

# ***Gut Microbiome and Human Health***



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# ***What is Gut Microbiome?***

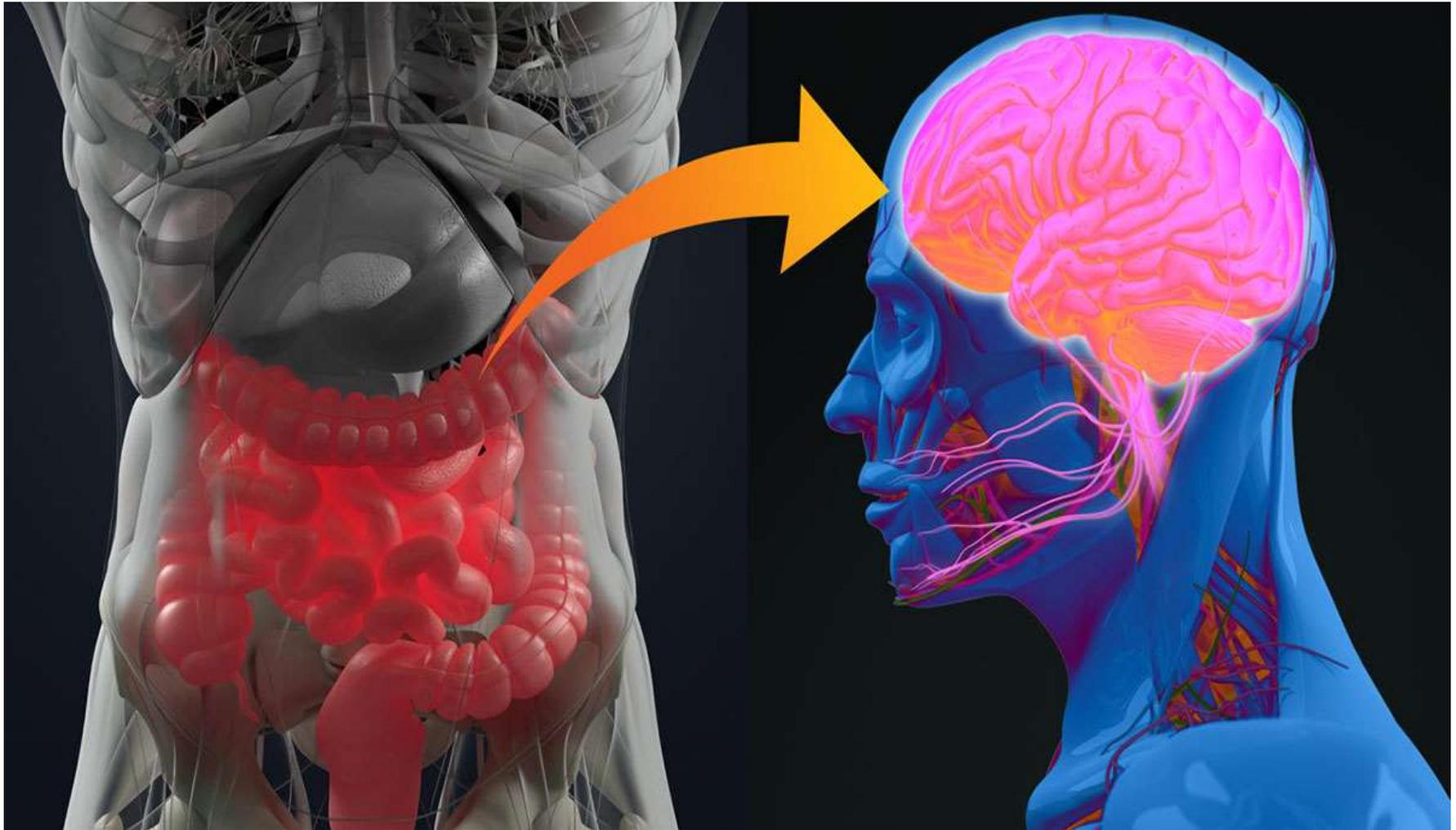
- ***Bacteria, viruses, fungi and other microscopic living microorganisms are***
- ***Trillions of these microbes exist mainly inside your intestines and on your skin***
- ***(10 times more than the human cells)***
- ***Most of the microbes in your intestines are found in a "pocket" of your large intestine called the cecum, and they are referred to as the gut microbiome.***
- ***Although many different types of microbes live inside you, but bacteria are the most dominant.***
- ***Approx 1,000 species of bacteria in the human gut microbiome, and each of them plays a different role in your body. Most of them are extremely important for your health, while others may cause disease***
- ***Altogether, these microbes may weigh as much as 2–5 pounds (1–2 kg), which is roughly the weight of your brain. Together, they function as an extra organ in your body and play a huge role in your health.***

***The gut microbiome refers to all of the microbes in your intestines, which act as another organ that's crucial for your health.***

# ***Why the Gut Microbiome Is Crucial for Your Health***

- ***Your body is full of trillions of bacteria, viruses and fungi. They are collectively known as the microbiome.***
- ***While some bacteria are associated with disease, others are actually extremely important for your immune system, heart, weight and many other aspects of health.***
- ***This article serves as a guide to the gut microbiome and explains why it's so important for your health.***

