

Gut Microbiota and cancer

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ALL YOU NEED
TO KNOW

Gut microbiota and cancer: a new world waiting to be explored.

Let's take a journey through the secrets of **the intestine**, take a look at its ecosystem, so fragile and delicate, **yet crucial for our health**.

Measuring 7 metres, it is home to microbes, immune cells and many others to discover, all living together...



What is the microbiota?

● 39 to 44,000 billion microbes in our intestine

Microbiota, group of micro-organisms such as bacteria, viruses, parasites, yeasts and fungi which live within a specific environment.

Our body is home to several microbiota, at the surface of our skin, in our mouth, our nose, our lungs... The most well-developed is **the microbiota** colonising our intestine. This is the gut microbiota which develops in the small bowel and in the colon especially.

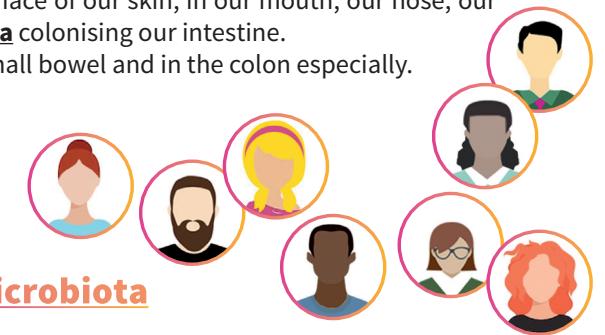
● Your microbiota is unique!

1,000 species make up the gut microbiota

Each individual is host to around **160 species**. We therefore all have a unique combination! Alone it weighs **2 kg** and is made up of more micro-organisms than there are cells in our body!

The gut microbiota evolves according to our diet, our state of health, and any medical treatments we may be taking.

New species are discovered each day!



2 kg
1,000 species
160 species per individual



Symbiosis between our body and the microbiota

This harmonious relationship between our body and the microbiota is called **symbiosis**.

● Digestion

The gut microbiota helps us to digest.

Different bacteria break down the food our body is unable to digest, such as starch and vegetable fibres.

They turn it into nutrients that our body can use.

The microbiota also contributes to the synthesis of some vitamins.

● Natural defences

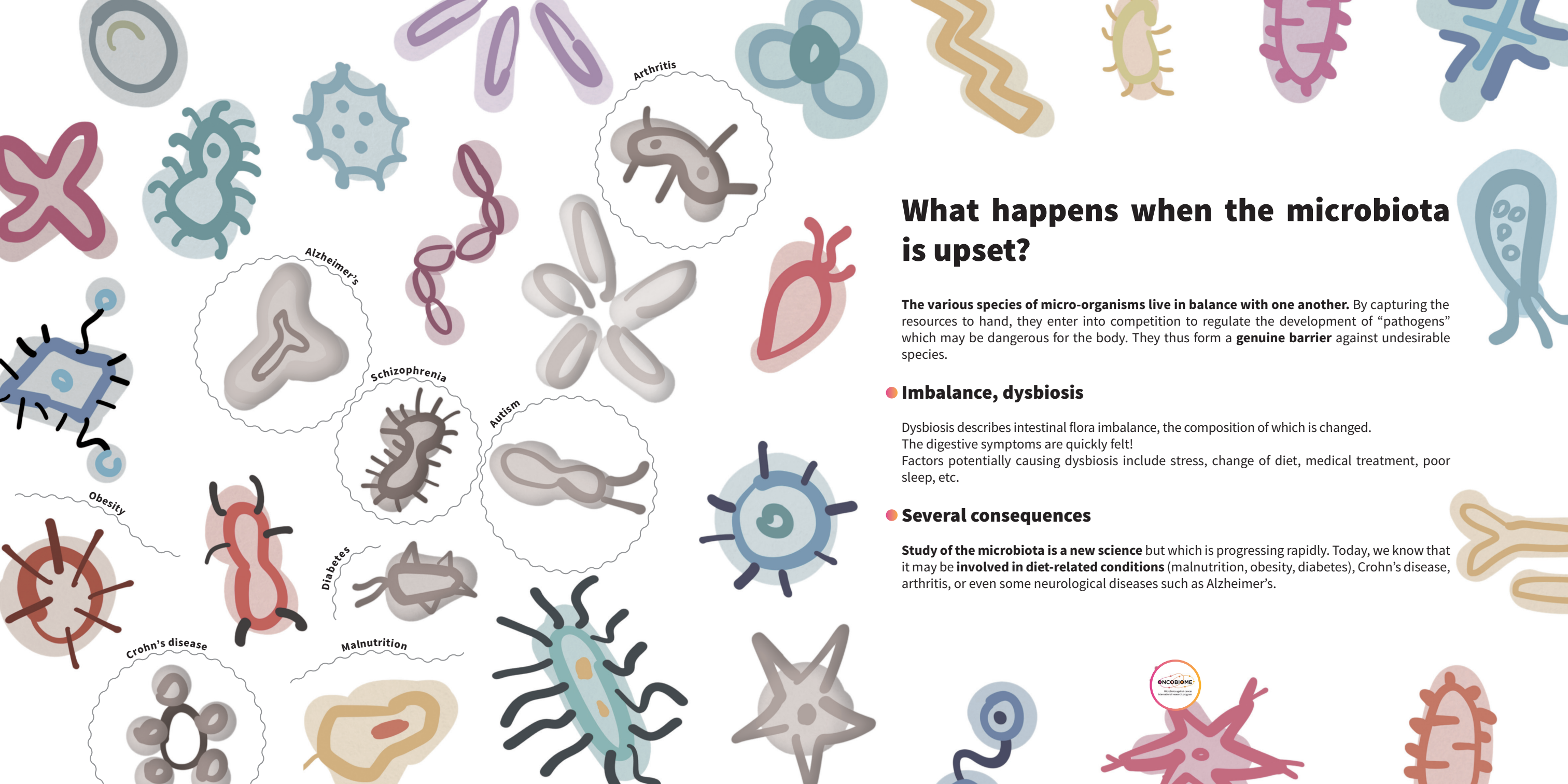
The gut microbiota plays a major role in our immune system.

