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REVIEW ARTICLE

THE POTENTIAL HEALTH BENEFITS OF RESISTANT STARCH ON HUMAN METABOLISM- A NARRATIVE REVIEW

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ABSTRACT

Resistant starch, also known as water-soluble dietary fiber, has the advantages of both water-soluble and insoluble fibers. The characteristic of resistant starch is that resistant starch is difficult to be absorbed by the small intestine, so it will not increase blood sugar and has the effect of controlling blood sugar. Like dietary fiber, it is decomposed after entering the large bowel and becomes food for beneficial bacteria in the intestine, which contributes to intestinal health. Its functions include: delaying gastric emptying, preventing a sharp rise in blood sugar, lowering blood cholesterol, and the functions of insoluble dietary fiber include: increasing stool volume, promoting intestinal peristalsis, preventing constipation and hemorrhoids, preventing colorectal diverticulitis and colorectal cancer. The term resistant starch appeared in 1982, also known as difficult-to-digest starch or the third type of dietary fiber. Resistant starch cannot be decomposed by human digestive enzymes until the colon end. The heat generated by the fermentation and utilization of intestinal bacteria is much lower than that of ordinary starch, and the maximum heat generated per gram is no more than 2.8 kcal (ordinary starch is 4 kcal).

KEYWORDS: Resistant Starch; Metabolism, Functional Foods; Intestinal Health; Water Soluble Dietary Fiber.

INTRODUCTION

Resistant starch is one of the dietary fibers, which can be water-soluble or water-insoluble according to its different types [1].

1. Functions of water-soluble dietary fiber: delay gastric emptying, prevent sharp rise in blood sugar, and lower blood cholesterol.

2. Functions of insoluble dietary fiber: increase stool volume, promote intestinal peristalsis, prevent constipation and hemorrhoids, prevent diverticulitis and colorectal cancer. Dietary fiber refers to plant-derived components that cannot be decomposed by hydrolytic enzymes in the human digestive tract, including two main components: polysaccharides and lignin; resistant starch is a white, odorless powder, 90% of which is dietary fiber. The fiber type is water-soluble fiber, which has high solubility and clear aqueous solution. Dietary fiber is divided into water-soluble fiber and insoluble fiber. Water-soluble fiber is soluble in water and becomes a gel-like semi-fluid after absorbing. Under the action of bacteria in the colon, it is fermented to generate gas, which belongs to prebiotics. Some soluble fibers can prevent intestinal mucosal adhesion and migration of potential pathogenic bacteria, thereby regulating intestinal inflammation, this effect can delay gastric emptying and prevent rapid rise in blood sugar [2]. Contrabiotic does not mean to prevent the rapid rise of blood sugar, but to prevent the adhesion of intestinal mucosa and the migration of potential pathogenic bacteria. Insoluble fiber is insoluble in water, but it is an inert substance for human metabolism, providing intestinal bulking and increasing satiety feeling full, but non-fermentable substances that change the absorption rate of water-soluble dietary fiber

and also prebiotics [1], fermented in the large intestine; such as filling fiber absorbs water when passing through the digestive tract to promote defecation. Dietary fiber can change the intestinal tract. The nature of the biophase of the flora, thus altering the way nutrients and chemicals are absorbed [3]. Dietary fiber refers to plant-derived food components that cannot be decomposed by human digestive tract enzymes, mainly polysaccharides and lignin can be divided into two categories:

1. Soluble fiber is soluble in water and becomes a gel-like semi-fluid after absorbing water. Under the action of bacteria in the colon, it is easy to ferment to produce gas and physiologically active by-products and it is a prebiotic. Certain soluble fibers prevent intestinal mucosal adhesion and translocation of potential pathogenic bacteria, thus regulating intestinal inflammation. These effects are called contrabiotic.
2. Insoluble fiber can be insoluble in the water, is metabolically inert, provides intestinal bulking, can be non-fermented; for example, lignin can change the absorption rate of soluble dietary fiber. It can also make prebiotics ferment in the large intestine such as: resistant starch. These filling fibers absorb water as they pass through the digestive tract to facilitate bowel movements. At present, the dietary fiber added in the processing of beverages and foods mostly uses soluble fiber inulin.

