

PROBIOTICS, POSTBIOTICS AND PREBIOTICS AS FUNCTIONAL INGREDIENTS FOR HEALTH

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Perspectives and challenges in doctoral research

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FUNCTIONAL FOODS / INGREDIENTS

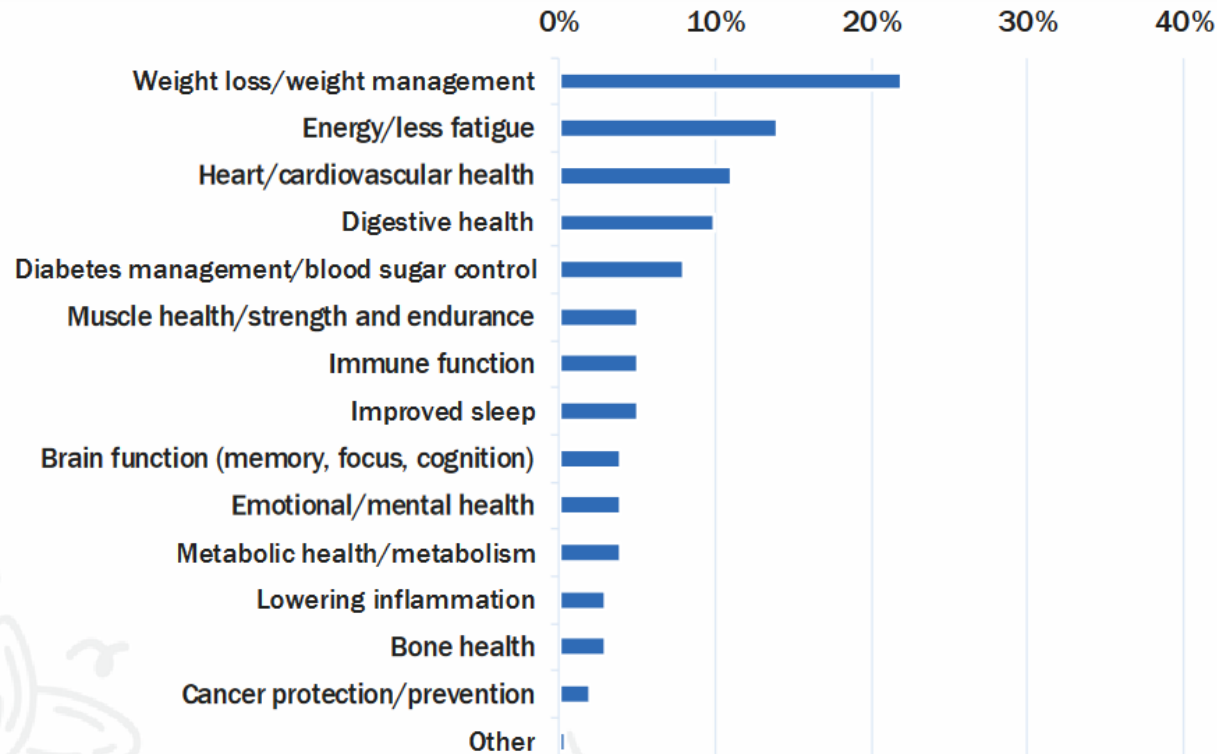
Functional foods can be defined as foods and food components that may provide benefits beyond basic nutrition.

Functional foods include a wide variety of foods and food components believed to improve overall health and well-being, reduce the risk of specific diseases, or minimize the effects of other health concerns.

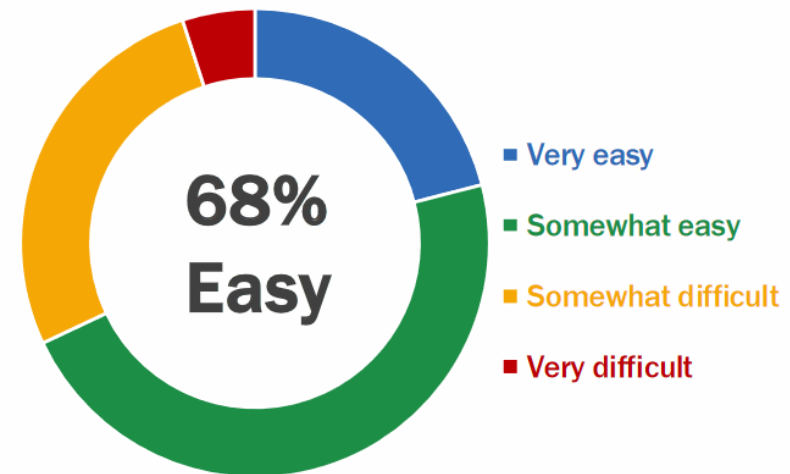
HEALTH BENEFIT SOUGHT FROM FOOD



#1 Health Benefit Sought from Food



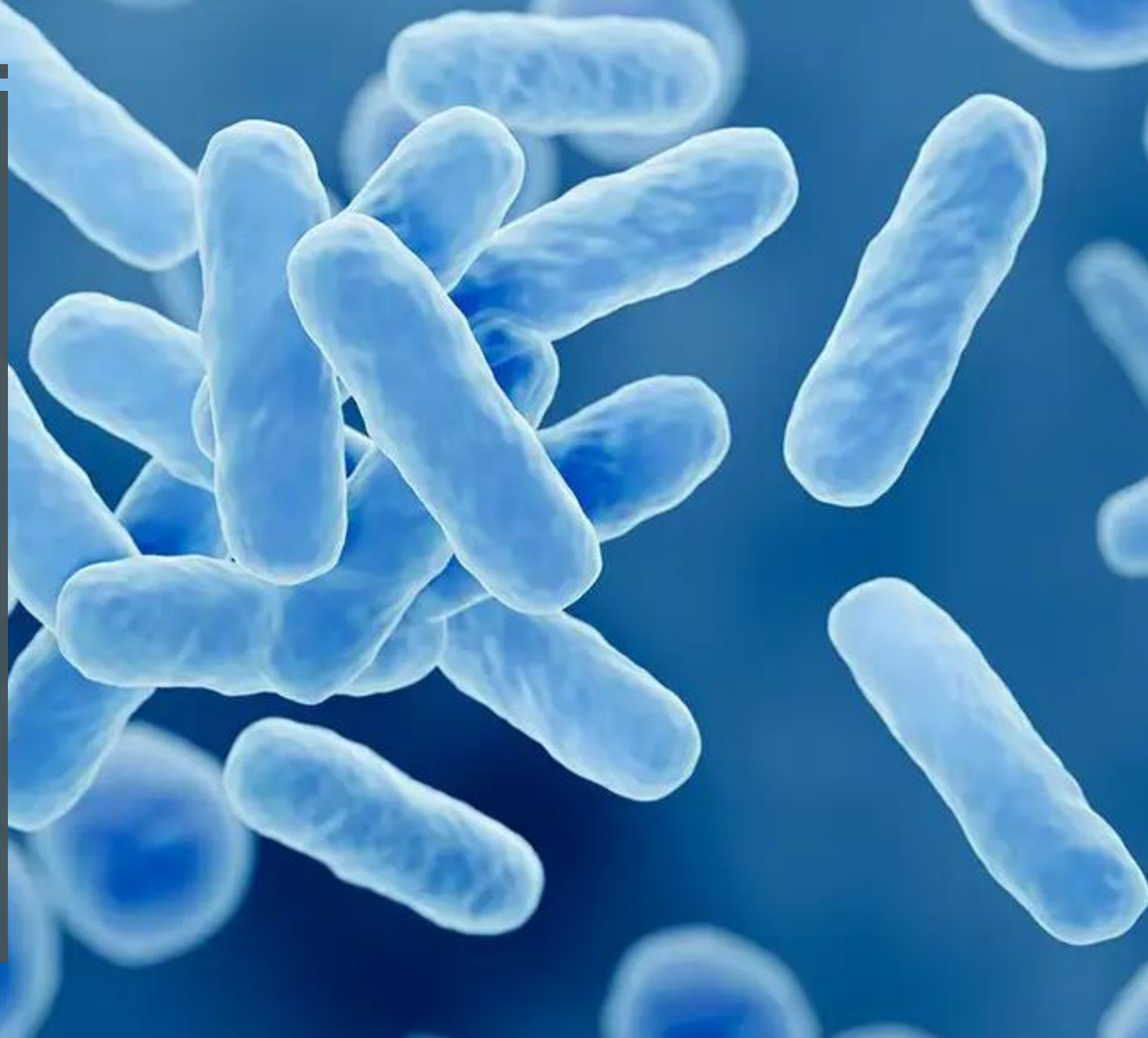
Ease of Finding Food that Supports Top Health Benefit



