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Fiber: Not Enough of a Good Thing?

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The most recent Surgeon General's *Report on Nutrition and Health* advises Americans to increase consumption of all complex carbohydrates, including dietary fiber.

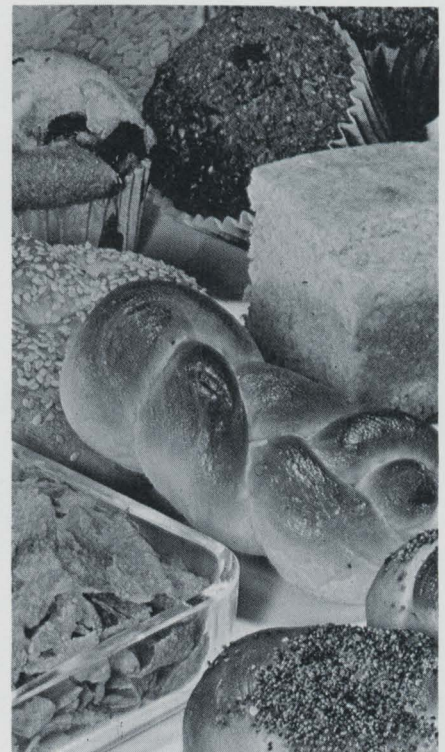
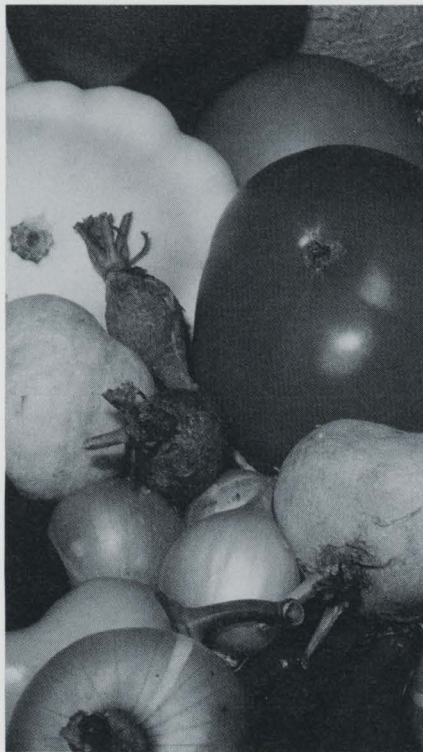
Despite intensive efforts by nutritionists, manufacturers, and others to spread the word about the virtues of fiber, intakes remain below the levels recommended by some health authorities. One reason may be that some population groups still know little about fiber and its relationship to health. Who are they? Likewise, what groups can identify foods high in dietary fiber and which Americans have the highest fiber intake?

Data from USDA's 1989-90 Diet and Health Knowledge Survey (DHKS) and its associated Continuing Survey of Food Intakes by Individuals (CSFII) provided the basis for this article. The CSFII survey collects information on what Americans eat and how much they eat, as well as personal health-related data. The DHKS, a follow-up survey to the CSFII, collects information from the household's main meal planner/preparer on his or her attitudes and knowledge about food and nutrition and health issues (see inside front cover for

more information about the surveys). These surveys are among the first to provide information on nutritional knowledge and attitudes and food consumption from the same individual. Only meal planners/preparers who provided 3 days of food intake information and completed the DHKS are reported in this article. There were

2,880 respondents meeting these criteria.

These surveys reveal that many meal planners are aware of the relationship between what they eat and their overall health. With regard to dietary fiber, a fair number are aware of the link between intake and various health problems. A number of meal planners are



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Regardless of a person's age, race, or income, two food categories provided the bulk of dietary fiber: cereal and bakery products, and vegetables and potatoes. Fruit seems to be a neglected source.

also able to distinguish among high- and low-fiber foods.

Yet despite this "good news," average dietary fiber intakes are still far below amounts recommended by the National Cancer Institute and the American Cancer Society—suggesting that nutritional knowledge and awareness may not be sufficient to spur consumption changes.