Inulin, also known as chicory fiber, belongs to water-soluble dietary fiber. It is a fructo-oligosaccharide formed by the polymerization of 8-9 fructose. Its structure is not absorbed by the human body, but it can be fermented and decomposed by probiotics (*Bifidus bacteria*) in the intestine. As a source of nutrition for its growth, it helps to maintain the stability of the beneficial flora in the gastrointestinal tract. In addition, the expansion effect of dietary fiber will prolong the time that food stays in the stomach and produce a sense of satiety. On the other hand, it can also promote intestinal peristalsis, and help smooth bowel movements. And it reduce food intake, and its own calorie and fat content are relatively low, to achieve the effect of weight control; in addition, the sweetness of inulin is 1/10 of that of sucrose, and it will have natural sweetness when combined with sugar substitutes (Aspartame, Xylitol, etc.). It will not increase insulin secretion and maintain blood sugar stability. A low-calorie sugar substitute that is often used, and the biggest feature of soluble dietary fiber is that it can be fermented, and fermentation also promotes the nutrient source of bacterial growth. Bacteria are like humans, most of which are harmless to the human body and are polymerized into fructo-oligosaccharides. Fiber inulin is like the food we eat, there are hard, soft, delicious, and unpalatable. Good probiotics can ferment chicory fibers, while bad bacteria only target small molecules and strong water solubility and less viscous chicory fiber is fermented.

The molecular chicory fiber dissolves very slowly and has a high viscosity. It is not suitable for food processing of beverages, but it is a food that probiotics like. The small molecule chicory fiber dissolves quickly and has almost no viscosity. It is very suitable for food processing of beverages, but it is also the main fermented food source for bad bacteria, a paper published by American scholars in the journal *Cell* in 2018. Dysregulated microbial fermentation of soluble fiber induces cholestatic liver cancer, which clearly points out that animal experiments have the disadvantage of causing liver cancer in animals. The reason is the result of a large number of bad bacterias, which make the bile acids metabolized by cholesterol unable to be excreted, and reflux to liver stasis to induce liver cancer in experimental animals [14].

WATER SOLUBLE DIETARY FIBER

Dietary fiber can be divided into two categories: 1.Soluble fiber is soluble in water, becomes a gel-like semi-fluid after absorbing water, and is easy to ferment under the action of bacteria in the colon to produce gas and physiologically active by-products, which are prebiotics; some soluble fibers prevent the migration of potentially pathogenic bacteria on the intestinal mucosa can regulate intestinal inflammation. This effect is called contrabiotic [3]. 2.Insoluble fiber is insoluble in water, is metabolically inert, provides bulking, can be non-fermented, for example: lignin can change the absorption rate of soluble dietary fiber, which can also be prebiotic and fermented in the large intestine, such as: resistance starch. Filling fiber absorbs water as it passes through the digestive tract to facilitate bowel movement. Dietary fiber can alter the properties of substances in the gastrointestinal tract and alter the way other nutrients and chemicals are absorbed. Dietary fiber is mainly a group of non-starch polysaccharides, and its components include: cellulose, lignin, glycosyl xylan, resistant dextrin, wax, chitin, pectin, dextran, inulin and low polysaccharides,

resistant starch, etc. During the digestion process, fiber can absorb water in the small intestine. Dietary fiber can increase the volume of intestinal and gastric contents, and at the same time increase the feeling of fullness, promote gastrointestinal motility, and relieve constipation. Dietary fiber can increase intestinal and gastric content. The volume of food in the stomach can increase the feeling of fullness. It can also promote gastrointestinal motility and relieve constipation. At the same time, dietary fiber can also absorb harmful substances in the intestinal tract for excretion. Excessive intake of dietary fiber will interfere with calcium, magnesium, zinc, etc. For the absorption of minerals and micronutrients, the general recommended intake is 20-30 grams per day; the benefits of dietary fiber include: bacteria decompose into nutrients for the intestinal mucosa, which helps probiotics survive in the body and decompose fiber; in addition, water-soluble dietary fiber covers carbohydrates, which can also prolong the residence time of food in the intestinal tract, reduce the absorption rate of glucose, prevent the rapid rise of blood sugar after meals, and help stabilize blood sugar in the body, while the effect of water-soluble fiber and cholesterol can coating bile acid promotes bile acid excretion to prevent bile acid from being recycled in the human body's enterohepatic circulation, effectively reduces blood lipids in the body, and prevents cardiovascular diseases [4]. 50% of insoluble dietary fiber can be fermented by bacteria, which can increase the volume of feces, promote intestinal peristalsis, reduce the time of feces staying in the intestine and the contact area between feces and small intestinal villi, reducing the occurrence of constipation and shorten the passage of feces in the intestinal tract. However, the intake of dietary fiber of 25-35 grams is only helpful to the maintenance of health. If it is to help fight diseases, dietary fiber should be eaten at least 50 grams per day.