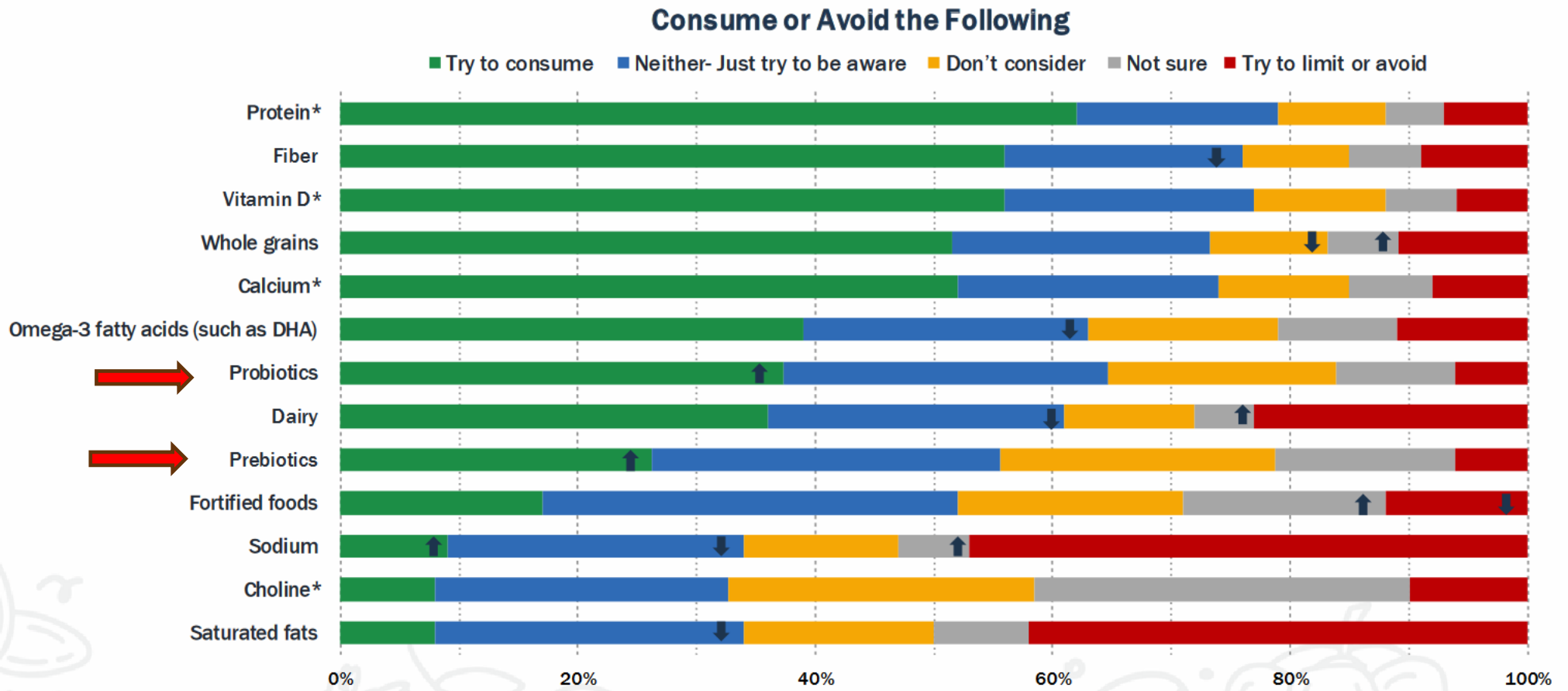
PROBIOTICS

- Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host

FAO/WHO Guidelines, 2002



MORE ARE TRYING TO CONSUME PROBIOTICS AND PREBIOTICS

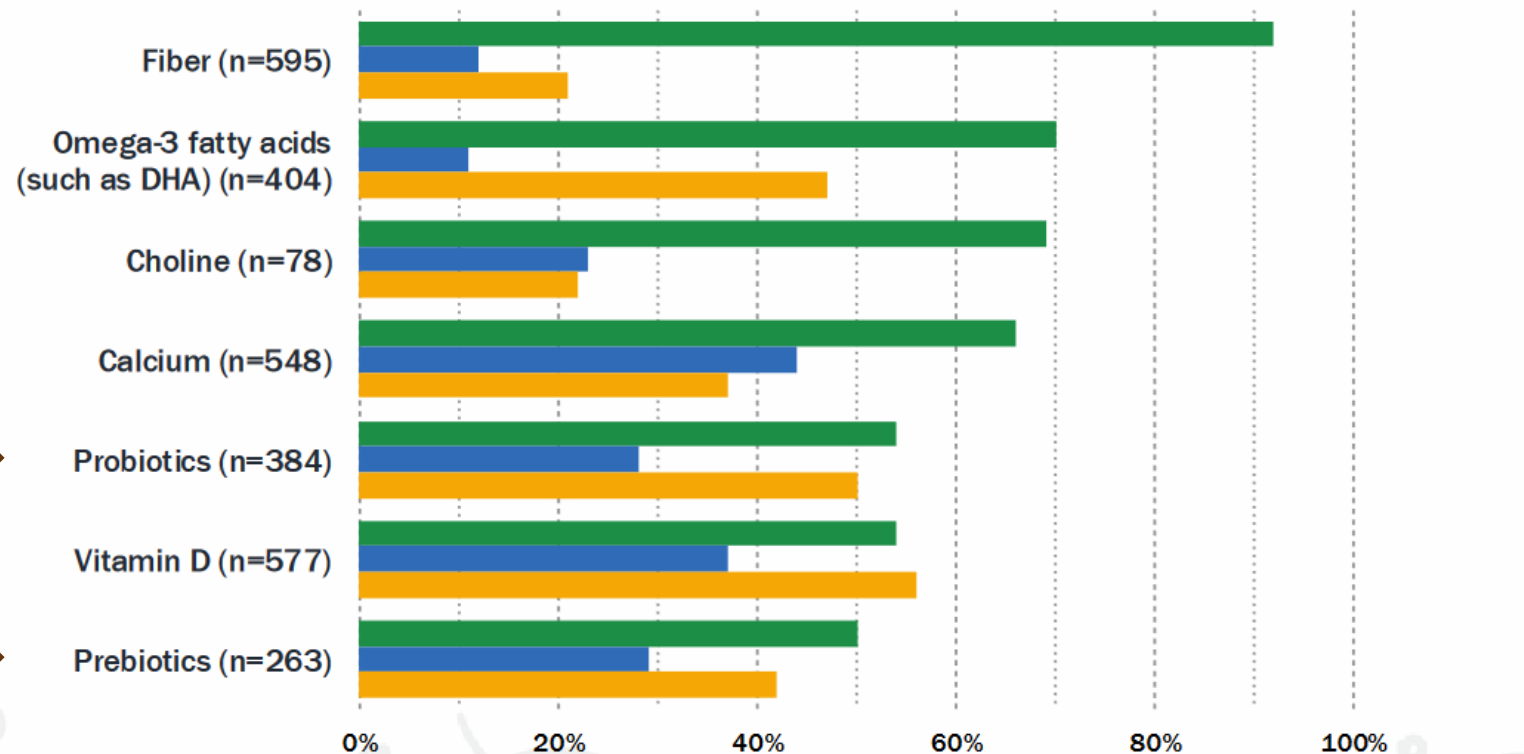


CONSUMERS MOST OFTEN SEEK MANY NUTRIENTS FROM FOODS VS. BEVERAGES OR SUPPLEMENTS



Sources Used to Consume Following Nutrients

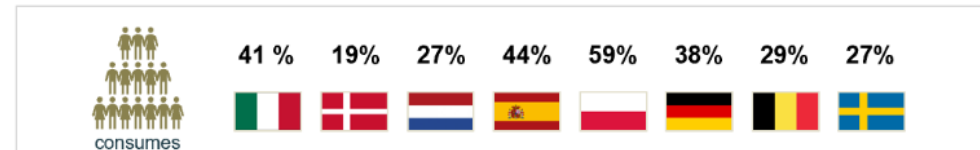
■ Foods ■ Beverages ■ Supplements



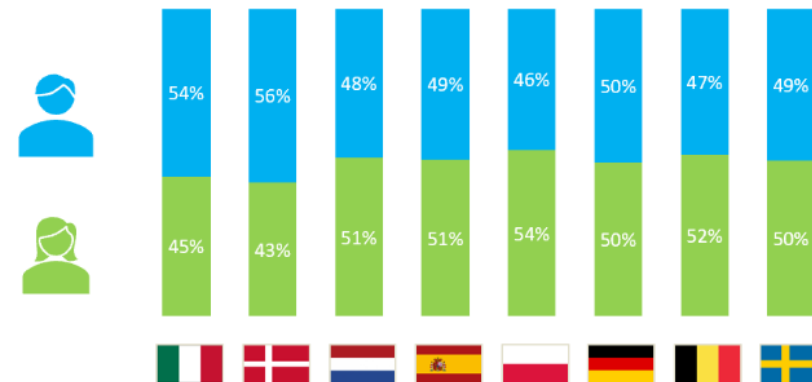
WHO ARE THE PROBIOTICS CONSUMERS?