Advantages to a High-Fiber Diet Relatively Clear

According to the CSFII, Americans currently consume about 12 grams of dietary fiber per day, a far cry from the National Cancer Institute's recommendation of eating foods that provide 20 to 30 grams of fiber per day. The Daily Reference Value, established by the Food and Drug Administration for use on food labels, is 11.5 grams of dietary fiber per 1,000 calories—28.75 grams of fiber in a 2,500 calorie diet. Consequently, we have a long way to go before reaching most recommended intakes and, therefore, obtaining the full advantages of a high-fiber diet.

Much has been written concerning the link between dietary fiber consumption and health. Elevated blood cholesterol levels are known to be one of the chief risk factors in heart disease, and a number of studies have linked diets high in soluble-fiber with reduced blood cholesterol levels (see box for more on the types of fiber). Only soluble fiber may produce a significant reduction of blood cholesterol levels, and the exact mechanism of this action is not yet totally understood.

"Eating foods with fiber is important for proper bowel function and can reduce symptoms of chronic constipation, diverticular disease, and hemorrhoids," according to the *Dietary Guidelines for Americans*. The guidelines suggest

Dietary Fiber: A Complex Carbohydrate

Sugar, fruit, vegetables, and breads are all sources of carbohydrates. In fact, all sugars and starches that we eat, as well as dietary fiber, are carbohydrates. Most carbohydrates are converted by the body into an essential substance—glucose, the main sugar in the blood and the body's basic fuel.

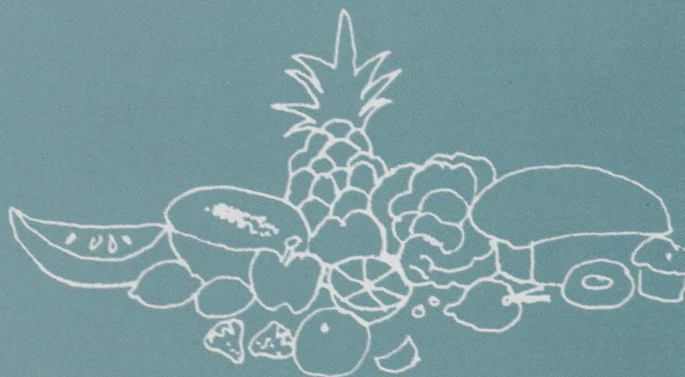
There are two general types of carbohydrates: simple and complex. Simple carbohydrates are the familiar sugars contained in such products as non-diet sodas and candy—foods that are generally high in calories with little nutritional value. In contrast, most foods containing complex carbohydrates are loaded with nutritional extras. Compare, for example, a slice of whole wheat bread, which contains 130 calories, and a regular soda with 150 calories. In addition to carbohydrates, the bread contains valuable nutrients, such as protein, B vitamins, iron, and dietary fiber. The soda contains none of these nutritional benefits.

All dietary fibers have two things in common: they are found only in plant foods and they are resistant to human di-

gestive enzymes. While most other foods are digested and then absorbed as they pass through the small intestine, dietary fiber enters the large intestine relatively intact. This helps reduce symptoms of chronic constipation, diverticular disease, and some types of "irritable bowel."

Dietary fiber is divided into two basic groups, soluble and insoluble. Insoluble dietary fiber absorbs many times its weight in water, expanding in the intestine. This type of dietary fiber is found mainly in whole grains and on the outside of seeds, fruit, legumes, and other foods. This type of fiber is key in promoting more efficient elimination by increasing stool bulk and may alleviate some digestive disorders. It is also thought to play a role in colon cancer prevention.

Soluble dietary fiber is found in fruit, vegetables, seeds, brown rice, barley, oats, and oat bran. It can help produce a softer stool, and it works to increase cholesterol excretion in the bowel (by binding bile acids) and preventing their reabsorption.



that diets low in dietary fiber may increase the risk of developing certain types of cancer.