At the same time, it absorbs toxins in the intestinal tract to facilitate excretion. However, excessive intake of dietary fiber will interfere with the absorption of calcium, magnesium, zinc and other minerals and micronutrients. The general recommended amount of dietary fiber is at least 30 grams per day. In foreign countries, the recommended dietary fiber intake for teenagers under the age of 18 is include: age plus 5; for example, for children aged 15, the daily intake of dietary fiber is 20 grams, but not more than 20 grams, like 18-year-old teenagers, one day dietary fiber intake up to 20 grams. A total of 5 surveys have been conducted in China. The 4^{th} and 5^{th} studies on the nutritional intake of Chinese people were fine-tuned, and there were three large-scale comparative surveys; each survey found that the dietary fiber intake of Chinese people is insufficient, far below the recommended intake. Half of that, the latest national nutrition and health status change survey, which had converted to the amount of crude fiber intake, and the average dietary fiber intake for men is about 13.7 grams per day, and the average for women is about 14 grams, which is serious lower to compared to the recommended intake of 25-35 grams.

In the early days, fiber was considered to be a kind of carbohydrate that cannot be digested by the human body. It was not until recent years that it was discovered that although fiber cannot be digested by the human body, it can be utilized by the human body, and probiotics have gradually received attention; for example, water-soluble fiber contains about 80-100% of it can be fermented by bacteria, and can be turned into nutrients of the intestinal mucosa, which is what is often said now: the function of cultivating the environment for the growth of good bacteria in the intestines can help control blood sugar and cholesterol, etc. Substances considered to be of no use to the body are therefore valued and considered as the sixth nutrient. Dietary fiber can be divided into water-soluble and water-insoluble. It is mainly divided into water-soluble dietary fiber and water-insoluble dietary fiber. Dietary fiber refers to food nutrients that are not easily digested in plants, non-starch polysaccharides of plants which including: cellulose, lignin, chitin, pectin, β-glucan, inulin, low-carbon polysaccharides, etc. Water-soluble fibers include: pectin , Gum, mucilage, vegetable gum, seaweed gum, oligosaccharides, etc., mainly found in vegetables, fruits, whole grains, beans, konjac and other foods. Non-water-soluble fibers include: lignin, plant epidermis, hemicellulose , chitin, mainly found in plant epidermis and unprocessed gluten, whole wheat, grains, beans, roots, fruit peels and other foods.

Resistant starch refers to a starchy substance widely found in carbohydrates. The definition given by experts from the world Food and Agriculture Organization is: starch and its degradation products that are not absorbed in the small intestine of healthy people. It turns out that there are two types of starch in food, one is easily digested by the human body, and the other is not easily digested by the human body. This kind of starch that is not easily digested by the human gastrointestinal tract is called resistant starch. Resistant starch (RS), also known as indigestible

starch, was discovered by Englyst et al. in 1982. It refers to a starch or starch hydrolysis that cannot be hydrolyzed by digestive enzymes in healthy humans, but can be fermented by microorganisms in the colon product. Like dietary fiber, it has a wider health meaning than dietary fiber, and it is recognized by many scholars as one of the most important achievements in the research on the relationship between carbohydrates and health in recent years. Correspondingly, when resistant starch of the following has become a popular research on food and nutrition in European and American countries, and the content of resistant starch in the diet of western residents has increased to more than 10%. The clinical functions and benefits of resistant starch include:

1. Weight control: because resistant starch has water absorption which can increase the satiety of the gastrointestinal tract, and the heat produced is much lower than ordinary starch, so it can reduce the accumulation of body fat.

2. Help blood sugar control: the way resistant starch produces energy is through intestinal bacteria fatty acids produced by plexus, rather than glucose after general starch is decomposed, so it does not directly affect blood sugar, and resistant starch can improve insulin resistance. So that the effect of unit insulin can exert better blood sugar control effect, and there will be long-term avoid the effect of premature apoptosis of the pancreas.

