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## REPORT

### New Findings on Fiber

#### Research Confirms Benefits of Fiber for Weight Loss, Lower Cholesterol, and Reduced Blood Glucose.

By Stephen Laifer

Recent interest in the importance of including fiber in the diet belies the fact that nutritional specialists have advocated its benefits for more than half a century. Even before the fifth century BC, the Greek physician Hippocrates, often regarded as the father of Western medicine, recommended consuming fiber-rich natural foods. In 1953, nutritionist E. H. Hipsley introduced the term “dietary fiber” to represent intake of the indigestible components of plant cell walls.<sup>1</sup>

A more precise definition of fiber was established in 1969, as prevailing nutritional habits were linked with the prevalence of various diseases.<sup>2,3</sup> In their study of traditional foods consumed by different cultures, Drs. Hugh Trowell and Dennis Burkitt noted that cultures with diets rich in plant foods rarely suffered from illnesses like diabetes, cancer, and cardiovascular disease.<sup>4</sup> By contrast, these diseases had become widespread in developed Western societies in the late 1800s with the advent of a milling technique that produced a new, fiber-depleted dietary staple: white flour.<sup>3</sup> Fiber, they therefore reasoned, might offer protection against many of the diseases prevalent in modern Western societies.



These early nutrition research findings have been borne out by countless subsequent studies. One recent study found that every additional 10 grams of fiber consumed on a daily basis cuts the risk of coronary heart disease death by 27%.<sup>5</sup> Modern medicine recognizes fiber—the edible parts of plants that are resistant to digestion and absorption in the human small intestine—to be an essential component in maintaining a healthy body. Today, a growing body of research is examining one of fiber’s least-publicized benefits: its ability to help reduce caloric intake and thus maintain a healthy weight.

### CONTROLLING WEIGHT, PREVENTING DISEASE

One of the most alarming health concerns of the last decade is explosive growth in the number of people—especially younger people—who are overweight or obese. Processed foods and increasingly sedentary lifestyles exacerbated the problem throughout the twentieth century. By the turn of the millennium, obesity had already become epidemic in the US and other industrialized nations.<sup>6</sup> Using standardized heights and weights, the 1999-2000 National Health and Nutrition Examination Survey (NHANES) estimated that 65% of American adults were overweight or obese.<sup>7</sup> Being overweight or obese is associated with the increased risk or onset of afflictions such as atherosclerosis, coronary heart disease, and diabetes.

Modern science confirms that fiber can help maintain normal body weight by reducing food intake at each meal. The body processes a fiber-rich meal more slowly, which promotes feelings of fullness or satiety sooner. Fiber-rich food is also typically lower in calories, fat, and added sugars, and is thus less “energy dense” than other dietary choices. All these factors help create a dietary pattern that can be beneficial in preventing or correcting undesirable weight gain.



A study by the Dutch Animal Sciences Group found that dietary fiber stabilized glucose and insulin levels in sows on restricted diets several hours after feeding. The animals’ behavior indicated that increased fiber intake promoted a prolonged feeling of satiety.<sup>8</sup> Dietary energy density was the focus of another series of long-term studies designed to prove that diets low in energy-dense foods promote weight loss. In studies lasting longer than six months, weight loss was more than three times as great in people eating low-fat, high-fiber diets than in those eating diets low in fat only.<sup>9</sup>

A 1997 study investigated the effects of one week of supplementation with guar gum (a water-soluble fiber) on hunger and satiety, as well as calorie intake, in obese test subjects. Adding fiber to the diet decreased food intake, and subjects on a reduced-calorie diet reported diminished hunger after supplementing with fiber. Thus, fiber may assist in weight-management programs by promoting a feeling of fullness, decreasing hunger, and promoting adherence to a reduced-calorie diet.<sup>10</sup>

Another study confirmed these effects. When overweight individuals added 14 grams of fiber daily to their otherwise unrestricted diet, they consumed 10% fewer calories. This led to an average of 4.2 pounds of weight loss in just under four months.<sup>11</sup>

Research also indicates that energy density and macronutrient composition may be more important than caloric intake in diets that contribute to obesity.<sup>12</sup> Usually, foods that are rich in dietary fiber are relatively low in fat and contain components that are primarily indigestible. A diet that provides energy from proteins, vitamins, minerals, and fibers can help lower fat intake and assist in maintaining or improving body weight. These factors are especially important in treating obesity in children, according to the Department of Pediatrics at Harvard Medical School, which notes that modern nutritional research indicates an important role for fiber in regulating body weight.<sup>13</sup>

