

## Opinion

### The Secret of Fruits and Vegetables

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#### Introduction

The secret of fruits and vegetables finally revealed or how a wheat, corn or pea extract may treat your diabetes or obesity. These extracts are called prebiotics their mode of action at the level of microbiota.

For 800,000 years nature has been the only refuge for man, providing him with food, drink and medicine. It was necessary to wait 2008 to understand how nature could act on our pancreas and on our other organs, how an extract of these plants could act on the blood sugar so-called blood sugar and diabetes if the figure is too high.

Fruits and vegetables have long been regarded as sources of vitamins, minerals, and insoluble fiber. They are the essential nutrients for form and health. Today, modern nutrition attributes an important role to fruit consumption and eating habits in many parts of the world. The World Health Organization (WHO) recommendation, to consume at least 400g of fruit and vegetables a day (not counting potatoes and other starchy tubers), is far from being achieved [1].

In France, the Inca 2 study (companion of 2006-2007) showed that the average consumption of French fruits and vegetables is only 280g per day (Inca 2, 2009). In 2011, the nutrinet study, launched in 2009 in order to better understand eating behaviors and nutrition-health relations of the French, showed that of the 2,06,000 nutrinautes, only 46% followed the national recommendation "5 servings of fruit and

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vegetables per day" [2]. In addition to high levels of vitamins and micronutrients, fruits and vegetables are a source of dietary fiber. These latest, naturally present in plant foods, are neither digested nor absorbed by the digestive system.

In 2008, next to insoluble fiber, the great revolution was the discovery of soluble fiber in wheat, corn. Many articles, more in the United States than in Europe, recommend the consumption of these fibers in daily diet. Dietary intakes of soluble fibers are very specific.

The nutritional intake of dietary fiber varies from:

- 19g/day for children
- 19 to 38g/day for teenagers
- 21g/day to 38g/day for adults [3]

Soluble fiber has the property of lowering cholesterol and blood sugar, while insoluble fiber increases the volume of feces to regulate transit. Most plant foods (fruits and/or vegetables) contain both types of fiber. However, the amount of each type of fiber varies by food.

The consumption of fruits and vegetables is low for some populations and does not reach the recommended intake of soluble fiber. Since it is possible to extract these fibers from many foods (wheat, corn, peas and etc.), the daily recommendation can be reached.

Soluble fiber can have beneficial effects on metabolism and health, by their action on the human intestinal microbiota. Nutriose is a non-viscous dietary fiber with a total fiber content of 85% and a mono and disaccharide content <0.5%. Nutriose has a structure of linear and branched glycosidic bonds which make it resistant to hydrolysis in the small intestine and therefore available for bacterial fermentation in the human large intestine [4]. Nutriose induces a low glycemic response; it is well tolerated by the human digestive system, even in high doses unlike the inulin widely used in the USA [5]. Studies conducted as early as 2007/2008 indicates that nutriose has prebiotic potential, these studies have shown that ingestion of Nutriose® may modulate intestinal microbial ecology with an increase in the number of Bacteroides and *Lactobacillus* spp. reduction of *Clostridium perfringens*, thus increasing the production of AGFA and lowering the pH [6].

In addition, it has been demonstrated in the 2007/08 experiment in China that ingestion of 14, 18 and 24g of nutriose over a nine-week period reduces the feeling of hunger and leads to weight loss and fat reduction in a group of overweight patients [7]. The higher quantity ingested of nutriose is large and the better the result (Figure 1).

**Another example:** Olygose is a soluble pea fiber. It is rich in galactooligosaccharides; Prebiotic carbohydrates that confer specific modifications to the intestinal bacterial composition. The Shoaf study [8], indicated that galactooligosaccharides were effective in preventing bacterial colonization and invasion of pathogens by their non-stick ability. Today, Olygose has obtained a health claim in Brussels about lowering the blood

sugar level. Indeed, Olygose contributes to the stabilization of type II diabetes. In addition, alpha-galacto-oligosaccharide based olygosis also reduces the feeling of hunger and thereby reduces the risk of obesity [9].

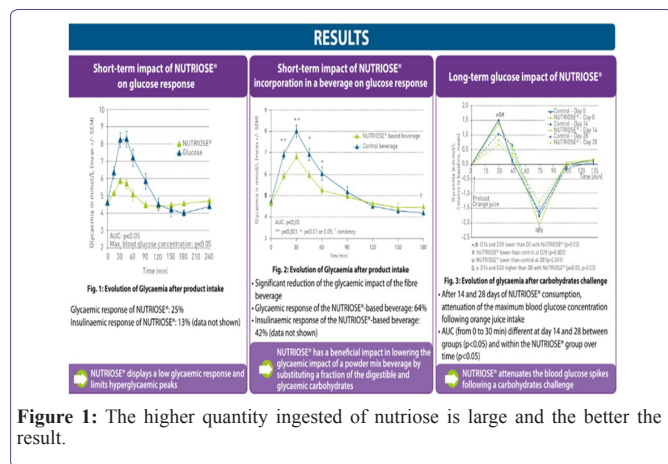


Figure 1: The higher quantity ingested of nutriose is large and the better the result.