Research on the link between dietary fiber and health is not sufficiently developed to associate a specific type of fiber or characteristic of fiber—such as particle size, chemical composition, or water-holding capacity—with reducing health risks. That is, the specific mechanism through which fiber works to reduce health risks has not yet been found. It is not clear whether the health benefits are due to fiber or to other substances in foods that contain fiber.

For these reasons, the new nutrition labeling regulations require food labels which make health claims about dietary fiber intake to contain very specific language. The new food labeling regulations set forth by The Nutrition Labeling and Education Act of 1990 currently specifically prohibit health claims relating fiber consumption to reduced risk for coronary heart disease and cancer. The new regulations do allow health claims relating diets low in fat and high in fiber-containing grain products, fruit, and vegetables to a reduced risk of cancer and/or coronary heart disease.

Some People Know About Fiber and Believe They Need More of It

The DHKS revealed that nearly 9 out of 10 meal planners believe that what you eat can make a big difference in your chances of getting a disease; about 12 percent disagreed. About 59 percent of the meal planners felt their diet was healthy and saw no need to change. In contrast, about 40 percent disagreed with the statement that their diet is healthy and change is not necessary.

When it came to fiber, 42 percent of the meal planners thought their diets should contain more. Only 3 percent thought their diets contained too much fiber, while over 50 percent thought their diets were about right in fiber (table 1). Those feeling their diets should be lower in fiber consumed only 7.3 grams per day, meal planners believing their diets contained about the right amount consumed 11.4 grams, while those thinking their diets should be higher in fiber con-

sumed 12.5 grams. All of these groups fell well below the National Cancer Institute's recommended daily consumption of 20 to 30 grams.

Over half (54 percent) of the meal planners indicated that they were aware of health problems associated with fiber intake (table 2). Of those, 15 percent mentioned circulation and heart problems, 40 percent mentioned cancer, and about 56 percent said bowel problems. Meal planners who were

Table 1
Many Believe They Get the Right Amount of Fiber in Their Diet

Group	Share of meal planners	Meal planners report the level of fiber in their diet should be—		
		Lower	Higher	About right
Percent				
All	100	3	42	51
Age:				
Under 30 years	18	5	47	45
30-49 years	45	3	52	43
50-69 years	24	3	30	64
70 years and over	13	2	20	70
Sex:				
Male	20	2	42	50
Female	80	4	41	52
Race:				
White	85	3	41	53
Black	11	6	49	40
Other ¹	4	3	32	56
Income, percent of poverty line ² :				
130 percent and less	18	5	35	54
131-185 percent	11	2	43	53
186-350 percent	28	2	40	53
Over 350 percent	43	4	45	50
Education:				
Less than high school	21	3	43	49
Completed high school	35	4	43	50
More than high school	43	2	37	59

Note: Data may not total due to rounding. ¹"Other" race includes Aleuts, Eskimos, American Indians, Asian/Pacific Islanders, and other nonwhite/nonblacks. ²The poverty line adjusts household income for household size and composition. In 1989, the average poverty threshold for a household of four was \$11,669. The Food Stamp Program uses 130 percent of the poverty line as the cutoff for its income eligibility criteria; the Women, Infants, and Children (WIC) Program uses 185 percent of the poverty line as the cutoff for its income eligibility criteria.

Table 2
Over Half Are Aware of Fiber's Health Benefits

Group	Share of meal planners	Awareness of link between low fiber intake and health risk:		
		Aware	Unaware	No answer
Percent				
All	100	54	46	1
Age:				
Under 30 years	18	45	54	1
30-49 years	45	59	40	1
50-69 years	24	56	44	1
70 years and over	13	42	56	2
Sex:				
Male	20	50	49	1
Female	80	55	45	1
Race:				
White	85	56	43	1
Black	11	41	59	—
Other ¹	4	48	52	—
Income, percent of poverty line ² :				
130 percent and less	18	38	62	1
131-185 percent	11	49	49	3
186-350 percent	28	56	43	1
Over 350 percent	43	61	39	—
Education:				
Less than high school	21	35	63	2
Completed high school	35	51	51	1
More than high school	43	65	65	—