# ***Gut Permeability and Depression***

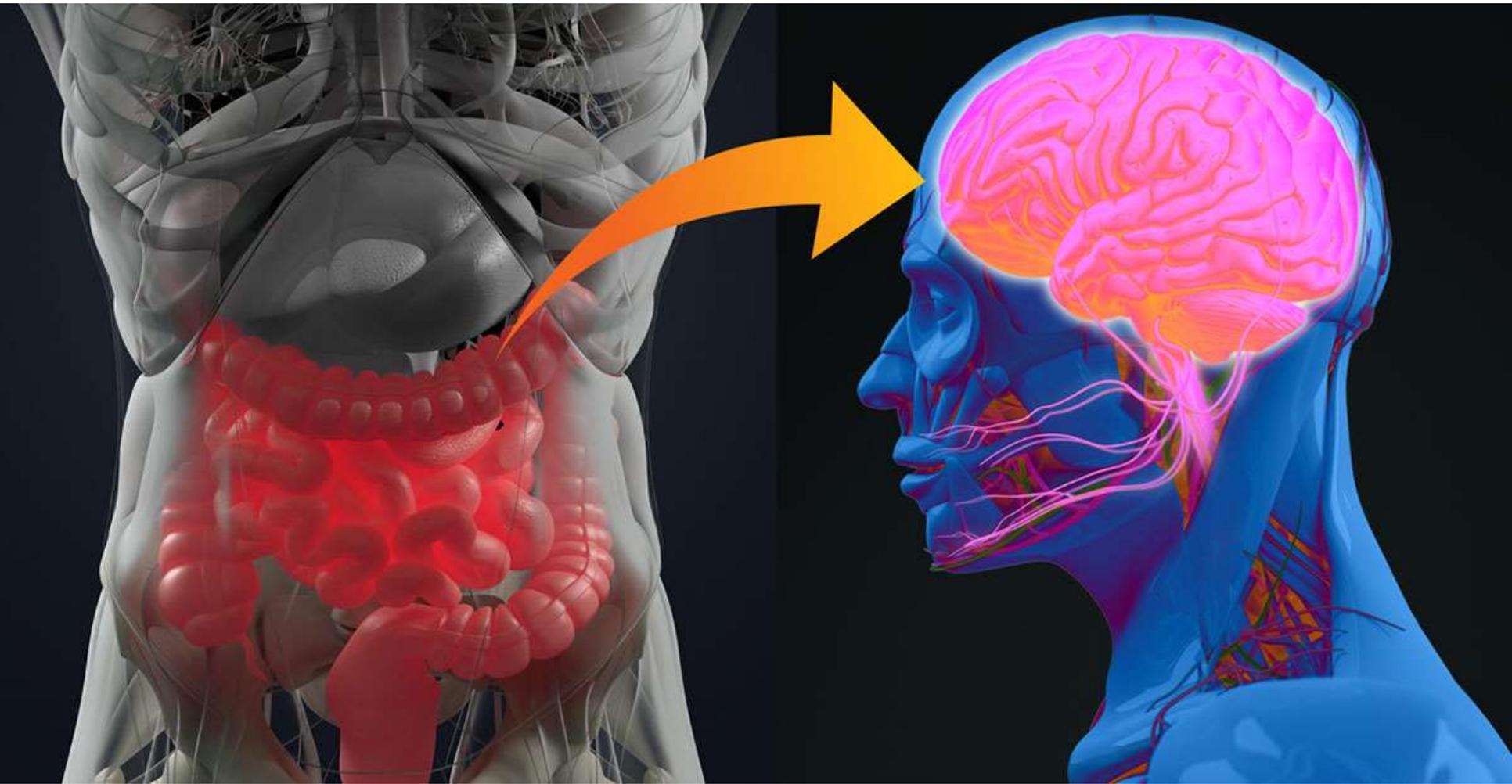


- Leaky gut leads to inflammation that results in depression.
- 70% of our immune system lies in gut,
- Gastrointestinal epithelium prevents free movement of toxicants, microbes, antigens

# ***Benefits of the normal flora***

- 1. Synthesize and excrete vitamins Vitamin K and Vitamin B12***
- 2. Prevent colonization by pathogens competing for attachment sites or for essential nutrients***
- 3. May antagonize other bacteria the production of substances which inhibit or kill non-indigenous species(nonspecific fatty acids, peroxides, bacteriocins).***
- 4. Stimulate the development of certain tissues i.e. intestines, certain lymphatic tissues, capillary density***
- 5. Stimulate the production of cross-reactive antibodies. Low levels of antibodies produced against components of the normal flora are known to cross react with certain related pathogens, and thereby prevent infection or invasion.***

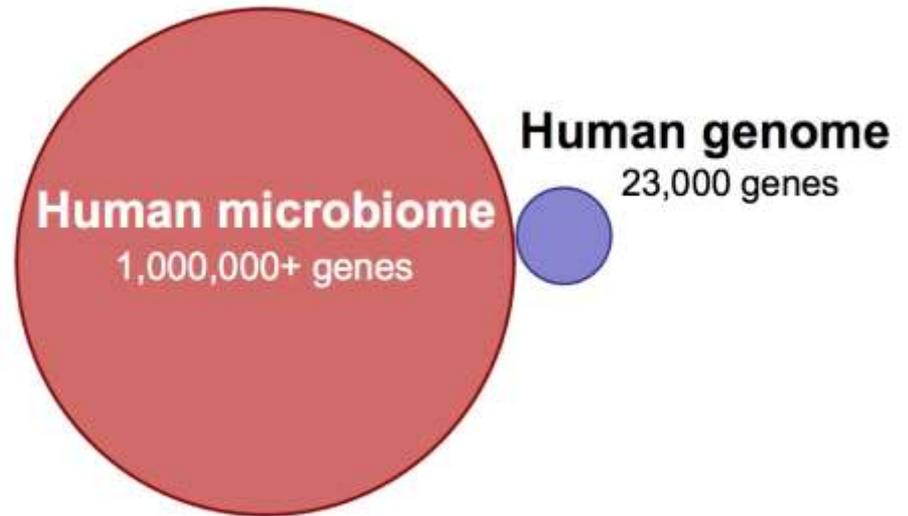
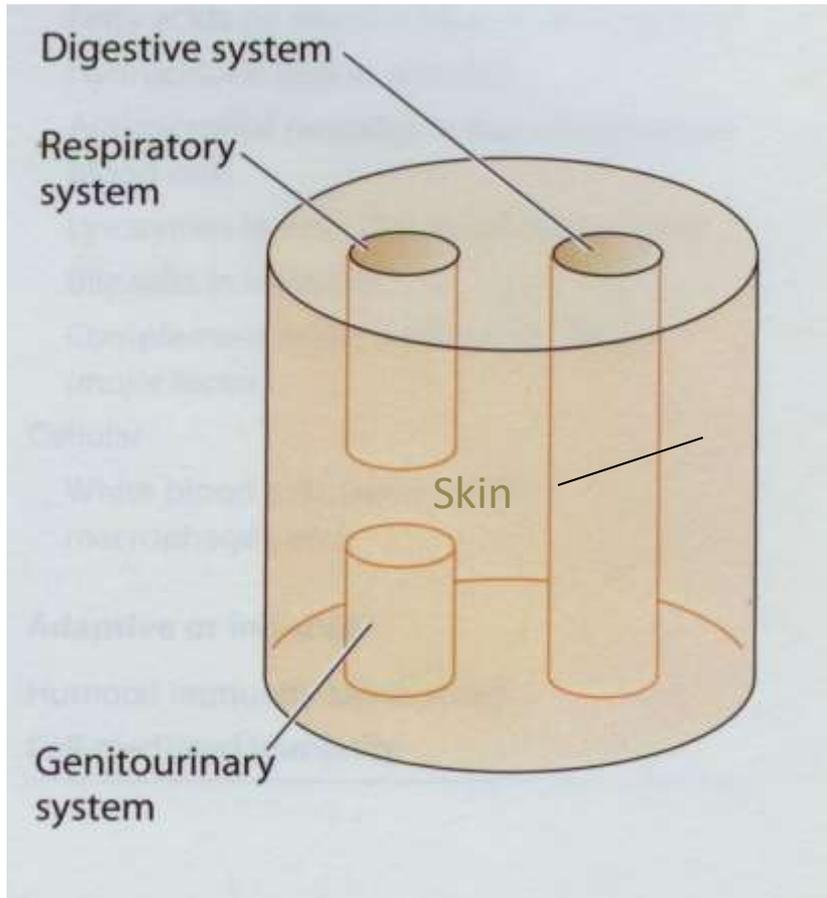
# ***Gut microbiota***



# ***Gut is responsible for immunity***

- ***Inflammation is the primary driver of chronic illness***
- ***Our gastrointestinal tract houses at least 70% of our immune system***
- ***We outsource countless bodily functions to our beneficial microbial***
- ***Communities (“microbiomes”) — these microorganisms outnumber our human cells 10:1***
- ***The gut is the gatekeeper of inflammatory response***