- A survey conducted online in 8 European countries (Italy, Denmark, the Netherlands, Spain, Poland, Belgium, Germany, and Sweden)
- 8.000 consumers, 1.000 consumers by country, representative of the general population (from 18 years old and +)
- from several geographical areas per country ensuring a fair geographical distribution.
- Gender: about 50% of women and men in each country



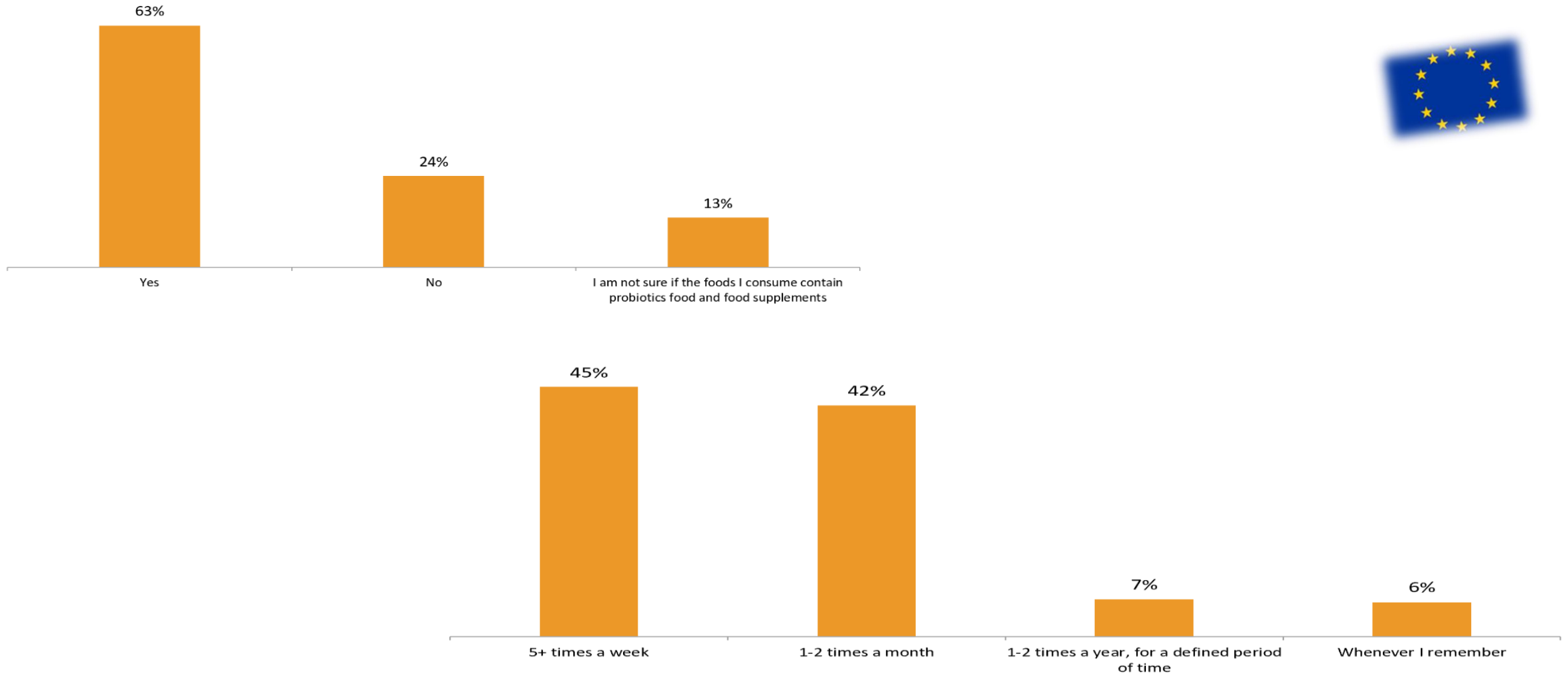
► Gender (n=2838)



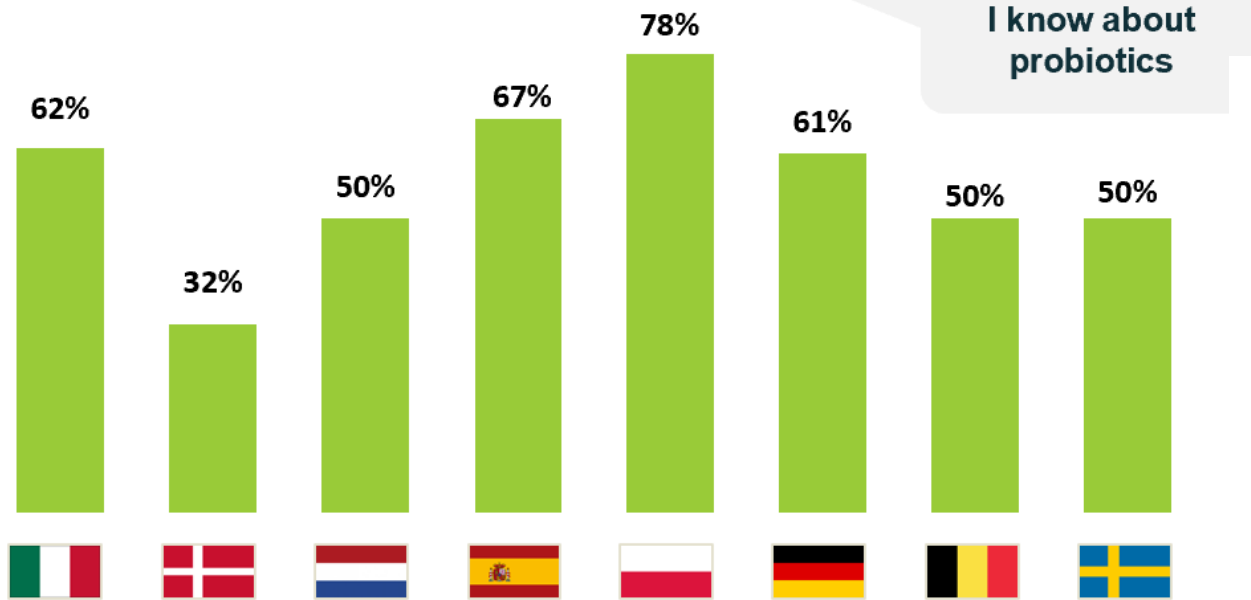
► Age (n=2838)

