Advances

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THE MICROBIOME

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Advanced Biotics

Seven clinically tested probiotics for
balanced intestinal microflora

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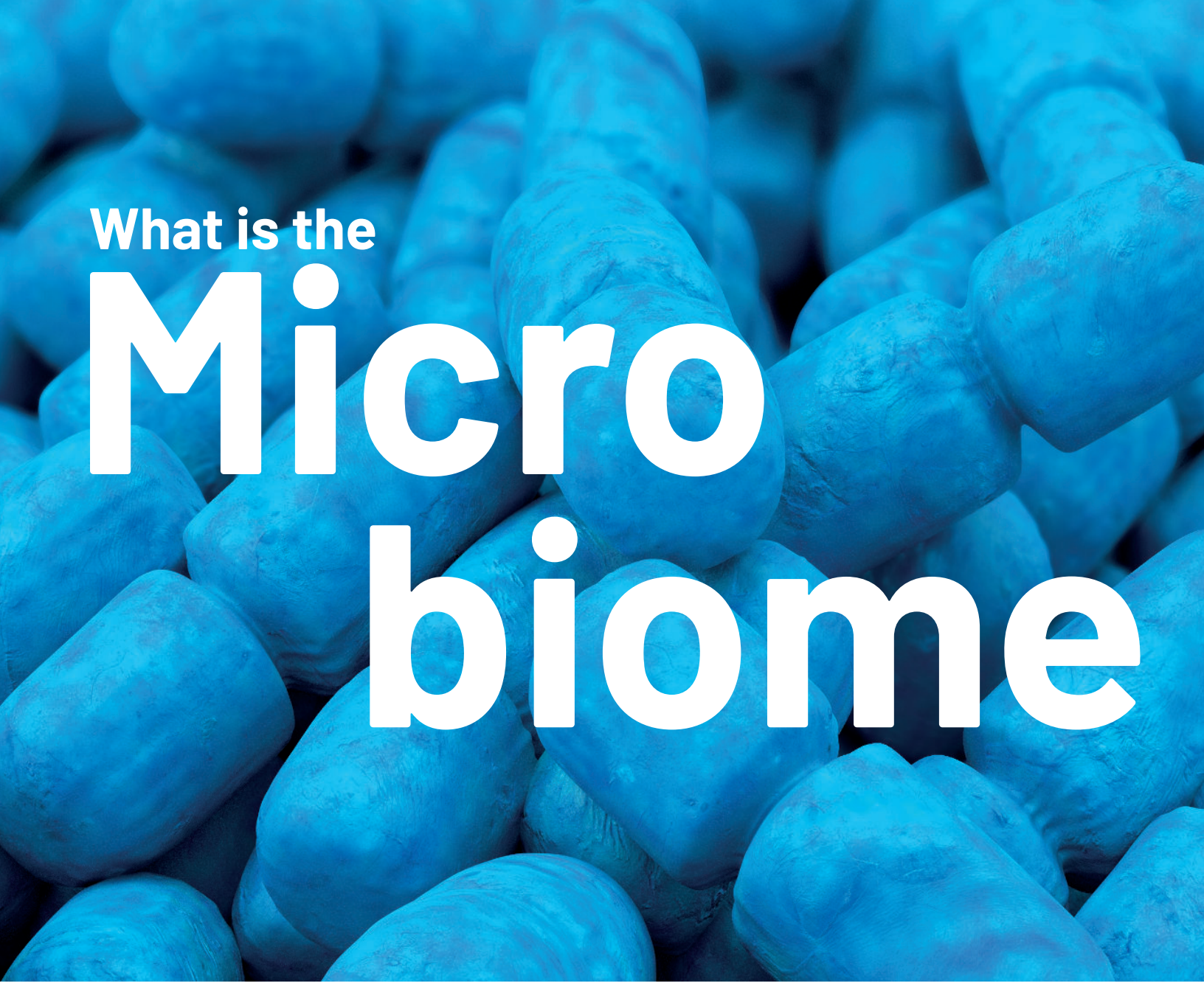


What is the Microbiome

We are NOT alone!

At any given time, we have trillions of microbes in and on our bodies, outnumbering our cells ten to one. Many of these microbes are helpful, like the bacteria in our digestive tracts that help us break down food for optimal digestion, while others are pathogenic, making us ill or at the very least, more susceptible to disease. Although bacteria are the biggest players in the microbial community, humans are also a host to single celled organisms known as archaea, as well as fungi, bacteriophages and other microbes, including viruses that attack bacteria. Together, all of these become the human microbiota.

The concept of the "microbiome" was suggested by Joshua Lederberg in 2001 to define "the ecological community of commensal, symbiotic and pathogenic microorganisms that literally share our body space". Extensive research has identified components of the microbiome in nearly every human body site, including tissues and blood.

Exposure to bacteria is beneficial in building a hardy immune system. Over 100 trillion beneficial microorganisms inhabit the human body. Over 10,000 different species have been identified with over 200 of those species residing in the gut. About 30% of the gut microbiome is common between humans, the remaining 70% is very person specific and as such, the microbiome is likened to human fingerprints. It is interesting to note that the composition of this extensive microbiome differs by location in which they occur (for instance, the composition of microbes in the oral cavity will differ from the composition in the gut), as well as health states (whether healthy or not healthy). The human body is considered a superorganism, because of the vast array of microbial genomes present in and on the body and the interaction between these genomes. These microbial genomes are in constant interaction with the human genome; therefore, it is not surprising that these microbial communities play a significant role in shaping our immune system and metabolic health.

Although it has been known for some time that the human body inhabits these microbial communities, it was only within the last

by Pamela Ovadje, PhD

20 years that researchers started to study the effects of these resident microbes on health and wellness. The Human Microbiome Project (HMP) and the METAgenomics of the Human Intestinal Tract (MetaHIT) were collaborative projects in the United States and Europe respectively, funded between 2008 and 2012 to characterize the human microbiome and gut microbiome respectively. These projects became the foundation to develop databases on which future microbiome research is being built. These projects also identified that microbial communities colonize four major sites of the human body – the mouth, gut, vagina and skin, although microbial colonization also happens in tissues and blood. In the oral cavity alone, there are more than 700 bacterial species or phenotypes that have been detected, with more information available on the pathogenic bacteria that cause oral diseases, than on the bacterial/microbial strains that confer a health benefits.

It is clear now that the microbial community of healthy individuals differ significantly from that of unhealthy individuals or individuals with chronic health conditions and these microbes are able to persist in both acute and chronic forms, depending on the need or health status of the individual. Microbial communities, especially in the gut, can play important roles in maintaining host physiology starting from nutrient acquisition and synthesis, energy homoeostasis, maintenance of colonization resistance and immune development and maintenance. The gut microbiome plays an especially important role in the fermentation and digestion of complex plant polysaccharides (fibres) from diet, which results in the production of short chain fatty acids (SCFA), including acetate, propionate and butyrate. These SCFAs are used as an energy source and for improved oxygen consumption by colonocytes, while allowing the proliferation of more good bacteria in the gastrointestinal tract. The microbiome, as a whole, irrespective of colonized location has several important activities, including aiding in digestion, production of some vitamins, modulation of metabolic function and behaviour, regulating adaptive immunity, modulating inflammatory signalling and protecting the host against pathogen invasion.