# A microbe's view of us

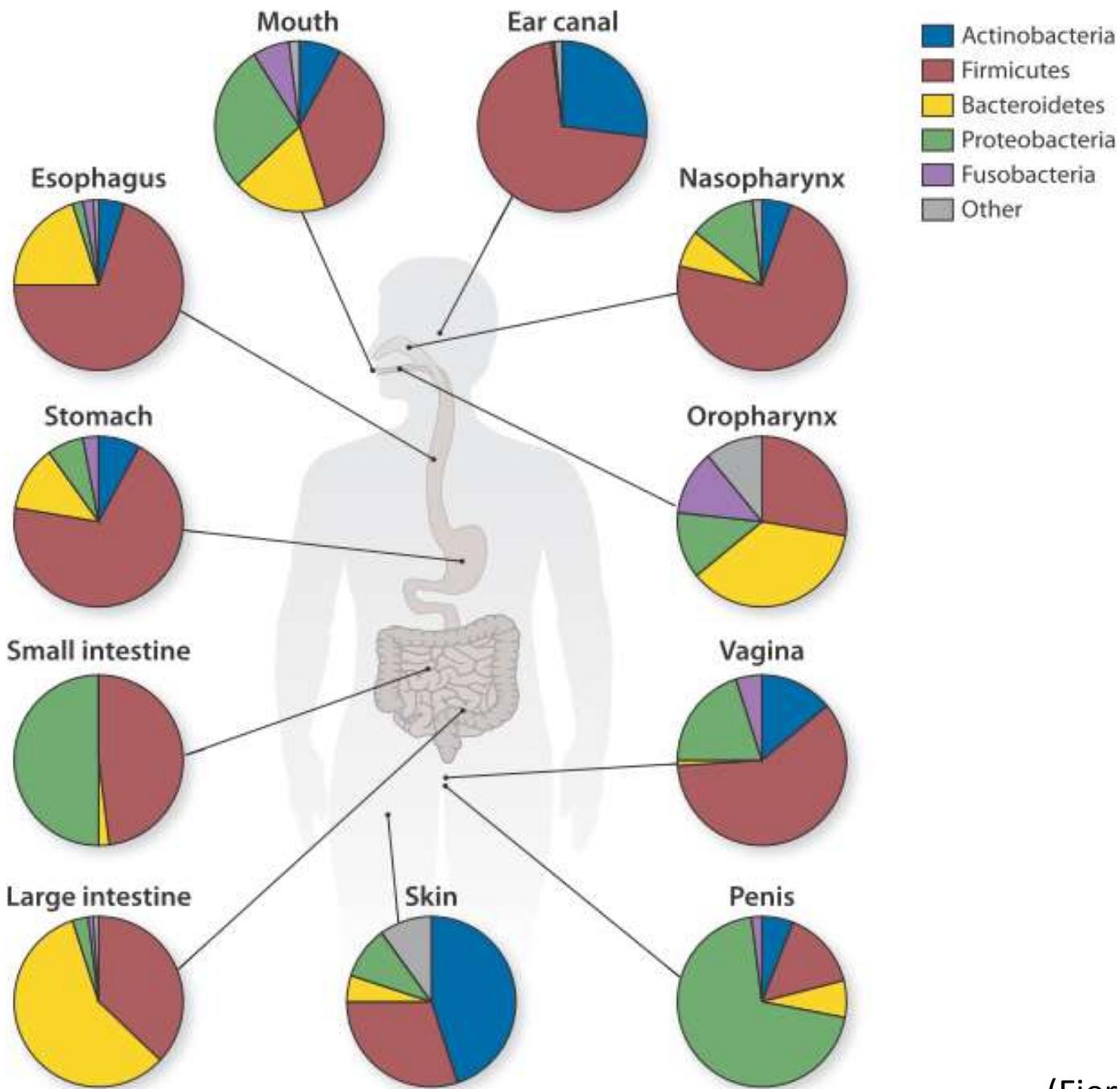


***Bacterial cells outnumber your body cells 10:1 and comprise up to 4-6 lbs of your body mass***

## ***Sites that harbor a normal flora:***

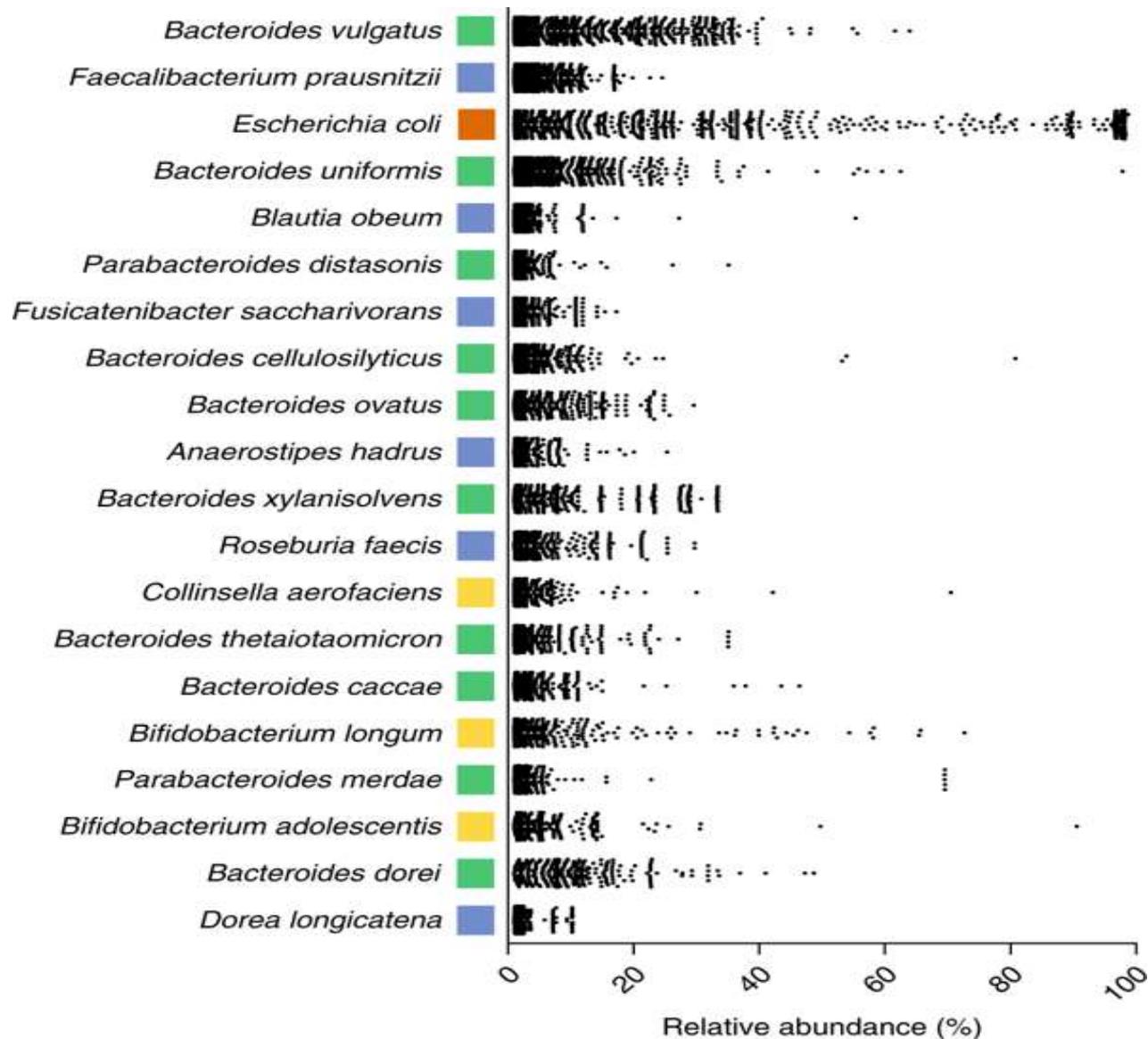
- Skin and mucous membranes***
- Upper respiratory tract***
- Gastrointestinal tract***
- Outer opening of urethra***
- External genitalia***
- Vagina***
- External ear canal***
- External eye (lids, conjunctiva)***