	Italy	Denmark	Netherlands	Spain	Poland	Germany	Belgium	Sweden
18 - 24	9%	22%	14%	10%	7%	15%	15%	13%
25 - 34	17%	31%	32%	23%	24%	20%	26%	30%
35 - 44	23%	26%	23%	31%	27%	19%	19%	22%
45 - 54	27%	13%	14%	21%	17%	22%	21%	14%
55 - 64	17%	5%	11%	13%	19%	15%	13%	14%
65 +	9%	4%	6%	2%	6%	9%	7%	7%

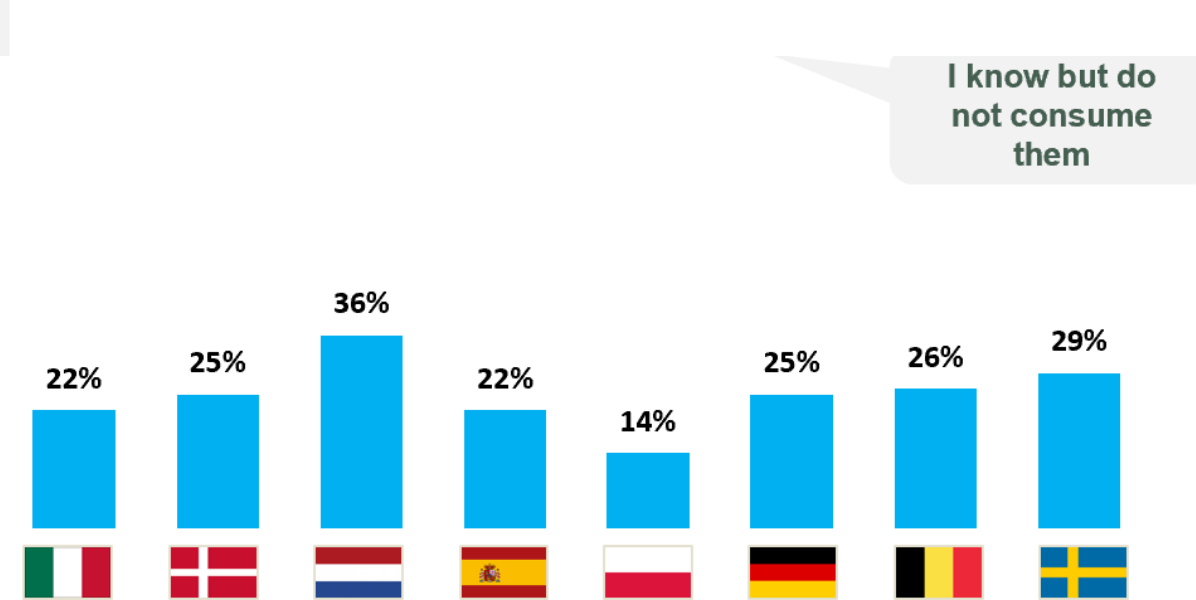
DO YOU CONSUME PROBIOTICS?



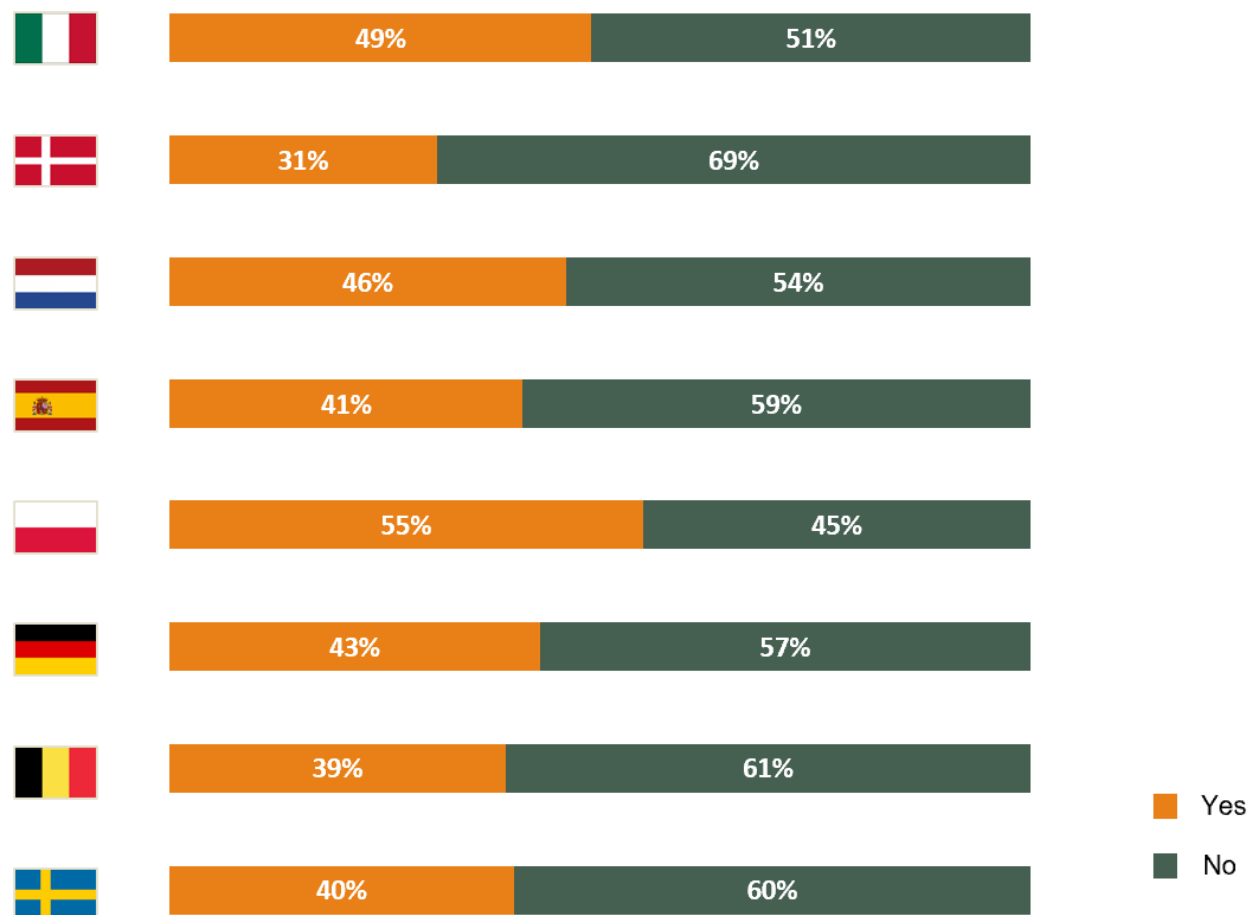
DO YOU KNOW WHAT PROBIOTIC FOOD AND FOOD SUPPLEMENTS ARE?



DO YOU CONSUME PROBIOTIC FOOD AND/OR FOOD SUPPLEMENTS?

