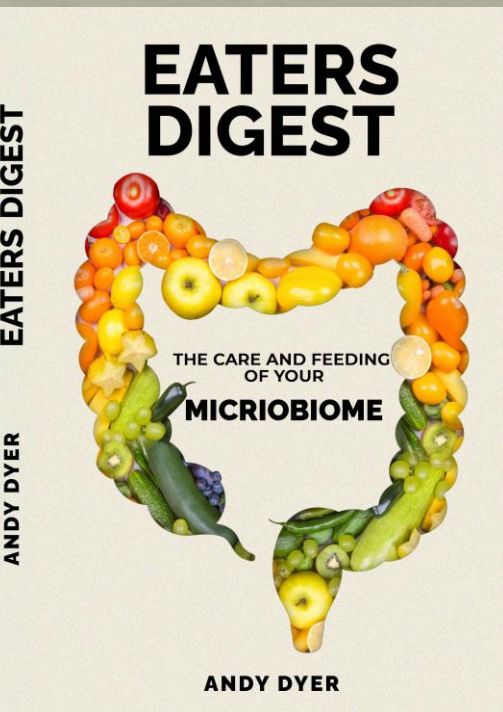


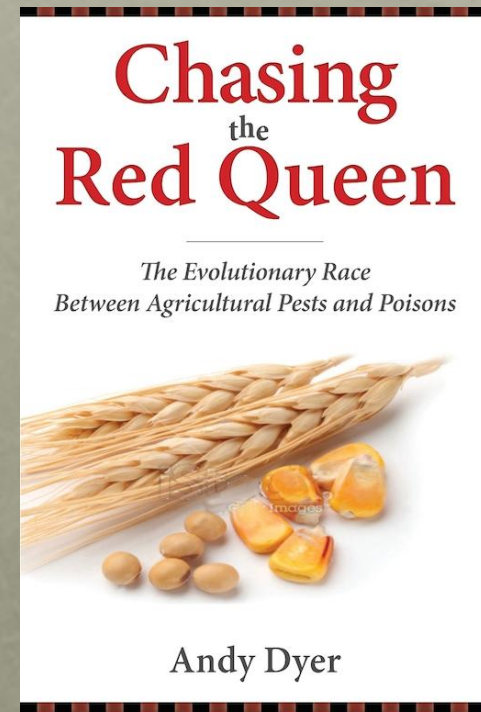
The Microbiome & Implications for Human Health



Andy Dyer
USCA Professor Emeritus



Biological, Environmental
& Earth Sciences



BEFORE WE START....

The Rules of the Ecological Game

- Simple (linear) cause-and-effect does not exist
- All interactions are complex and indirect
- Stability and diversity are connected
- All of health and disease is contextual
- All diet-related diseases are ecological syndromes

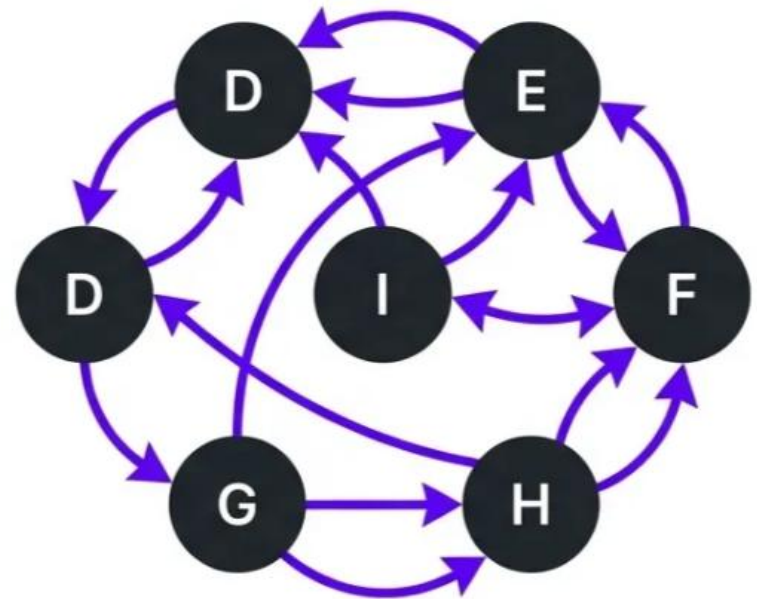
This means linear solutions cannot solve them, diversity has probably been reduced, the interactions are complex and difficult to identify, and there are no quick fixes.

LINEAR THINKING



A → B LOGIC. SINGLE DIRECT CAUSE. PREDICTABLE PATH.

SYSTEMS THINKING



FEEDBACK LOOPS. INTERCONNECTED. RIPPLE EFFECTS.