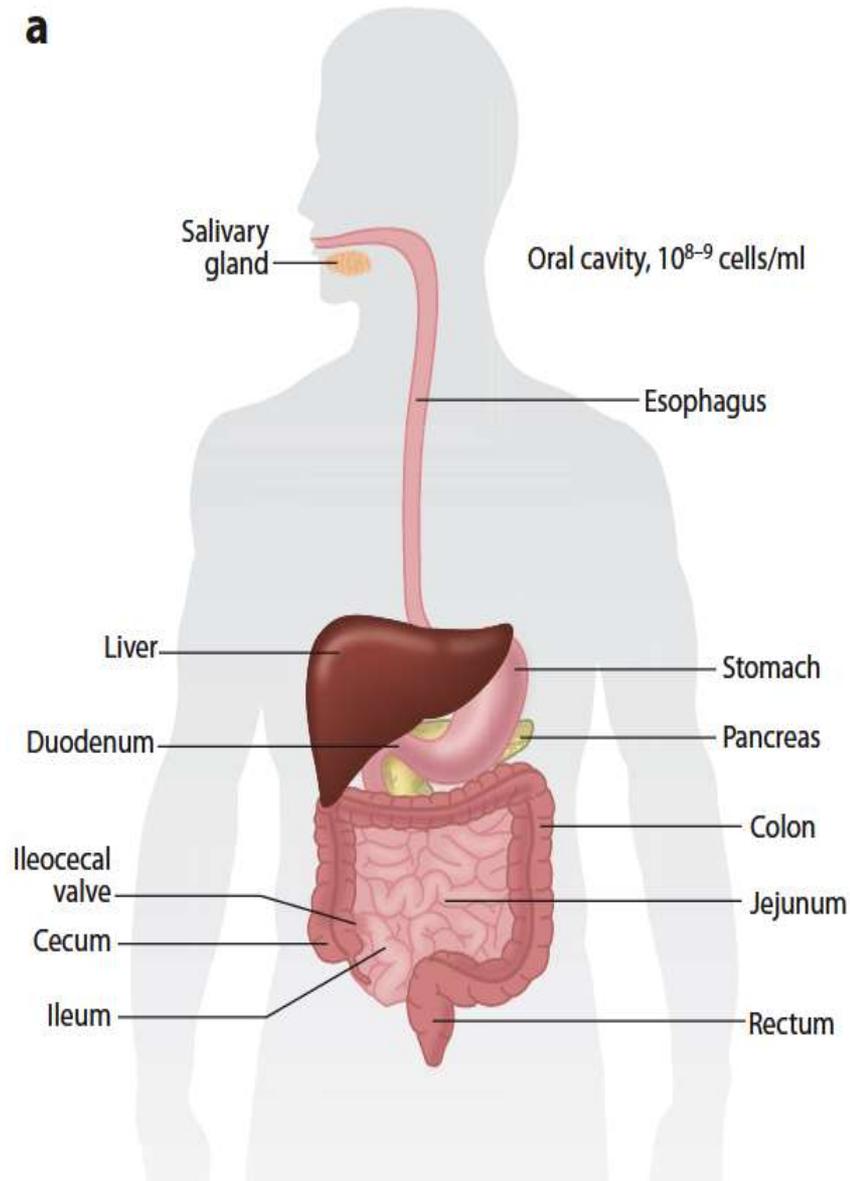
(Fierer et al 2012)