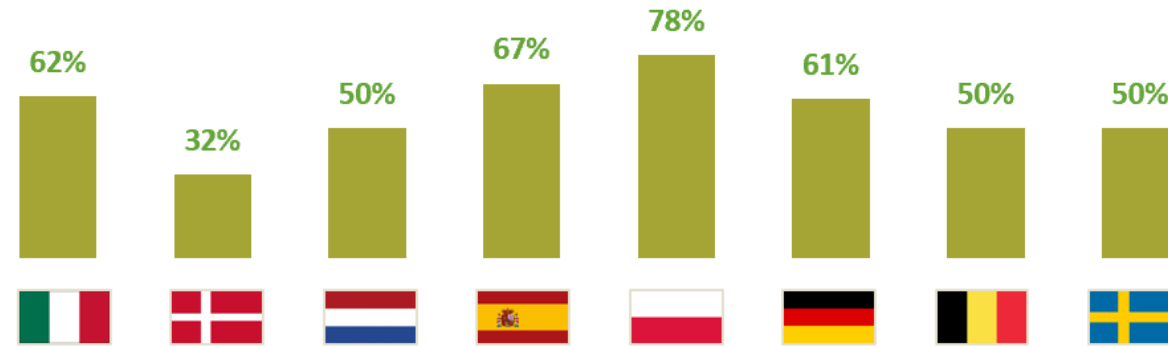


DO YOU BELIEVE YOU ARE INFORMED ABOUT PROBIOTICS IN PRODUCTS?

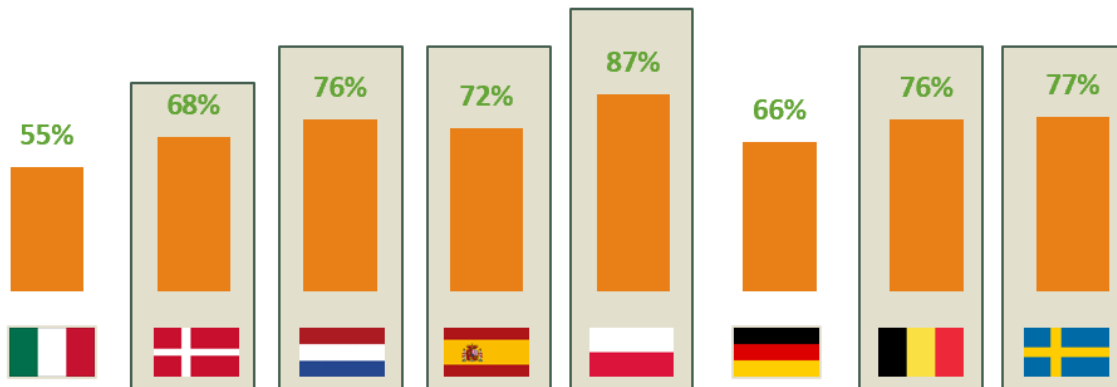


PROBIOTICS OR LIVE BACTERIA?

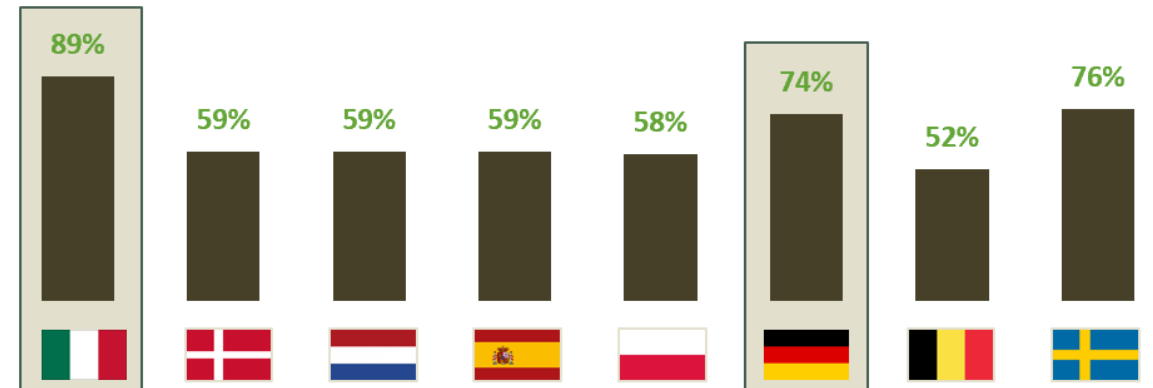
► Familiarity with 'probiotics' (n=1000 per country)



► Familiarity with 'live bacteria' (n=1000 per country)











► Familiarity with 'live cultures' (n=1000 per country)











Most familiar with

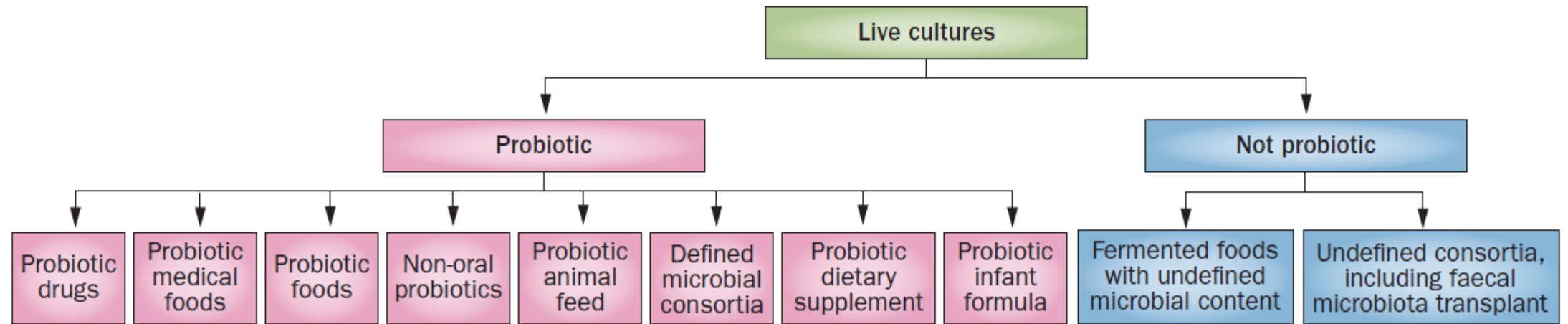
WHAT DO YOU THINK PROBIOTICS ARE USEFUL FOR?

								
Improve bacterial flora, digestion, stomach	14%	20%	31%	30%	24%	23%	24%	41%
Allergy, immune system, support, prevent disease	23%	12%	11%	23%	22%	19%	27%	18%
Good Health, wellbeing, reinforce	11%	11%	14%	17%	9%	18%	12%	18%
Did not answer, no idea, other use	55%	58%	50%	36%	50%	47%	42%	33%
n	211	124	229	225	196	231	209	228

FOR WHAT REASONS DO YOU CONSUME PROBIOTICS?

