



Opportunities in Gut Health & Immunity

August 18th 2020

 **BASF**

We create chemistry

What we will speak to you about today



An overview of the immune system

Get to know the various parts of the immune system, what functions they have and how it works



Consumer understanding of the immune system

Look into purchasing behaviors, consumer understanding of the connection between the gut & the immune system, and commercial opportunities



Differentiating with 2'-Fucosyllactose

Be introduced to the origin of 2'-FL and what benefits it offers at the interface between gut health and immunity



Why choose BASF?

Understand how Prebilac® 2'-FL can help differentiate your offer, and how else we can support you to launch attractive products in the market

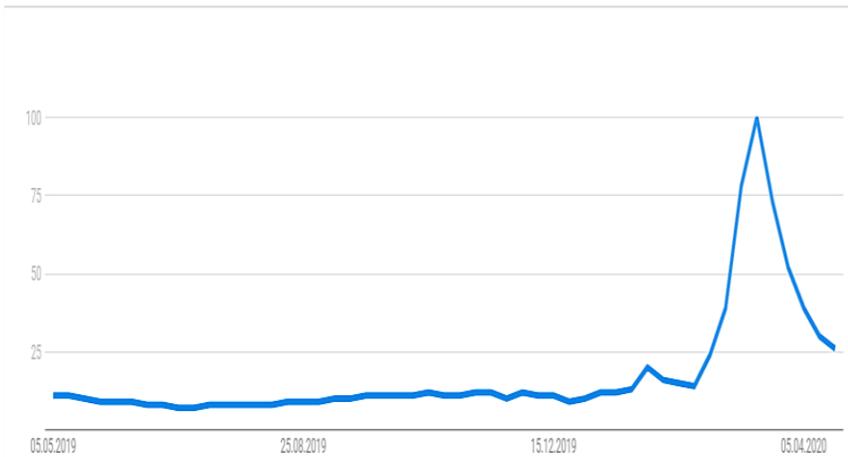


A close-up, profile view of a woman with dark hair, looking thoughtfully to the left. Her hand is resting on her chin, and she has a contemplative expression. The background is softly blurred, showing what appears to be a crowd of people in a bright, outdoor setting.

**How can I support
my immune system?**

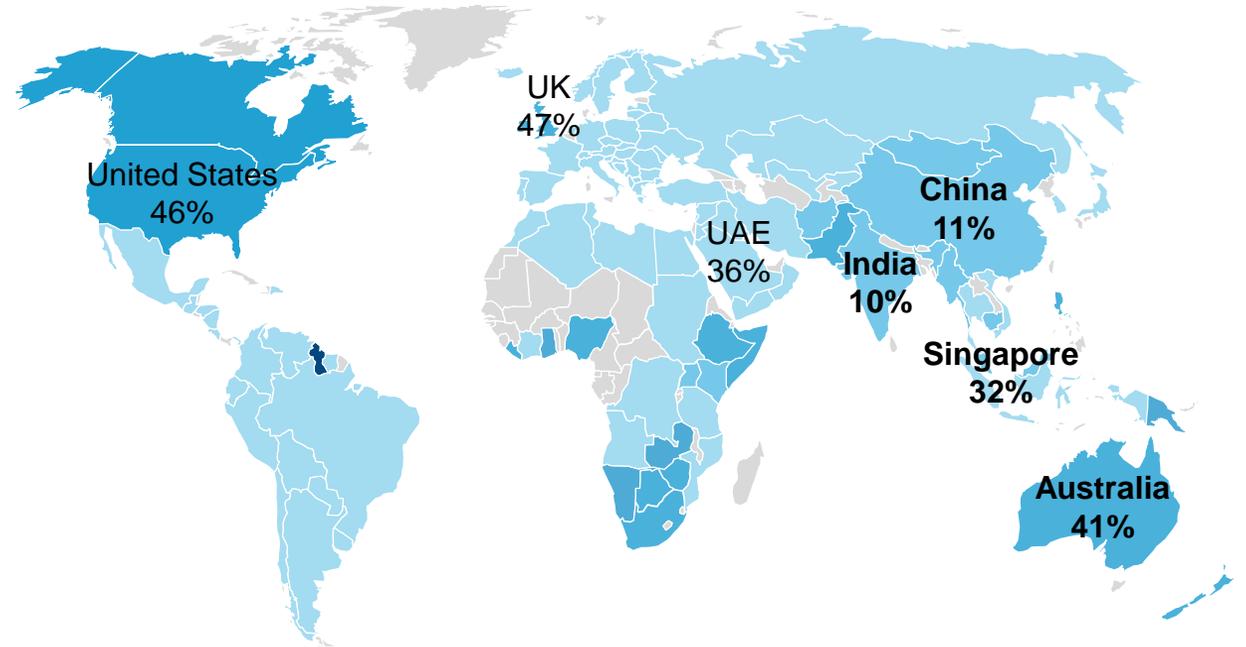
The immune system is a topic of high interest: Google searches have spiked during the past months

Searches for 'immune system' past 12 months across all categories



Relative popularity worldwide (%)

100% = highest popularity of search topic at a given timepoint.



Relative popularity by country

- Highest popularity among all searches in the country
- Lowest popularity

The consumer is concerned and full of questions

“I am concerned about my family & friends too.”

“I am actively seeking products to boost my immunity.”

“I am nervous, anxious and concerned about my health.”

“What should I take, who should I buy from?”

“What is really important to me now?”



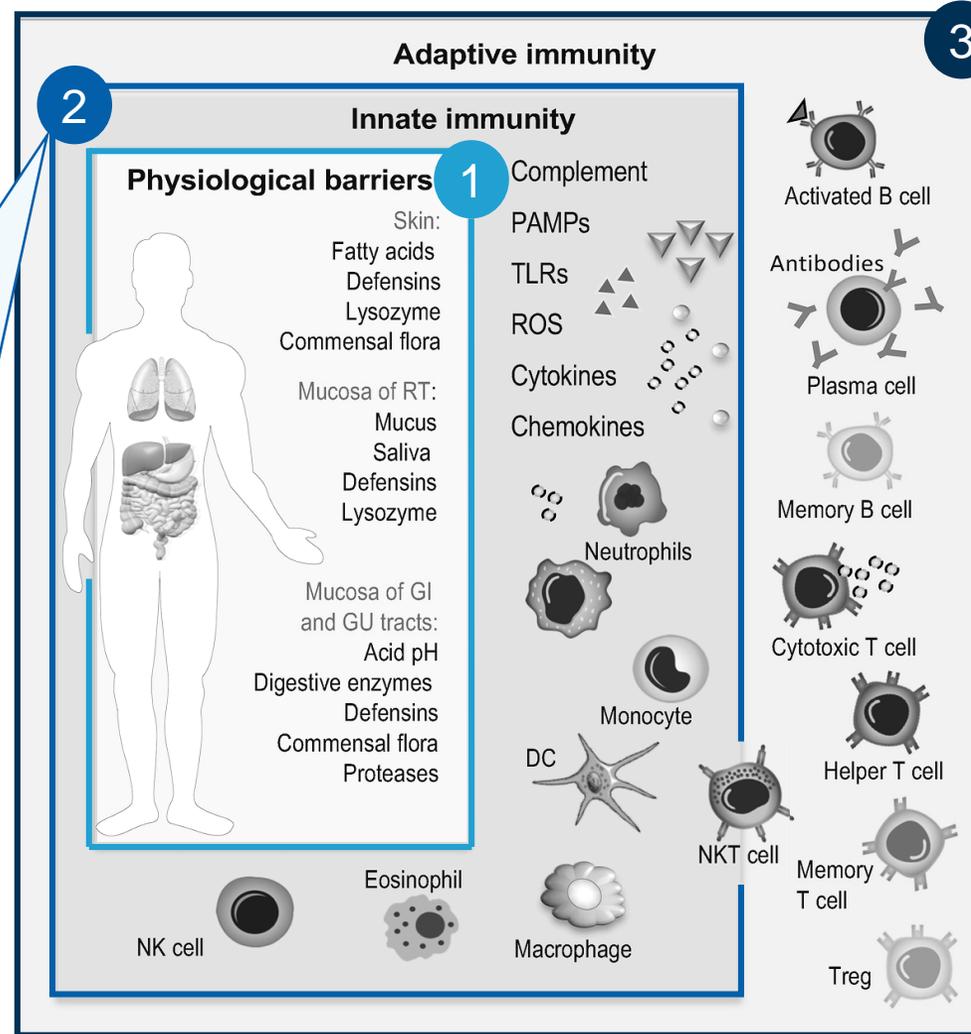
The immune system:

What are we talking about?

The immune system functions along three main lines of defense

2 Innate immunity:

- Available at birth
- Reacts quickly in an unspecific manner
- Key defense during first-time exposure to pathogens
- Often not fast enough to prevent symptoms of disease



3 Adaptive immunity:

- Builds up during lifetime
- Reacts quickly with pathogen-specific antibodies
- Antibodies produced after vaccination or first exposure to pathogens; available for lifetime or certain period
- Pathogens are bound by antibodies and destroyed by immune cells before symptoms of disease occur



70% of
immune cells
are located
in the gut

Number of gut bacteria:
1.3 x higher
than the number of
total body cells

The gut microbiome: A new “organ” is being discovered, offering opportunities to support health across lifestages

Unique like a fingerprint

- Influenced by genetics and type of birth
- Showing typical changes over the lifetime
- Responsive to lifestyle factors like diet, drug usage, exercise

Complex effects on human metabolism

Linked to a number of diseases including gastrointestinal or mental disorders, autoimmune diseases, diabetes and obesity



A first line of defense

- Protect against pathogens
- Constant communication with the immune system

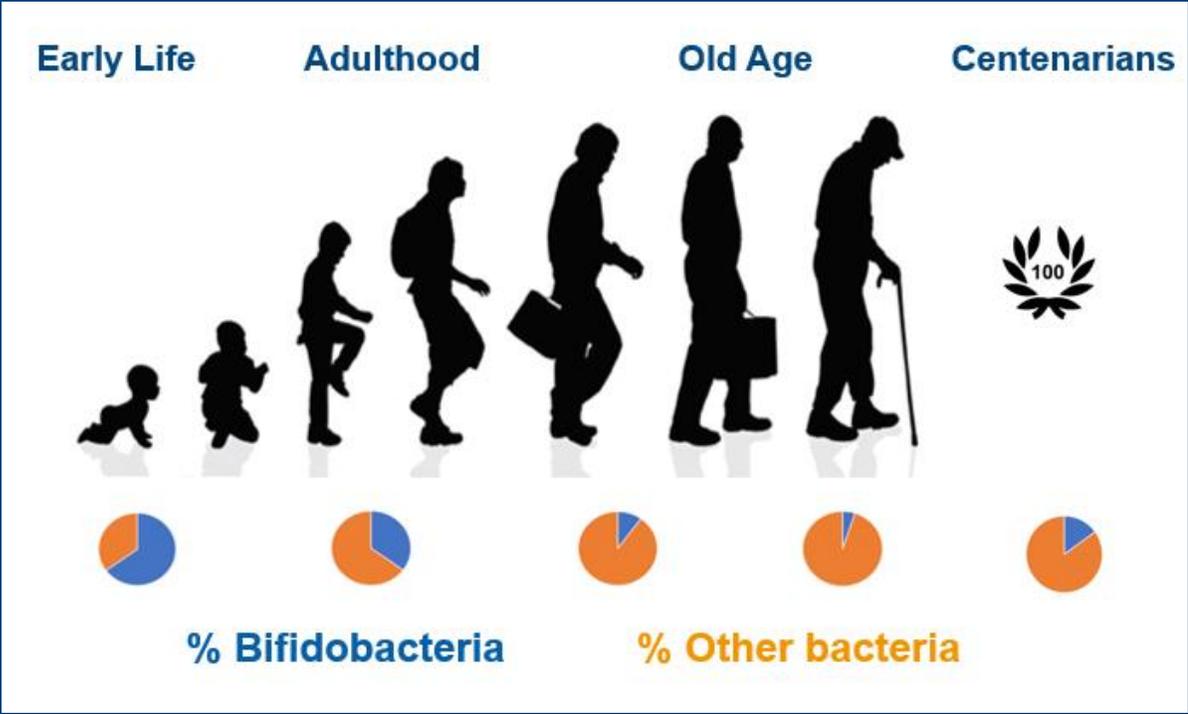
The Gut Microbiome

The largest, densest and most diverse microbial community in the human body

Composition matters

- Healthy state: balanced, stable, diverse microbiota
- Dysbiosis: abnormal colonization, decline in beneficial & increase in harmful bacteria

Beneficial Bifidobacteria were found to be associated with health promoting effects across the life stages