All of the microbiota have extensive roles in the development of immunity, host nutrition, energy metabolism, synthesis of vitamins and fat storage, and in some cases could influence human behaviours. It is important to note that unlike the host genome, which is relatively constant, the microbiome is dynamic and adapts to changes in development, environmental factors and disease states (Figure 1). Additionally, the microbiome differs from person to person, even if they have the same health status and environmental factors. Therefore, it is important to understand the diversity in microbiome colonization and how it affects health and wellness.

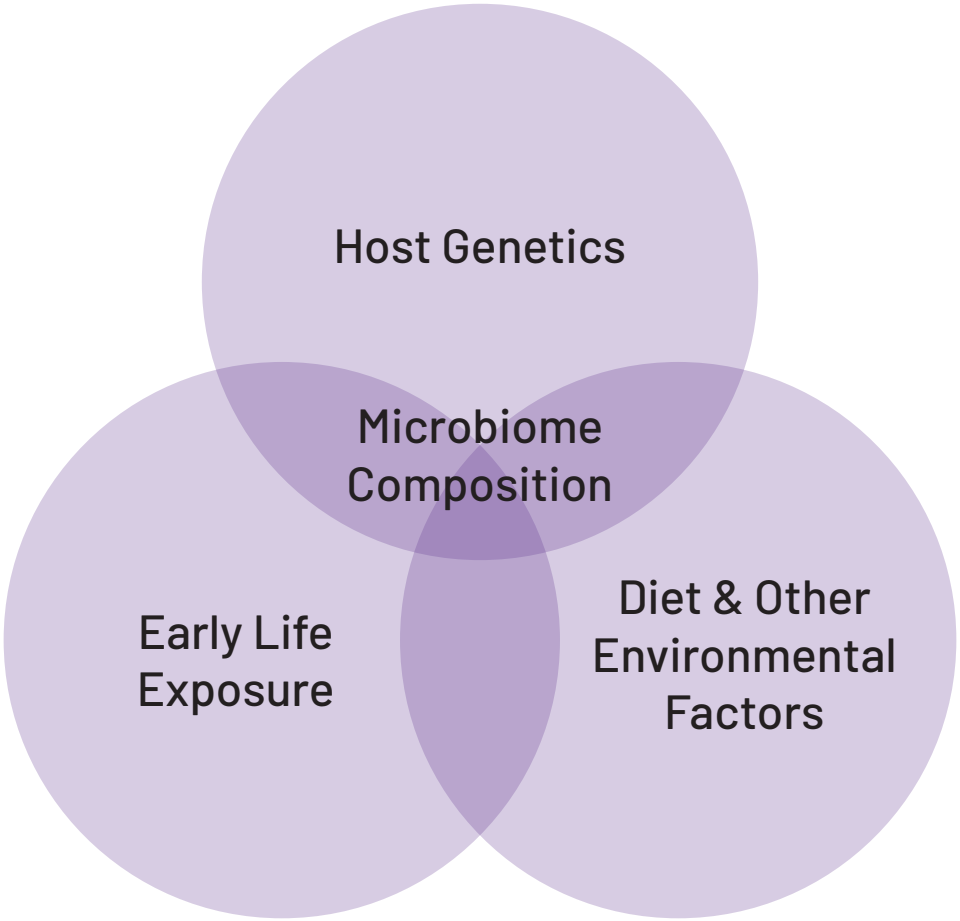
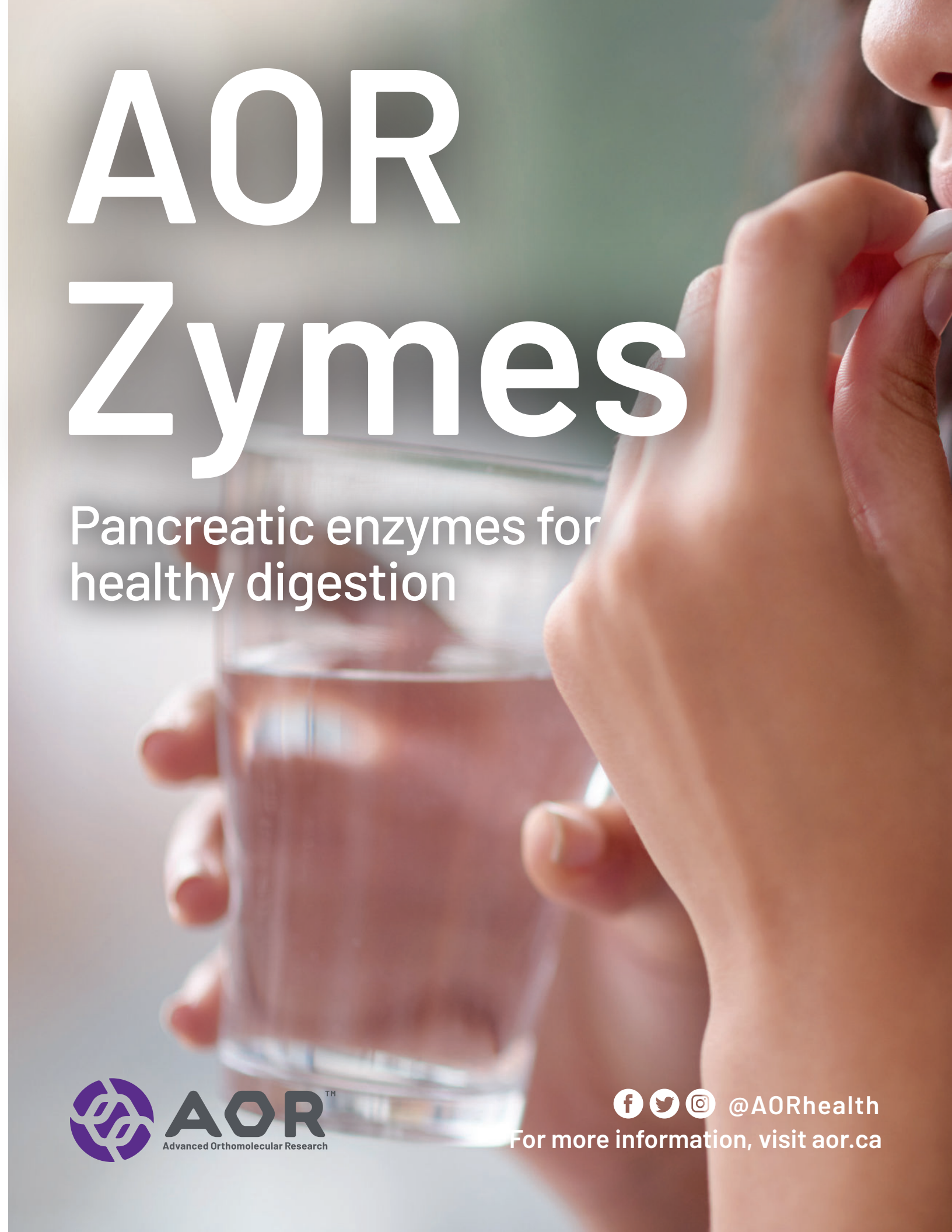