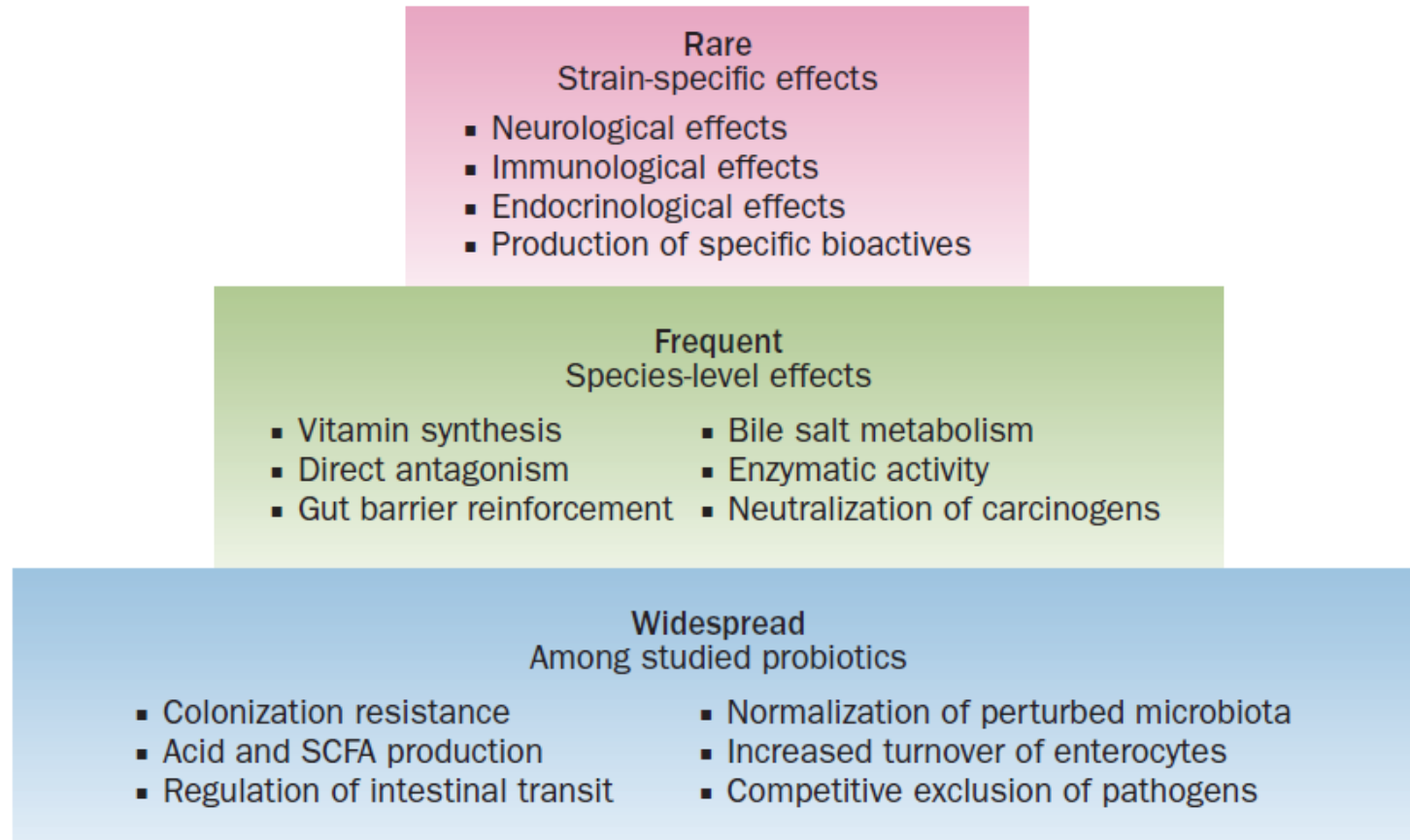
								
Improve bacterial flora, digestion, stomach	12%	18%	15%	23%	18%	17%	18%	32%
Allergy, immune system, support, prevent disease	27%	9%	6%	13%	21%	14%	15%	14%
Good health, wellbeing, reinforce	25%	44%	45%	46%	36%	43%	32%	30%
Did not answer, no idea, other use	37%	35%	39%	23%	28%	29%	39%	29%
n	412	192	271	443	585	376	292	267

OVERALL FRAMEWORK FOR PROBIOTIC PRODUCTS



Hill, C. et al. *Nat. Rev. Gastroenterol. Hepatol.* 11, 506–514 (2014)

POSSIBLE DISTRIBUTION OF EFFECTS AMONG PROBIOTICS



Hill, C. et al. Nat. Rev. Gastroenterol. Hepatol. 11, 506–514 (2014)

PREBIOTICS

- A substrate that is selectively utilized by host microorganisms conferring a health benefit.