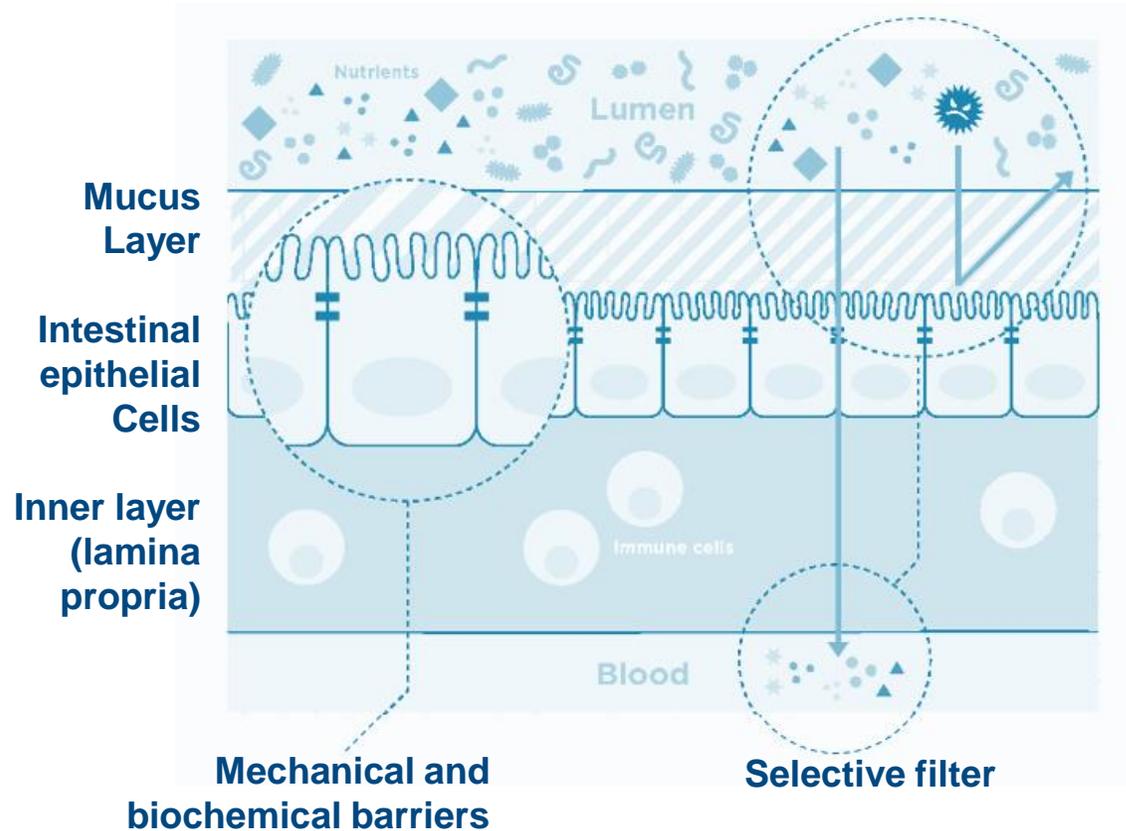


Impacts on the level of bifidobacterial change throughout life
e.g. Mode of birth, Necrotizing enterocolitis, Allergies, Obesity, Diabetes mellitus, Diet, Irritable Bowel Syndrome

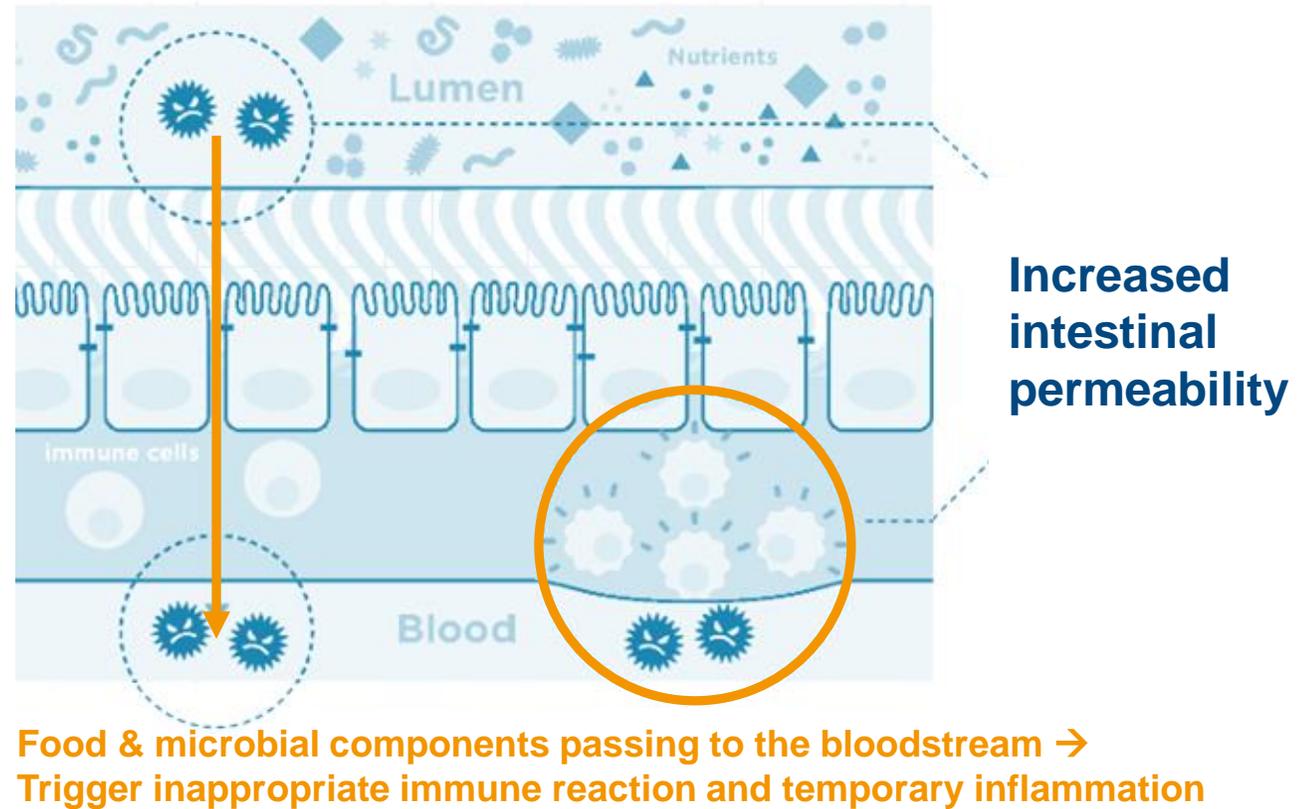
- Support the immune system to fight against inflammation
- Immunomodulation
- Production Short Chain Fatty Acids
- Prevention of diarrhea / constipation
- Ameliorate lactose intolerance
- Improve gastrointestinal symptoms
- Protect the gut barrier

The Intestinal Barrier acts as important “Gate Keeper”