The different species of micro-organisms live in balance in our intestine and interact directly with our immune system which learns to recognise them to better defend itself.

Research is gradually finding it plays other roles, especially in growth, appetite, stress and production of hormones...

The gut microbiota is now considered by some as an organ in its own right.





What happens when the microbiota is upset?

The various species of micro-organisms live in balance with one another. By capturing the resources to hand, they enter into competition to regulate the development of “pathogens” which may be dangerous for the body. They thus form a **genuine barrier** against undesirable species.

● Imbalance, dysbiosis

Dysbiosis describes intestinal flora imbalance, the composition of which is changed. The digestive symptoms are quickly felt! Factors potentially causing dysbiosis include stress, change of diet, medical treatment, poor sleep, etc.

● Several consequences

Study of the microbiota is a new science but which is progressing rapidly. Today, we know that it may be **involved in diet-related conditions** (malnutrition, obesity, diabetes), Crohn’s disease, arthritis, or even some neurological diseases such as Alzheimer’s.





It has been demonstrated that the composition of the microbiota has an effect on treatments.

For example, taking antibiotics before the treatment decreases its efficacy.

What is the link between the microbiota and cancer?

● A link between the composition of the microbiota and cancer

Some bacteria in the microbiota can produce toxic substances. According to the quantity of these toxins, and our state of health, the microbiota can produce an environment propitious to the development of cancer.

● Working with the microbiota, improving the effectiveness of cancer treatments

The challenge lies in identifying:

- the bacteria preventing the development of cancer and/or which can be used to elicit an effective response to treatments.
- bacteria related to a poor prognosis.

● Where the cancer escapes the immune system

Our immune system is able to detect and destroy cancer cells and to protect healthy cells.

However, **some cancer cells develop the ability to escape these controls.** They thus slow the immune system's activity and continue to proliferate.

● Immunotherapy

Some drugs enable the immune system to take back control and kill the cancerous cells.



The importance of the microbiota for health and its impact on the efficacy of certain cancer treatments have been confirmed.

However, its functioning and reactions to external inputs remain difficult to predict. If you are suffering from cancer, it is strongly recommended that you do not try to act on your microbiota without the advice of your doctor.

Is it possible to work with the gut microbiota?

● Minimising factors promoting imbalance

A healthy, balanced diet has a positive effect on health.

It maintains the body's essential functions, minimises the risk of developing certain diseases and decreases their severity when they do occur.

What you eat each day, already has an effect on your microbiota.