Figure 1: The interaction between various factors and the diversity and composition of the microbiome.
Adapted from: https://www.taconic.com/taconic-insights/microbiome-and-germ-free/how-gut-microbiome-is-established.html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Eating to Support a Healthy Gut Biome

By Cassy Price, BBA

The microbiome has been a hot health topic for a while now, as scientists increasingly discover the central role that gut bacteria play in our overall health. With these discoveries has come tons of information about ways to support and build your own healthy biome. However, having so much information available about healthy eating can make it tricky to be sure what is best for a healthy gut.

Your gut microbiome contains of trillions of bacteria and other microorganisms, both friendly and unfriendly. Studies have linked gut bacteria to changes in mood and mental health, tendency to obesity and to cardiovascular health. We want to help you sift through all the noise and get down to the practical solutions for ingredient swaps, nutritious recipes and all aspects of cooking and eating so you can build and support your healthy gut biome and in turn support your digestion and overall health.

To improve your digestive health, there are four steps (the four R's) that need to be followed. First, you will need to **remove** unhealthy bacteria from your gut by cutting out foods, toxins, and harmful chemicals that may cause inflammation or an imbalance in your gut bacteria such as pesticides, hormones, antibiotics, and certain medications. Next, you will **repair** your gut lining by loading up on plant foods and supplements that heal your gut and support the microbiome. As well, you will want to **replace** the bad bacteria you've eliminated and **replenish** them with healthy bacteria, stomach acids and digestive enzymes that support your overall health.

There are core food categories you will want to include in your diet as a means of supporting and growing your healthy gut bacteria. These include:

Prebiotics

Prebiotics are the fuel, or food, for probiotics feed on. They are often indigestible carbohydrates and help probiotics to grow and multiply in your gut. Research has suggested that prebiotics may help probiotics become more tolerant to certain environmental conditions, including pH and temperature changes[1].

Prebiotics					
Garlic	Asparagus	Barley	Flaxseeds	Artichoke	Almonds
Onions	Bananas	Apples	Seaweed	Chickpeas	Pistachio nuts

Probiotics

Probiotics are made of good live bacteria and yeasts that naturally live in your body and provide health benefits. Fermented foods are a natural source of probiotics. Regularly consuming fermented foods can provide your digestive system with the probiotic support it requires to maintain a balanced microbiota.

Probiotic Foods				
Yogurt	Tempeh	Kombucha	Traditional Buttermilk	Kvass
Kefir	Kimchi	Pickles	Miso	Sauerkraut

Fibre

Fibre is a complex carbohydrate sourced solely from plants that can't be digested by the human body. Leafy greens, such as spinach or kale, are an excellent sources of fibre. They also provide nutrients like folate, vitamin C, vitamin K and vitamin A. Research shows that leafy greens also contain a specific type of sugar that helps fuel growth of healthy gut bacteria.[2]

There are two types of fibre, soluble and insoluble. A healthy diet contains a mix of both soluble and insoluble fibre. Soluble fibres are commonly found in foods, such as avocado, sweet potato, black beans, oats, barley, and citrus fruits. Insoluble fibre can be found in beans, whole wheat or bran products, green beans, potatoes, cauliflowers, and almonds.

Insoluble

Insoluble fibre doesn't dissolve in water. It is left intact as food moves through the gastrointestinal tract and acts like a toothbrush for our intestinal walls.

Soluble

Soluble fibre is easily dissolved in water, and is broken down into a gel-like substance that is digested by bacteria in the colon.

Resistant Starch

Starch is a type of complex carbohydrate produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in numerous staple foods such as potatoes, wheat, corn, and rice. Not all the starch we consume will be digested. The starch that passes through the intestinal tract unchanged is resistant starch.

Research has shown that resistant starch can have powerful health benefits including improved insulin sensitivity, lower blood sugar levels, reduced appetite and various benefits for digestion.[3] Additionally, resistant starch doesn't release glucose within the small intestine. Instead, it reaches the large intestine where it is consumed or fermented by bacteria, turning it into short-chain fatty acids (SCFAs).[4]

Enzymes

Digestive enzymes are proteins that help the body break down food and absorb maximum nutrients to improve the overall health of your microbiome. They are a crucial part of achieving complete gut biome balance. Our bodies are capable of producing digestive enzymes in our saliva, stomach, and small intestine. The various enzymes produced each play a key role in digestion; amylase (from saliva) breaks down carbohydrates, protease (in the stomach) breaks down protein, and lipase (small intestine) breaks down fats. However, if your body doesn't produce enough digestive enzymes, you will be unable to absorb all of the nutrients from your food.

Dietary Sources of Digestive Enzymes			
Pineapple	Raw Honey	Kefir	Miso
Papaya	Bananas	Sauerkraut	Kiwi
Mango	Avocados	Kimchi	Ginger

Fatty Acids

Fatty acids are the building blocks of the fat in our bodies and in the food we eat. They have many important functions in the body, including energy storage. Omega-3, omega-6 and omega-9 fatty acids are all important dietary fats, however, the balance of these fatty acids is crucial as imbalance may contribute to a number of chronic diseases.

Omega-3

Omega-3 fatty acids are polyunsaturated fats, a type of fat your body can't make. Since the body can't produce them, these fats are referred to as "essential fats" meaning that you have to get them from your diet. Research has found omega-3s play a role in improving heart health[5,6], supporting mental health[7,8], promoting bone health[9]and fighting inflammation[10].

Researchers have also found elevated tissue omega-3 fatty acids may influence human physiological parameters in part by affecting the gut microbiome[12]. In mice they induced changes in the gut bacteria composition resulting in reduced metabolic endotoxemia and inflammation.[13]

Omega-6

Omega-6 fatty acids are also essential, polyunsaturated fats. Although omega-6 fatty acids are essential, the modern Western diet contains far more than necessary[14], which can increase inflammation and inflammatory disease.[15]
Inflammation seems to be the common denominator among the immune system, the microbiome, and long-chain polyunsaturated fatty acids.[16]

Omega-9

Omega-9 fatty acids aren't strictly "essential" and are monounsaturated unlike omega-3 and omega-6. Researchers have found consuming a diet high in omega-9 fatty acids on cholesterol levels, insulin sensitivity and inflammation.[17,18]

Polyphenols

Polyphenols are antioxidants that act as fuel for microbes. Preliminary research suggest that polyphenols are able to express prebiotic properties and exert antimicrobial activities against pathogenic gut microflora.[19]

Sources of Polyphenols				
Cloves	Blueberries	Plums	Beans	Pecans
Cocoa	Strawberries	Apples	Hazelnuts	Walnuts
Blackberries	Raspberries	Black Currants	Artichokes	Spinach

A diverse microbiota is most often considered to be a healthy one. There are hundreds of species of bacteria in your intestines. Each species plays a different role in your health and requires different nutrients for growth, which is why it is so important to eat a diverse range of whole foods.