Gut barrier intact

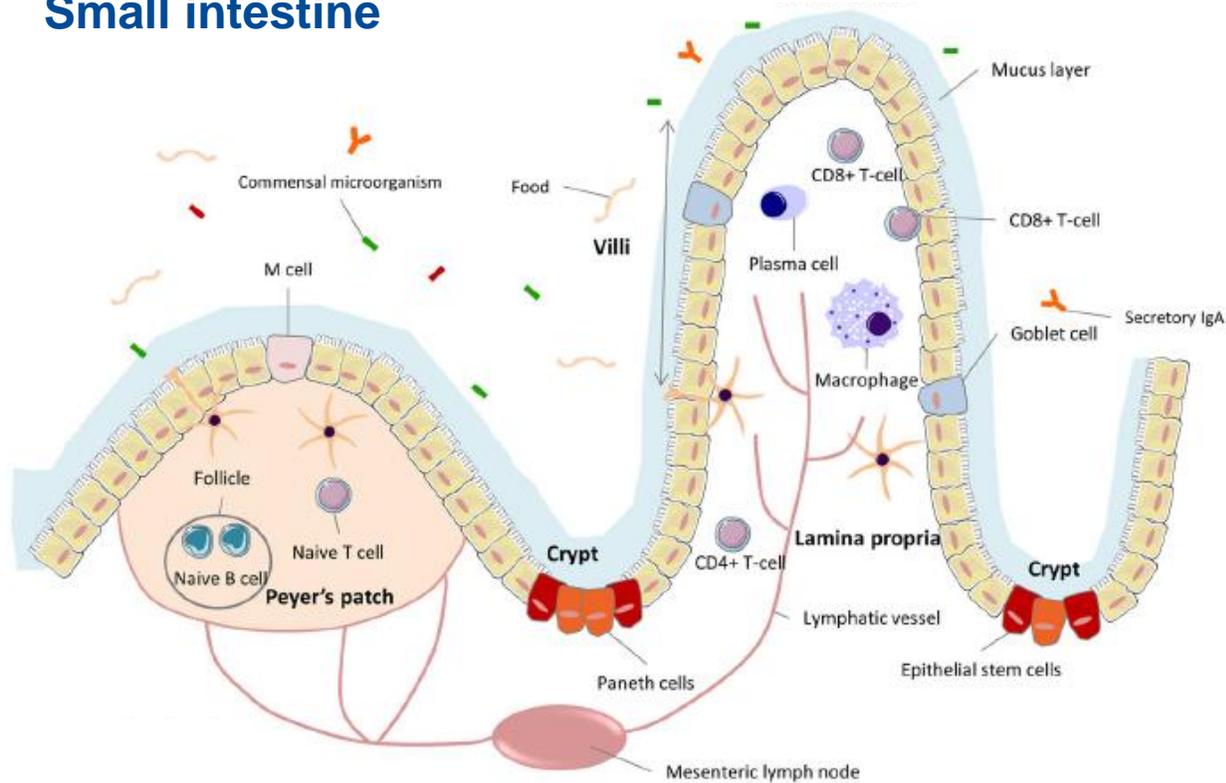


Gut barrier disrupted

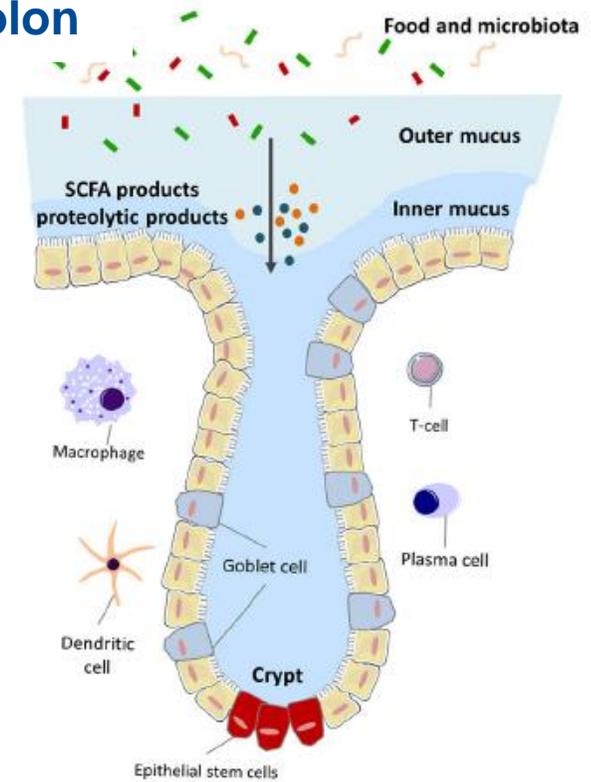


The intestinal Immune functions via complex interaction between the microbiota, the epithelial and immune cells

Small intestine



Colon



The immune system:

What does the consumer know & understand?



6 out of 10 consumers say that they are **more conscious about their health** and wellbeing due to COVID-19.

A photograph of three people sitting at a white marble table against a grey marble wall. On the left, a man in a white shirt holds a glass of orange juice. In the center, a woman in a light pink top holds a fork with a piece of broccoli over a white bowl of salad. On the right, a woman in a tan top holds a small glass bowl of food. All three are smiling and looking towards each other.

73% of consumers say they will make greater attempts **to eat and drink healthy**

Consumers know well established health ingredients that play a role in supporting immune health – BASF provides them all

Vitamin A



- Skin, eye, lung, and gut barriers inhibiting pathogen intrusion
- Effectiveness of vaccinations
- Precursor of retinoic acid, key regulator in the immune system;

Vitamin D



- Skin, eye, lung, and gut barriers inhibiting pathogen intrusion
- Regulation of anti-microbial defense proteins

Carotenoids



- Beta-carotene: same effects as vitamin A
- All carotenoids: antioxidant function, tissue protection

Vitamin E



- Skin, eye, lung, and gut barriers inhibiting pathogen intrusion
- Anti-inflammatory function
- Stimulation of immune cells, particularly in elderly people

Vitamin B₁₂



- Modulation of immune cells
- Steering lymphocytes to infected tissues
- Skin, eye, lung, and gut barriers inhibiting pathogen intrusion

DHA/EPA



- Anti-inflammatory function
- Stimulation of immune cells

Lower risk of allergies, respiratory infections, autoimmune diseases, chronic inflammation and an overall strengthened immune system

Consumers also show strong awareness for the connection between the gut and the immune system

37% of consumers are aware of and **extremely / very interested in the gut microbiome**, and how the good and bad bacteria in the gut impact overall health



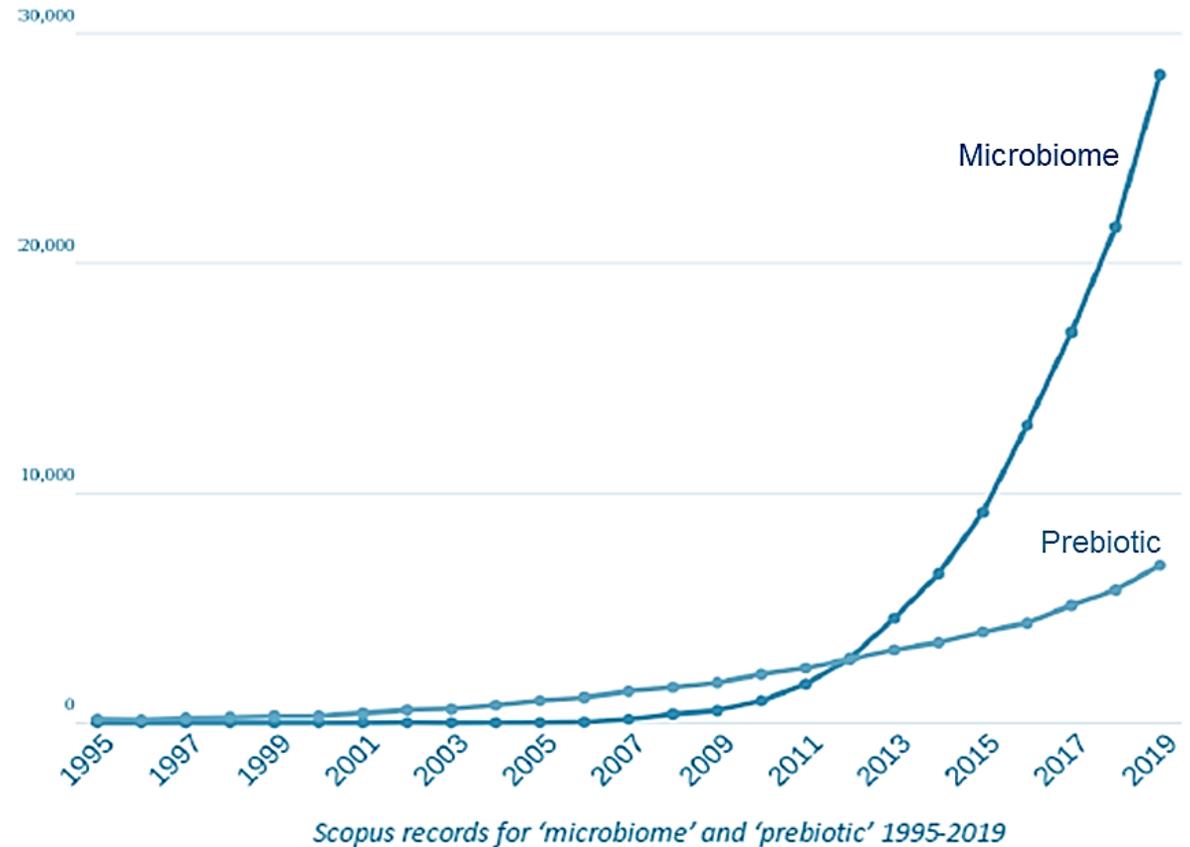
66% of consumers who take a probiotic supplement do so for a **healthier microbiome**