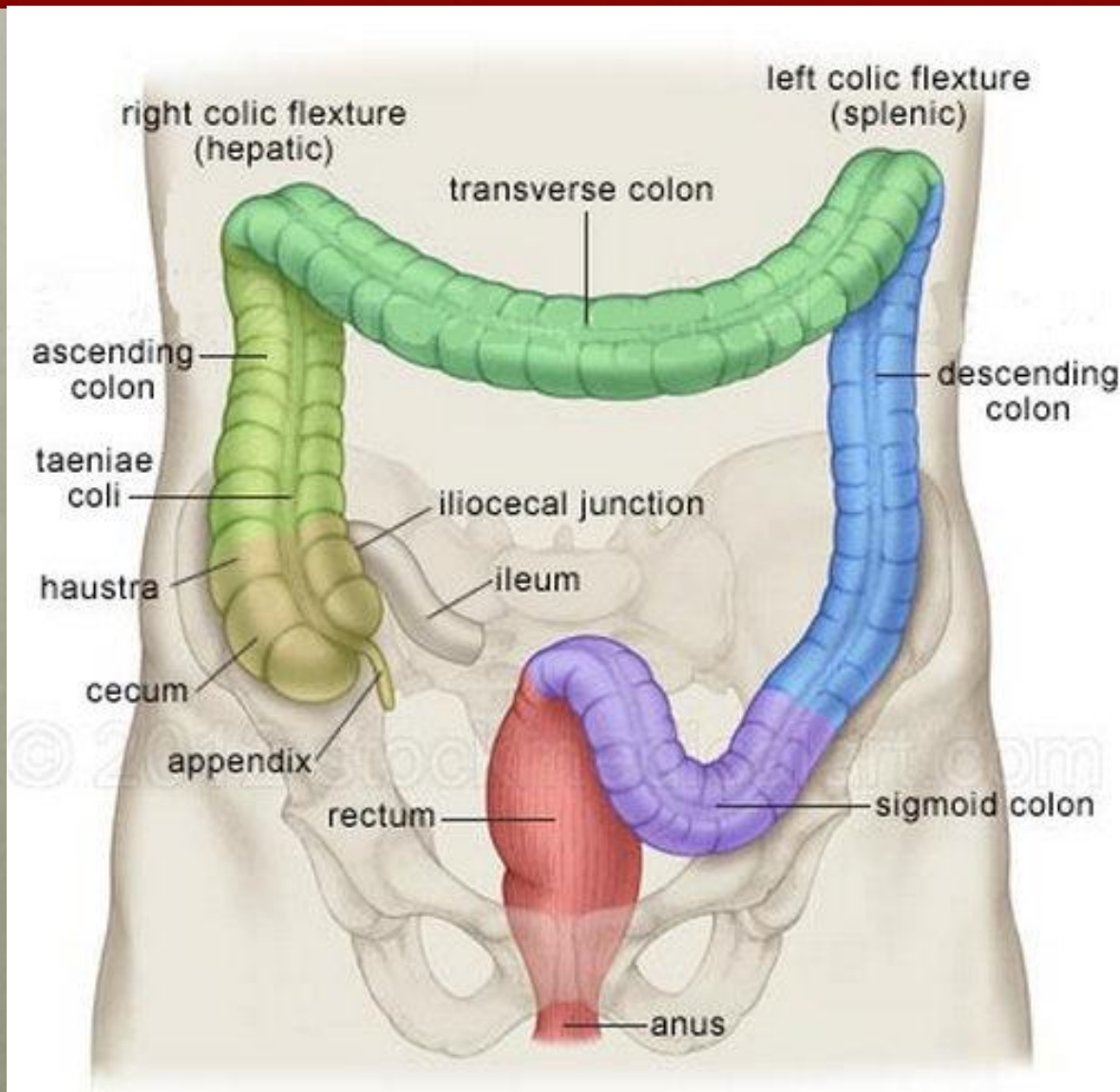
COGNITIVE DISSONANCE

$$9 + 3 = 5$$

WHAT IS IT?

- 600 species of microbes on the skin, 800 in the mouth, 1000-1500 in the colon, but perhaps 10,000 in all.
- Bacteria, fungi, protozoans, viruses
- 100 trillion bacteria in the colon, about 2.5 pounds.
- Most of the feces we produce is actually bacteria.
- The bacteria feed on what we cannot digest in our small intestine, by anaerobic fermentation.
- We cannot digest plant material. Bacteria live on that plant material.

