal agencies have issued similar recommendations for achieving a healthy diet, including: The Surgeon General's Report on Nutrition and Health in 1988, the National Research Council Report on Diet and Health: Implications for Reducing Chronic Disease Risk in 1989, and Healthy People 2000 and 2010: National Health Promotion and Disease Prevention Objectives in 1990 and 2000, respectively, by the U.S. Public Health Service of the Department of Health and Human Services.

Dietary recommendations developed by independent health organizations such as the American Heart Association closely resemble those issued by the federal government, indicating a general consensus among nutrition scientists regarding the role of diet in health and disease.

Dietary Guidelines for Americans

In 1992, the USDA released the Food Guide Pyramid as a nutrition education tool to help put the Dietary Guidelines for Americans into action. The Pyramid serves as a visual translation and general guide for daily food choices. It includes specific recommendations for daily intake of five different food groups and serving sizes as well as guidelines for moderating intake of fats and sugars. For the most current dietary and nutritional guidelines set by the USDA go to <https://www.cnpp.usda.gov/dietary-guidelines>.

American Adults: Obesity, Chronic Disease, Physical Activity, and Diet

Over the last 30 years, the prevalence of obesity and overweight among Americans has become a national concern; it is referred to as an epidemic. Today, approximately two-thirds of U.S. adult males and females are overweight, according to the 1999-2000 NHANES survey. In addition, data suggests the greatest increases in obesity and overweight have been among Hispanic and African-American women and those with lower income and less education. Overweight and obesity are also particularly common among Pacific Islander women.

Currently, only 45 percent of adults in the United States engage in regular physical activity consistent with recommendations. Approximately 26 percent are not active at all according to the Behavioral Risk Factor Surveillance System, a survey conducted by the Centers for Disease Control and Prevention.

In addition to combating obesity, a growing body of research suggests that regular physical activity can reduce the risks of heart disease, cancer, hypertension, non-insulin dependent diabetes mellitus, osteoporosis, and many other health problems traditionally linked to poor diet. The American College of Sports Medicine, the Centers for Disease Control, and the U.S. Surgeon General recommend accumulating 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week to gain physical activity's health benefits. Additional fitness benefits may be gained from implementing continuous bouts of moderate (for greater than 30 minutes) and vigorous activity (greater than 20 minutes). In 2002, an expert Dietary Reference Intakes panel recommended spending a total of at least one hour of moderate intensity physical activity per day to maintain a maximum level of cardiovascular health. Individuals should consult with their health care provider before beginning any type of exercise program.

As the proportion of the U.S. population ages, balanced nutrition and physical activity will become even more important to maintain the function and independence of older adults and enhance their quality of life

Obesity & Weight Management

Rates of overweight and obesity in the United States have grown to epidemic proportions over the last 20 years. As recently as 1988, the Surgeon General estimated that one-fourth of American adults were overweight. The latest government data indicate that approximately 64 percent of adults are either overweight or obese. The impact of this is financial and human. The direct costs associated with treatment of chronic health problems, such as heart disease, Type II diabetes, and some cancers, resulting from overweight and obesity accounted for approximately \$93-117 billion dollars of U.S. health and related medical expenditures. Scientists estimate that 400,000 deaths are attributed to poor diet and lack of exercise each year. According to Julie Gerberding, director of the Centers for Disease Control, "obesity is quickly catching up to tobacco as the leading actual cause of death."

Childhood overweight and obesity rates are especially alarming. According to the 1999-2000 National Health and Nutrition Examination Survey (NHANES), 10 percent of two- to five-year-olds and 15 percent of children and adolescents six to 19 years old in the United States are overweight. The prevalence of overweight among children and adolescents has doubled in the last twenty years and tripled over the past forty years. Research shows that overweight children

are more likely to become overweight adults and, therefore, are at greater risk for associated health problems. In fact, 60 percent of overweight five- to ten-year-old children already have at least one risk factor for heart disease.

While all children are at risk, Mexican American and non-Hispanic black children may be at higher risk for overweight than non-Hispanic white children. The prevalence of overweight among non-Hispanic black and Mexican-American adolescents increased more than 10 percentage points between NHANES studies conducted in 1988-1994 and 1999-2000. NHANES 1999-2000 data indicated that non-Hispanic black and Mexican-American adolescents ages 12-19 are more likely to be overweight (24 percent) than non-Hispanic white adolescents (13 percent). Additionally, Mexican-American children ages 6-11 were more likely to be overweight (24 percent) than non-Hispanic black children (20 percent) and non-Hispanic white children (12 percent).

