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Food and obesity

" How to reduce eating disorders through a major consumption of fruits and vegetables that reduce the effects caused by stress. Implication of the intestinal microbiota"

In recent years, the knowledge relating to the gut microbiota bacteria to explode. These advances have their origins in new techniques (metagenomics) that make it possible to know the genetic material of the microbiota. A day later, we could even have the genetic code of our gut microbiota.

These discoveries have turned our eyes on many health problems (allergies, diabetes ...) and in particular that of obesity.

The question is posed: beyond genetic predispositions, diet and exercise, the composition of the intestinal flora would contribute to obesity?

1. The gut microbiota, specific to each individual

Each individual has his personal profile of intestinal microbiota, a type of barcode or bacterial fingerprint. The challenge for our researchers today is to be able to detect "barcodes" or fingerprints at risk predisposing to certain diseases including obesity.

Indeed, several studies have found that obese people have a particular gut microbiota profile.

2. An established link between gut microbiota and obesity

Two studies, published in Nature[1],[2], show that there is a link between the richness of certain intestinal bacteria and obesity.

These two studies analyzed the bacterial genome of 341 people, including 134 non-obese and 207 obese. A quarter owns a "poor" microbiota in bacterial species, 80% of obese individuals belong to this group. This group presents, moreover, an increased risk of type 2 diabetes, cardiovascular disease ...

When we introduce a low-calorie diet, rich in protein and fiber to this group over 6 weeks, we observe:

a. a decrease in weight,
b. an improvement of the biological parameters,
c. And also an increase in the wealth of intestinal bacteria.

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[1] Cotillard et al., (2013), Nature, 500(7464):585-8.

[2] Le Chatelier et al., (2013), Nature, 500(7464):541-6.

Other studies, carried out in animals by Jeffrey Gordon's teams, showed that axenic mice (without intestinal microbiota) had a lower adiposity than their congeners with intestinal microbiota and that they remained thin even with a diet rich in fats[3].

In the same vein, researchers at INRA Jouy-en-Josas, were able to observe that under a high fat diet, axenic mice took three times less weight than normal mice fed in the same way[4].

3. What is the role of the gut microbiota on energy metabolism?

Some flora tend to save energy and thus promote weight gain, and others, to facilitate energy expenditure and therefore weight loss. The different mechanisms underlying the involvement of the gut microbiota in the control of energy metabolism have yet to be clarified.

Our bacteria feed on all the nutrients that have not been digested in the first part of our intestines. These are some of the non-digestible sugars contained in the fibers that are used by bacteria to make small volatile fatty acids (butyrate, acetate, propionate) that are short chain fatty acids (SCFA).

These fatty acids are a source of energy for our body and also play a role in metabolic regulation by interacting with factors that control gene expression or by binding to specific receptors[5].

The intestinal microbiota is also involved in the metabolism of proteins and lipids.

It therefore seems important to focus as much on the "functional" aspect of the intestinal microbiota as on its composition in bacteria.

4. The intestine, our second brain

The intestine is a real brain: it contains 200 million neurons as much as the brain of a dog or a cat. 95% of serotonin, "serenity hormone" is made in the intestine.

There is communication between the gut and the brain and if stress influences our gut, the reverse is true too: our second brain can play with our emotions and our behaviors.

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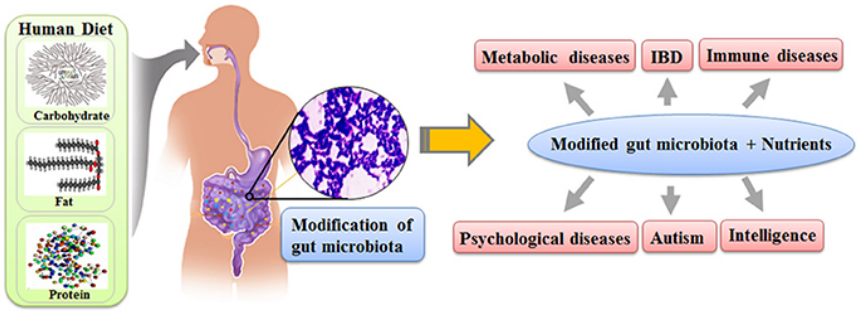
[3] Turnbaugh P., Ley R., Mahowald M., Magrini V., Mardis E., & Gordon J. (2006) An obesity-associated gut microbiome with increased capacity for energy harvest – Nature 444, 1027-1031.