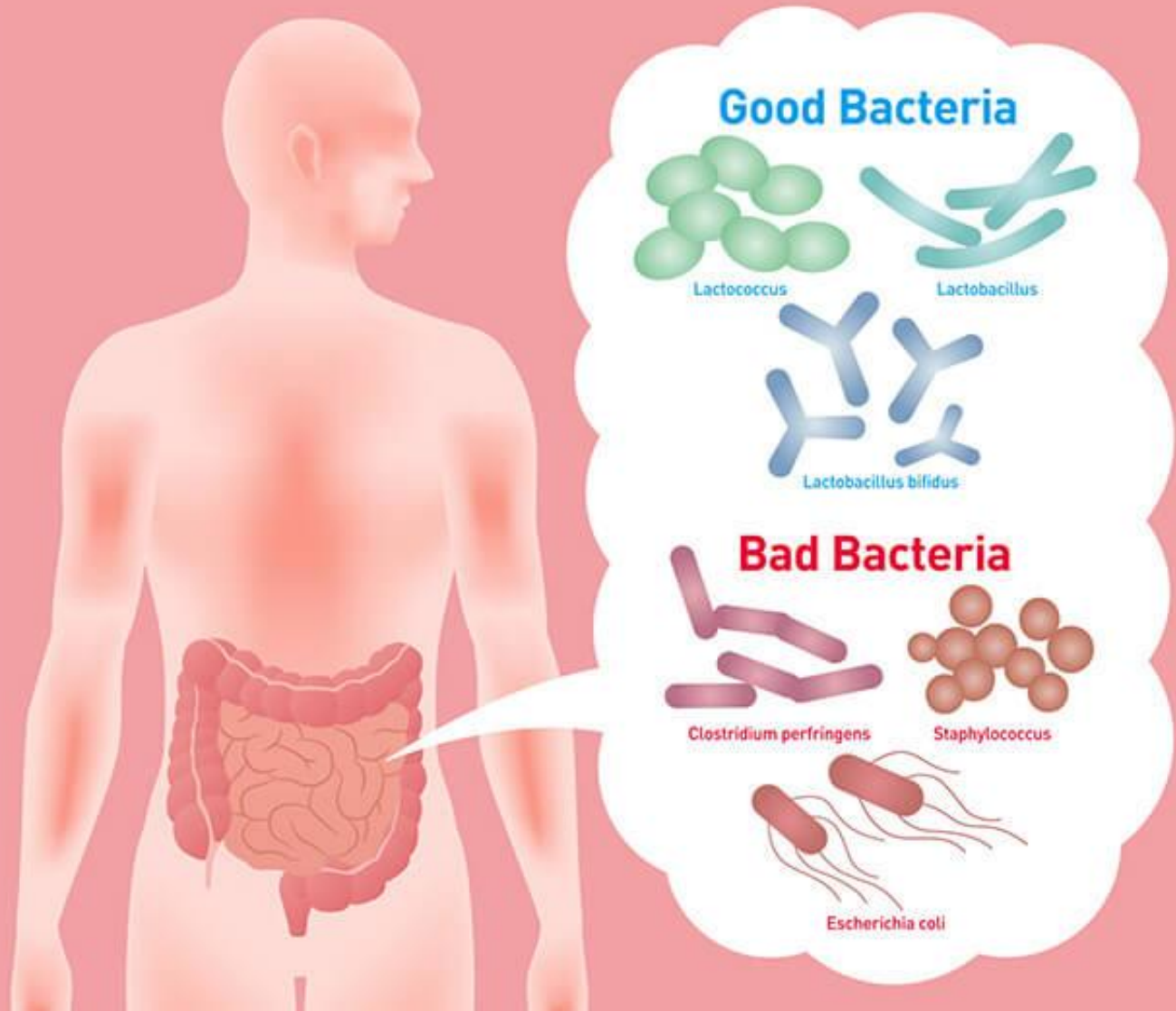
WHERE IS THE GUT MICROBIOME?



WHO IS IT?

(FOCUS IS ON BACTERIA...FOR NOW)

- We have to overcome our natural distrust of bacteria.
- 99% of them are partners or associates
- But we're not sure which ones are which.



Good and Bad Bacterial Flora



BIFIDOBACTERIA

The various strains help to regulate levels of other bacteria in the gut, modulate immune responses to invading pathogens, prevent tumour formation and produce vitamins.



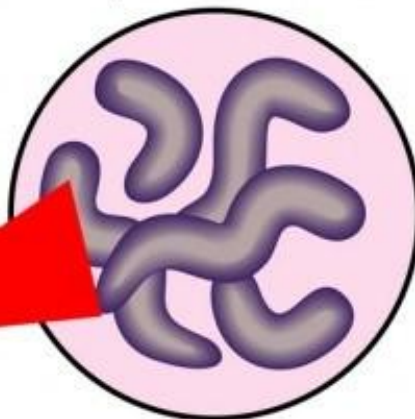
ESCHERICHIA COLI

Several types inhabit the human gut. They are involved in the production of vitamin K2 (essential for blood clotting) and help to keep bad bacteria in check. But some strains can lead to illness.



LACTOBACILLI

Beneficial varieties produce vitamins and nutrients, boost immunity and protect against carcinogens.



CAMPYLOBACTER

C Jejuni and C coli are the strains most commonly associated with human disease. Infection usually occurs through the ingestion of contaminated food.



ENTEROCOCCUS FAECALIS

A common cause of post-surgical infections.



CLOSTRIDIUM DIFFICILE

Most harmful following a course of antibiotics when it is able to proliferate.