3. Maintain intestinal health: after the resistant starch is fermented and utilized by the human intestinal flora, many metabolites will be produced, such as short-chain fatty acids and organic acids such as acetate, propionate and butyrate. These acidic substances lower the pH value of the intestinal tract and inhibit the growth of human pathogenic bacteria. Among them, butyrate can reduce the toxic effects induced by secondary bile acids and reduce the risk of colorectal cancer [4].

TYPES OF RESISTANT STARCH

Resistant starches can be further divided into the following four categories according to their characteristics [5]:

1. RS1: It is a physically trapped starch that is “completely indigestible” by digestive enzymes, and exists in natural foods such as seeds, legumes, and unprocessed whole grains. Physically trapped starch, which cannot be digested and absorbed by digestive enzymes, exists in natural foods such as seeds, legumes, and unprocessed whole grains.

2. RS2: It is mainly the "completely ungelatinizable" substances (resistant starch granules) in starch granules, which exist in uncooked potatoes, green bananas, some pods and corn starch rich in amylose. It is mainly resistant starch granules in starch granules, present in uncooked potatoes, underripe bananas, certain pods and amylose-rich cornstarch.

3. RS3: It is mainly retrograded starch produced by gelatinization and retrograde starch. It can be obtained from starch processed products, such as bread, baked products, cooked pasta and steamed buns. It is mainly retrograded starch produced by gelatinization and recoagulation of starch; it can be obtained from starch processed products, such as bread, baked products, cooked pasta and steamed buns.

4. RS4: Non-naturally occurring substances, which are chemically modified starches purified from α1,4-D-glycoside chain polymers in aged starch through physical or chemical methods in the laboratory. Substances that do not exist in nature are derived from the extraction of healthy ingredients from aged starch through artificial physical and chemical methods in the laboratory, and they usually cannot be delicious at the same time. Some food factories in Taiwan use resistant starch in daily foods, such as: noodles, bread and biscuits, etc., can accurately determine whether the intake of resistant starch is sufficient, as shown in Table 1.

TABLE 1- *Compare of RS1-RS5 (RS1, type I resistant starch; RS2, type II resistant starch;RS3, type III resistant starch; RS4, type IV resistant starch; RS5; type V* Resistant starch).

Type	Starch Characterization	Example	Others
RS 1	Physiologically unacceptable starch, generally whole grains and large starch granules. Refers to those starches that cannot be accessed by amylase due to the barrier effect of the cell wall or the sequestration effect of proteins	partially ground grains and legumes	
RS 2	Naturally Resistant Starch	Potatoes, bananas and corn, wheat, taro	
RS 3	Starch that crystallizes during cooling or storage after gelatinization and is difficult to be decomposed by amylase is also called aged starch.	Boiled cold potatoes.	
RS 4	Retrocondensed starch produced by starch through gelatinization and storage process can be produced after processing chemical modification.	green beans	
RS 5	Chemically Modified Starch (Chemically Modified Starch), after physical or chemical denaturation, the molecular structure of starch is changed.		RS5 is a starch-lipid complex

RSI: Physically inaccessible starch coarsely ground or whole-kernel grains.

RSII: Granular starch with the B- or C-polymorph High-amylose maize starch, raw

Potato, raw banana starch.

RSIII: Retrograded starch Cooked and cooled starchy foods.

RSIV: Chemically modified starches Cross-linked starch and octenyl succinate Starch.

RSV: Amylose-lipid complex Stearic acid-complexed high-amylose starch.

As far as its properties are concerned, resistant starch is the same as dietary fiber. It cannot be digested and absorbed in the intestinal tract like other carbohydrates, and cannot be broken down into glucose. Instead, it is fermented by physiological bacteria in the large intestine to produce short-chain fatty acids and gas. Stimulate the growth of beneficial bacteria in the intestines, and the influence of dietary fiber on health is thus brought into play: weight loss or slimming; resistant starch itself contains very low calories, and more importantly, it is not Digested and absorbed, and will not give the human body Increase calories, but can fill the stomach, and the effect

of satiety is longer, and then achieve the effect of dieting and slimming, so it is especially suitable for obese people; research shows that resistant starch has a physiological activity similar to dietary fiber, which can reduce energy absorption and promote nutrition such as fat metabolism and delay blood sugar rise and so on.