Global in Scope

Overweight/obesity is not just a U.S. issue. The World Health Organization (WHO) reported in 1995 that there were an estimated 200 million obese adults. By 2000, the number of obese adults was estimated to be 300 million, with as many as 1.7 billion people overweight. The WHO considers obesity to be one of the top ten causes of preventable death of people worldwide. While malnutrition and unsafe sex account for more deaths, high blood pressure, smoking, high cholesterol, and obesity are impacting both industrialized and developing countries. The 2003 Joint FAO/WHO Expert Consultation on Diet, Nutrition, and the Prevention of Chronic Diseases estimated that non-communicable diseases (NCDs) such as obesity, diabetes, hypertension, stroke, and various forms of cancer accounted for 60 percent of the 55.7 million deaths that occurred in 2000. If unchecked, NCDs are expected to contribute nearly 75 percent of all deaths by the year 2020.

Body Mass Index (BMI) and Definitions of Overweight/Obesity

The Centers for Disease Control and Prevention, researchers, and health professionals use Body Mass Index (BMI) as the preferred method for determining overweight and obesity in adults, though other methods exist and are in use. The interpretation of BMI can be found in the graph below, but it is important to note that BMI does not use body fat or frame size in its calculations. Therefore, it is possible for an individual with a high proportion of lean body mass (muscle) to have an elevated BMI and not necessarily be at risk for adverse health conditions associated with overweight and obesity.



What are the Health Effects?

Physiological consequences of overweight and obesity can range from non-fatal effects that impact quality of life (e.g., respiratory problems, joint discomfort, infertility) to conditions that put an individual at risk for premature death. Among these conditions are Type II Diabetes, hypertension, elevated cholesterol, cardiovascular disease, and gall bladder disease. There are also data implicating obesity as a factor in the development of certain cancers such as breast and colon cancer.

Most health professionals believe that the more overweight an individual is, the higher risk he or she is to experience these health problems. Fortunately, the converse also appears true. By losing even 10 percent body weight, an overweight individual can improve his or her health if the weight loss is maintained.

It's All About You: Relating the Dietary Guidelines to American Life

The Dietary Guidelines Alliance was formed with members from health organizations, the food industry, and the government to develop effective, consumer-focused messages to convey the Dietary Guidelines for Americans. "It's All About You" is a usable message campaign that translates the recommendations into simple, positive ways consumers can integrate these basic health principles into their lives. It consists of five core messages designed to motivate consumers into rethinking and positively changing their eating and activity routines:

- **Be Realistic:** Make small changes over time in what you eat and the level of activity you do. After all, small steps work better than giant leaps.
- **Be Adventurous:** Expand your tastes to enjoy a variety of foods.
- **Be Flexible:** Go ahead and balance what you eat and the physical activity you do over several days. No need to worry about just one meal or one day.
- **Be Sensible:** Enjoy all foods, just don't overdo it.
- **Be Active:** Walk the dog, don't just watch the dog walk.

Lab Activity I

Determine the following data on yourself.

Gender	Height (in)	Weight (lb)	BMI	TDER (kcal)	Ideal Weight (lb)

Body Mass Index

To calculate your body mass index (BMI) using the following equation: **BMI = (weight in pounds x 703) ÷ (height in inches)²**

1. What does your BMI say about you?

Total Daily Energy Requirement

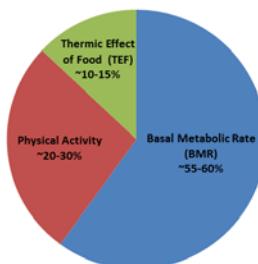
TDER or Total Daily Energy Requirement is the amount of energy (measured in kilocalories) that an individual needs to satisfy all metabolic and body functions for one day. If a person consumes less than their calculated TDER over many days, he or she will lose weight and if an individual consumes more calories than his or her calculated TDER, then he or she will gain weight. There are many ways to determine TDER, one way is to take the sum of the individual's **basal metabolic rate (BMR)**, **volunteer muscular action (VMA)**, and **specific dynamic action (SDA)**.

Basal Metabolic Rate is the amount of energy (measured in kilocalories) that an individual uses to satisfy basic metabolic processes. This is usually measured when the individual is at rest and fasting.

Volunteer muscular action is the amount energy needed to perform activities beyond resting such as exercise, work, and other routine activities. Active individuals will have a higher VMA than those that are less active.

Specific dynamic action (also known as **TEF**) is the amount of energy that is needed to digest or break down food.

Components of Energy Expenditure



Find the BMR formula for your age and gender and calculate your BMR.