Check out our recipe section for a few ideas to get you started on your journey to a healthy gut biome.

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Gut Healthy Recipes

Toasted Nutty Overnight Oats

Ingredients

1 cup old fashioned oats
1/8 cup chia seeds
1/8 tsp fine sea salt
1 cup cashew milk
¼ cup chopped toasted walnuts
¼ cup fresh raspberries
1 dollop of Greek yogurt
1 tbsp maple syrup (optional)

Directions

1. Preheat the oven to 300ºF.
2. Spread the oats and walnuts on a baking sheet in an even layer and bake, stirring occasionally, until lightly toasted, about 15 minutes.
3. Combine oats, chia seeds and salt in a bowl.
4. Add the yogurt and milk and combine until there are no clumps
5. Cover and refrigerate for at least two hours, ideally overnight
6. In the morning, top with toasted walnuts and fresh raspberries
7. Drizzle with maple syrup if desired and enjoy!

Crispy Cauliflower with Tempeh 'Bacon'

Ingredients

1 large head of cauliflower, cut into florets
1 tsp dried onion flake
1 tbsp minced garlic
½ tsp sea salt
½ tsp cracked black pepper
2 tbsp olive oil

Tempeh Bacon

1 package of tempeh (approximately 250 grams)
½ cup tamari
½ tbsp water
1/3 cup apple cider vinegar
1/3 cup maple syrup
1 tbsp smoked paprika
1-2 tbsp olive oil

Garnish

1 avocado
½ lemon
Sriracha

Ingredients

1. Preheat oven to 400ºF (200ºC).
2. In large bowl, toss cauliflower florets with olive oil, onion flake, garlic, salt and pepper. Spread on parchment paper–lined baking sheets and roast for 40 minutes or until tender. Flip the florets halfway through to ensure even cooking.
3. Thinly slice the tempeh
4. Mix all the liquid ingredients and smoked paprika in a shallow dish that you can use to marinate the tempeh
5. Lay the slices of tempeh in the dish and marinate in the fridge for at least 1 hour
6. Heat a non-stick pan to medium and add 1 tbsp of olive oil
7. Add the tempeh and cook on both sides until all the liquid is absorbed and it is fully caramelized (15 – 20 minutes). Add more oil as needed to avoid sticking.
8. Peel, pit and slice the avocado. Squeeze the lemon over the avocado slices.
9. Add the roasted cauliflower to a serving dish. Top with tempeh and avocado slices. Drizzle with Sriracha and serve.

Individual

Apple Crisp

Ingredients

6 Apples
1 Lemon
4 tbsp salted butter, cut into small cubes
6 tbsp raw brown sugar
¼ tsp ground cinnamon
1 cup apple cider
1 cup whole milk
2 tsp lemon zest
1 ½ cups steel-cut, gluten free oats
Plain Greek yogurt

Directions

1. Preheat oven to 375ºF
2. Cut off the top third of each apple and core out the apple adding an extra two inch diameter to create a basin
3. Rub the exposed apple flesh with lemon and place them open side up into a nine inch square baking dish
4. Dice the carved-out parts of the apples (without the core and seeds), and mix them with 2 tbsp sugar, cinnamon and remaining lemon juice
5. In a separate bowl, stir together the milk (warmed), remaining sugar, lemon zest, oats, butter and apple mixture
6. Stuff apples with the oat mixture.
7. Pour the apple cider into the bottom of the baking dish
8. Cover the dish with foil and bake until the apples are tender, about 35 minutes

Garlic and Miso Noodle Bowl

Ingredients

2 1/2 cups soybean sprouts
1 1/2 tbsp sesame oil
2 tsp rice wine vinegar
4 eggs
300 g (10.5 oz)
package soba noodles
3/4 lb (340 g) shell-on shrimp
(head removed)
Salt for seasoning
2 tbsp olive oil
2 tbsp unsalted butter
2 cloves garlic, minced
12-15 steamed asparagus spears
2 radishes, julienned
1 avocado, sliceda

Dressing

1/4 cup rice wine vinegar
1/4 cup plus 1 tbsp white miso paste
2 cloves garlic, minced
2 tbsp grated ginger
2 tbsp fresh lime juice
2 tbsp sesame oil
1/3 cup grapeseed oil, or other neutral oil

Directions

Dressing

1. Place the sprouts in a large bowl and season with sesame oil, rice wine vinegar, and salt
2. Toss and marinate in the fridge for 30 minutes, tossing every 10 minutes

Eggs and Noodles

3. Bring a pot of salted water to a rolling boil to soft boil the eggs
4. Prepare an ice bath in a large bowl
5. With a push-pin, make a small hole on the large end of each of the eggs
6. Slowly lower the eggs into the boiling water and boil for exactly 6 minutes
7. Immediately transfer the eggs into the ice bath and leave them in there for 4 minutes
8. Peel the eggs carefully and set aside
9. Bring a large pot of salted water to a boil to cook the noodles
10. Drop in the noodles and boil for about 4 minutes until completely cooked through
11. Drain the noodles into a colander and run cold water over them to stop the cooking
12. Once the noodles are cool, transfer them to a large bowl and toss with 1/3 of the miso dressing

Garlic Shrimp

1. Peel and devein the shrimp
2. Season the shrimp with salt on both sides
3. Heat the olive oil and butter in a large skillet over medium-high heat
4. Once the butter has melted into the olive oil, add the shrimp in one layer
5. Sear the shrimp for 1 1/2 minutes on each side until just cooked through
6. Remove from the pan and place them into a bowl
7. Turn the heat down to medium-low and add the garlic into the residual oil/butter
8. Sauté the garlic for 30 seconds until fragrant
9. Pour garlic mixture onto the shrimp and toss to coat

Assembly

1. Place the noodles into each serving bowl
2. Arrange the steamed asparagus, radish, avocado, marinated sprouts, garlic shrimp and soft boiled egg around and on top of the noodles
3. Drizzle some dressing over the avocado, asparagus and egg
4. Enjoy!