## CALCIUM COMPLEMENTS FIBER'S EFFECTS

While weight loss is associated with myriad benefits for health and longevity, one potentially negative effect of losing weight is that it often reduces bone mass and increases the risk of fracture. In fact, researchers have hypothesized that during periods of weight loss, the body's calcium requirement increases.<sup>20</sup> Diets rich in protein and calcium may protect against bone loss during weight reduction.<sup>21</sup>

### GLUCOMANNAN AND PGX™

Soluble fibers offer many health-promoting benefits through their ability to form a soft gel with water. Research indicates that soluble fibers help lower blood cholesterol, slow glucose absorption, and promote regular bowel movements. While found in many sources such as fruits, vegetables, oats, and beans, the most-promising soluble fiber may come from glucomannan. Derived from konjac root, glucomannan has an extraordinary water-holding capacity and is the most viscous of all known dietary fibers.<sup>14</sup>

Glucomannan offers benefits for those seeking to lose weight. Studies show that supplementing with glucomannan enhances the weight-loss effects of a calorie-restricted diet.<sup>15</sup> Glucomannan may promote weight loss in obese adults, even in the absence of a calorie-restricted diet. When obese adults consumed 1 gram of glucomannan fiber one hour before each meal for eight weeks, they lost an average of 5.5 pounds of body weight—with no other changes to their eating or exercise patterns.<sup>16</sup>

Glucomannan creates a feeling of satiety or fullness through its water-binding effects. By creating a thick gel, glucomannan delays gastric emptying and slows the release of sugar into the bloodstream, which helps to lower levels of insulin and blood glucose. Additionally, glucomannan improves blood-lipid profiles and can lower systolic blood pressure.<sup>17,18</sup> Because of these effects, glucomannan can greatly benefit individuals with metabolic syndrome or diabetes.

One of the most promising fiber products available today is a proprietary blend of glucomannan, xanthan gum, and sodium alginate called PGX™. This fiber blend reduces harmful cholesterol and LDL (low-density lipoprotein), slows carbohydrate absorption, and promotes weight loss. Unlike some other fiber sources, however, PGX™ confers benefits even in small doses.

Scientists at the University of Toronto examined how various forms of fiber modulate the glycemic index. In this study, participants consumed 3 grams of various fibers before a 20-gram glucose challenge. The glycemic index of the control group receiving no fiber was 100, which correlates with a large increase in blood sugar level. Participants who received 3 grams of either psyllium or xanthan gum saw only minor reductions of 3% and 6%, respectively, in the glycemic index. By contrast, participants consuming 3 grams of the PGX™ proprietary fiber blend saw a 39% reduction in their glycemic index. Thus, consuming 3 grams of PGX™ before eating significantly reduces insulin-spiking carbohydrates released into the bloodstream following a meal.<sup>19</sup> (For more information on PGX™, see "Novel Fiber Limits Sugar Absorption," Life Extension, September 2004.)

Calcium not only helps protect bone health during weight loss, but also assists in weight loss. Calcium can actually increase the rate of weight and fat loss during caloric restriction. In a 24-week study of obese adults on a calorie-restricted diet, those on a diet high in calcium or dairy foods lost more weight and body fat than those on a standard diet. In addition, more abdominal fat was lost in the calcium and dairy groups.<sup>22</sup>



A recent study shed some light on how calcium may promote weight loss. Calcium may help reduce body weight by binding to fat in the intestine and increasing its excretion from the body.<sup>23</sup> Danish researchers demonstrated a 2.5-fold increase in the amount of fat measured in fecal matter after calcium supplementation.<sup>23</sup>

Some studies show a stronger weight-loss effect from dairy calcium than from supplemental calcium. This may be due to other components of dairy products that promote optimal body composition, such as branched-chain amino acids and whey protein.<sup>24</sup> Epidemiological and clinical trials indicate that diets that include three or more daily servings of dairy products result in significant reductions in fat tissue mass in obese adults, even in the absence of

caloric restriction. When included in a calorie-restricted diet, dairy foods markedly accelerate weight and body fat loss.<sup>24</sup>

Calcium's other health-promoting benefits may include improving cardiovascular health by lowering blood pressure and raising levels of beneficial HDL (high-density lipoprotein). Additionally, calcium has been shown to help prevent colon polyps and to reduce the recurrence of kidney stones.<sup>25</sup>

## LOWERING CHOLESTEROL AND TRIGLYCERIDES

Heart disease is one of the leading causes of mortality in the Western world. Because heart disease is linked to obesity, cardioprevention through dietary means has until recently focused almost exclusively on reducing intake of cholesterol and fat. More recent research, however, shows an important link between enhanced cardiovascular health and greater intake of fruits, vegetables, and whole grains.<sup>26</sup> The protective effect of plant-based foods has been ascribed in large part to their fiber and phytochemical content.