43% do that for **immunity**

55% of consumers believe that their **digestive health** plays an **extremely / very important role in the immune function**

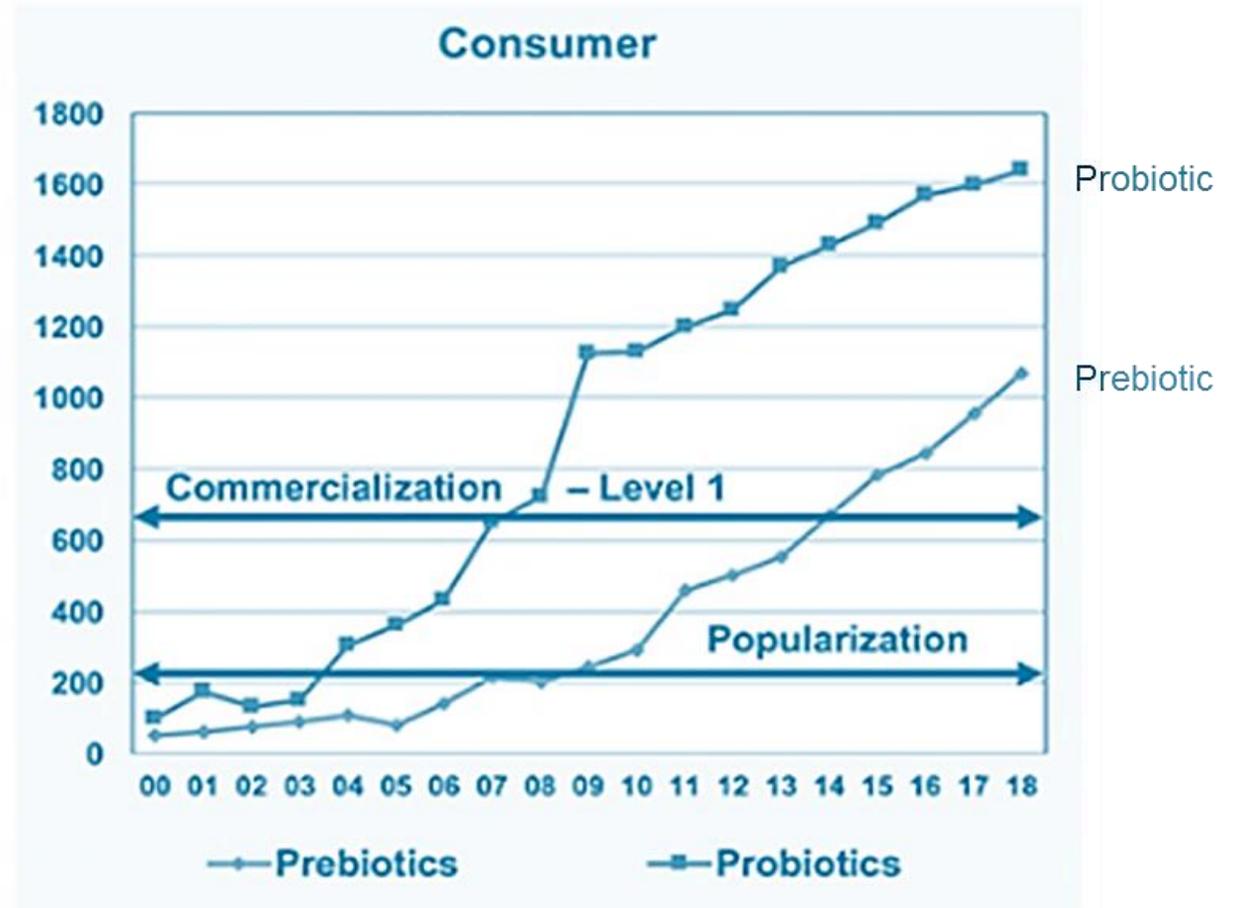
Gut health & microbiome are mega-trends...

- As more people realize they have billions of bacteria helping them to make it through the day, they want to actively take care of them
- Digestive health, the microbiome, pro – and prebiotics are all part of the same mega-trend
- From a science point of view, research interest in the microbiome has grown exponentially
- Industry, academics and consumers are now quite used to digestive health and concepts of probiotics... and are looking to explore related areas of prebiotics



... that will only become bigger with the rise of prebiotics

- In the consumer marketplace there is growth for both, pro- and prebiotics
- Growth in probiotics appear to be maturing / stabilizing at level 1 mass market
- Prebiotics, being a smaller market at this point, continues to accelerate



Connecting the dots between gut and immune health creates clear opportunities in terms of positioning

THE CONVERSATION

Gut reaction: How the gut microbiome may influence the severity of COVID-19

Shirin Moossavi, Postdoctoral Fellow, International Microbiome Centre, University of Calgary and Marie-Claire Arrieta, Assistant Professor, Physiology, Pharmacology and Pediatrics, University of Calgary

2 aspects play important roles

1 Mucous Membranes

Being the ink between the gut and immune systems, this epithelial barrier is often referred to as the **1st line of defense**. There are many ingredients with **EFSA claims for maintaining mucous membranes** e.g. vitamin A, niacin, riboflavin, biotin. Furthermore, research indicates **prebiotics** can keep the gut mucosa healthy.

2 Gut Microbiome

Feeding the good gut microbiota can improve overall health → which could translate into a healthier immune system. **Prebiotics** are substrates for the good bacteria.

Consumer groups



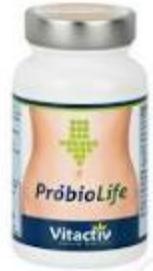
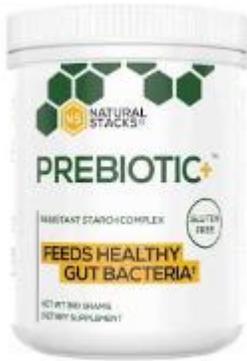
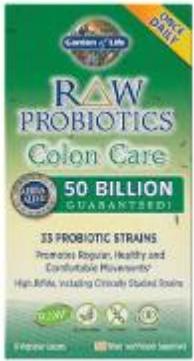
The adult including elderly

- Changes of the microbiota in obese/stressed adult and/or elderly may relate to an impaired immune response
- Thinning of mucous membranes

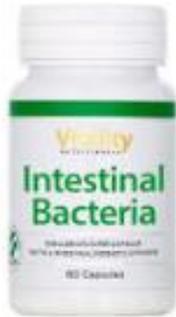


The toddlers and children

- No more breastfeeding in toddlers lead to frequent infections
- Picky eating and unhealthy diet in young children lead to dysbiosis and digestive trouble



How to differentiate your product to stand out?