# Dominant bacterial species within the human gastrointestinal micro-biota (Nature Biotechnology, 2019)

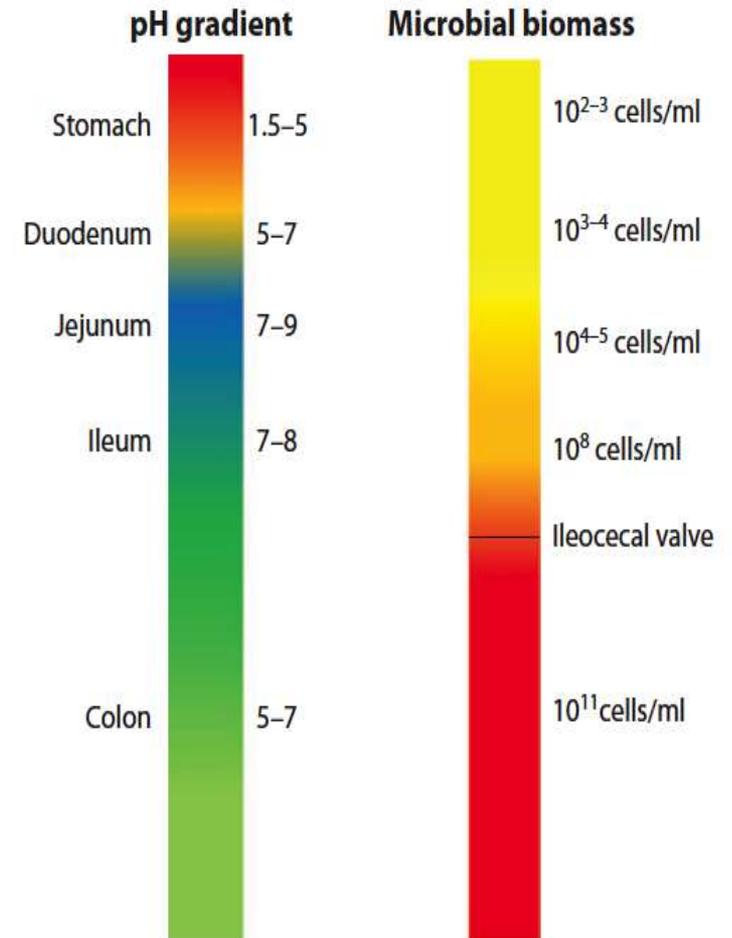


# Relationship between Microbial Biomass and pH

a

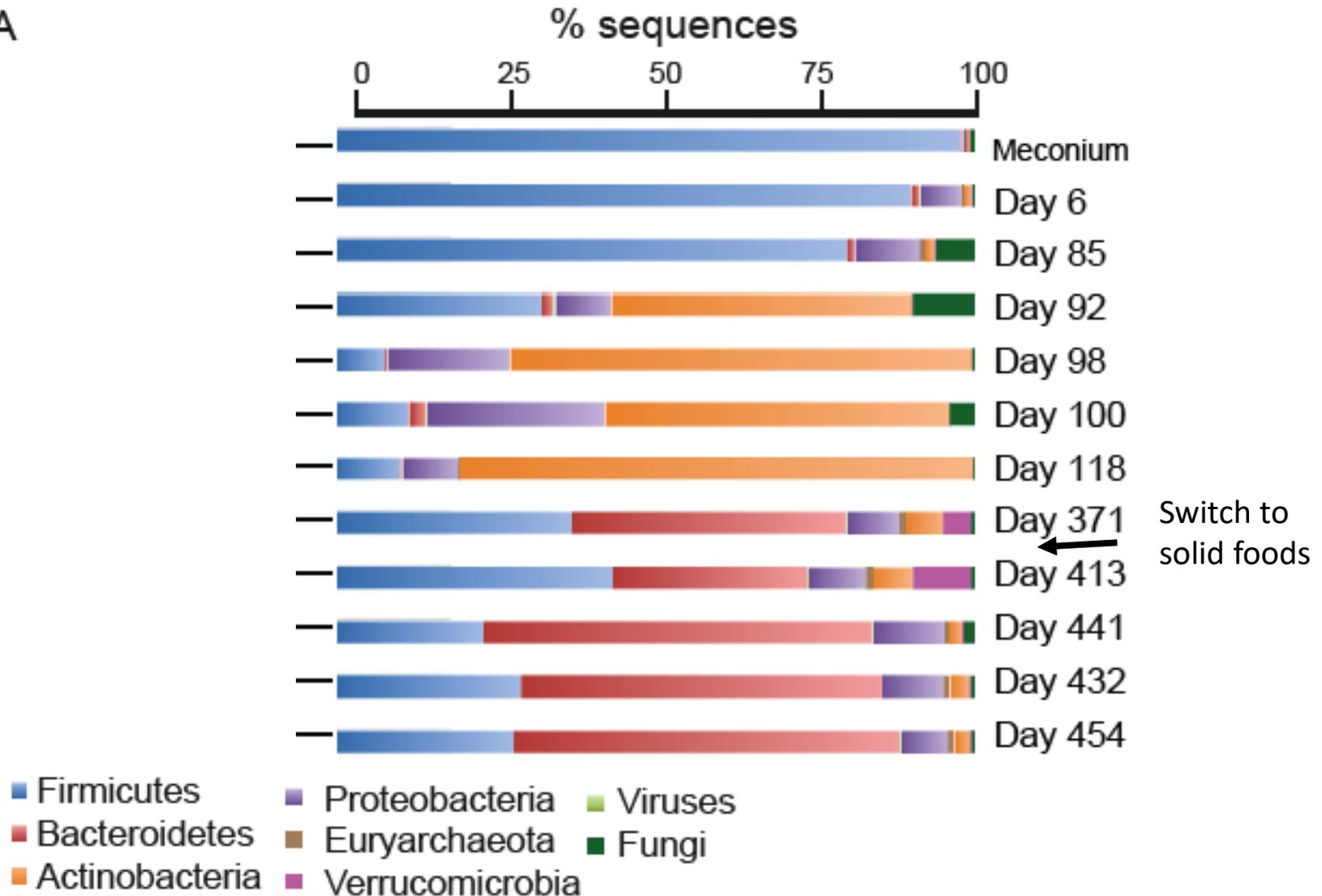


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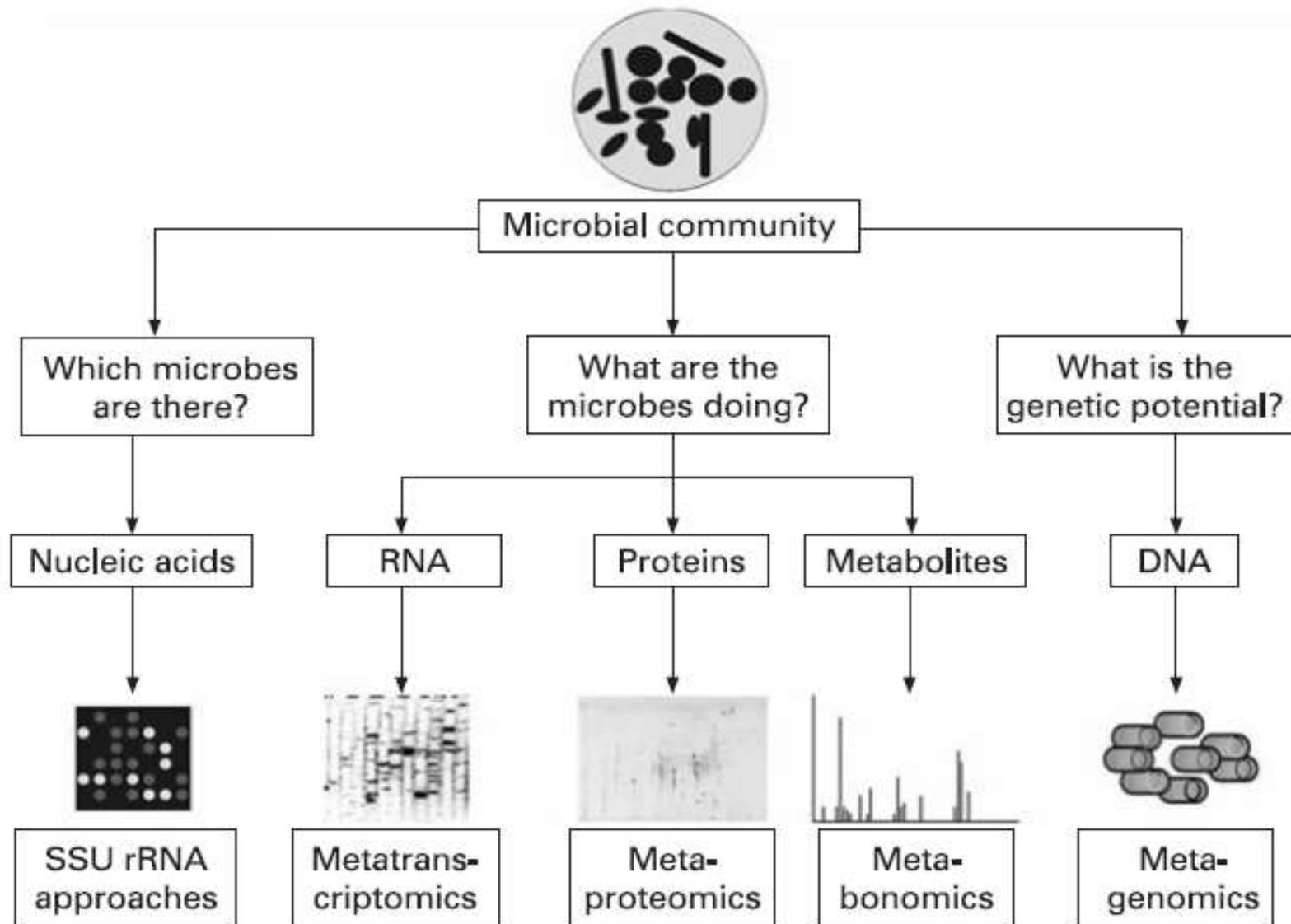


# Succession of Microbial Communities in Gut

A



# Characteristics of Microbial Communities



# Diet Affects Microbial Populations

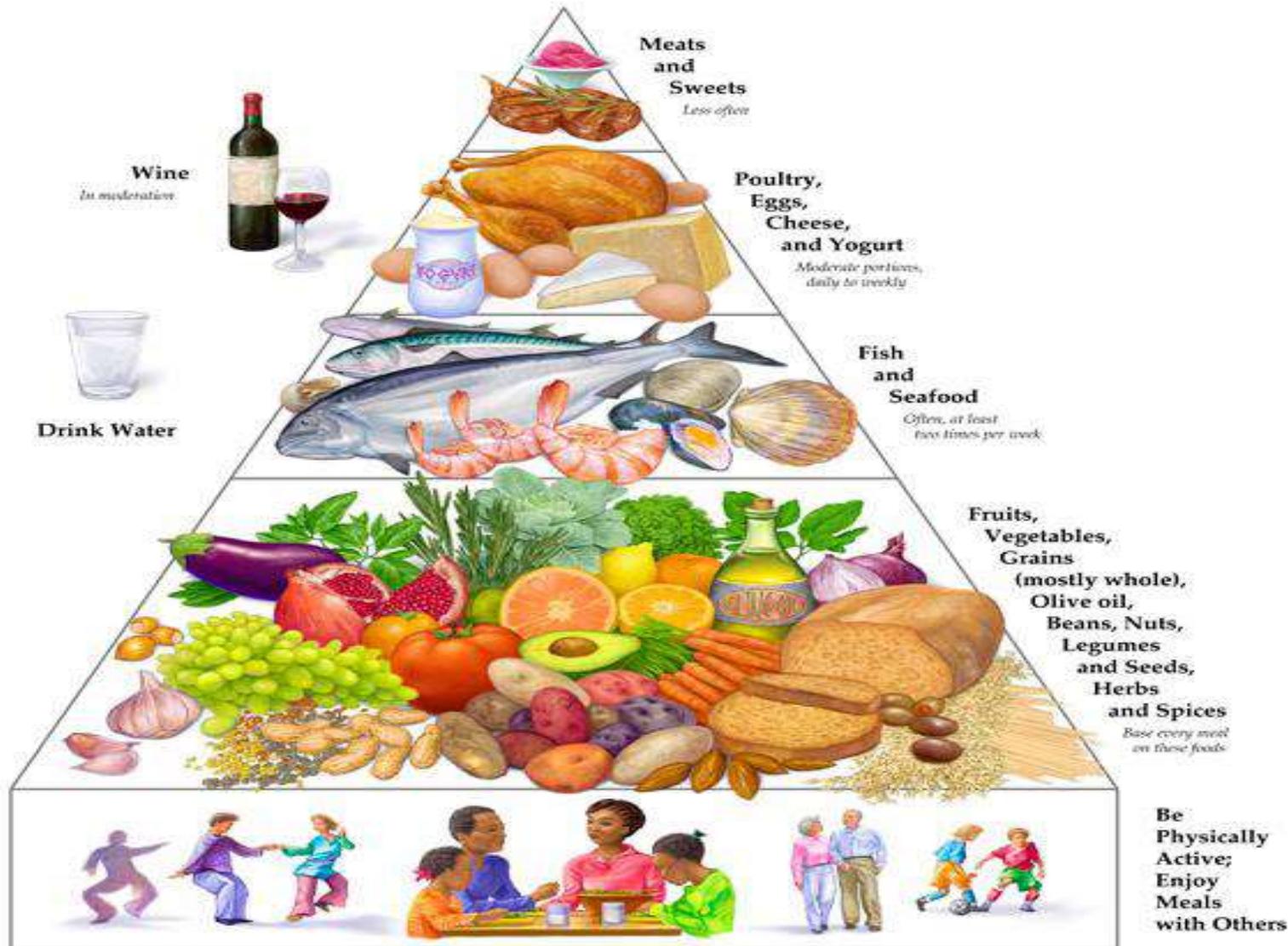


Illustration by George Middleton

# **RESEARCHES ABOUT GLUTEN**

- 1. There's been an explosion of research implicating the immune-modulating and inflammatory effects of gluten and sugar (often co-occurring). Many individuals perceive that they are totally "fine" until that day when they're not. In reality, there has been a long period of "incubation" of symptoms.**
- 2. No matter what you've read, you should know that eating gluten provokes an inflammatory response in everyone. In about 80% of people, it precipitates intestinal wall changes that allow for various compounds, food particles, and bacteria and their immunotoxic components (e.g., LPS or lipopolysaccharides) to enter the bloodstream. In animal models, LPS is used to induce "depression." There are many scientific studies establishing the role of inflammation in depression, including postpartum.**