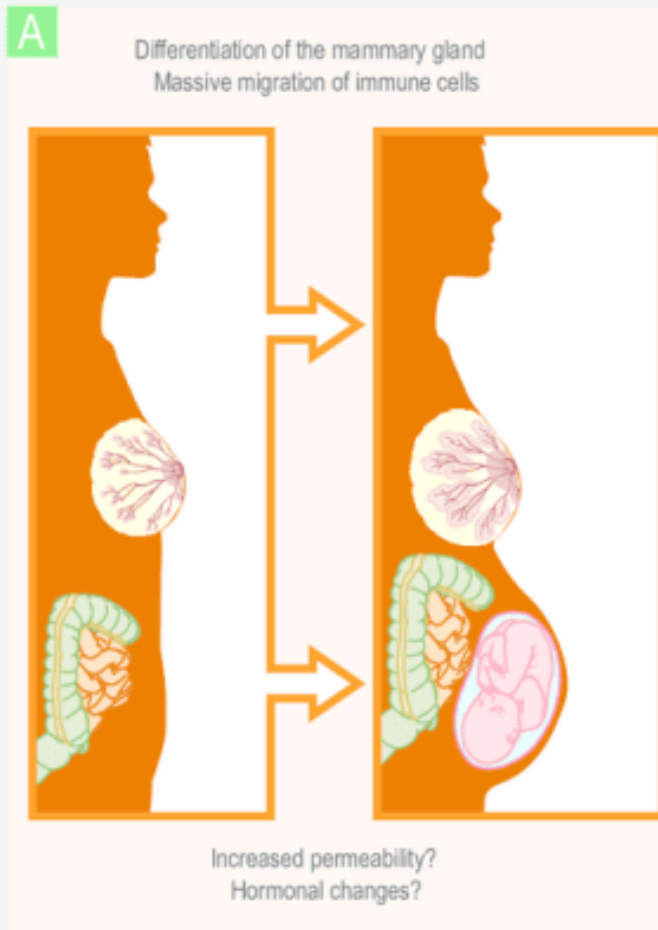
GOOD

BAD

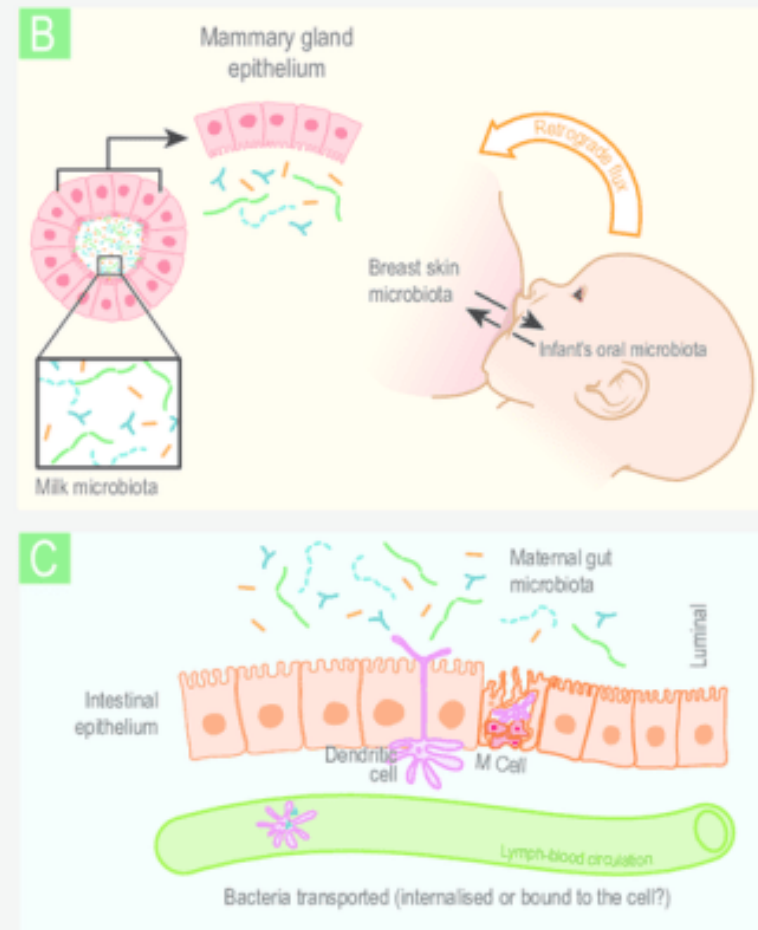
WHERE DID IT COME FROM

- Naturally, from our mother first, and our families second.