ISAPP, 2017

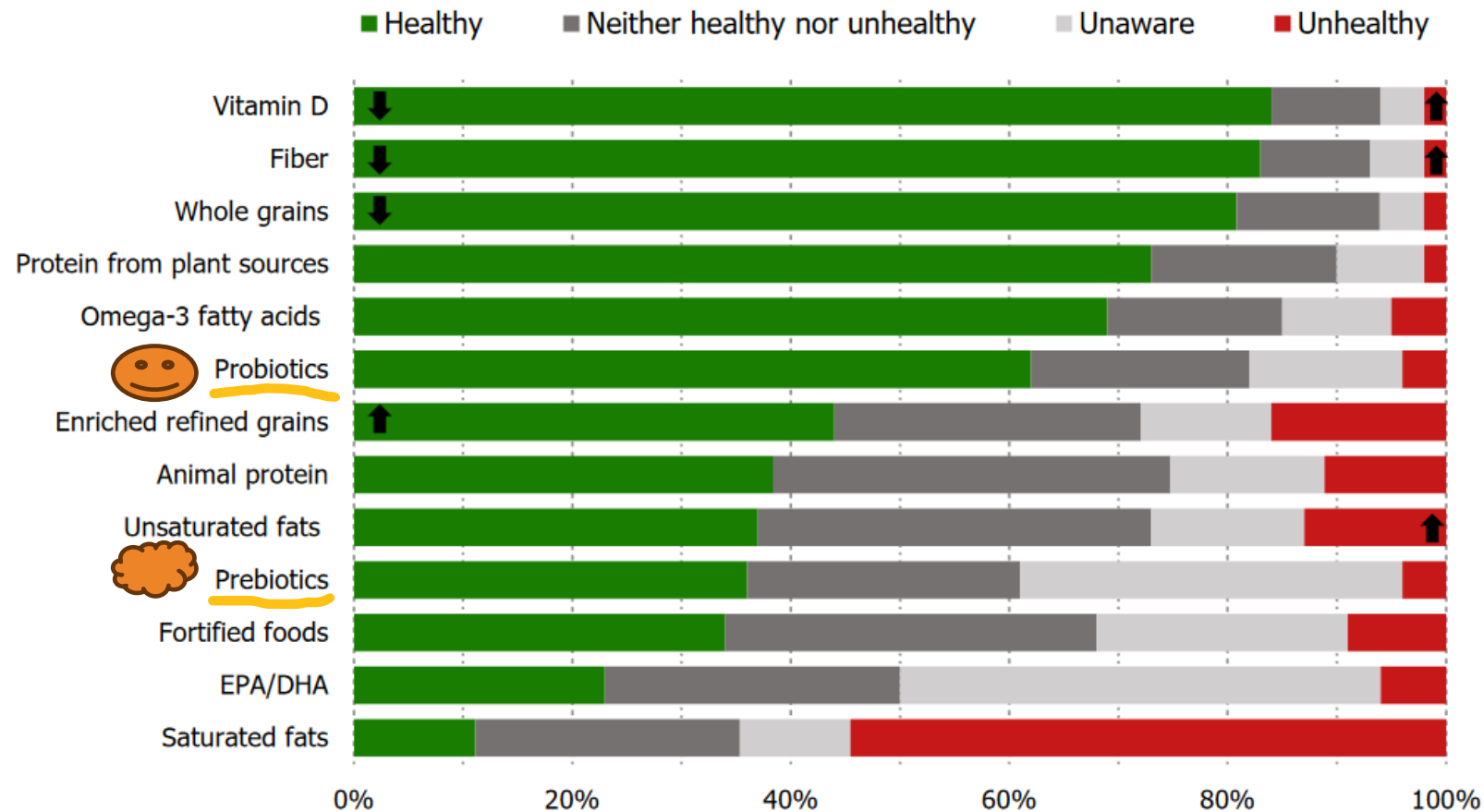
STEFANIA SILVI, UNIVERSITY OF CAMERINO



CONSUMERS SEE MANY NUTRIENTS AS HEALTHY

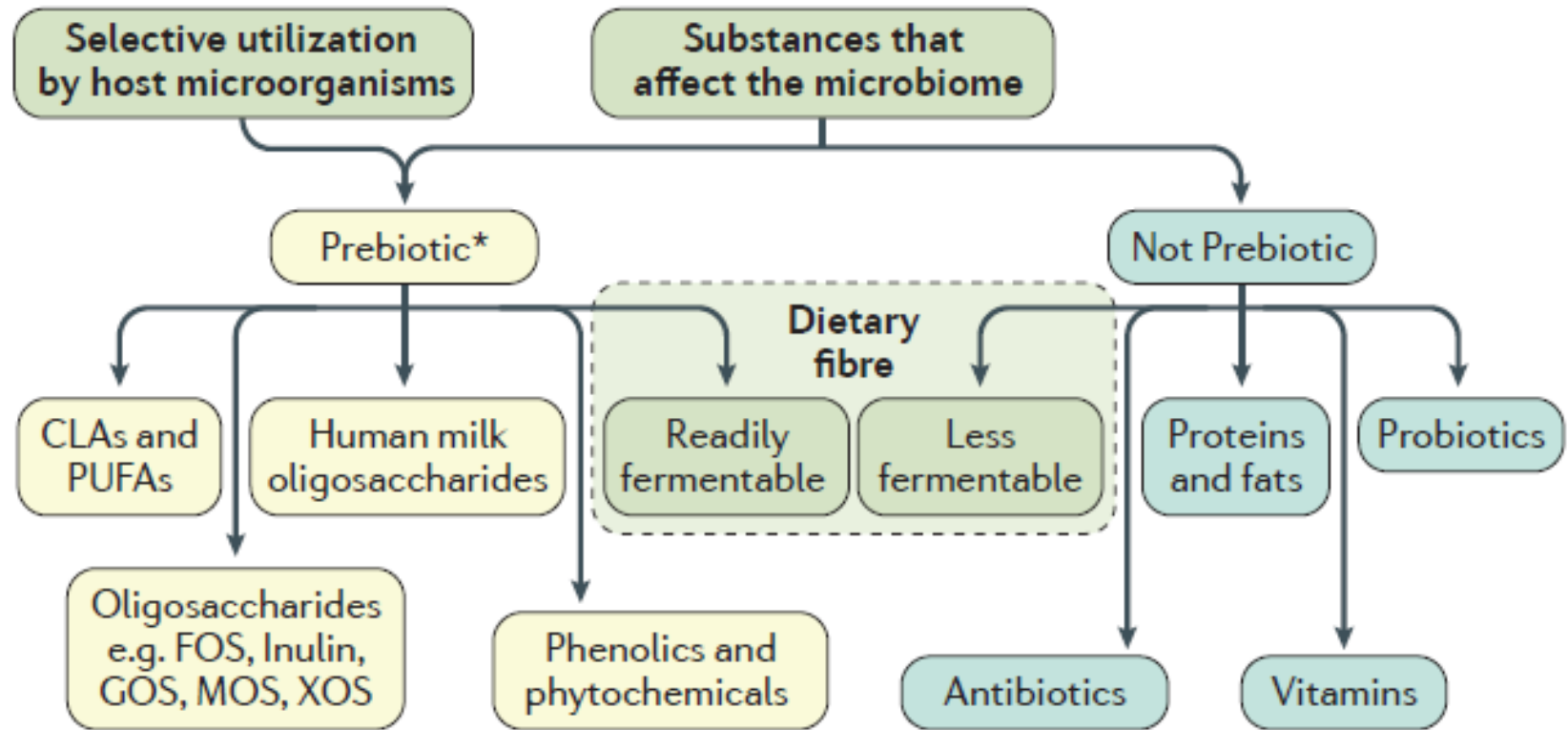


Perceived Healthfulness of Foods



Only **36 %** of people said **PREBIOTICS** were healthy compared to **62 %** who said the same for **PROBIOTICS**. A whopping **35 %** were unaware of their effect on health.

UPDATED DEFINITION BY ISAPP – INTERNATIONAL SCIENTIFIC ASSOCIATION FOR PROBIOTIC AND PREBIOTIC SELECTIVE UTILIZATION BY HOST MICROORGANISMS



ISAPP, 2017

WHICH FOODS ARE SOURCES OF PREBIOTICS?

- **Fruit, vegetables, cereals** and other **edible plants** all have potential to provide prebiotics. Artichokes, asparagus, bananas, berries, chicory, garlic, green vegetables, legumes (like peas and beans), onions, tomatoes, oats, barley and wheat are among the sources of naturally occurring prebiotic fiber.
- A few items on the ingredients list like **lactulose, inulin and oligosaccharides**, which are also classified as prebiotic. They are sometimes called “isolated” or “synthetic” fibers because they’re added to foods like granola bars, cereal, and yogurt to boost their nutrition content and aren’t intrinsically present in the original product.

WE DON'T KNOW WHAT THE “IDEAL” AMOUNT OF DAILY PREBIOTIC INTAKE IS

- There's no map of exactly which strains of probiotic bacteria use which kinds of prebiotics, whether they are from an apple, an artichoke or inulin in a snack food. This makes it difficult to selectively enhance the presence of different types of beneficial bacteria, which may turn out to be an important factor for our health.
- To date, **only one prebiotic, chicory inulin**, has received an EU health claim: **“Inulin improves bowel function”**. This approval was based on demonstration of a cause–effect relationship between consumption of the non-fractionated mixture of monosaccharides (<10% of total carbohydrate), disaccharides, inulin-type fructans and inulin extracted from chicory with a mean DP ≥ 9 , and maintenance of normal defecation by increasing stool frequency.

EXTRA VIRGIN OLIVE OIL EXHIBITS PROMISING PREBIOTIC ACTIVITIES



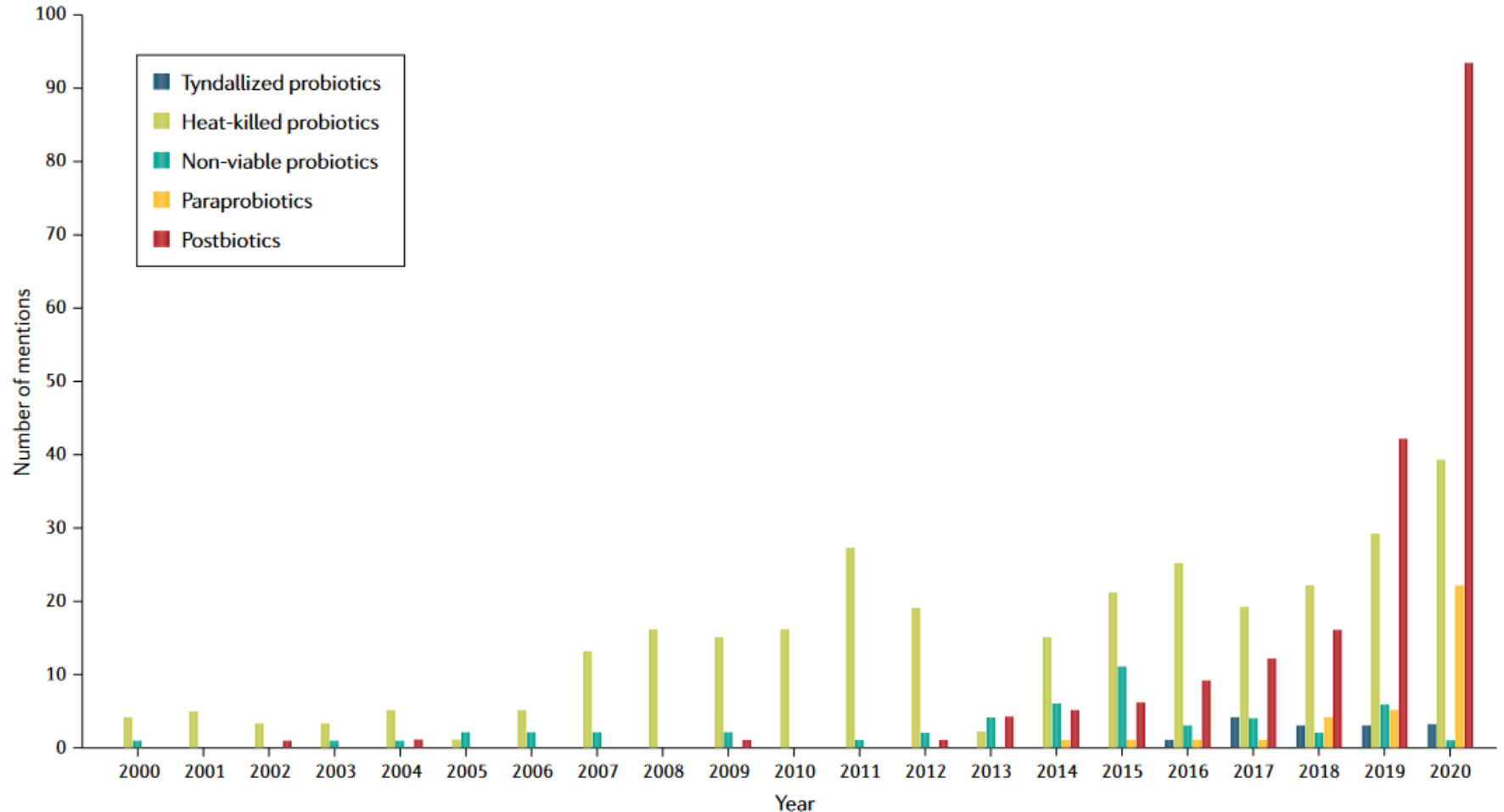
A total of **20 EVOO** samples from 5 different cultivars were studied. The selected varieties, all farmed in Marche region (Italy), were *Ascolana tenera*, here indicated as *Ascolana*, *Coroncina*, *Mignola*, *Piantone di Mogliano* and *Raggia*