● Micro-organism intake: probiotics

Living micro-organisms, mainly bacteria or yeast can be ingested directly. Some foods have an especially high bacteria content: dairy products, cheeses, fermented foods...

Bacteria and yeasts are also available in freeze-dried form and come back to life when exposed to a favourable environment again, in your intestine.

● Nourishing the microbiota: prebiotics

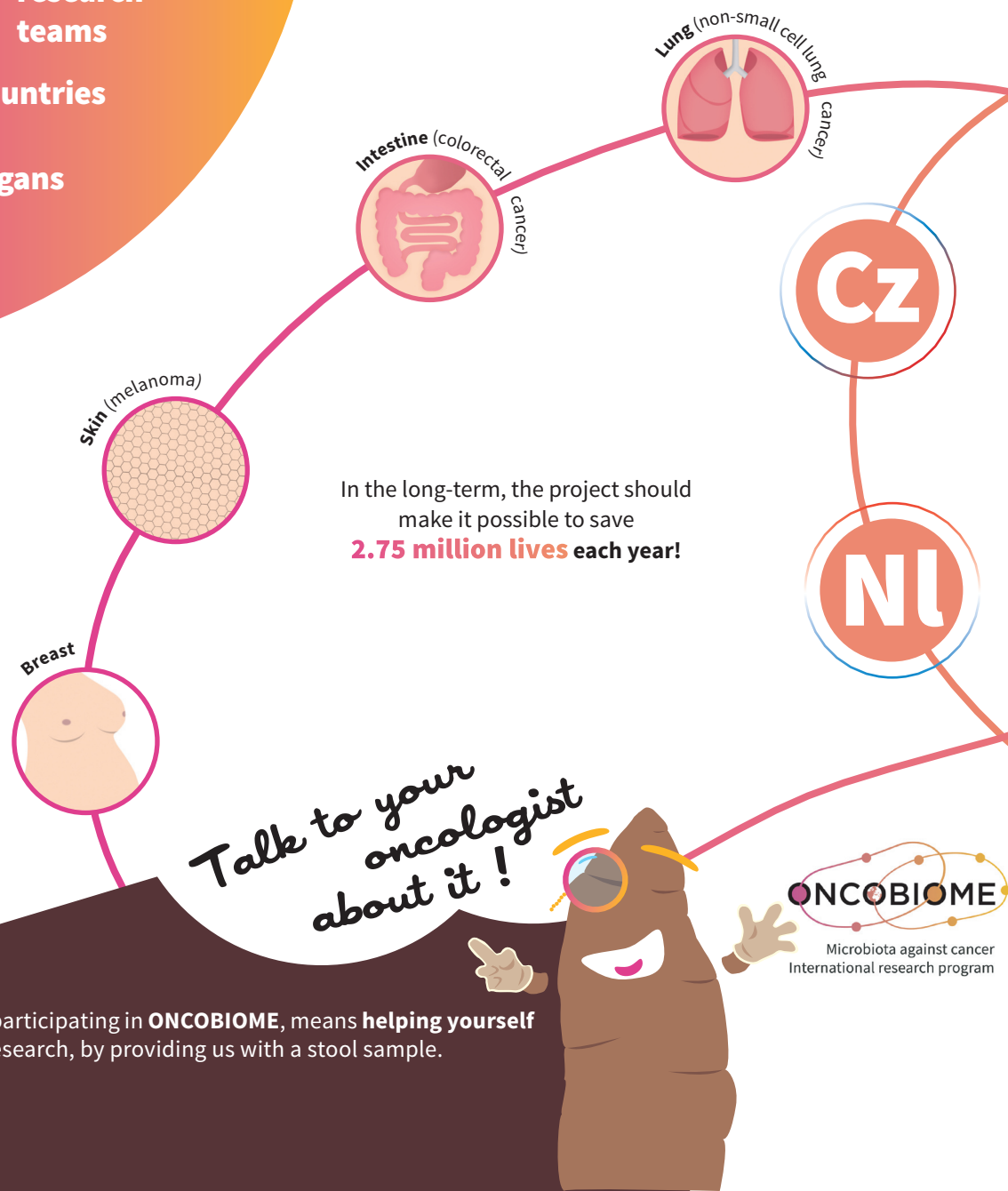
Foods which nourish and therefore promote the development of certain bacterial species can be consumed.