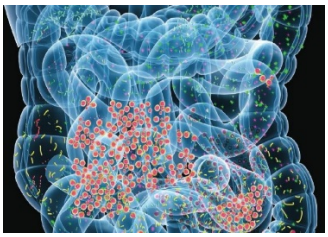
[4] Obésité, la flore intestinale mise en cause, Philippe Gérard – Pour la Science n°447, janvier 2015.

[5] Delzenne N.M, Neyrinck A.M, Cani P.D., (2012) Implication du microbiote intestinal dans l'obésité et les pathologies associées : quelles perspectives thérapeutiques et nutritionnelles ? Obésité 7 :234-239.



4.1 A link between gut microbiota and eating disorders

An INSERM research team in Rouen specializing in the brain / intestine relationship has made an important discovery[6]: a protein made by a well-known bacterium from the gut microbiota Escherichia coli is the look-alike for a hormone, melanotropin, which intervenes on satiety. When this protein is made in abundance, antibodies neutralize it and at the same time neutralize melanotropin. Hence an increase in appetite.



By assaying the antibodies of 60 people with eating disorders, the Rouen team showed that these people had a high number of antibodies proving the tendency to compulsions. Restoring a better balance in the gut microbiota and thus modulating the production of the protein made by E. coli may help to limit excessive compulsions.

4.2 Modulate the intestinal microbiota through diet with prebiotics

The idea of modulating the composition and / or activity of the intestinal microbiota by adequate nutritional intake appears as a complementary pathway in the management of obese subjects.

By their ability to favorably modulate the composition and activity of the intestinal microbiota, prebiotics constitute an interesting research track.

[6] Tennoune et al., Translational Psychiatry (2014), 1–11.

4.2.1 Prebiotics, definition

Prebiotics are "non-digestible compounds that, through their metabolism by microorganisms of the gut, modulate the composition and / or activity of the gut microbiota, thereby conferring a physiological benefit to the host"[7].

They are found for example in fruits and vegetables (bananas, asparagus, Jerusalem artichokes and onions, cooked salsify ...).

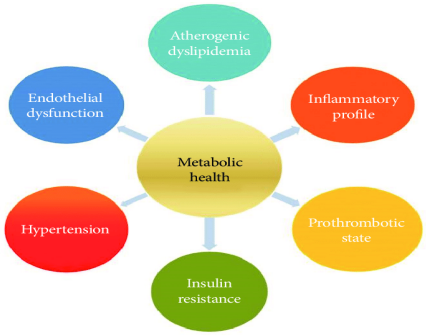
4.3 Early studies on prebiotics

In the context of obesity and associated metabolic diseases, studies in animals have shown that the administration of prebiotics can reduce adiposity and glycemia in particular[8].

Other studies have shown that taking prebiotics almost systematically increased the number of bifidobacteria[9].

This research still needs to be completed to better characterize the interest of a targeted nutritional intake on the intestinal microbiota of obese patients.

But the involvement of the gut microbiota in the occurrence of obesity opens new perspectives of research and treatment for better metabolic health.



[7] Bindels LB, Delzenne NM, Cani PD, Walter J (2015) Towards a more comprehensive concept for prebiotics. Nat Rev Gastroenterol Hepatol.

[8] Delzenne NM, Neyrinck AM, Backhed F, et al (2011) Targeting gut microbiota in obesity: effects of prebiotics and probiotics. Nat Rev Endocrinol 7:639–46.

[9] Cani PD, Neyrinck AM, Fava F, et al (2007) Selective increases of bifidobacteria in gut microflora improve high-fat-diet-induced diabetes in mice through a mechanism associated with endotoxaemia. Diabetologia 50:2374–83.