***Butyrate Producing Faecalibacterium and Coprococcus are always associated with good life living people while these are absent in depressed patients along with Dialister (Nature Microbiology 4:2019)***



An analysis of fecal metagenome data also showed that better mental health was associated with the gut microbiome's ability to produce a metabolite of the human neurotransmitter dopamine called DOPAC.

# ***Eliminate Processed Foods and Food Toxins From Your Diet***

## ***WHAT ARE PROCESSED FOODS?***

- 1. Broadly speaking, they are anything in a package.***
- 2. More specifically, they are anything that contain more than one to three ingredients, including: hydrogenated vegetable oils, preservatives, dyes, emulsifiers, tenderizers, and taste enhancers.***
- 3. Processed food is chemicalized so that it is portable and shelf-stable. It is manipulated for texture, good mouth feel, and taste.***
- 4. It also tends to be polluted with toxicants, such as pesticides.***

***Buying organic is an important start.***

# ***Add Whole Foods, Good Fats, and Therapeutic Foods to Your Diet***

- 1. Foods with long ingredients,***
- 2. whole, simple foods that often don't even come with a Nutrition Facts label;***
- 3. Fresh fruits and vegetables, including root vegetables.***
- 4. Pastured meats, wild fish, eggs, nuts, and seeds.***
- 5. Traditional fats like olive oil, coconut oil, or grass-fed ghee***
- 6. As a start, avoid gluten-containing grains.***
- 7. Quinoa, buckwheat, white rice, and white potatoes may ultimately be fine***

# **Add Fermented Foods to Your Diet to Restore and Balance Your Gut Flora PREBIOTICS AND PROBIOTICS ARE ESSENTIAL TO GUT HEALTH.**

- 1. Prebiotics are food for probiotics.**
- 2. Probiotics are the good, beneficial live bacteria that help to keep the ecology of your gut in balance.**
- 3. Probiotics can actually reverse psychiatric symptoms.**
- 4. Fermented foods are simply probiotic foods.**
- 5. Most people enjoy fermented food supplements from health food stores**
- 6. Healthy bacteria through wholly natural sources, such as: Sauerkraut, Pickles, Kimchi and other fermented vegetables, Coconut kefir.**
- 7. Fermented foods are delicious and flavorful. They are relatively easy to make on your own, too.**

***This is an easy and powerful basic step toward a happier body and a healthier brain.***

# ***MAJOR ROLES OF GUT MICROBES***

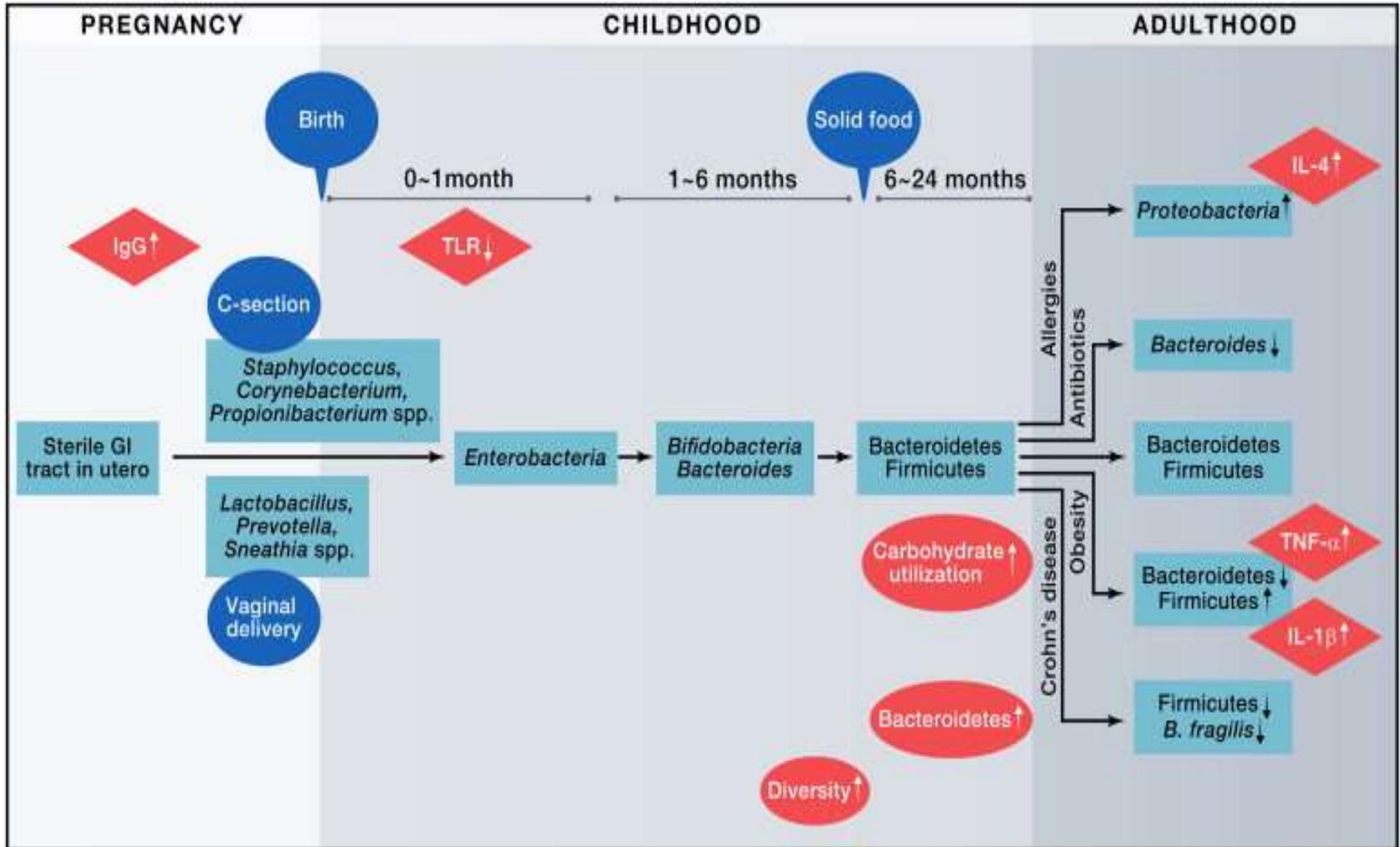
**Digesting breast milk:** Some of the bacteria that first begin to grow inside babies' intestines are called *Bifidobacteria*. They digest the healthy sugars in breast milk that are important for growth ([8Trusted](#))

**Digesting fiber:** Certain bacteria digest fiber, producing [short-chain fatty acids](#), which are important for gut health. Fiber may help prevent weight gain, diabetes, heart disease and the risk of cancer ([11Trusted](#))

**Helping control your immune system:** The gut microbiome also controls how your immune system works. By communicating with immune cells, the gut microbiome can control how your body responds to infection ([18Trusted](#))

**Helping control brain health:** New research suggests that the gut microbiome may also affect the central nervous system, which controls brain function ([20Trusted](#))