Salvesi C, Coman MM, Tomás-Barberán FA, Fiorini D, Silvi S. In vitro study of potential prebiotic properties of monovarietal extra virgin olive oils. *Int J Food Sci Nutr.* 2024 Feb;75(1):45-57. doi: 10.1080/09637486.2023.2270639. Epub 2023 Oct 16. PMID: 37845639.

WHAT ARE POSTBIOTICS?

- Spurred on by growing awareness and the increasing use of the term “postbiotics” in research and in commercial products, in 2021 the International Scientific Association of Probiotics and Prebiotics (ISAPP) formally defined a postbiotic.



POSTBIOTICS

- Preparation of inanimate microorganisms and/or their components that confers a health benefit on the host



WHAT ARE SOME EXAMPLES OF POSTBIOTICS?

- Many different types of postbiotics, ranging from familiar nutrients like **vitamin B12**, **vitamin K**, **folate** and **some amino acids** to less-familiar varieties like **short-chain fatty acids**, **enzymes**, **lipopolysaccharides**, fragments of bacterial cell walls, **bacterial lysates**, and **cell-free supernatants**.

WHAT ARE THE HEALTH EFFECTS OF POSTBIOTICS?

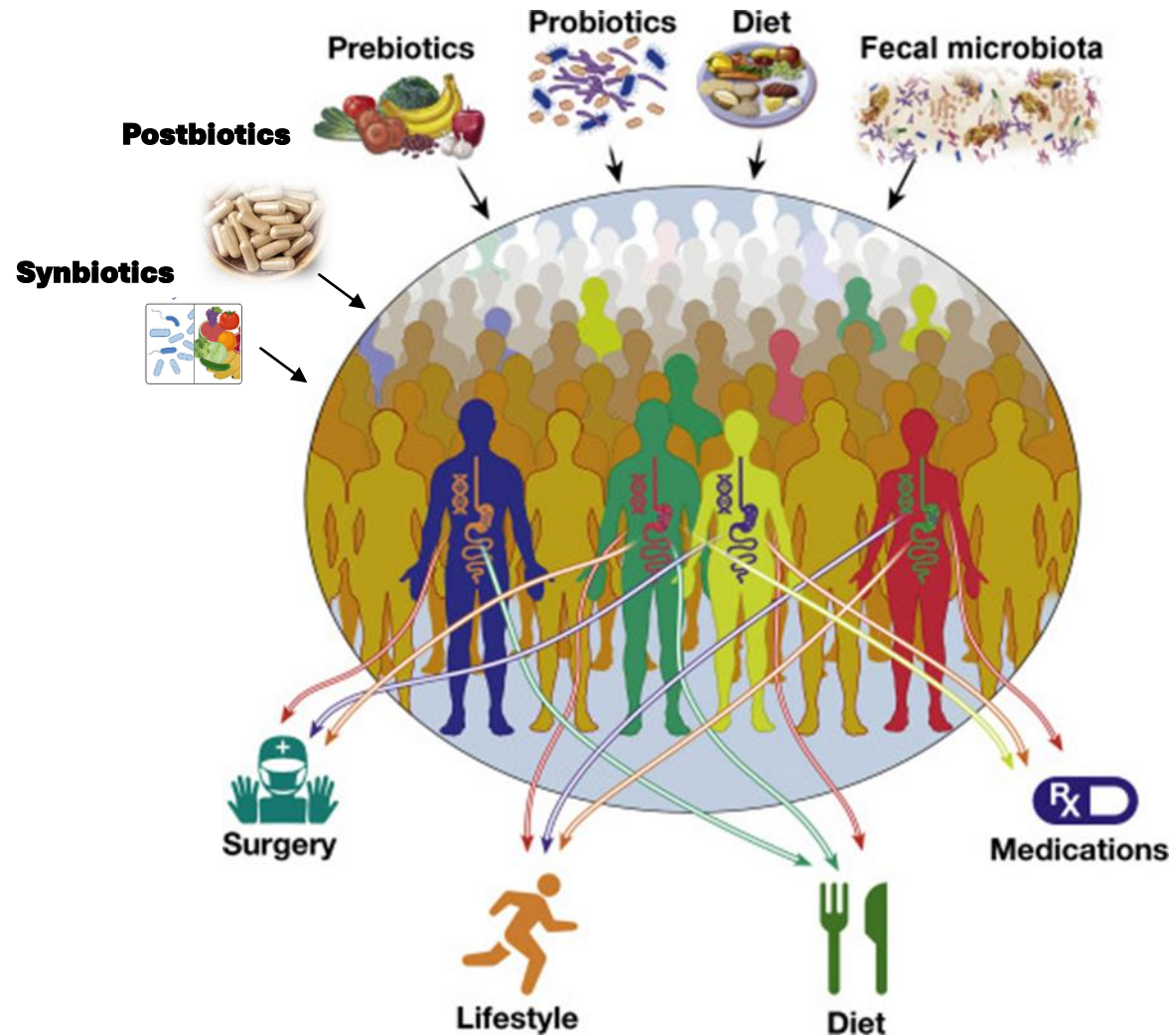
- There are a few areas of our health for which postbiotics might hold particular promise:
- **Immune function:** A few studies have demonstrated that postbiotic supplementation may reduce development of the common cold and recurrent respiratory tract infections.
- **Gastrointestinal conditions:** Postbiotic supplementation has alleviated symptoms of irritable bowel syndrome and inflammatory bowel disease in a few randomized controlled trials.



ARE POSTBIOTICS SAFE?

- It should be considered when investigating postbiotics: the starting material, the means of inactivation and assurance of safety.

THE GUT MICROBIOTA AS THE TARGET FOR THE HUMAN HEALTH



Knowing and understanding the functioning of the intestinal microbiota and being able to interfere on its dynamism, constitutes a great tool for contributing to improve human health



THANK YOU FOR YOUR ATTENTION!

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