**Other fibers are of great interest for health:** Fibregum for example, a soluble fiber of acacia gum, which received the health claim in 2016 as a fiber that helps to lower the glycemic index and also protects against cavities. Fibregum provides a feeling of fullness and thus allows for weight loss, so that there is also an action against obesity. Acacia gum consumption in healthy subjects at 20g per day for four weeks has been shown to significantly increase the number of bifidobacteria, lactobacilli and bacteroides. It should be added that there were no side effects during these four weeks [10].

The 2008 discovery confirms the need to eat fruits and vegetables every day; their daily intake is generally much lower than the amounts recommended by WHO. To be healthy, the contribution of soluble fiber is necessary. The evolution of technologies will allow to explore the secrets of nature which contains substances with extraordinary therapeutic effects and to extract the soluble prebiotic fibers.

Fresh fruits and vegetables are the healthiest foods, and you have to consume a lot! For the good state of our microbiota there is also soluble fiber solution, in powder form easy to consume in water or in another liquid. However the consumption of insoluble fibers which regulate the transit, contained in the leeks, the salads, and in the green vegetables, the fruits, will not have to be neglected.

Eating a good fruit or a good vegetable is a pleasure! Every day, new research helps us to discover essential elements for health and well-being. To this day, fruits and vegetables have not revealed all their secrets, research continues. 2008 was the pivotal year, we understood, that year, that the new technologies would allow us to systematically explore all the riches of this Nature. The modern means of extraction have made it possible to know and extract substances unknown until now and which will prove beneficial for our health. Fundamental research, also, has advanced a lot, microbiology, physiology, molecular biology and we understand better how the circuit that goes from the food to the nucleus of the cell works.

The first question that can be asked: What is the mode of action of prebiotic fibers on the microbiota?

It is certain today that the prebiotics by definition have a real stimulating action on the microbiota bacteria; with then chain reaction in the circuit which includes the mucus, the microbiota, the digestive wall, and the lymphoid tissue etc., there will be secretion of AGCC, neurotransmitter. And more the current position of researchers remains wider: Possible targets include the microbiome, intestinal barrier, derived molecules or host targets, or perhaps a combination of them.

After five years of using prebiotics on several hundred patients, I consider this solution the most suitable and the simplest and the cheapest. Other possible interventions include diet, probiotics, metabolites, fecal transfer or perhaps a combination of several of them.

Here are the essential elements; the gut microbiota contains more than 100 trillion microorganisms [11], which include about 160 species and 9 million genes [12]. The intestinal microbiota, stimulated by prebiotics, is essential for the metabolism of the host because it facilitates the digestion and absorption of:

- Food [13]
- Neutralize drugs and carcinogens
- Synthesize choline [14]
- Secondary bile acids [15-17]
- Folate [18]
- Vitamin K2 [19] and
- Short Chain Fatty Acids (SCFA)

In addition, the intestinal microbiota protects the host against pathogenic infections [20], stimulates and strengthens the immune system [21], epithelial cells [22] and regulates oxidative stress [23].

New research shows a bidirectional communication exists between the gut microbiota and mitochondria [24-26]. The bidirectional cross talk between the gut microbiota and mitochondrial functions (Figure 2).

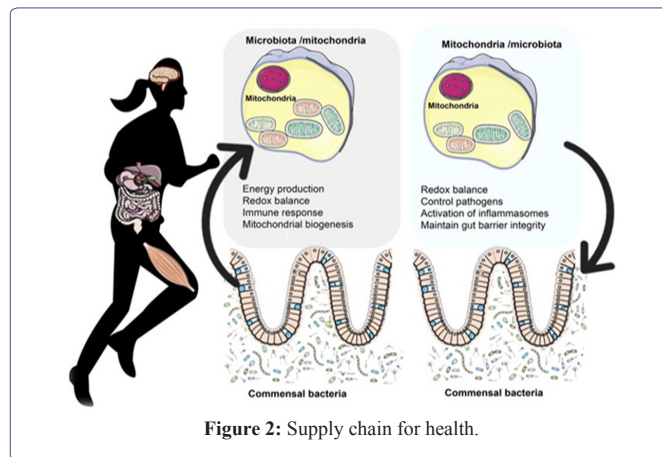


Figure 2: Supply chain for health.

This is the complete circuit, it starts at the level of the fruit or vegetable eaten, that we choose the most hypotoxic possible, and ends at the intracellular level in the nucleus with a passage through the mitochondria: this circuit called it.

**Conclusion**

The discovery of 2008 confirms the need to eat fruits and vegetables every day because the presence of soluble fibers or prebiotic

inside these foods. Fresh fruits and vegetables therefore remain the healthiest foods for men against metabolic diseases (diabetes, overweight and obesity, cardiovascular) their daily intake is usually much lower than the quantities recommended by the WHO.

To be in good health, it is especially the supply of fibers which is necessary (at the rate of approximately 20g per day), it would be necessary then to consume a lot of fruits and vegetables per day!

Today several techniques have made it possible to isolate the soluble fibers of many foods, for the good state of our microbiota, they are in form of powder, easy to consume since they are soluble in water. However the intake of insoluble fiber that regulates the transit, is contained in leeks, salads, as well as other green vegetables, fruits, it should not be neglected. Eating a good fruit or a good vegetable is a pleasure! Every day, new research makes us discover vital essential elements for health and well-being. Until this day, fruits and vegetables have not disclosed all their secrets, the mystery continues.

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