Kefir Coleslaw

Serves 8

Ingredients

6 cups thinly sliced cabbage
1 cup shredded carrots
1 cup apple, julienned
¼ cup chopped fresh parsley
1 shallot, thinly sliced
1 cup plain kefir
2 tbsp virgin olive oil
2 tbsp apple cider vinegar
1 tbsp poppy seeds
1 tbsp honey
1 lemon juiced
½ tsp each salt & freshly ground black pepper

Directions

1. Stir together cabbage, apple, carrots and parsley in large bowl
2. Whisk together shallot, kefir, oil, vinegar, poppy seeds, honey, lemon juice, salt and pepper in another bowl
3. Pour dressing over cabbage mixture and toss to coat
4. Let stand for 15 minutes before serving

Smoked Salmon Eggs Benedict with Buttermilk Hollandaise

Serves 2

This decadent dish is a staple for any brunch. It is packed full of fatty acids to help combat inflammation as well as pre and probiotics to support a healthy microbiota.

Ingredients

1/2 cup traditional buttermilk
1 tbsp flour
2 egg yolks
1/2 tsp finely grated lemon zest
2 tbsp melted butter, room temperature
Salt, to taste
4 slices sourdough bread, toasted
4 eggs
1 tbsp white vinegar (for poaching)
3 oz smoked salmon
2 teaspoons capers
Thinly sliced red onion

Directions

Hollandaise

1. Whisk buttermilk with flour and salt in a heatproof bowl until smooth
2. Whisk in egg yolks and lemon zest
3. Position bowl over a saucepan of simmering water
4. Drizzle in the melted butter whisking frequently, until mixture has thickened and doubled in volume
5. Remove from heat and set aside

Eggs Benny

1. Steam asparagus for 5-10 minutes depending on thickness of spears
2. Set a pot of water to boil and add vinegar
3. Crack each egg into its own small bowl
4. When the water reaches a boil, reduce it to a gentle simmer
5. Dip the bowl containing the egg into the water, and let the water cook the egg for a moment before you let it drop into the water
6. Drop in the remaining eggs in the same way, one at a time
7. Cook the eggs for 3 minutes for a soft poach, 5 minutes for a solid yolk. The first egg in should be the first egg out.
8. Remove the eggs with a slotted spoon and place on a paper towel to dry
9. Assemble the eggs benny by layering smoked salmon, asparagus, onion, and a poached egg on each slice of sourdough toast
10. Drizzle with hollandaise and top with capers

An Introduction to the

Gut Brain Connection

By Dr. Aaron Zadek ND, CISSN

It is easy to forget how complex and diverse our gastrointestinal tract (GIT) is. For most of us it is a cycle of eating, digesting and elimination. What goes unnoticed is the fact that your GIT houses one of the most important nervous systems in your body, accompanied by trillions of living microorganisms that make up your gastrointestinal flora. It is often surprising to learn that your gastrointestinal nervous system, also known as the enteric nervous system (ENS), contains approximately 100 million neurons (Guyton and Hall 2006). This is almost equal to the number of neurons found in your entire spinal cord.

The gut-brain axis refers to the connection between your enteric nervous system and your central nervous system – specifically the complex bi-directional communication between your GIT and your brain. There are many neuropeptides that serve as important influencers on both gut and brain function. These biological peptides are communication molecules carrying information and signals that affect a variety of digestive, immune and hormonal functions within the gut, nervous system and other organs (Holzer and Farzi 2014). This is a concept that we can all relate to; think back to a time where you have been so nervous that your gastrointestinal tract felt like it was tied in a knot or you felt nauseous. How come such an emotional reaction can affect our digestive tract so strongly?

There are evolutionary theories as to why it is useful for our GIT and central nervous system to be so interconnected. It is reasonable to conclude that the brain and gut must interact to ensure that signals involving hunger are strong enough to stimulate a desire to find and consume food for the sake of survival. The gut must also be able to differentiate between helpful and dangerous foods. Harmful foods in particular, such as those that are toxic or allergenic, must be recognized to ensure future consumption is limited or avoided all together. To facilitate this recognition the gastrointestinal tract must be able to communicate with the brain and other organs within the body. Lastly, the gut has to maintain balance within its microbial community which can affect nutritional status, immune function i.e. training our body to identify detrimental bacteria, as well as production of GABA and serotonin (Holzer and Farzi 2014) (O'Mahony and Clarke 2015).

Serotonin in particular is a major signaling molecule in the enteric nervous system with function that overlaps with the central nervous system. Many know serotonin for its role in mood regulation but it has a much larger role within the enteric nervous system (ENS). Over 90% of serotonin is produced in the gut, produced by enterochromaffin cells to modulate intestinal secretions, peristalsis, blood flow, as well as the perception of pain and nausea (Vadder, et al. 2018) (O'Mahony and Clarke 2015). Serotonin is also produced by our intestinal flora from tryptophan to be used as a signal within the gut-brain axis to modify host behaviour (O'Mahony and Clarke 2015). The relationship between microbiota and serotonin levels is fascinating; with animal studies showing that the reduction in microbiota from antibiotic use results in a decline of circulating serotonin levels, serotonin receptors, gastric motility and maturation of the ENS (Vadder, et al. 2018). Clearly serotonin is more than just a mood molecule and its precursor, 5HTP, is implicated in the development of microvilli. These microvilli are important to increasing the surface area of the intestine, improving nutrient absorption.

Infection, stress, and antibiotic use can all effect gut microbiota, and are suggested as a possible causes of irritable bowel syndrome (IBS) (Carabotti, et al. 2016). It is interesting that many gastrointestinal pathologies such as inflammatory bowel disease as well as IBS are found to be associated with anxiety and depression and it brings us back to the reciprocal nature of signal molecules present within the gut and brain (Holzer and Farzi 2014). Stress is a whole body sensation and its effects on the gut microbiota can result in short and long term changes after the initial stimuli. Chronic stress in adult mice showed substantial differences in the bacterial composition of the GIT compared to unstressed control groups (Cryan and Dinan 2012). Another difference was an increase in circulating levels of cytokines and chemokines, markers of immune activation and inflammation. Chronic stress also disrupts the integrity of the intestinal barrier resulting in infiltration of immune activating bacterial components such as lipopolysaccharide, which will place the body on alert that there may be an intruder. Damage done by chronic stress can be reversed through probiotic use, with Lactobacillus farciminis in particular shown to improve GIT barrier function damaged from psychological stress, while Lactobacillus helveticus and Bifidobacterium longum have been shown to decrease serum cortisol and improve psychological distress in humans (Messaoudi, et al. 2011). Age is another factor that must be considered, as our ability to adapt to physiological stress decreases over time. There is a lot to still be learned on the effects of stress on the gut-brain axis, not all stress is negative and there is much to understand regarding the gut-brain axis and its ability to cope with short and long term stressors.

The communication between the enteric nervous system and the rest of the body is clearly a complex network, involving the neuroendocrine, immune, microbiotic, and sympathetic and parasympathetic autonomic nervous systems (Carabotti, et al. 2016). Changes to gut microbiota via antibiotics, stress or pathology such as inflammatory bowel disease appear to directly impact incidence of anxiety and depression. The production of serotonin from our intestinal cells and gut microflora is important in communication between the enteric and central nervous systems as well as health and development of our gastric microvilli. It is clear that the gut is not just about nutrient absorption and that optimizing health of the GIT and gastric microbiota, especially after antibiotic use and stressful events, can help improve immune function, inflammation and cognitive health.