Vegetable fibres for example, promote the development of certain bacterial species.

Concentrates of these elements are also on offer in the form of tablets or capsules.



17 research teams
8 countries
4 organs



In the long-term, the project should make it possible to save **2.75 million lives** each year!

Talk to your oncologist about it!

Actively participating in **ONCOBIOME**, means **helping yourself** to help research, by providing us with a stool sample.

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ONCOBIOME : an international project

Coordinated in France by
Gustave Roussy

Faced with the explosion in the number and variety of cancers related to environmental factors and to our lifestyle, it is essential to understand the causes. The microbiota is one of the factors contributing to the appearance of cancer, its development and sensitivity to treatments.

● Ambitious objectives

- **Identify** the specific features of the microbiota related to the appearance or progression of cancer,
- **Decipher** the capacity of the cancer-related microbiota to regulate the immune system and its impact on the prevention or progression of the cancer,
- Accurately **define** the characteristics of the microbiota to predict the onset of cancer and establish its prognosis,
- **Develop** diagnostic tools based on these characteristics.

A stool biobank is currently being compiled. **The diversity of the stool biobank and its richness.** The more people there are to add to it, the more relevant and effective the work of **ONCOBIOME** will be. **We need your contribution to this great scientific, medical and human adventure.**

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TEST YOURSELF

Now you are abreast of the latest progress in science on the gut microbiota, its link to your health, the onset of cancer and the effectiveness of its treatment.

To test your knowledge, take this short quiz!

A Which type (s) of micro-organisms make up the microbiota?

- 1 • Bacteria
- 2 • Fungi
- 3 • Viruses
- 4 • Yeasts
- 5 • Minerals

B Among the following statements, which is false?

- 1 • The composition of the microbiota is unique to every individual
- 2 • The gut microbiota weighs almost 2 kg
- 3 • The gut microbiota of each individual is made up of almost 1,000 species of micro-organisms
- 4 • The gut microbiota develops on the surface of the intestinal wall

C Among these factors, which one or ones can contribute to dysbiosis?

- 1 • Lack of sleep
- 2 • Stress
- 3 • Altitude
- 4 • Diet

D What are the elements which nourish the micro-organisms forming the microbiota called?

- 1 • Probiotics
- 2 • Prébiotics
- 3 • Prabiotics
- 4 • Post-biotics

E Of what is compiled the stool biobank, essential component of the ONCOBIOME project?

- 1 • Cancer tumour samples
- 2 • Intestinal wall samples
- 3 • Cancer patients
- 4 • Stool samples

F Can I join in the research on the microbiota?

- YES YOU CAN!



SOLUTIONS A : 1,2,3,4 / B : 3 / C : 1,2,3,4 / D : 1 / E : 4

References

Sender R, et al. Revised Estimates for the Number of Human and Bacteria Cells in the Body. PLoS Biol. 2016;14:e1002533

Daillère R et al. Elucidating the gut microbiota composition and the bioactivity of immunostimulatory commensals for the optimization of immune checkpoint inhibitors.

In press :

Daillère R et al. Trial watch : the gut microbiota as a tool to boost the clinical efficacy of anticancer immunotherapy. Oncolimmunology, 9:1, 1774298, DOI: 10.1080/2162402X.2020.1774298

INSERM. <https://www.inserm.fr/information-en-sante/dossiers-information/microbiote-intestinal-flore-intestinale>

Normand S et al. La dysbiose, une nouvelle entité en médecine ? Med Sci 2013;29(6-7):586-589

Lynch SV et al. The Human Intestinal Microbiome in Health and Disease. N Engl J Med 2016;375(24):2369-2379

Karl JP et al. Effects of Psychological, Environmental and Physical Stressors on the Gut Microbiota. Front. Microbiol. 9:2013. doi: 10.3389/fmicb.2018.02013

Raisch J et al. Certaines bactéries de la flore commensale exacerberaient-elles la carcinogénèse colorectale ? Med Sci (Paris) 2016 ; 32 : 175–182

BECOME A RESEARCH PARTICIPANT

Better understanding the role of the **gut microbiota** in the development and progression of cancer will help predict and anticipate cancer, improve its diagnosis and make cancer treatment more effective..

**If you suffer from cancer, you
can make a tangible
contribution to this project.**

Talk to your doctor about it!



Microbiota against cancer
International research program

www.oncobiome.eu

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