# Development of Gut Microbiome



# **Foods to Avoid**

**Foods that reduce the health of your gut and microbiome should be completely avoided.**

**These foods include:**

- **Processed and fried foods.**
- **Sugar and high-fructose corn syrup.**
- **Artificial sweeteners - except for small quantities of Lakanto.**
- **Trans and hydrogenated fats.**
- **Starchy fruits and vegetables, such as bananas, potatoes, corn and peas.**
- **Deli meats high in salt and fats.**
- **Peanuts, soy and other legumes except for chickpeas and lentils.**
- **High-mercury fish.**
- **Dried fruit and fruit juices.**
- **All grains containing gluten.**
- **Eggs and dairy except for butter and ghee.**
- **Yeast and foods containing it.**

# ***Additional Advice***

***Take organic foods, avoid chemicals in non-natural household cleaners and personal care products.***

***Good water filter is essential, drink enough water that reduces many toxins, pesticides and harmful hormones from your body.***

***Diet with various supplements to reduce inflammation, remove unhealthy bacteria, and help strengthen your gut include zinc, glutamine, berberine, caprylic acid, quercetin, garlic, grapefruit seed extract, wormwood, oregano oil, probiotics, and vitamin D.***

***Dieters are also warned to avoid overusing certain drugs — such as antibiotics, non-steroidal anti-inflammatory drugs (NSAIDs), and proton pump inhibitors — which may disrupt the balance of your gut bacteria.***

## ***NEVER FORGET-***

***Diet encourages eating organic foods, using a water filter, and taking various supplements. It discourages the use of non-natural household cleaners and personal care products, as well as the overuse of certain drugs.***

# Restoration of Gut Health

***Diet may improve the gut health in various ways.***

***Foods rich in probiotics and prebiotics facilitate healthy gut,***

***Probiotics are **live bacteria** that help colonize your gut and prevent unfriendly bacteria from overpopulating; found in foods like yogurt, kefir, tempeh, kombucha, and unpasteurized fermented vegetables, such as sauerkraut, pickles, and kimchi***

***Prebiotics are a type of fiber that helps feed these friendly bacteria. You can find them in foods such as asparagus, garlic, Jerusalem artichokes, onion, leek, and radishes — all of which are plentiful in the Microbiome Diet.***

***Prebiotics and specific probiotic strains such as Lactobacilli and Bifidobacteria may also help seal gaps between intestinal cells, preventing leaky gut syndrome.***

***Research further reports that probiotics may combat digestive disorders, such as irritable bowel syndrome (IBS), Crohn's disease and ulcerative colitis.***

***They may also help protect against infections with the Helicobacter pylori, one of the main causes of ulcers and stomach cancers.***

***Microbiome Diet also limits your intake of added sugar. Too much added sugar may negatively affect gut bacteria by allowing harmful species to overgrow.***

***The diet also warns against the overuse of antibiotics, NSAIDs, and proton pump inhibitors. Studies show that these medications can damage the gut wall and wipe-out microorganisms — including friendly bacteria.***

***Therefore, avoiding these medications whenever possible may contribute to a healthier gut as well.***

# **Foods to Eat**

***Foods that promote Microbiome :***

***Wild salmon and grass-fed meat.***

***Fermented vegetables, such as sauerkraut and kimchi.***

***Non-starchy vegetables, such as asparagus, carrots, garlic, artichokes, leeks, onions, and radishes.***

***Non-starchy fruits, such as tomatoes, avocado, apples, cherries, grapefruit, kiwi, oranges, nectarines, rhubarb, and coconut.***

***Nuts, seeds, and their butter.***

***Sunflower and olive oils.***

***Chickpeas and lentils.***

***Lakanto sweetener in small amounts.***

***Herbs and spices.***

***In phase two of the diet, foods like free-range eggs, dairy, legumes, gluten-free grains, and certain starchy fruits and vegetables can be reintroduced.***

# Meal Plan

## Day 1

**Breakfast:** Fruit salad with Brazil nuts.

**Snack 1:** Parsnip sticks with almond butter.

**Lunch:** Chicken and vegetable soup.

**Snack 2:** Roasted cauliflower with curry.

**Dinner:** Grilled salmon with roasted Brussels sprouts, mixed greens, and fermented beets.

## Day 2

**Breakfast:** Pancakes made with almond flour topped with almond butter and fruit.

**Snack 1:** Walnuts and cherries.

**Lunch:** Vegetable salad topped with sauerkraut, chickpeas, and a parsley-lemon vinaigrette.

**Snack 2:** Celery sticks with guacamole.

**Dinner:** Zucchini noodles topped with marinara sauce and chicken meatballs.

## Day 3

**Breakfast:** Blueberry and almond breakfast cookies.

**Snack 1:** Sautéed pineapple topped with shredded coconut.

**Lunch:** Vegetable salad topped with miso-glazed cod.

**Snack 2:** Carrots with hummus.

**Dinner:** Flank steak tacos with steamed veggies, salsa, and guacamole.

# **Health Risk**

- In the latest issue, it can again be seen that consumers often underestimate risks which are classified as health-relevant from the point of view of risk assessment, such as food hygiene at home. One new topic is the question of awareness of several pathogens in the food sector. "While most people have heard of Salmonella, only a minority has heard of Campylobacter," explains BfR President Professor Dr. Dr. Andreas Hensel. "This is despite the fact that Campylobacter is by now the most common bacterial pathogen of intestinal infections in Germany." The view of consumers that food in Germany is safe has hardly changed, while smoking, climate and environmental pollution, unhealthy or wrong diet and alcohol are still perceived as the greatest health risks.***

# ***Microbiome Diet Helps***

***By improving your gut health, the Microbiome Diet may also protect you against a variety of diseases.***

***These include obesity, type 2 diabetes, heart diseases, metabolic syndrome, colon cancer, Alzheimer's and depression.***

***What's more, your microbiome is responsible for turning fiber into short-chain fatty acids that strengthen your gut wall and your immune system.***