HMO:

**How can they contribute to gut health
and immunity?**

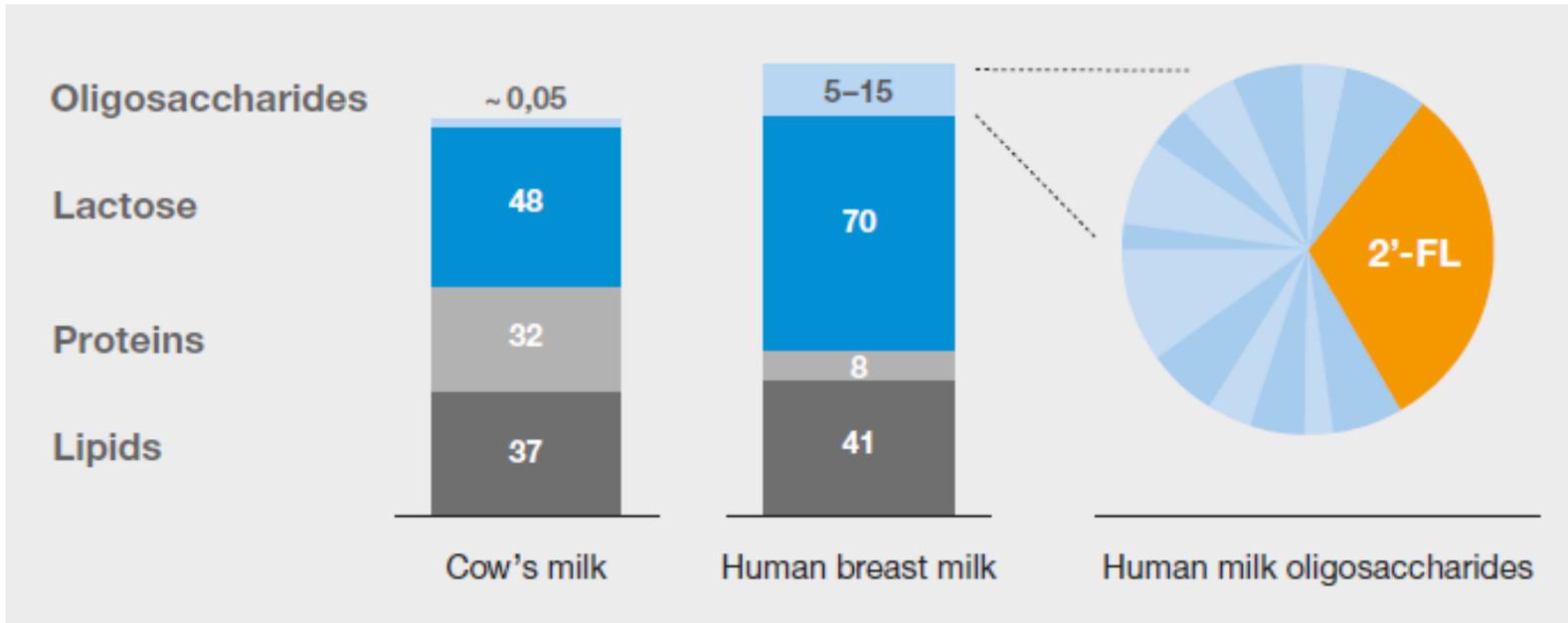


Human Milk Oligosaccharides (HMOs):

Multiple layers of protection,
from gut health to immunity

HMOs are the 3rd largest macromolecular component in human milk, their concentration is 300 x higher compared to cow's milk

Macronutrients in Cow's milk and human breast milk (g/Liter)



Good to know about HMOs

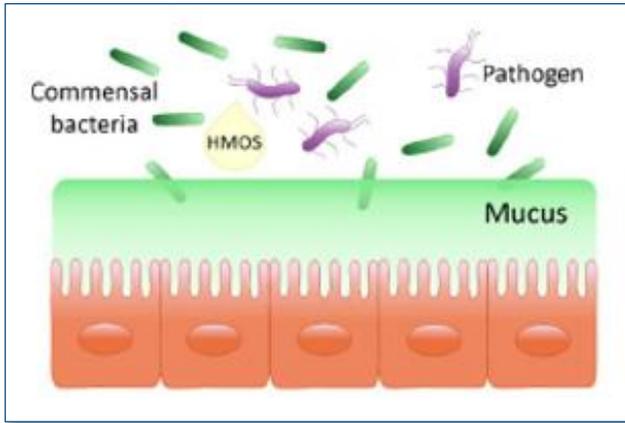
- 5 – 15 g / l in breast milk
- > 130 structures described, of which about 15 make up > 80% of the total amount
- Most HMO are not generally present in animal milks
- Composition of HMO depends on many factors, e.g. stage of lactation, environment, blood group / secretor status of the mother



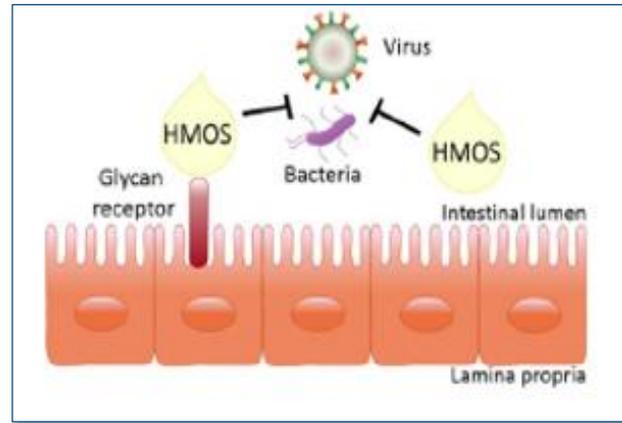
2'-FL

2'-Fucosyllactose (2'-FL) is the best researched HMO so far

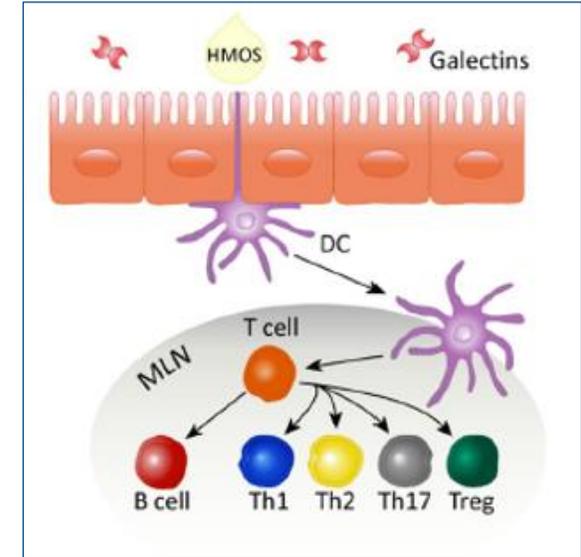
2'-FL specific structures enable various mechanisms of act at the gut barrier interface