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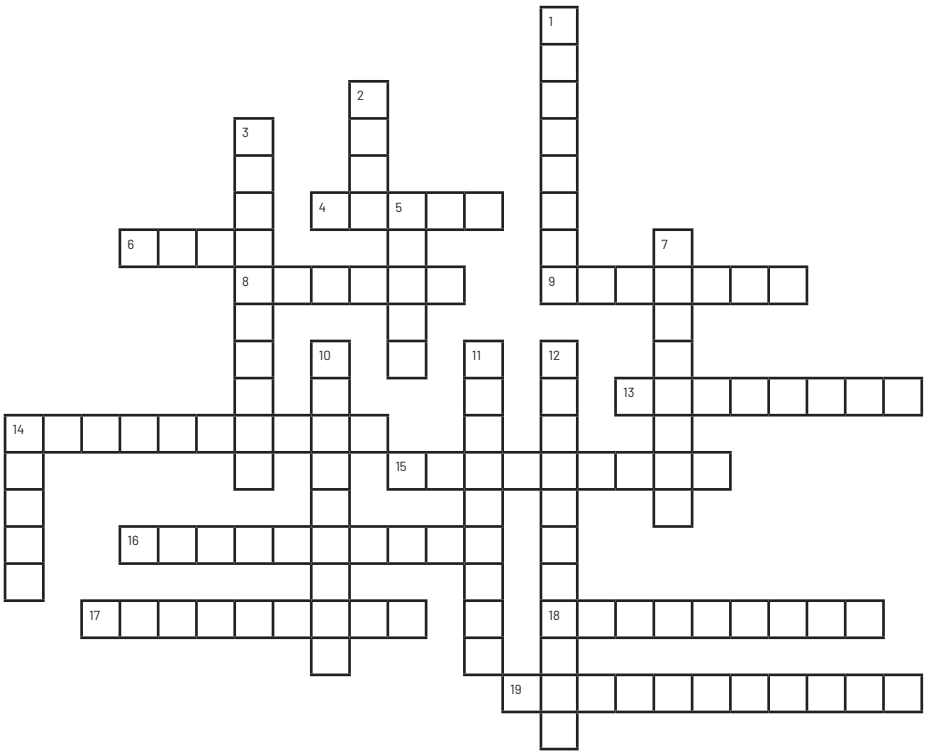
Know Your Microbiome

Advance your microbiome knowledge with this crossword challenge! Find the answers to complete the puzzle. Use the answer key on page 31 to see how many you got right.



Down

1. A person's microbiome may influence their susceptibility to infectious _____
2. The microbiome may weigh as much as _____ pounds.
3. Helps prevent the growth of harmful bacteria (two words)
5. The microbiome is defined as all the bacteria, viruses, _____, archaea, and eukaryotes that inhabit the human body
7. Gut _____ are involved in harvesting energy from food
10. The human microbiome consists of 10-100 trillion _____ microbial cells
11. People can alter the _____ and number of microbes in their gut
12. Microbes inhabit all parts of the body that are exposed to the _____
14. Approximately 1,000 different types of bacteria live in this

Across

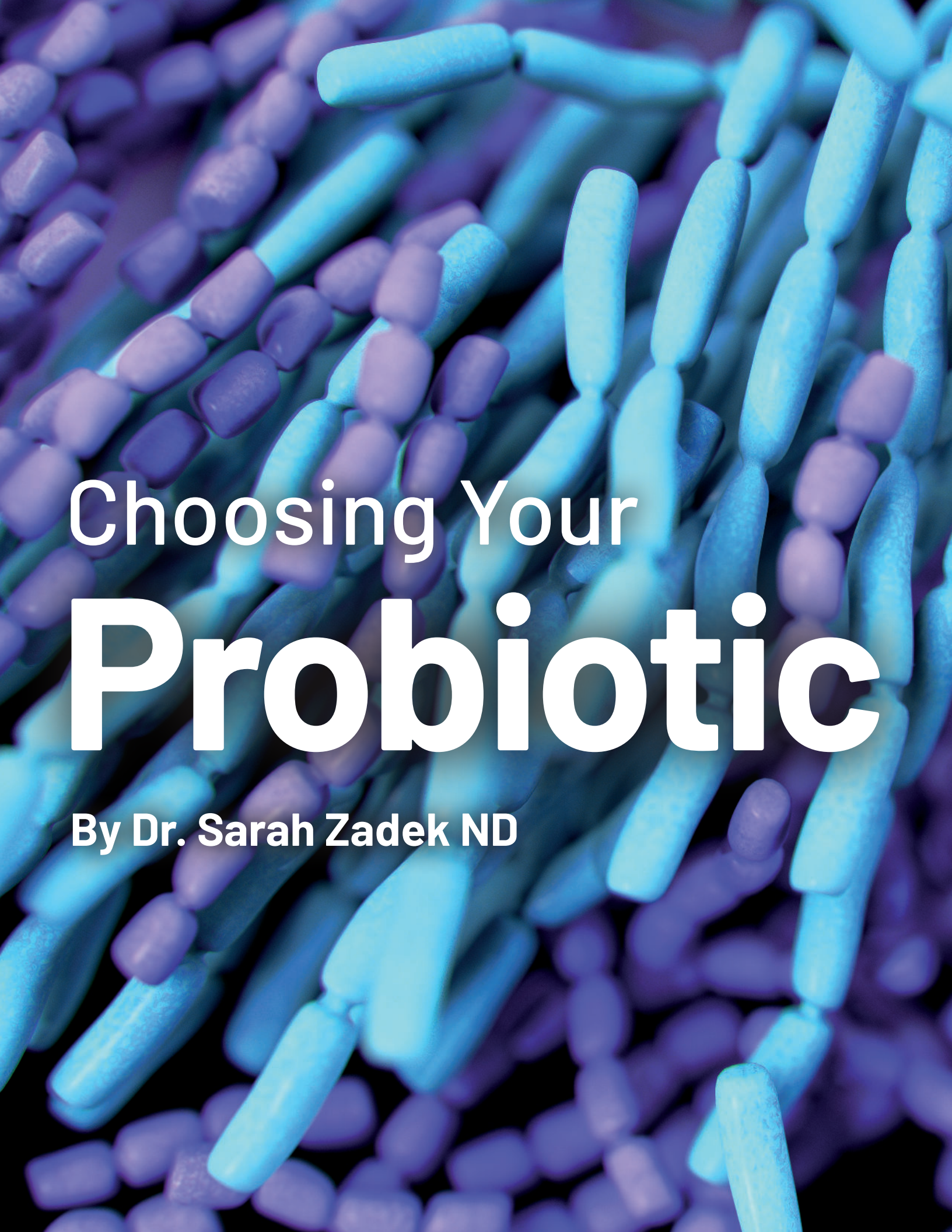
4. Fermented foods like _____ contain beneficial live microbiota
6. This may be the most powerful influence on the gut microbiome
8. Microbiota stimulate the _____ system
9. The microbiome contains many different _____
13. The neonatal microbiome is influenced by the type of _____
14. Getting enough sleep and exercising regularly can affect this
15. Fruits, vegetables, beans, and whole grains are good sources of these fibres
16. These have a wide-range of health benefits.
17. This system, including the small and large intestine, houses about 99% of the microbiome
18. There are 10 times the number of these cells in the human gut than in the whole human body
19. These can alter the patterns of gut microbiota

Which Bacteria are You?