Starch is not only calories, including brown rice and various coarse grains and miscellaneous grains, it is also an important source of dietary fiber, and contains resistant starch (indigestible starch) that helps weight control; if you deliberately avoid starch, you will lose dietary fiber and resistant starch Benefits to the body; a balanced diet should be comprehensive. The dietary recommendations of the National Health Department of the Ministry of Health and Welfare are divided into six categories, of which whole grain roots are in the middle, and others include: beans, fish, meat and eggs, vegetables, fruits, low-fat dairy products, oils and nuts and seeds, the six major nutrients are not interchangeable; they have the

function of absorbing water in the digestive system. Dietary fiber is mainly a variety of plant substances that are not starchy polysaccharides, including: cellulose, lignin, arabinyl wood polysaccharides, resistant starch, resistant dextrin, wax, chitin, pectin, dextran, inulin and oligosaccharides, etc. [7].

ADVANTAGES OF RESISTANT STARCH

(1)Resistant starch can resist the decomposition of enzymes, release glucose slowly in the body, have a low insulin response, control blood sugar balance, reduce hunger, and is especially suitable for diabetics; (2) resistant starch has the function of soluble dietary fiber. After eating, it can increase the amount of defecation, reduce constipation, and reduce the risk of colon cancer; (3) resistant starch can reduce the amount of blood cholesterol and triglycerides, because the amount of cholesterol and triglycerides in excreta increases after eating resistant starches; therefore, it has a certain weight loss effect [8]. In the early days, people thought that fiber was just "a kind of carbohydrate that cannot be digested by the human body". It was not until recently that although fiber was found to be indigestible by the human body, it can be used by the human body from 10% to 100% which can be fermented by bacteria. Water-soluble dietary fiber can use enterohepatic circulation to reduce LDL, and can become a nutrient for the intestinal mucosa, etc. [9], are no longer considered to be of no benefit to the human body.

Resistant Starch Can Reduce Energy Absorption, Promote Fat Metabolism, And Delay Blood Sugar Rise

1. Reduce Caloric Intake And Fat Storage

According to the different digestion and absorption capacity of resistant starch of each person; for most people, each gram of resistant starch provides an average of 2.8 calories, but for those with high blood insulin levels, each gram of resistant starch provides only 2.2 calories (Sajilata et al., 2006). Higgins et al. respectively gave 12 subjects a diet with resistant starch accounting for 0%, 2.7%, 5.4% and 10.7% of the total carbohydrate source for 4 weeks. The results of indirect energy measurement and 14C isotope detection showed that when the diet contained resistant starch. When the content of resistant starch accounted for 5.4% of the total sugars, the amount of triglyceride oxidized to carbon dioxide in the body was significantly higher than that of the group without resistant starch, while the value of respiratory quotient was significantly lower than that of the group without resistant starch. But the blood of the two groups which are no significant difference in fatty acids, and this study also showed that when the dietary resistant starch content accounted for 5.4% of total carbohydrates, it has the effect of increasing postprandial lipid oxidation and, in the long run, reducing body fat storage. Since resistant starch has lower calories than normal sugars, and has the effect of reducing appetite and increasing satiety. It can promote the decrease of body mass index and help weight control [10].

2. Conducive To Blood Sugar Control

Resistant starch cannot be decomposed into glucose in the small intestine, so it will not increase the blood sugar concentration in the body, and has minimal impact on insulin secretion. It is suitable for patients with unstable blood sugar or hyperglycemia. Behall et al. found in a study of normal weight and overweight women that women who ingested 3.4 grams of resistant starch at the same meal had significantly lower postprandial blood glucose levels than women who did not ingest resistant starch, and those who ingested carbohydrate β at the same time -glucan and resistant starch, the postprandial blood glucose increase area was also significantly lower than that of women who only ingested resistant starch or did not ingest resistant starch.

Zhang et al. of China randomly divided 40 patients with type 2 diabetes into two groups for a crossover test. Group A was given 30 grams of resistant starch every day for the first four weeks, and group B was used as the control group. Then group B was given 30 grams of resistant starch every day for the next four weeks, and group A served as the control group. The results showed that at the end of the intervention period after taking 30 grams of resistant starch per day, the insulin sensitivity of the two groups of patients was significantly improved, and the blood sugar before and after meals was also significantly decreased [11].