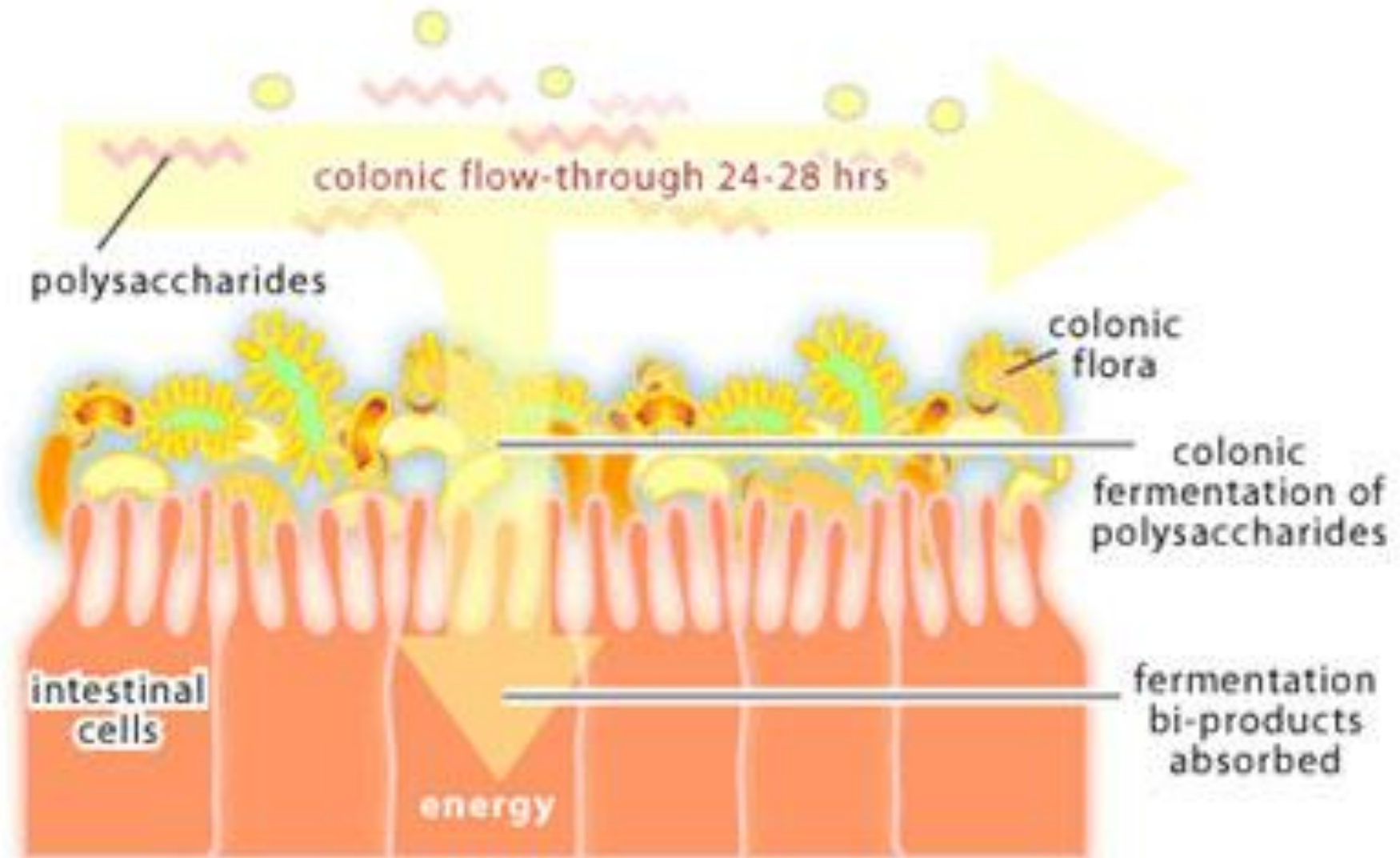
Physiological changes during pregnancy



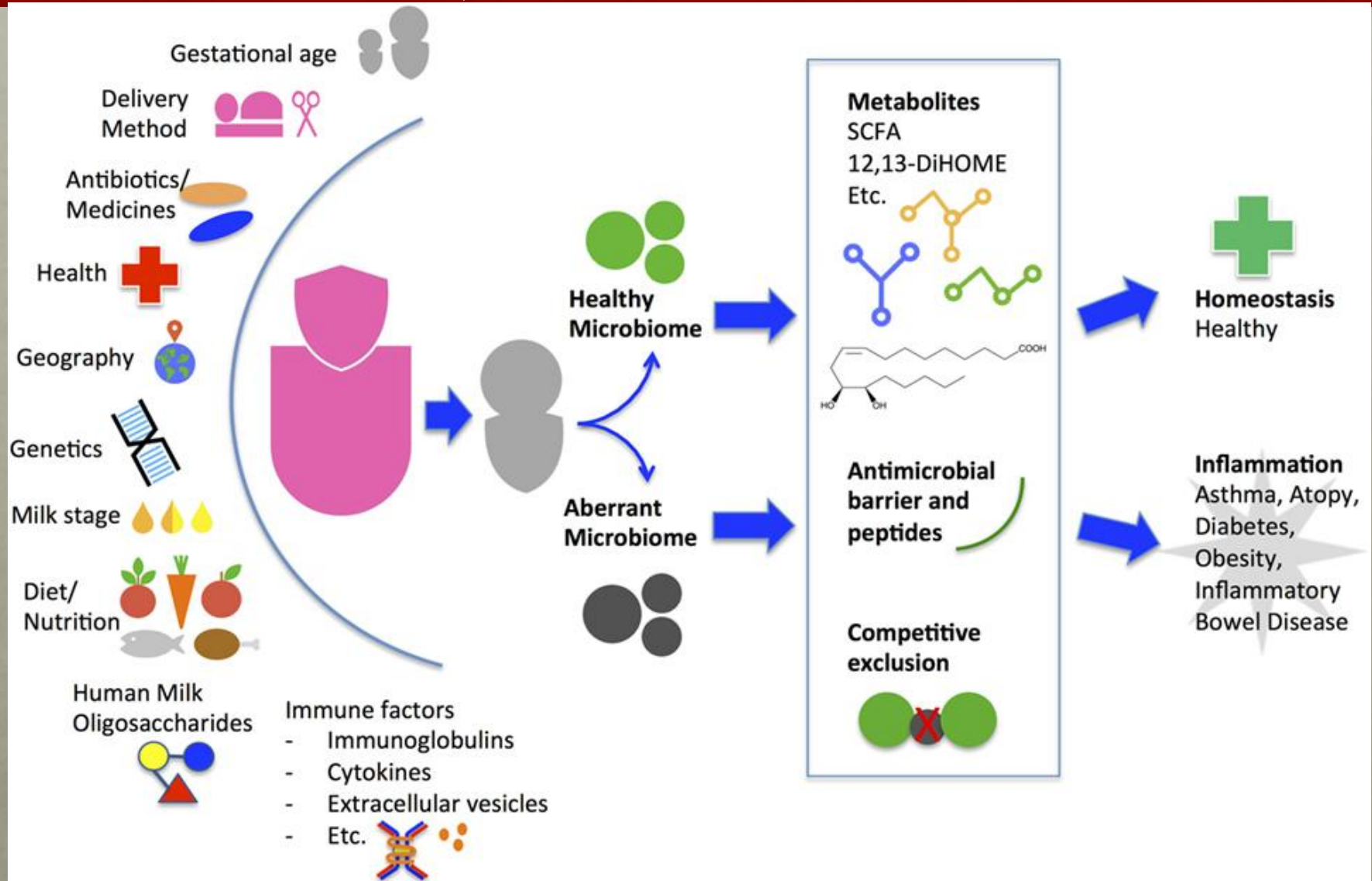
Potential routes



UNDERSTANDING THE PARTNERSHIP

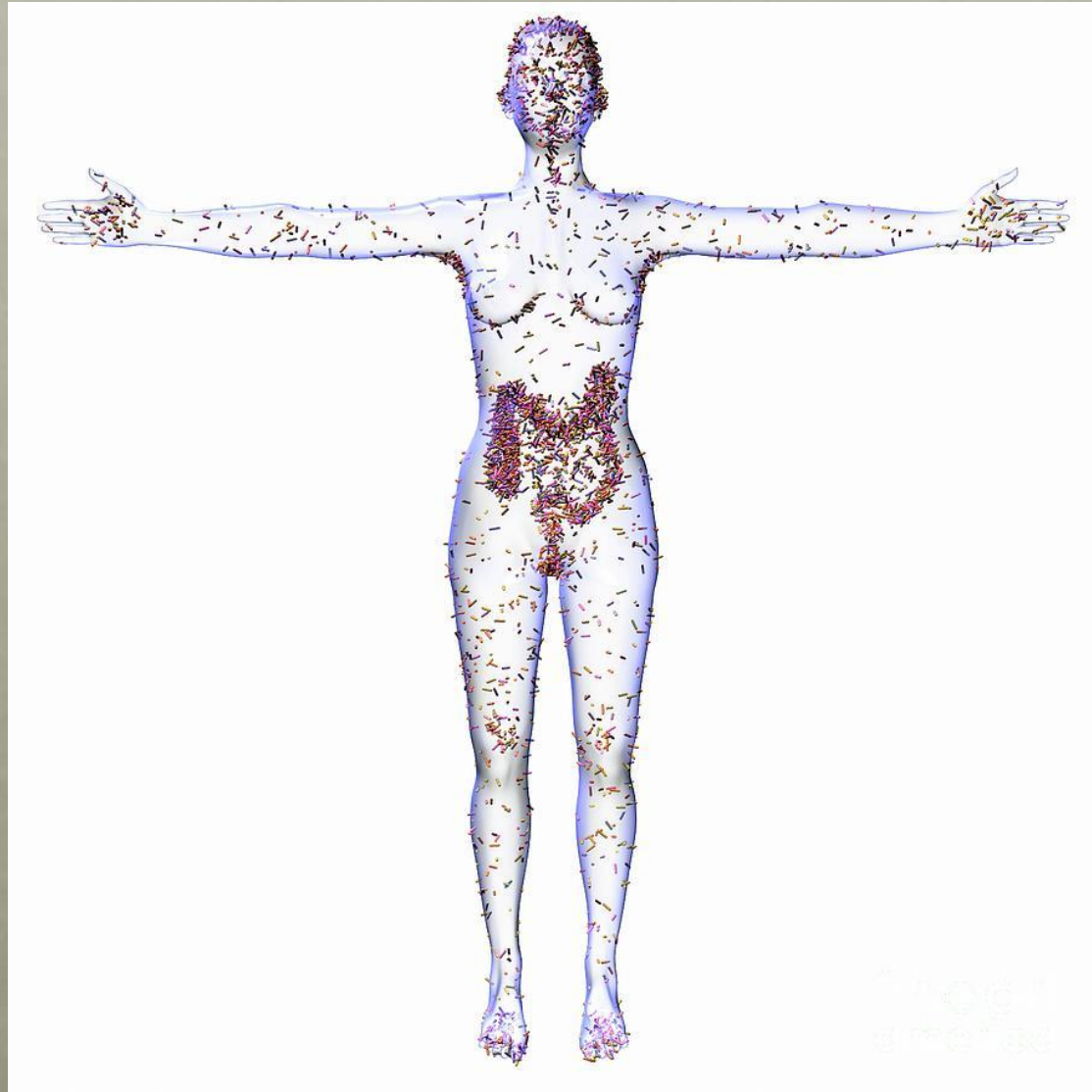


WHEN OUR BACTERIA ARE HEALTHY, WE ARE HEALTHY



WHAT TO REMEMBER

- We are walking ecosystems.
- We cannot live without the microbiome.
- Our health depends on a healthy microbiome.
- The microbiome depends on us for its health/survival.
- The microbiome protects us.