Take the quiz!

1. Do you like to unwind with a cold beer? Yes = 2 points
2. Do you have a sweet tooth? Yes = 2 points
3. Is yogurt one of your favourite breakfast foods? Yes = 2 points
4. Have you been told you're co-dependant? Yes = 2 points
5. Are you the person people come to when they're irritated or stressed? Yes = 5 points
6. Are you a caregiver, especially to those that are sick? Yes = 5 points
7. Do you love pickles and kimchi? Yes = 5 points
8. Is resiliency one of your best qualities? Yes = 8 points
9. Do you prefer a warm climate? Yes = 8 points
10. Do you like getting your hands dirty now and then? Yes = 8 points

Flip over to page 31 to see how you scored.



Choosing Your Probiotic

By Dr. Sarah Zadek ND

Experiencing gas and bloating? Want to strengthen your immune system? Suffering from depression or anxiety? Do you have chronic bad breath?

Well, for all of these and much more, there's a probiotic for that. But that seems to be where many people get stuck. We know probiotics are good for so many things, from treating conditions to preventing them, but when it's suggested to take a probiotic, how do you know which one to choose?

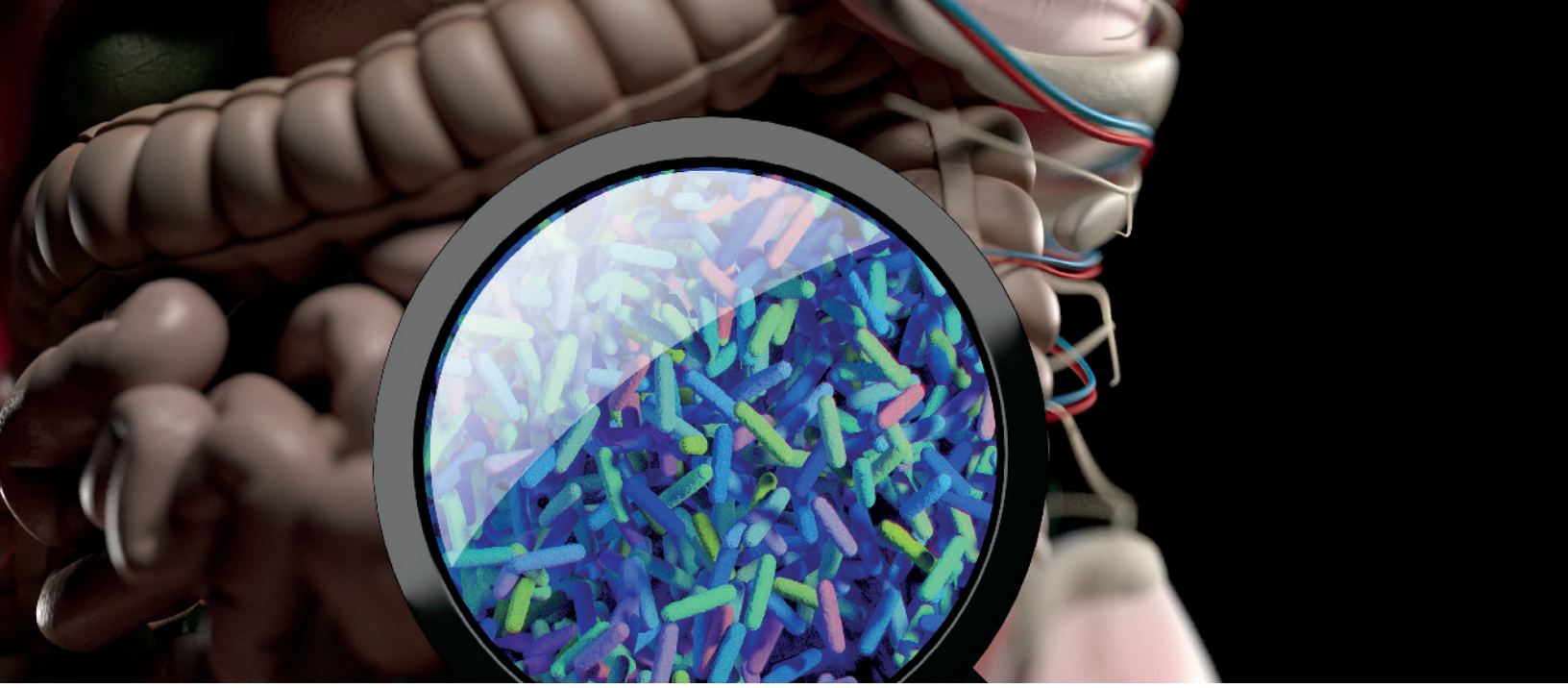
Not all probiotics are the same, nor are they equally effective. That's actually quite the understatement, because not only are probiotics formulated with different species, but for each species, there are also different strains. Some probiotics are blends or "multi-strains," some containing only three strains while others could have a dozen or more. But more isn't necessarily better especially when you consider that many multi-strain formulas haven't tested the effect of all these strains together. This is pretty important when you consider we're talking about living organisms that interact with each other and their host (our body).

In general, a probiotic is a live microorganism, such as a bacteria or yeast that takes up residence in our gastrointestinal tract (GIT) and promotes some type of health benefit. Regardless if supplementing with a probiotic, the GIT is already dense with microorganisms, some of which may be beneficial to health, while others may be detrimental. All the while, these bacteria aren't just crawling around, but producing chemicals, gasses, signaling molecules, and nutrients. They're active and can even influence bacteria of other species. Some beneficial bacteria can produce bacteriocins that inhibit pathogenic bacteria, making your GIT a happier and healthier place. This is one of the goals of a probiotic: to replace harmful or pathogenic bacteria.

Probiotics have multiple other functions as well. The signaling molecules they produce or influence act on the immune system and the nervous system, called "GALT" (gut associated lymphatic tissue) and the enteric nervous system, respectively.

With this in mind, most consumers in North America believe that more is better. That is, the more strains you consume in a probiotic supplement the better the health outcome. Yet, this is not the case. In fact, the presence of bacterial diversity can be helpful or harmful, depending on the location in the body. For example, low diversity of strains in the gut is associated with obesity and inflammatory bowel diseases, where high diversity in the vaginal environment can cause a dysbiosis called bacterial vaginosis: a condition that causes the tissue to become itchy, swollen and malodorous.