3. Promote Gut Health

Resistant starch is a kind of dietary fiber, which can increase the volume of feces, and can also be used as a substrate for microbial fermentation in the large intestine. After fermentation, it produces short-chain fatty acids and organic acids such as acetate, propionic acid, butyric acid, and reduces intestinal pH. Chain fatty acids can reduce the amount of toxic ammonia in the intestine, and thus may prevent colorectal cancer. Dronamaraju et al. took 65

colorectal cancer patients as clinical intervention research objects. After being randomly divided into groups, they were given 30 grams of starch containing resistant starch and starch without resistant starch for a period of 4 weeks. The size of tumors and expression of colonic mucosa hyperplasia and cell cycle regulation genes (CDK4 and GADD45A), which are closely related to butyrate production, were observed. The experimental results showed that the mitotic rate of colon polyp cells in the resistant starch group was significantly lower than that in the non-resistant starch group (the proliferation of colon polyp cells is a marker of malignant tumors). Butyrate is an important regulator of the growth and differentiation of colon cells, CDK4 and The GADD45 gene is also related to the production of butyrate, and resistant starch can regulate the expression of CDK4 and GADD45 genes, so it is beneficial to maintain intestinal health. Studies on cancer gene expression and cell mitosis have shown that resistant starch in food may have an anti-cancer effect by regulating tumor cell genes. However, these hypothesis still needs to be corroborated by more relevant molecular dynamics studies [12].

4. Adjust blood lipid metabolism

Japanese experts tried to feed mice with 40% resistant starch feed. After a few weeks, the elevated plasma cholesterol and triglycerides of these experimental mice were all reduced to normal levels. It is suggested that resistant starch has the effect of regulating blood lipids and preventing arteriosclerosis and cardiovascular and cerebrovascular diseases. Preliminary animal experiments have shown that resistant starch can inhibit the appetite of mice, reduce subcutaneous fat and visceral fat, and increase bile acid excretion in the small intestine and feces of rats after ovariectomy. Serum cholesterol and efficacy in reducing the insulin/glucose ratio in mouse plasma. The resistant starch contained in processed potato chips can also increase the amount of short-chain fatty acids in the gut of rats, especially butyrate, and the number of lactic acid bacteria in the gut also increases. Kishimoto et al. had first confirmed with mice experiments that resistant maltodextrin could inhibit the increase in blood triglycerides in mice after ingesting corn oil [12-14], and then designed a single-blind crossover with 13 healthy people in this experiment. The effect of resistant maltodextrin on postprandial blood triglycerides was tested. After a meal containing about 50 grams of fat, subjects drank 5 grams or 10 grams of resistant maltodextrin. Bud dextrin beverage, found that the rise of blood triglycerides, RLP-cholesterol and insulin were significantly inhibited after meals.

CONCLUSION

Resistant starch can be divided into five categories according to its characteristics. RS1 is a physically trapped starch that cannot be digested and absorbed by digestive enzymes. It exists in natural foods such as seeds, legumes, and unprocessed whole grains. RS2 is mainly resistant starch granules in starch granules, present in uncooked potatoes, immature bananas, some pods and amylose-rich cornstarch. RS3 is mainly retrograded starch produced by gelatinization and reflux of starch, which can be obtained from starch processed products, such as bread, baked products, cooked pasta and steamed buns. RS4 is a non-naturally occurring substance, which is a chemically modified starch purified from the α1,4-D-glycoside chain polymer in aged starch through physical or chemical methods in the laboratory [15-18]. Amylose-lipid complex has been proposed as resistant starch (RS5), because of its resistance to enzyme hydrolysis. The presence of amylose-lipid complex in starch granules increases their enzyme resistance by restricting the granule swelling during cooking. Resistant starch is a food containing natural cornstarch or natural ingredients modified by food technology to contain a large amount of high-amylose cornstarch. It can improve the problem of rapid rise in blood sugar after meals, prevent involuntary hypoglycemia reactions, and reduce insulin resistance. Hyperglycemia and other effects, but there is no long-term research to prove its benefits for diabetics; there are many fiber powders on the market that claim to help control weight; for example, the fiber content of fiber powder products such as psyllium and chia seeds is very high. If the intake from normal food is insufficient every day, supplementing with these fiber powders occasionally is also a small supplement, but because the fiber powder itself is not very tasty, the products may have added flavors and sugar processing ingredients to increase it. Therefore, we can ingest it from natural foods such as fruits and vegetables and whole-grain rhizomes, because fresh fruits and vegetables not only contain fiber, but also many vitamins and antioxidants, which fiber powder cannot provide [16,17,19]. Resistant starch is the indigestible portion of starch and can escape the small intestine and be fermented in the colon. The potential health benefits of RS have been widely studied in both animal studies and human clinical trials [18].

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