1. FEEDING OURSELVES AND OUR MICROBIOME

- What is food? It isn't the same for both of us.
- There is food and then there are calories.
- Food has changed. We have not.
- Microbiome depends on food quality which means we depend on food quality.

PFC FOODS

- Proteins 4cal/g
 - Absorbed into the blood → the liver
 - Provides amino acids
- Fats/lipids 9cal/g
 - Absorbed into the lymph system → the neck
 - Provides some nutrients depending on the fats
- Carbs 4cal/g
 - Absorbed into the blood → the liver
- By the way, 1lb of fat → ~450g → ~4000 calories

THESE ARE CALORIES,
NOT REAL FOOD



THIS WILL ONLY HURT, NOT HELP
AVOID BROWN FOOD

THIS IS FOOD, NOT CALORIES



FOCUS ON NUTRIENTS

- **Vitamins-** necessary for body functions
- **Minerals-** necessary for body functions
- **Cellulose-** food for the microbiome
- **Plant nutrients-** may be the basis for overall healthy body, immune system, nervous function, recovery and healing, overall well-being.

THE FOOD WE EAT...

- Fuels our bodies (PFC foods)
- Feeds the microbiome -> immune system, nervous system, interacts with other systems, provides nutrients to us that don't come from our food.
- Contains 1000s of plant chemicals that act in many unknown ways to stimulate and protect our bodies. Plants should be viewed as SLOW MEDICINE.
- Must be produced in a way that allows these interactions to occur. This is increasingly NOT happening.

NUTRIENTS

- A poorly defined concept in the food world.
- HHS says carbs, fats, and proteins are nutrients.
 - These are energy sources mostly
- Nutrients
 - proper functioning of the body systems,
 - disease prevention and resistance,
 - resilience and recovery

In that sense, nutrients are medicinal.

NUTRIENT SOURCES

- **Microbiome:** plants, diverse kinds, diverse families
 - Whole, fresh or frozen, with strong flavors, aromas, colors
- **Humans:** mostly plants for two reasons
 - Feed the microbiome diversity of foods (types of fiber)
 - Bio-active compounds: flavors, aromas and colors
- What's the catch? No matter how hard you try to eat right, the foods available to us are depleted in nutrients.

WHAT HAS CHANGED?

- Food production and food quality (mostly >1950)
- Synthetic pesticides (>1947)
 - 1 billion #/yr, found in every stream, 90% of wells (USGS)
- Synthetic fertilizers (>1947)
 - Doubled crop production per acre
- Ubiquitous plastic and petrochemicals (>mid-1950s)
- Personal Care Products
- Fast Food (>1970s)
- Sugary drinks (>1980s) and the Dollar Menu
- Drugs/medicine/supplements as a substitute for health

Tomato vs “tomato”