Note: Data may not total due to rounding. — = Less than 1 percent. ¹"Other" race includes Aleuts, Eskimos, American Indians, Asian/Pacific Islanders, and other nonwhite/nonblacks. ²The poverty line adjusts household income for household size and composition. In 1989, the average poverty threshold for a household of four was \$11,669. The Food Stamp Program uses 130 percent of the poverty line as the cutoff for its income eligibility criteria; the Women, Infants, and Children (WIC) Program uses 185 percent of the poverty line as the cutoff for its income eligibility criteria.

aware of health problems consumed 12.9 grams of fiber per day compared with 10.5 grams for those unaware of the linkage.

Most of the meal planners were aware, at least generally, that different kinds of dietary fiber have different bodily interactions. About 75 percent agreed that different kinds of fiber have different health benefits. Only 18 percent disagreed with the statement.

Meal planners were able to identify which in a pair of foods was higher in fiber in about five out of six cases—exceeding the Federal Government's goal that by 1990, 70

percent of the population would be able to identify foods that are good sources of fiber. When asked which foods had more fiber (fruit or meat, cornflakes or oatmeal, whole wheat or white bread, orange juice or apples, popcorn or pretzels, and kidney beans or lettuce), about 80 percent chose the correct food in at least five out of six comparisons. The only example that fell short of the goal was for kidney beans versus lettuce. Only 59 percent of the respondents correctly identified kidney beans as having more fiber.

On average, female meal planners were more likely than male

meal planners to correctly identify the better fiber sources (table 3).

Both income and education seemed to be associated with knowledge about sources of fiber. For example, out of six questions, the highest income meal planners answered an average of 5.2 questions correctly, compared with 4.3 for the lowest income group. Meal planners with at least some college background answered about 5.2 questions correctly, while those with less than a high school education correctly identified only 4.2.

Translating Awareness Into Intake

A first step in meeting the challenge of improving dietary fiber intake is to identify target groups that have low dietary fiber intakes and determine whether they lack awareness of the nutritional benefits of increased fiber consumption.

Consumption of fiber increases with age (table 3). Meal planners under age 30 consume 10.5 grams of fiber daily, while those over age 70 consume 13.1 grams. And, older meal planners are much more likely than their juniors to believe that their diets contain about the right amount of fiber to be considered healthful (table 1). Yet, age is not clearly associated with awareness of health problems associated with fiber intake. Over half of meal planners under age 30 and those over age 70 did not know of any diet-health link associated with fiber (table 2). This compares with 40 to 44 percent for middle-age meal planners.

Male meal planners consume about 20 percent more fiber each day than do female meal planners (14 grams versus 11.7), mainly because of their higher food intake. About the same share of men and women meal planners, 50 percent, thought their diets contained about the right amount of fiber. However, female meal planners were

Table 3
Meal Planners Can Identify Good Sources of Fiber

Group	Correctly identified the better source of fiber among two foods	Fiber intake
	Average number of correct answers (out of six)	Grams
All	4.8	12.0
Age:		
Under 30	4.7	10.5
30-49 years	5.0	10.8
50-69 years	4.9	12.7
70 and over	4.5	13.1
Sex:		
Male	4.4	14.0
Female	4.9	11.7
Race:		
White	4.8	12.3
Black	4.9	9.5
Other ¹	4.5	12.3
Income, percent of poverty line ² :		
130 percent and less	4.3	11.1
131-185 percent	5.0	12.5
186-350 percent	4.8	11.2
Over 350 percent	5.2	13.0
Education:		
Less than high school	4.2	11.1
Completed high school	4.9	12.3
More than high school	5.2	12.3

¹Other¹ race includes Aleuts, Eskimos, American Indians, Asian/Pacific Islanders, and other nonwhite/nonblacks. ²The poverty line adjusts household income for household size and composition. In 1989, the average poverty threshold for a household of four was \$11,669. The Food Stamp Program uses 130 percent of the poverty line as the cutoff for its income eligibility criteria; the Women, Infants, and Children (WIC) Program uses 185 percent of the poverty line as the cutoff for its income eligibility criteria.

more likely to be aware of problems associated with fiber intakes.