Sex	Age	Formula to calculate BMR
Female	0 - 3	(Wht in Pounds / 2.2) x 61.0) - 51
	3 - 10	(Wht in Pounds / 2.2) x 22.5) + 499
	10 - 18	(Wht in Pounds / 2.2) x 12.2) + 746
	18 - 30	(Wht in Pounds / 2.2) x 14.7) + 496
	30 - 60	(Wht in Pounds / 2.2) x 8.7) + 829
	60 +	(Wht in Pounds / 2.2) x 10.5) + 596
Male	0 - 3	(Wht in Pounds / 2.2) x 60.9) - 54
	3 - 10	(Wht in Pounds / 2.2) x 22.7) + 495
	10 - 18	(Wht in Pounds / 2.2) x 17.5) + 651
	18 - 30	(Wht in Pounds / 2.2) x 15.3) + 679
	30 - 60	(Wht in Pounds / 2.2) x 11.6) + 879
	60 +	(Wht in Pounds / 2.2) x 13.5) + 487

National Research Council, Recommended Dietary Allowances 1989

2. What is your basal metabolic rate?

Based on the activity scale provided below, determine your VMA. For example, the VMA for a housewife whose BMR is 1500 kcal is calculated by multiplying 1500 kcal x 40% or 0.4, which equals 600 kcal.

Physical activity

- The energy requirement depend on the occupation, physical activity and lifestyle of the individual.

Light worker (teachers, doctors)	30-40% BMR
Moderate worker (housewives, students)	40-50% BMR
Heavy work (labourers)	50-60% BMR
Very heavy work (workers & rickshaw pullers)	60-100% BMR

3. What is your VMA?

Specific Dynamic Action is 10% or 0.1 of (BMR + VMA).

4. What is your SDA?

Lab Activity 2

Determine the calories for the following snacks. You can search the web to find some of the data.

Snacks	Kcal/Serving	# of Serving	Total Kcal
Cheetos			
Regular Sprite			
Reese Butter Cups			
Monster Energy Drink			
KitKat			
Starbuck's Mocha Frappucino			

5. If you consumed a KitKat and a whole can of Monster, what percent of your TDER will you have consumed? Show all your work!
6. If you had consumed 1 serving of Cheetos and a can of Sprite, what percent of your TDER is this?
7. What percent of your TDER is a tall (12 ounce) Mocha Frappucino?

Activity Calories/min.	120 lb.	140 lb.	160 lb.	180 lb.
Basketball	7.5	8.8	10.0	11.3
Bowling	1.2	1.4	1.6	1.9
Cycling (10 MPH)	5.5	6.4	7.3	8.2
Dancing (aerobic)	7.4	8.6	9.8	11.1
Dancing (social)	2.9	3.3	3.7	4.2
Gardening	5.0	5.9	6.7	7.5
Golf (pull/carry clubs)	4.6	5.4	6.2	7.0
Golf (power cart)	2.1	2.5	2.8	3.2
Hiking	4.5	5.2	6.0	6.7
Jogging	9.3	10.8	12.4	13.9
Running	11.4	13.2	15.1	17.0
Sitting, quietly	1.2	1.3	1.5	1.7
Skating (ice and roller)	5.9	6.9	7.9	8.8
Skiing (cross country)	7.5	8.8	10.0	11.3
Skiing (water and downhill)	5.7	6.6	7.6	8.5
Swimming (crawl, moderate pace)	7.8	9.0	10.3	11.6
Tennis	6.0	6.9	7.9	8.9
Walking	6.5	7.6	8.7	9.7
Weight Training	6.6	7.6	8.7	9.8

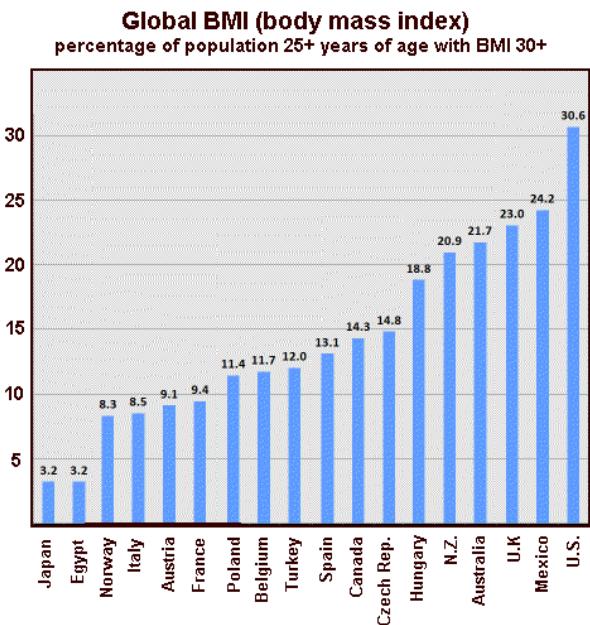
8. Refer to the Activity/Calories chart above, estimate how many minutes of walking would it take YOU to burn the calories contained in a can of regular Sprite.

9. How many minutes of jogging would it take YOU to burn off the calories contained in one serving of Cheetos and a can of regular Sprite?

10. Describe three health problems associated with obesity.

11. Do you think that obesity is a problem only for those who are obese? Why or why not?

12. Can you automatically assumed that a person with a BMI of 32 is obese? Why or why not?



13. Considered the graph above. Why do you think the U.S. has the highest percentage of adults over 25 who are obese?