Traditional



Modern



We are what we eat

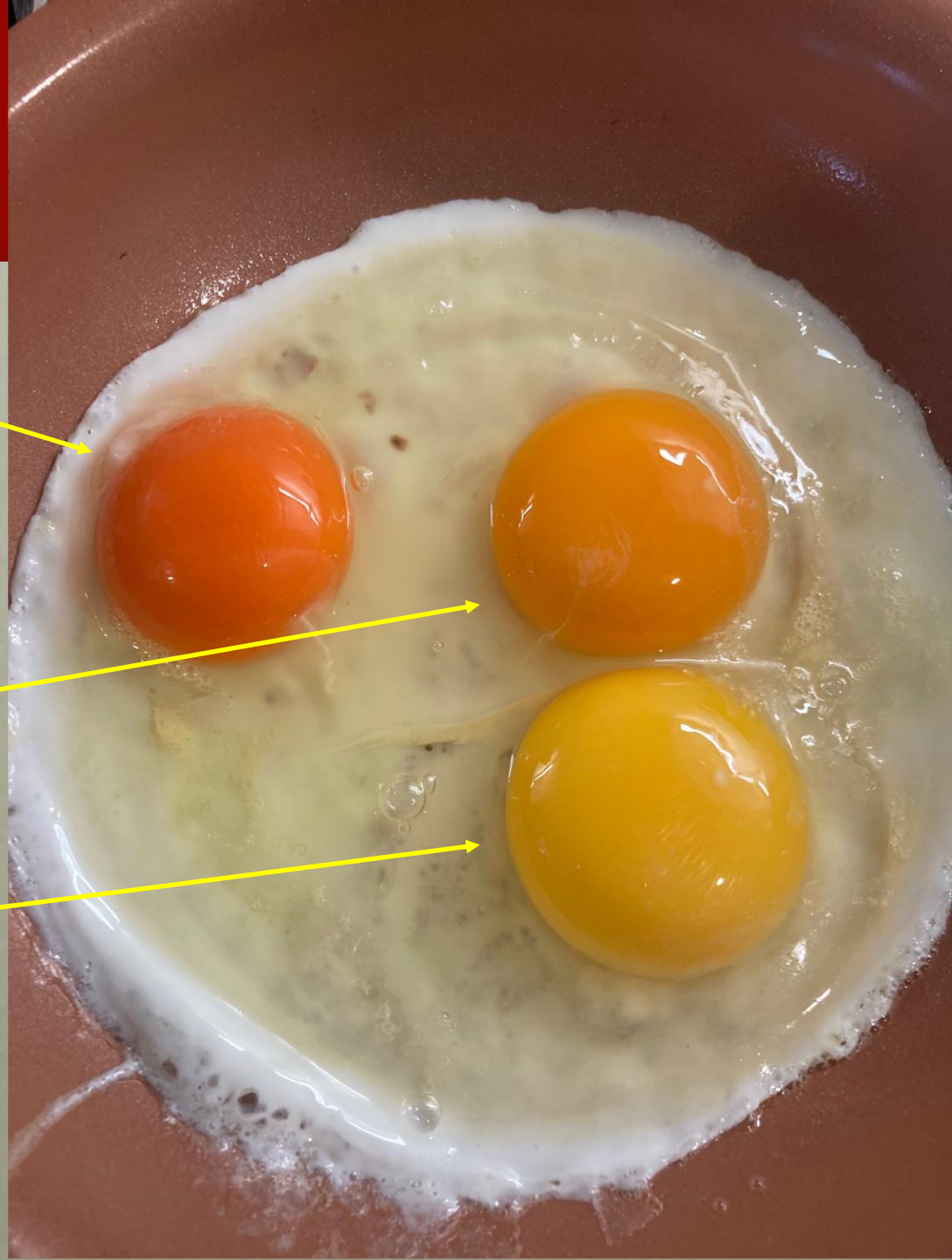


Nutrient dilution

Heirloom egg
\$7/dozen

Free-range egg
\$4/dozen

Commercial egg
\$1/dozen



5-HR ENERGY

How healthy is this?

The context is missing

Supplement Facts

Serving Size 1.93 fl oz

Amount Per Serving		% Daily Value*
Niacin (as Niacinamide)	30mg	188%
Vitamin B6 (as Pyridoxine Hydrochloride)	40mg	2353%
Vitamin B12 (as Cyanocobalamin)	500mcg	20833%
Choline	2mg	<1%
Sodium	15mg	1%
Potassium	13mg	<1%
Energy Blend	1870mg	**
Taurine, Glucuronic acid (as or from glucuronolactone), Malic Acid, N-Acetyl L-Tyrosine, L-Phenylalanine, Caffeine (200mg), Citicoline		
*Percent Daily Values are based on a 2,000 calorie diet. **Daily value not established.		

Other Ingredients: Purified Water; Natural and Artificial Flavors; Sucralose; Potassium Sorbate, Sodium Benzoate and EDTA (to protect freshness).



SIMPLE BREAD

Nutrition Facts

Serving Size 30g

Servings Per Container 30

Amount Per Serving

Calories 60 Calories from Fat 0

% Daily Value*

Total Fat 0g 0%

Saturated Fat 0g 0%

Trans Fat 0g

Cholesterol 0mg 0%

Sodium 240mg 10%

Total Carbohydrate 12g 4%

Dietary Fiber 2g 9%

Sugars 0g

Protein 2g

Vitamin A 0% * Vitamin C 0%

Calcium 0% * Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Calories 2,000 2,500

Total Fat	Less than 65g	80g
Sat. Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2400mg	2400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram

Fat 9 * Carbohydrates 4 * Protein 4

INGREDIENTS:

Rye meal, flour (wheat),
water, salt, yeast.

“WONDER” BREAD

INGREDIENTS: UNBLEACHED ENRICHED FLOUR (WHEAT FLOUR, MALTED BARLEY FLOUR, NIACIN, REDUCED IRON, THIAMIN MONONITRATE, RIBOFLAVIN, FOLIC ACID), WATER, HIGH FRUCTOSE CORN SYRUP, YEAST, CONTAINS 2% OR LESS OF EACH OF THE FOLLOWING: CALCIUM CARBONATE, SOYBEAN OIL, WHEAT GLUTEN, SALT, DOUGH CONDITIONERS (CONTAINS ONE OR MORE OF THE FOLLOWING: SODIUM STEAROYL LACTYLATE, CALCIUM STEAROYL LACTYLATE, MONOGLYCERIDES, MONO- AND DIGLYCERIDES, DISTILLED MONOGLYCERIDES, CALCIUM PEROXIDE, CALCIUM IODATE, DATEM, ETHOXYLATED MONO- AND DIGLYCERIDES, ENZYMES, ASCORBIC ACID), VINEGAR, MONOCALCIUM PHOSPHATE, YEAST EXTRACT, MODIFIED CORN STARCH, SUCROSE, SUGAR, SOY LECITHIN, CHOLECALCIFEROL (VITAMIN D3), SOY FLOUR, AMMONIUM SULFATE, CALCIUM SULFATE, CALCIUM PROPIONATE (TO RETARD SPOILAGE).

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IN THE MIDDLE AISLE



BOTTOM LINE

- Humans are ecosystems, but we think of ourselves as individuals.
- When we eat, we must eat calories to run the body, but we must eat diverse plant materials to support the ecosystem within.
- Both systems require high-quality food with plant nutrients. All smells and flavors in plants are compounds made by plants that are bio-active and many act as nutrients.
- We do not understand how and what the microbiome does in our bodies, but we do know what foods support it.