A lower percentage of black than white meal planners were aware of health problems associated with the amount of fiber people eat. Fewer black meal planners thought their diets contained sufficient fiber than did white meal planners (40 percent versus 53 percent), and this is evidenced by their lower intakes: 9.5 grams versus 12.3 grams, respectively.

The awareness of health problems related to fiber intake appears to be associated with income and education (table 2). Sixty-one per-

cent of the highest income meal planners said they were aware of such health problems, compared with 38 percent among the lowest income group. Only 35 percent of meal planners with less than a high school education knew of health problems associated with fiber consumption, compared with 65 percent of those with more than a high school education.

Fruit a Neglected Source of Fiber

Regardless of a person's age, race, or income, two food categories provided the bulk of dietary fi-

New Nutrition Labels Coming

In January 1993, the Federal Government established new regulations which change the format and content of nutrition labels, standardize serving sizes, and define a number of claims regarding nutrient content.

The new format is required for most processed food products that are labeled after May 8, 1994 (for other than meat or poultry foods) or July 6, 1994 (for meat and poultry products). A number of foods in the stores are already sporting the new labels.

The new content provides information of current interest to consumers, such as the amount of saturated fat, cholesterol, and dietary fiber in one serving of the food. Standardized serving sizes will make it easier for consumers to compare products. Strict definitions of terms—such as "low fat," "light," "reduced fat," "low cholesterol," and "high fiber"—will help minimize confusion.

ber. Meal planners received an average of 42 percent of their dietary fiber from cereal and bakery products and 28 percent from vegetables and potatoes (table 4). (The food groups used were developed by USDA's Human Nutrition Information Service. In general, mixtures, such as TV dinners and casseroles, are categorized by their primary ingredient.)

The percentage of total dietary fiber received from any given food category varied with individual characteristics. For example, black

Table 4
Cereal and Bakery Products Are the Primary Source of Fiber

Group	Total fiber intake	Reported consumption from—					
		Meat, poultry, fish, and egg dishes	Cereal and bakery	Legumes, nuts, and seeds	Fruit	Vegetables and potatoes	Other
	Grams	Percent of fiber in daily diet					
All	12.0	7	42	8	11	28	4
Age:							
Under 30 years	10.5	8	45	7	8	27	5
30-49 years	10.8	7	43	7	10	28	5
50-69 years	12.7	6	40	10	13	30	3
70 years and over	13.1	5	41	8	16	28	2
Race:							
White	12.3	7	43	8	11	28	4
Black	9.5	7	36	12	9	31	5
Other ¹	12.3	8	42	10	13	24	3
Income, percent of poverty line ² :							
130 percent and less	11.1	7	39	13	10	28	3
131-185 percent	12.5	7	42	6	11	29	5
186-350 percent	11.2	7	41	8	11	29	4
Over 350 percent	13.0	7	44	7	12	27	4

Note: Data may not total due to rounding. ¹"Other" race includes Aleuts, Eskimos, American Indians, Asian/Pacific Islanders, and other nonwhite/nonblacks. ²The poverty line adjusts household income for household size and composition. In 1989, the average poverty threshold for a household of four was \$11,669. The Food Stamp Program uses 130 percent of the poverty line as the cutoff for its income eligibility criteria; the Women, Infants, and Children (WIC) Program uses 185 percent of the poverty line as the cutoff for its income eligibility criteria.

Food Consumption, Prices, and Expenditures, 1970-92

This annual comprehensive report by USDA's Economic Research Service presents historical data on U.S. food consumption, nutrients available for consumption, and retail food prices. Also included are U.S. and world food expenditures, and U.S. income and population.