Indeed, fiber's ability to reduce the risk of developing and dying from coronary heart disease was among the earliest findings of dietary fiber research.<sup>27,28</sup> A subsequent 12-year study of 859 southern California men and women upheld this finding, showing that a 6-gram increment in daily fiber intake was associated with a 25% reduction in ischemic heart disease mortality.<sup>29</sup>

Since that landmark long-term study, researchers have delved further into the effects of greater dietary fiber consumption on coronary heart disease risk. A 1999 study in Finland, for example, concluded that high intake of fiber and cereal products was associated with lower levels of serum cholesterol in coronary patients who were not using lipid-lowering medication.<sup>30</sup> Two types of fiber in particular—beta glucan (in oats) and psyllium husk—have been so thoroughly studied that the FDA has authorized a health claim that foods containing 0.75 or 1.7 grams of soluble fiber per serving, respectively, can reduce the risk of heart disease.<sup>31</sup>

High levels of cholesterol and LDL are accepted as risk factors for heart disease. Dietary fiber helps to reduce cholesterol by binding to cholesterol-laden bile excreted from the liver into the small intestine. This reduces the re-absorption of bile into the bloodstream and thus helps to lower total cholesterol, LDL, and serum triglyceride levels simultaneously.<sup>32</sup>

Triglycerides are the compounds in which fat moves through the bloodstream. People who have high levels of potentially harmful LDL and low levels of beneficial HDL often have high triglycerides.

Elevated triglyceride levels are increasingly associated with increased risk for heart disease.<sup>33,34</sup>

Fiber affects another heart disease risk factor known as C-reactive protein (CRP). Elevated CRP levels are associated with an increased risk of heart disease. A 2004 study by the federal Centers for Disease Control and Prevention examined the link between dietary fiber and CRP serum concentration. Using data from 3,920 participants aged 20 and older, the researchers found that increased fiber intake was associated with lower levels of CRP.<sup>35</sup> In fact, the risk of increased CRP concentration was almost halved for those with the highest fiber intake. Thus, fiber favorably influences numerous risk factors for cardiovascular disease, and may help to minimize or eliminate the need for potentially dangerous prescription drugs for cardiovascular health.

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#### NATURAL CANCER WEAPON

Medical researchers estimate that 30-40% of all cancers are preventable by lifestyle and dietary measures alone. Fiber-depleted processed foods are viewed as significant contributors to excess cancer risk.<sup>36</sup>

Recent studies have examined the role of a high-fiber diet—typically supplying more than 34 grams of fiber a day—in preventing cancer. Most of these studies have focused on colorectal cancer. A high-fiber diet reduced the risk for rectal cancer by a remarkable 56% in one study, while eating more than three servings a day of whole-grain products was associated with a 31% reduced risk. By contrast, consumption of refined grain products in excess of 4.5 servings a day was associated with a 42% greater risk of rectal cancer.<sup>37</sup> A similar study by a consortium of health groups, including the National Cancer Institute, showed that high intake of vegetables, fruits, and whole-grain foods—all high in dietary fiber—reduces the risk of distal colon adenomas (precancerous growths of the colon). Patients who consumed the most fiber had a 27% lower risk of adenomas than those who consumed the least fiber.<sup>38</sup>



The 2003 European Prospective Investigation into Cancer and Nutrition (EPIC) was the largest study ever to investigate the association between diet and cancer risk. Spanning 10 countries, the EPIC study followed 519,978 participants, aged 24 to 75, for nearly five years. The study results indicate that abundant intake of dietary fiber is highly protective against colorectal cancer. Participants who consumed the most dietary fiber had a 40% lower risk of developing colon cancer than those who ate the least fiber. The study authors proposed that if populations with a low average dietary intake of fiber doubled their fiber consumption, they could slash their risk of colorectal cancer by 40%.<sup>39</sup>

The Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial compared the fiber intake of 33,971 patients who tested negative for polyps to 3,591 patients who had at least one verified adenoma in the distal large bowel. The study found that patients consuming the most fiber had a 27% lower risk of adenomas than those who consumed the least fiber. Interestingly, the researchers further noted that fiber “might serve as a marker for unmeasured substances that have anti-carcinogenic effects.”<sup>40</sup>

#### DIABETES AND INSULIN CONTROL

The obesity epidemic in America has dramatically increased the incidence of type II diabetes by exacerbating insulin resistance.<sup>41</sup> For those who have tried unsuccessfully to lower cholesterol with a high-carbohydrate, low-fat diet, refined carbohydrates that are low in fiber may be to blame.