***A stronger gut wall can help prevent unwanted substances from entering your body and provoke an immune response.***

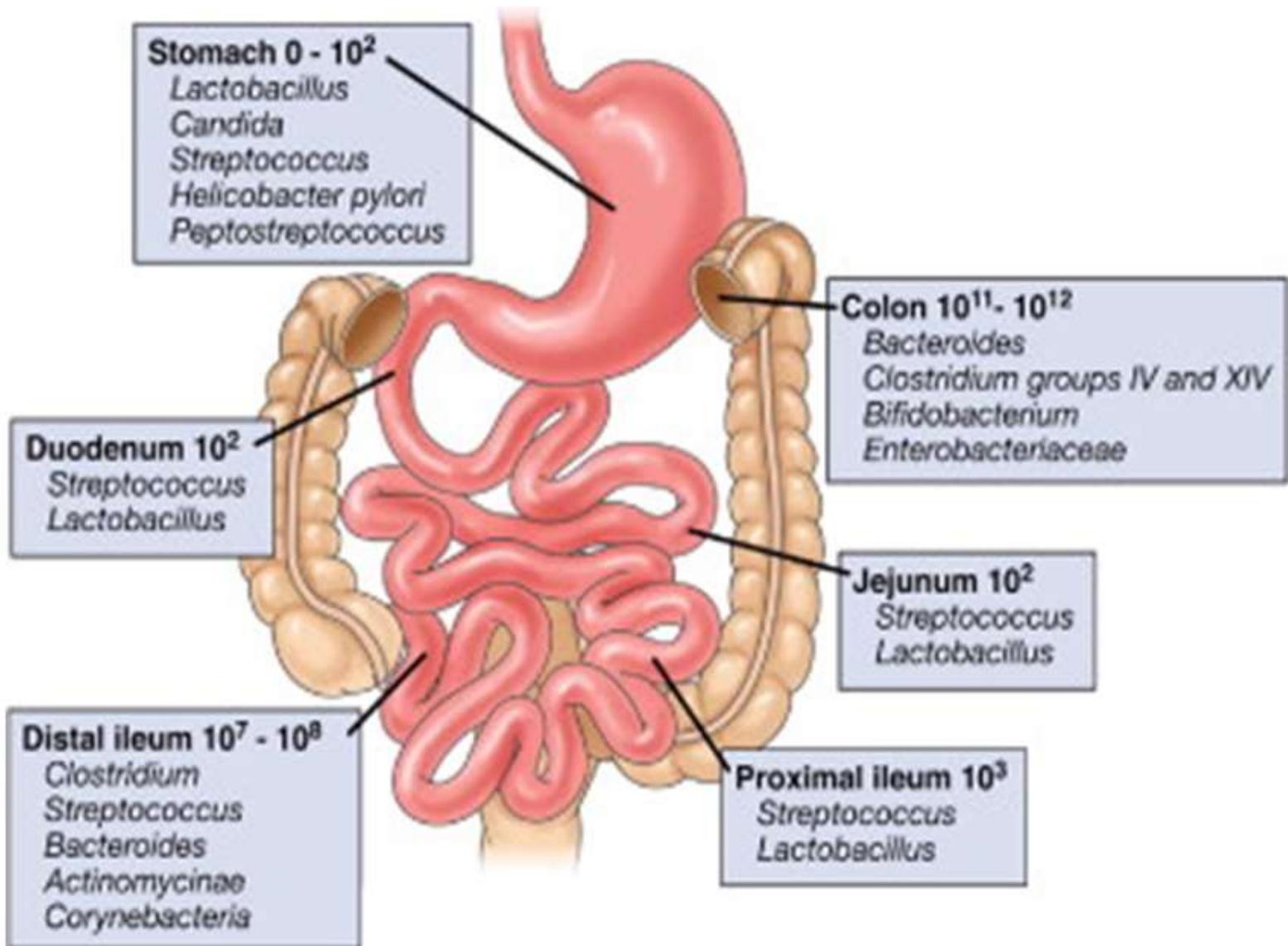
***Improves your overall health, digestion, absorption, your mood, brain, your positive thinking, prolong your age, improve your happiness and well being***

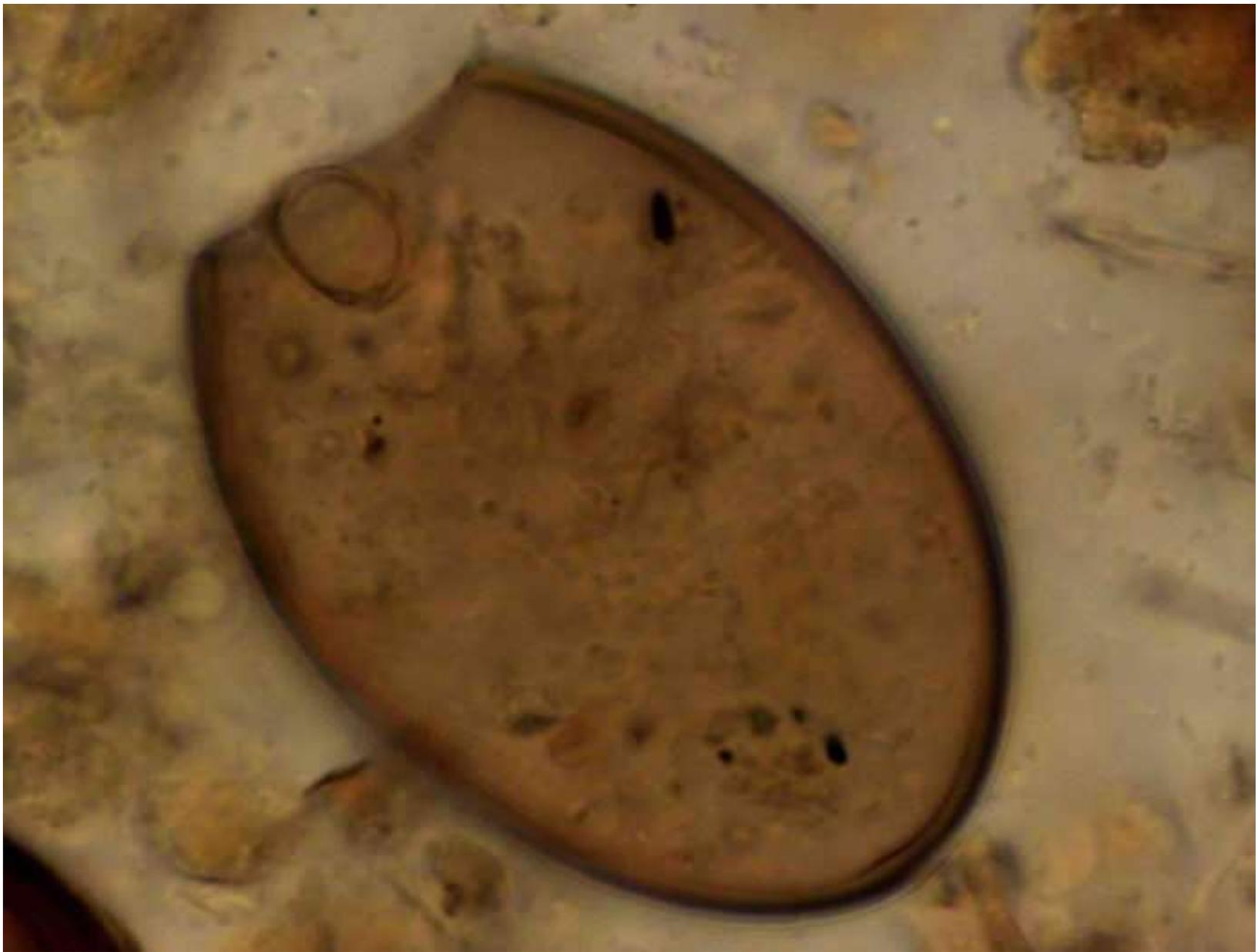
***Encourages eating plenty of fruit, vegetables, healthy fats, lean protein, and other plant-based foods, limit added sugar as well as processed and fried foods.***

***Healthier gut will boost your metabolism, reduce cravings, and promote weight loss, research in humans to confirm these benefits is lacking.***

***Microbiome Diet tends to be naturally low in fat but rich in vitamins, minerals, and fiber — which may contribute to weight loss without the need to count calories or measure portion sizes.***

# Quantitative Analysis of Microbial Communities





Microscopic fish tapeworm from the medieval latrine at Riga (Ivoy Yeh)  
Susane Sabine , October, 2020

## ***Research questions to be answered in HMP***

- ***How stable and resilient is an individual's microbiota throughout one day and during his/her lifespan?***
- ***How similar are microbiomes between members of a family, community or across communities in different environments?***
- ***Do all humans have an identifiable "core" microbiome and how is it acquired and transmitted?***
- ***What affects the genetic diversity of the microbiome and how does this diversity affect adaptation by the microorganism and the host to markedly different lifestyles and to various physiological or pathophysiological states?***

# The chicken microbiome

- The chicken microbiome is the community of microorganisms living in and on a chicken.
- A healthy balance of microorganisms makes for a healthy chicken.
- Microorganisms found in the guts of chickens do not usually make chickens ill, but if some of those microbes get onto the meat during processing and then into the human gut, they can cause illness in people.

# The soil microbiome



- The soil microbiome is the community of microorganisms that live in the soil.
- It is huge – scientists have found that virtually every soil sample they analyse contains around 30 000 species of microorganisms.

# Hope from the soil

- Some microbes in the soil microbiome make chemicals that destroy other microorganisms; maybe they can help us too.
- However, we have not found a way to culture 90% of the microorganisms that grow in soil in the laboratory, so we have a long way to go.
- In 2015, scientists discovered teixobactin – a completely new type of antibiotic from soil bacteria that cured MRSA and TB in mice.