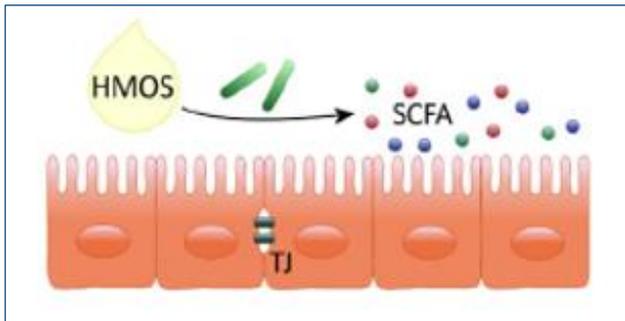
Support beneficial bacteria



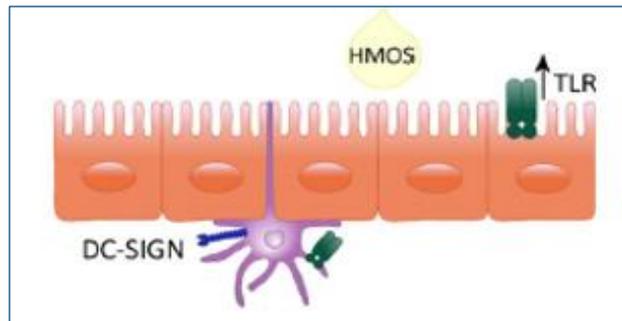
Antimicrobial / antiviral activity



Effects on inflammation & immune function

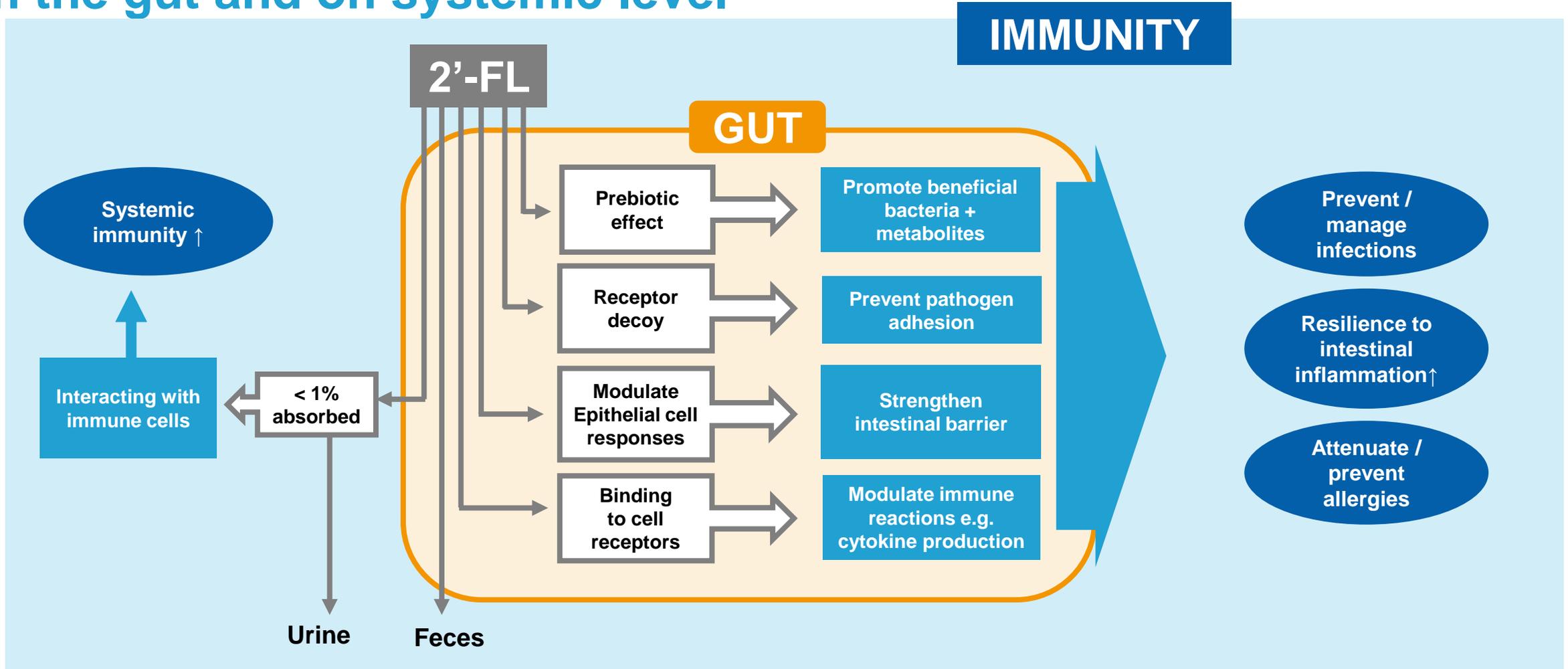


Mucosal barrier maturation

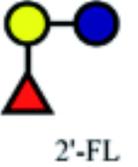


Modulate pathogen recognition

2'-FL can modulate immune functions directly and indirectly in the gut and on systemic level



Scientific evidence for 2'-FL in gut and Immune Health*



Observational Studies

Higher 2'-FL levels are associated with positive health outcomes

- Protection against *Campylobacter jejuni* associated infant diarrhea
- Bifidobacteria dominated early gut microbiota in breastfed infants
- Lower risk of allergic disease and eczema at age 2 yrs.

Experimental research

In-vitro and pre-clinical studies exploring mode of action

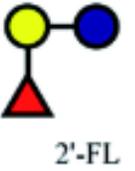
- Modulate immune reactions
- Attenuate food allergies
- Enhance response to influenza vaccination
- Strengthen intestinal barrier functions: Improve mucosal healing after resection; improve gut barrier integrity
- Selectively promote growth of beneficial bacteria
- Anti-adhesive / anti-microbial activity comprising bacteria and viruses

Intervention Trials

Clinical trials documenting beneficial effects of 2'-FL

- Fewer reports of respiratory tract infection, as well as use of antibiotics and antipyretics
- Modulating inflammatory cytokine profile
- Increasing abundance of beneficial bacteria in infants and adults

2'-FL differentiates from other prebiotics in the market & provides a new opportunity for gut health and immunity



- **A natural oligosaccharide that provides multiple layers of support for immunity and gut health**
- **Proven superiority in prebiotic-support & immunity boosting effects** attributed to the distinctive structure of 2'-FL compared to GOS, FOS and Inulin.
- **Synergistic effect with probiotics / vitamins for enhanced functional effectiveness** and corresponding consumer benefits.

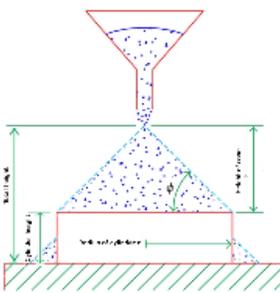
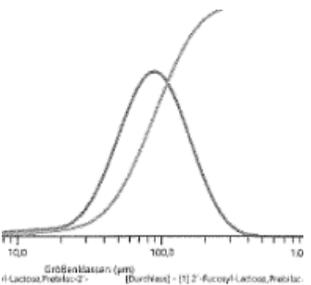
Why work with BASF & why Prebilac[®] 2'-FL?

