

# The Effects of Food on Digestion

**BACKGROUND:** When an animal eats, the food must be digested, or broken down into nutrients that the animal's cells can use. In humans food is mechanically and chemically digested. *Mechanical digestion* involves mixing, grinding, or crushing large pieces of food into small pieces. *Chemical digestion* occurs when digestive enzymes break down complex molecules, such as proteins into smaller molecules, which can then be absorbed in the intestines and carried throughout the body.

One of the things you must realize is that you cannot get the most from foods that you have not completely digested. Foods in your stomach have not been completely digested. The process of digestion is completed in the small intestine. You must also realize that the amount of time food spends in your stomach depends on the kinds of food you have eaten. Although you cannot control the length of time that food remains in your stomach, you can control the foods you eat.

In terms of chemical makeup, foods are classified into three categories. *Carbohydrates* (sugars and starches) provide immediate energy for the body's activities. *Proteins* are used for growth and repair of body tissues. *Fats* are a form of stored energy. Because stored fat must be broken down in the body's cells before it is used, stored fats are not a form of quick energy.

Table 1 presents a list of various foods. Although some of these foods contain more than one nutrient, the major nutrient in each food is shown. Table 2 shows the amount of time some of these foods remain in the stomach. Table 3 shows the recommended Dietary allowances for males and females between the ages of 12 and 16. And finally, table number 4 lists Nutritional information about a variety of popular foods. Use the tables to answer the questions on the following pages.

**Table 1: MAJOR NUTRIENT IN VARIOUS FOODS**

Food	Carbohydrate	Fat	Protein	Food	Carbohydrate	Fat	Protein
Bacon		X		Lean hamburger			X
Bread	X			Low-fat milk			X
Butter		X		Orange	X		
Cereal	X			Potato (boiled)	X		
Chicken (without skin)			X	Potato (fried or french-fried)		X	
Cream		X		Potato chips		X	
Steak			X	Spaghetti	X		

**Table 2: TIME VARIOUS FOODS STAY IN THE STOMACH**

Bread, spaghetti, rice, orange	2-3 hours
Chicken, lean hamburger, steak	3-4 hours
Bacon, butter, cream	4-6 hours

Table 3: Recommended Dietary Allowances

Sex	Age	Calories	Protein (g)	Calcium (mg)	Iron (mg)	Vitamins		
						A (i.u.)	B <sub>1</sub> (mg)	C (mg)
Males	12-16	2700-3000	46-54	1200	18	5000	1.4	50-60
Females	12-16	2100-2400	44-48	1200	18	4000	1.1	50-60

g = grams, mg = milligrams, i.u. = international units

Table 4: Table of Nutrition Information

Food	Amount	Calories	Protein (g)	Calcium (mg)	Iron (mg)	Vitamins		
						A (i.u.)	B <sub>1</sub> (mg)	C (mg)
Hamburger	113 g	300	20.2	11	3.1	40	.09	0
Hot dog or hamburger bun	1	90	2.5	22	0.6	trace	.08	trace
T-bone steak	227 g	800	30.0	16	4.4	150	.12	0
Fried chicken	¼	230	22.4	18	1.8	230	.07	0
Egg	11 g	80	6.5	27	1.2	590	.15	0
Flounder	100 g	70	14.9	61	0.8	—	.06	—
Bacon	1 slice	50	1.8	1	0.2	0	.04	0
Hot dog	1	125	7.0	3	0.6	0	.08	0
Shrimp	0.2 kg	145	28.3	26	1.8	—	—	—
American cheese	28 g	105	7.0	198	0.3	350	.01	0
Milk	1 cup	160	9.0	288	0.1	350	.07	2
Ice cream	1 cup	255	6.0	194	0.1	590	.05	1
Lima beans	½ cup	130	8.0	28	2.9	—	.12	—
Green beans	½ cup	15	1.0	31	0.4	340	.05	8
Broccoli	1 stalk	25	3.1	88	0.8	2500	.09	90
Corn	1 ear	70	3.0	2	0.5	310	.09	7
Blackeyed peas	½ cup	90	6.5	20	1.7	280	.02	14
Baked potato	1 med.	145	4.0	14	1.1	trace	.15	31
French fries	20	310	4.0	18	1.4	trace	.14	24
Potato chips	20	230	2.0	16	0.8	trace	.08	6
Apple	1 med.	80	0.3	10	0.4	120	.04	6
Banana	1 med.	100	1.0	10	0.8	230	.06	12
Fresh strawberries	½ cup	35	0.5	14	0.6	80	.02	16
Orange juice	1 cup	120	2.0	25	0.2	550	.22	124
White bread	1 slice	65	2.0	22	0.6	trace	.06	trace
Chocolate chip cookie	1	50	0.5	4	0.2	10	.01	trace
Chocolate cake	1 piece	235	3.0	41	0.6	100	.02	trace
Corn flakes	1 cup	95	2.0	6	0.5	0	.10	0
Pancake	1	105	3.2	27	0.6	.54	.08	trace
Syrup	1 Tbsp.	50	0	33	0.6	0	—	0

## *QUESTIONS:*

1. What type of food did you choose to barbecue? (Chicken, steak, vegetables,....)
2. What is the major nutrient found in this food? (carbohydrate, fat or protein)
3. Which kind of food remains in the stomach for the shortest period of time? (carbohydrate, fat or protein)
4. Which contains more protein per serving (according to table)— Steak or chicken?
5. Which contains more calories per serving (according to table)— Steak or chicken?
6. Steak and hamburger are both proteins. Steak remains in the stomach longer than hamburger. Suggest a reason why this is true.
7. Fried chicken usually remains in the stomach longer than broiled or barbecued chicken. Explain why.
8. Why would you become hungry more quickly after a meal of cereal and toast than after a meal of hamburger and eggs?

9. It is generally desirable for an athlete to compete on an empty stomach. During vigorous exercise, the blood flow to the digestive system decreases. If food is in the stomach, the decreased flow of blood may cause cramps. Keeping in mind the roles that carbohydrates, fats, and proteins play and the amount of time each remains in the stomach, estimate the number of hours it will take after your meal before you should compete. Explain how you calculated this.

10. Proteins are necessary for growth and repair in the human body. If you do not get these proteins in meat products, what are some alternative foods you could eat?

11. Why does cooking food before you eat it help the digestive process?

12. What is your recommended daily dietary allowance in Calories?

13. What percent of your daily dietary allowance of protein did you consume during our lab?

14. How many Calories do you think you consumed during the lab (bbq)?

15. Removing the skin from chicken before you cook and eat it reduces the number of Calories dramatically. Why do you think this is so?

## Bonus Questions: 2 pts. Each

1. Identify the muscle type you are eating. (if you didn't eat meat today, describe which type of muscle your neighbor is eating) Give general characteristics of this type of muscle.
2. Are there any bones in your meal? If so, name the bone. (if there is not, use a neighbor's meal)
3. Often times, meat tenderizer is used on meat before cooking. A chemist would say that it is "pre-digesting" your meat for you. What do they mean by this statement?
4. Name the other two types of muscle found in the human body (ones not found in your meal) and give general characteristics of each type.
5. What is the major difference between "white meat" and "dark meat"? (and don't say one is white and one is dark. Give me the anatomical and physiological difference)