Some Highlights . . .

- **Food Consumption:** Between 1970 and 1992, each American consumed, on average, 18 pounds less red meat, 26 pounds more poultry, and 3 pounds more fish and shellfish.
- **Food Prices:** As measured by the Consumer Price Index, retail food prices in 1992 averaged 1.2 percent above those in 1991—less than half the 1991 price increase of 2.9 percent. The 1992 increase was the lowest since 1967, when the index rose 0.9 percent.
- **Food Expenditures:** Americans spent over \$600 billion for food in 1992 and another

\$87 billion for alcoholic beverages. Away-from-home meals and snacks captured 45 percent of the U.S. food dollar, up from 39 percent in 1980 and 34 percent in 1970. The percentage of disposable income spent on food declined to 11.5 percent in 1992 from 13.9 percent in 1970.

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Measuring Fiber Content in Foods

Since dietary fiber is such a complex group of substances, it is difficult to measure the amount of fiber contained in various foods. Old methods measured fiber left after strong chemicals "digested" food—called "crude" fiber. But this amount of crude fiber only tells part of the story since the chemicals destroy some insoluble, and much soluble, fiber.

Today, milder chemicals and enzymes are used to analyze foods for their fiber content.

What remains in these analyses is "dietary" fiber. The amount of dietary fiber in a food includes soluble and insoluble fiber, and this measure is usually two to five times larger than its crude fiber.

A variety of methods have been developed for determining dietary fiber and for determining the soluble and insoluble fractions of dietary fiber. New research will continue to improve the available data on dietary fiber in foods.

Good sources of fiber	Serving size	Dietary fiber
	Standard reference	Grams per serving
Grains:		
Bread, white	1 slice	0.6
Bread, whole wheat	1 slice	2.0
Oatmeal, dry	1/3 cup	2.9
Rice, white, cooked	1/2 cup	0.3
Rice, brown, cooked	1/2 cup	1.8
Fruit:		
Apple, with skin	1 small	3.7
Banana	1 small	2.7
Figs, dried	10 fruit	17.4
Pear, with skin	1 large	4.0
Prunes, dried	10 medium	6.0
Vegetables:		
Asparagus, cooked	1/2 cup	1.9
Broccoli, cooked	1/2 cup	2.3
Carrots, cooked, sliced	1/2 cup	2.6
Green peas, frozen, then cooked	1/2 cup	4.4
Potato, with skin, baked	1/2 cup	4.8
Tomatoes, raw	1 medium	1.4
Legumes:		
Blackeye peas, canned	1/2 cup	4.0
Kidney beans, cooked	1/2 cup	6.5
Lentils, cooked	1/2 cup	7.8
Lima beans, canned	1/2 cup	5.8
Pinto beans, canned	1/2 cup	4.2
White beans, cooked	1/2 cup	6.3

Source: USDA, Human Nutrition Information Service, *USDA Nutrient Data Base for Standard Reference, Rel. #10, 1993.*

meal planners received 36 percent of their fiber from cereal and bakery products and 31 percent from vegetables and potatoes, versus 43 and 28 percent, respectively, for white meal planners.

Older meal planners tended to receive more of their fiber from fruit—16 percent for those over age 70, compared with 8 percent for those under age 30. Meal planners in the highest income households tended to receive less fiber from legumes, nuts, and seeds than did those with the lowest incomes. Instead, the highest income meal planners received more fiber from fruit, and from cereals and bakery products.

The arrival of mandated nutrition labels in 1994 and increased efforts by Federal and State governments and private groups to encourage people to eat healthier diets should push Americans higher up on the nutrition learning curve. These activities, coupled with food industry efforts to develop and market alternative food products of higher nutritional quality, will begin to pay dividends to all Americans in the form of healthier and longer lives. In turn, eating healthier should help drive down health care costs associated with nutrition-related diseases—an added advantage for all of us.

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