PREBILAC® 2'-FL SD HF - an excellent choice for your applications

- ✓ Optimized application properties
- ✓ Strict quality control
- ✓ High purity standard



Optimized particle size
Benchmarking showed superiority of BASF material compared to competitor material



Great flowability
positively impact mixing properties during the production of dry formulation process



Fast dissolution
characteristics positively impact the product of liquid applications

Stand out from the crowd with PREBILAC®



Ride on growing market momentum

- Empowers you to respond to an increasing consumer demand and evolving needs



Human designed prebiotic

- Allows to innovate products promoting a natural and holistic approach fostering digestive & immune health



IP protected

- Offers “protected differentiation” and positions you as frontrunner in innovation
- Patents for specific uses have been granted in Japan & US, with patents pending in other markets



Accompanied by emerging science

- Differs in molecular structure compared to other prebiotics
- Covers the use as prebiotic as well as anti-inflammatory agent (both backed by IP*)



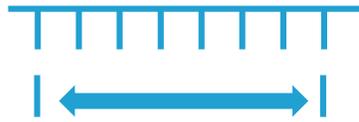
Easy to formulate

- Shows excellent flowability and dissolution properties, thereby being neutral in taste
- Enables a variety of formulations and universal applications

Capturing early mover's advantage in Asia Pacific with PREBILAC™ in Dietary Supplements innovations



We are here for you



**Well established and innovative range of health ingredient
with a pivotal role in securing immunity fitness**
Empowering you to launch relevant and on-trend products



Prototype development
Enabling quick market access and technical support to
formulate attractive consumer solutions



Regulatory & scientific expertise
Assisting you in building credible consumer solutions



Commercial marketing know-how
Supporting you in successfully positioning your product

Prebilac[®] - speed to market

**How to incorporate Prebilac[®] into attractive
consumer solutions?**

Prebilac® 2'-FL plus Vitamin Immunity Fruity Gummies

“I want a fun & tasty supplement that helps boost the gut immune system, for my family & I”

What is the market need?

- Digestive support is a key concern of consumers globally, representing 10% of the global dietary supplement market.
- Consumers are looking for natural, convenient and functional solutions to help support their digestive comfort.

What is the consumer benefit?

- PREBILAC™ 2'-FL is a human designed prebiotic to help consumers foster their digestive health.
- Differentiate your portfolio with an active ingredient that is structurally identical to the one found in human milk.
- Helps maintain a healthy digestive system in a fun, tasty and enjoyable gummy format.
- All applications are patent protected in major markets and endorsed by science.
- Provides 2.4g PREBILAC™ 2'-FL per 10g serve.



Health ingredients

See [Prebilac 2'-FL Product Page](#) for more information.
 *Please contact BASF for formulation or application discussion

PREBILAC™ 2'-FL 2.4g

Prebilac[®] 2'-FL plus Vitamin Immunity Tablets

“I want to take a supplement that helps boost my gut immune system.”

What is the market need?

- Supplements that can be easily consumed for supporting gut health
- Neutral taste and with convenient dosage format.

What is the consumer benefit?

- 2'-FL fosters a healthy gut by facilitating the growth of beneficial bacteria and supporting intestinal immune functions
- Helps maintain a healthy digestive system with convenient dosage control.
- All applications are patent protected in major markets and endorsed by science.



Health ingredients

Serving size: 3 tablet /dose

Dosage per dose
***Please contact BASF for formulation or application discussion**

Prebilac® 2'-FL + Probiotics plus Vitamin Immune Sachet

“I understand the importance of the microbiome and want to take the best supplement that helps boost my gut health and body immune system.”

What is the market need?

- Supplements combined probiotics and prebiotics with immune supporting key vitamins
- Easy way of obtaining beneficial nutrients in single dosage format targeting both gut health and immunity.

What is the consumer benefit?

- 2'-FL supports the gut health by dual-action, supporting beneficial microbiome and systemic effects.
- Probiotic strains provide additional beneficial microbes for gut.
- Vitamin D₃ strengthens antimicrobial defense, stimulates immune cells and has anti-inflammatory properties
- Vitamin B₁₂ supports production of antibodies and immune cells
- Vitamin B₂ contributes to the protection of cells from oxidative stress



Health ingredients

Serving size: 1 sachet/day

	Dosage per sachet
Prebiotics	1 g
Probiotics	1 g
Vitamin D ₃	5 µg
Vitamin B ₁₂	2.5 µg
Vitamin B ₂	1.4 mg

***Please contact BASF for formulation or application discussion**

Prebilac® 2'-FL plus Vitamin Immune Sachet

“I want a convenient & tasty supplement that helps boost my gut immune system.”

What is the market need?

- Supplements that can be mixed easily into beverages & foods
- Neutral taste or, alternatively, fruity taste (lemon, orange)

What is the consumer benefit?

- 2'-FL fosters a healthy gut by facilitating the growth of beneficial bacteria and supporting intestinal immune functions
- Vitamin D₃ strengthens antimicrobial defense, stimulates immune cells and has anti-inflammatory properties
- Vitamin B₁₂ supports production of antibodies and immune cells
- Vitamin B₂ contributes to the protection of cells from oxidative stress



Health ingredients

Serving size: 1 sachet/day

	Dosage per sachet
PREBILAC® 2'-FL	5 g
Vitamin D ₃	5 µg
Vitamin B ₁₂	2.5 µg
Vitamin B ₂	1.4 mg

***Please contact BASF for formulation or application discussion**

Find more information on our websites

Human Nutrition

Life Stages



Adults & Parenthood

Adults often lead a busy life, and therefore have a special need to stay fit and healthy.

[Read more](#)



Childhood & Adolescence

Receiving all the required nutrients during the first stage of life is crucial for physical growth, intellectual development and the prevention of future diseases.



Seniors

As life expectancies increase, preventing age-related diseases and thus staying healthy longer is becoming more and more important.

Application Areas



Beverages

We provide a wide range of functional ingredients, colors and filtration aids for the beverage industry. From juices and energy drinks to beer and wine.

[Read more](#)



Dietary Supplements

Our high-quality health ingredients are based on the most solid scientific foundations and can be used in a broad range of application forms.

[Read more](#)



Food

We provide a wide portfolio of performance and health ingredients to design food that looks and tastes good and has a pleasant feel as well.

[Read more](#)

www.basf.com/human-nutrition

PREBILAC® 2'-FL

Mother's Gift for Health Across Life Stages

Research has shown that 2'-FL supports the development of healthy gut and immune system, protection against allergic diseases and plays a role in the development of normal brain functions and cognition in early life and beyond.

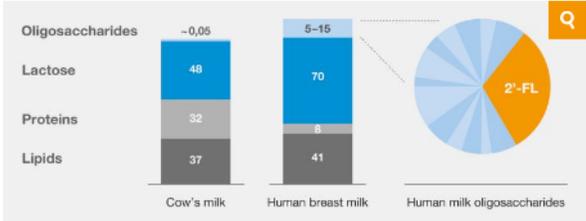
What is 2'FL?

2'-FL is a component of Human Milk Oligosaccharides (HMO), complex carbohydrates that are naturally present in breast milk. HMOs have been identified as the key differentiating factor between human and bovine milk. For the majority of mothers, 2'-FL is the most abundant HMO in their breast milk.

www.basf.com/prebilac

Discover PREBILAC® 2'-FL

- ↓ Prebilac Digestive Health One Pager
- ↓ Prebilac Infant Health One Pager
- 🔗 Press Releases
- 🔗 Events featuring PREBILAC 2'-FL
- 🔗 Follow us on Twitter
- 🔗 Follow us on LinkedIn
- 🔗 Contact us



Human milk oligosaccharides (HMO) is one of the major differentiators between cow's milk and human breast milk



We create chemistry