Emphasis should be placed on specific strains and how well researched they are in human studies for a particular outcome. Many multi-strain combinations on the market have actually never been studied together, or studied in humans, making it near impossible to predict how they will interact together and within the current gut ecosystem. Some may not even be able to survive the whole journey through the GIT, while others may be targeted towards specific areas of the body including the oral cavity, or the vaginal and/or uterine environments.



What must be required of a probiotic?

1. Each strain or combination of strains need to be clinically studied. Human studies carry the most weight though animal studies are often the stepping-stone for researchers to help predict how a specific strain may function in humans.

2. Strains must be stable and resistant to stomach acid, bile salts and digestive enzymes.

3. Strains must have demonstrated health benefits to the host.

4. Strains must be compatible with each other. If you're taking multiple strains together, you don't want them killing each other or blunting each other's health effects. The greatest combinations are those which have bacteria strains that promote the survival and proliferation of each other.

A great example of this is the Japanese-studied combination of three strains: Enterococcus faecium T-110, Clostridium butyricum, and Bacillus mesentericus. Together they have been studied in humans, and have shown to form heat- and pH-resistant spores for increased resilience. As well, these three strains demonstrated 10x the growth and proliferation in the presence of each other compared to their individual growth in isolation.

Each of these three strains also has shown specific functions in human gut health. Together they have demonstrated benefits such as reducing allergies,[1-3] improving immune function in the fight against colds and flu, and reducing intestinal symptoms such as bloating, constipation, and infectious diarrhea.[4]

C. butyricum produces short-chain fatty acids (SCFA) including butyrate, which is effective against acid-intolerant pathogenic bacteria. C. butyricum also produces an assortment of anti-bacterial peptides that work against other pathogenic bacteria.[5] SCFAs also stimulate the proliferation of intestinal epithelial cells, promoting wound healing and maintaining the intestinal barrier.

B. subtilis is recognized for its ability to act in a prebiotic fashion. That is, it supports the proliferation of the other two bacteria in this blend, but also of other beneficial commensal bacteria of the species Bifidobacteria. Another function of B. subtilis is in the production of a signaling molecule called competence- and sporulation-stimulating factor (CSF) which protects enterocytes from oxidative damage. This further protects the intestinal barrier.[6]

E. faecium has been shown to produce bacteriocins, antimicrobial peptides that work against multiple pathogenic bacterial species.[7]

Human studies have been conducted using this specific combination on patients with colitis, demonstrating remission in 45% of patients that were treated.[8] Another study showed 50% fewer relapses of ulcerative colitis in patients treated with this triple-therapy probiotic versus the control group.[9]

Conclusions

This well documented symbiotic combination distinguishes it from most probiotics on the market. It is a prime example of a proper probiotic supplement that delivers the desired results, has the research to back its claims, and contains strains that work synergistically. When choosing a probiotic, consumers should be skeptical of unbacked claims and products that use the "kitchen sink" approach. A formula providing dozens of strains may not always be better. Equally important is that each probiotic strain included serves a specific function. That is, not every probiotic can be used for constipation, or allergies, or... name an ailment. Each one is unique, producing its own specific set of effects in the body.

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Which Bacteria Are You? Scoring Chart

See how you scored on the quiz from page 27.

0-12 points – You're in the Lactobacilli Family

You love to start your day with a bowl of delicious yogurt, which is typically made with bacteria such as Lactobacillus bulgaricus. Some yogurts also contain L. acidophilus, but only those that list it in the ingredients and include live and active cultures. Like the Lactobacilli you love the natural sugars found in in fruits and veggies. After a long day, you love to crack a cold beer. Lactobacilli, especially L. casei and L. brevis provide the unique tart flavour of some sour beers such as Belgian lambics and American wild ales.

13-20 points – You're a Bifidobacterium bifidum

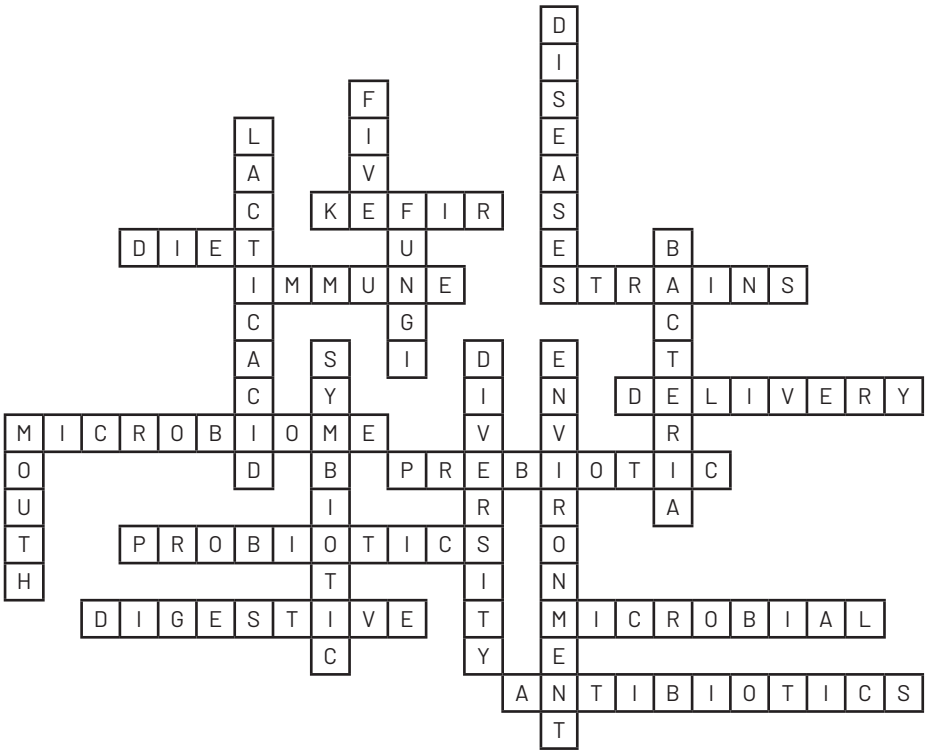
You're the person your friends come to when they are sick or stressed just like the Bifidobacterium bifidum, which are the gut bacteria that may help to treat IBS and other gastrointestinal issues. They support essential functions such as digestion. Several studies on human tissue cells indicate that B. bifidum might improve immunity. You love to snack on fermented foods like kimchi, tempeh, miso and pickles, which are abundant in Bifidobacteria bifidum.

21-30+ points – You're a Enterococcus Faecalis

Like Enterococcus faecalis, a common species of bacteria that lives in the GI tract, resiliency is one of your best qualities. You're able to live in very hot climates like the E. faecalis, with can thrive in hot, acidic or salty conditions. You have an infectious personality and make friends easily. Cleanliness may not always your forte though so make sure to wash your hands, especially when you're hanging out with others. E. faecalis infections often spread from person to person through poor hygiene.

Crossword Answer Key

Check your answers to the puzzle on page 25.



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