Refined, fiber-depleted carbohydrates tend to have a high glycemic index, and thus cause a rapid increase in blood sugar. Following their consumption, a “glucose spike” prompts the pancreas to release insulin, which in turn signals the liver to pump more triglycerides into the bloodstream. Dietary fiber slows the absorption of food so that blood sugar does not rise as rapidly, while also reducing insulin secretion.<sup>42</sup> This was demonstrated in a study published in 2004 in which a high fiber intake led to improved glycemic control, along with reduction of blood pressure and serum cholesterol and triglyceride levels.<sup>43</sup>

Fiber’s positive effects on blood glucose and insulin concentrations are most evident in people diagnosed with diabetes mellitus. In a randomized study, researchers compared the effects of a diet high in fiber (50 grams/day) to those of a moderate-fiber diet (24 grams/day) recommended by the American Diabetes Association. They found that a high intake of dietary fiber, particularly soluble fiber, significantly improves glycemic control, decreases hyperinsulinemia (a disorder associated with aberrant blood sugar control), and lowers plasma lipid concentrations in diabetic patients.<sup>44</sup>

In one study, guar gum improved metabolic control and decreased serum lipids of nine patients with type II diabetes.<sup>45</sup> In another promising research trial, three weeks of supplementation with guar gum lowered both fasting and after-meal blood glucose levels. In addition, the attenuation of insulin levels suggests that guar gum slowed the rate of carbohydrate absorption. Cholesterol levels dropped 14% on average in the diabetic subjects.<sup>46</sup> Thus, supplementation with soluble fibers like guar gum appears to improve glycemic control and lipid profiles in people with type II diabetes.

## SELECTING THE BEST FIBERS



Dietary fibers, which are resistant to digestion by enzymes in the gastrointestinal tract, can be classified as either water soluble or insoluble. Soluble fiber in particular helps lower cholesterol levels by binding to cholesterol in the intestinal tract and increasing its elimination from the body. Good sources of soluble fiber include beans, peas, rice bran, oats, barley, citrus fruits, and strawberries. Adding two to three servings of high-fiber fruit or cereal could provide powerful added protection for your heart.

Oat bran and oatmeal, both of which contain the fiber beta-glucan, have been the subject of growing attention.<sup>47</sup> In 1997, the FDA approved the health claim that “a diet high in soluble fiber from whole oats and low in saturated fat and cholesterol may reduce the risk of heart disease.”<sup>48</sup> Researchers have debated beta-glucan’s mechanism of action in the body. While some speculate that beta-glucan may act as a physical barrier in the intestinal tract by blocking the absorption of bile acids and cholesterol, others have theorized that soluble fibers are bacterially fermented in the colon, leading to the production of short-chain fatty acids that may lower cholesterol synthesis.<sup>49</sup>

According to a German study published in 2004, different sources of dietary fiber confer various benefits.<sup>50</sup> Food sources of dietary fiber like whole-grain bread, vegetables, and fruit are particularly useful in preventing and treating colon conditions and cancers. Purified dietary fibers such as cellulose, guar gum, psyllium, and beta-glucan help promote healthy blood sugar levels. All water-soluble fibers help maintain normal blood lipid levels, according to the study authors, but oat bran is especially effective.

## THE IMPORTANCE OF FIBER SUPPLEMENTS

The average American currently consumes only 12-17 grams of fiber a day from dietary sources, far below the 20-35 grams recommended by the American Dietetic Association and the 30 grams or more suggested by both the American Heart Association and the National Cancer Institute.<sup>51,52</sup>

Since many people do not want to change or cannot change their diets, supplements and natural fiber products can help them benefit from fiber’s many beneficial effects. Supplemental fiber products can provide optimal combinations and amounts of fiber, as well as complementary nutrients such as calcium. Incorporating increased fiber intake into a daily plan for healthy living can help you lower your risk of heart attack and cancer, as well as prevent or manage such common conditions as hypertension and diabetes mellitus. Moreover, fiber is a valuable tool in achieving optimal weight.



With increased fiber intake, some people may experience gastrointestinal discomfort or changes such as increased or loose bowel movements. This is simply the body’s period of adjustment to the introduction of greater amounts of dietary fiber. Medical professionals recommend adding fiber to the diet gradually until the body adjusts. Moreover, because soluble fibers form a gel with water, it is important to drink plenty of water with fiber supplements. Abundant water intake will help to optimize fiber’s actions in the body and prevent ill effects such as dehydration or constipation.

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