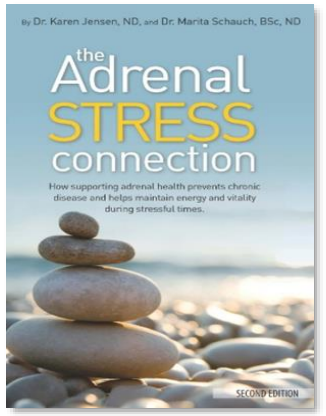
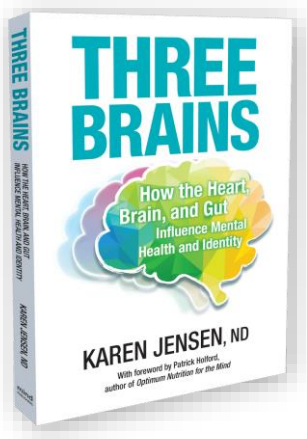
Dr. Karen Jensen, ND

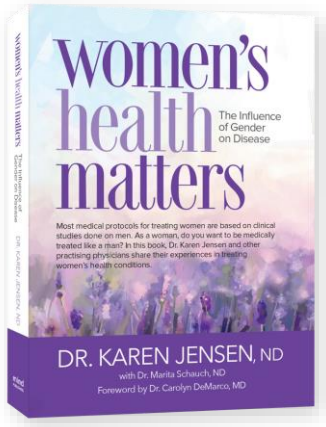
Dr. Jensen has been in the field of naturopathic medicine for 36 years. She is currently retired from clinical practice but continues to lecture and write articles and books on the naturopathic approach to wellness.

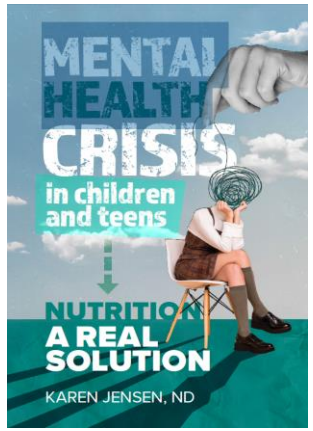
Dr. Jensen has authored and/or co-authored 8 books, including: *The Adrenal Stress Connection; Three Brains: How the Heart, Brain, and Gut Influence Mental Health*; *Women's Health Matters*; and *Mental Health Crisis in Children and Teens: Nutrition a Real Solution*

Note: Education and licensing of naturopathic doctors is varied in different countries. Canada requires undergraduate degree & 4 years naturopathic medical school; national board exams; in most provinces in Canada NDs have prescribing authority.









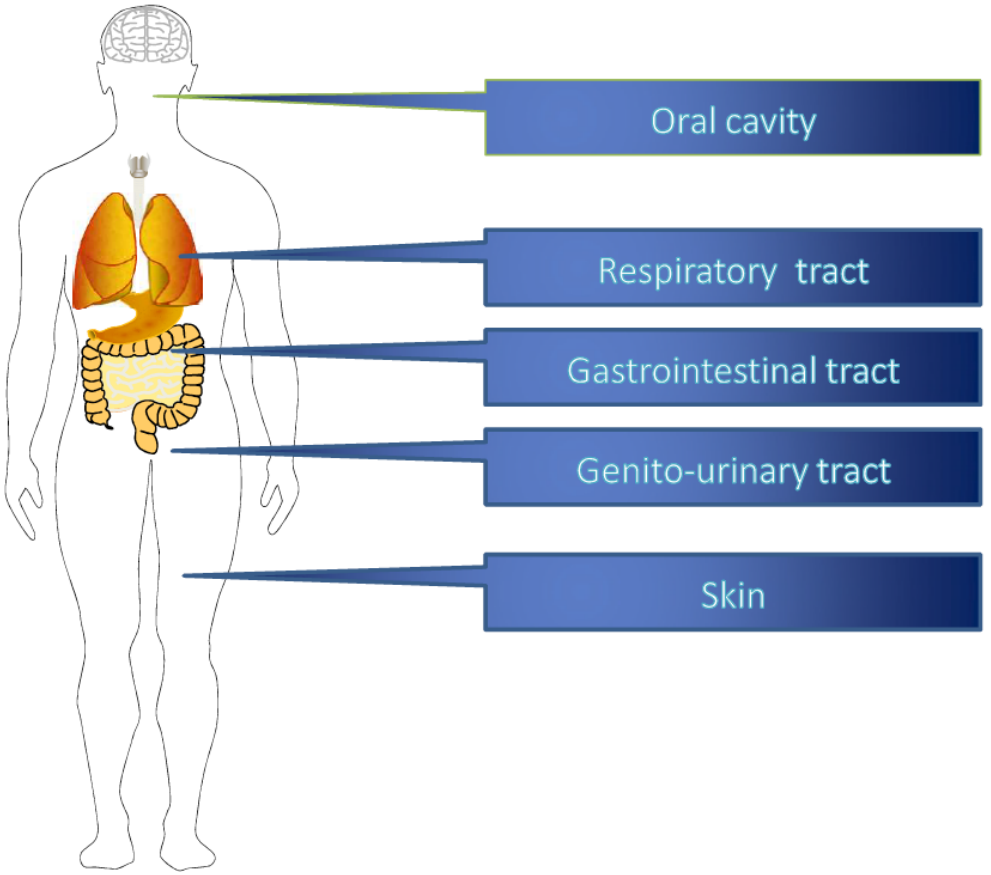
The Gut-Brain Superhighway

The Gut-Brain

All Disease Starts in the Gut: Hippocrates 460 BC

Not a new concept:

- The concept of the gut and the brain has a long history with interest and early research emerging in the early 19th century.
- The 21st century – greater interest and research in the gut-brain axis, revealing a bidirectional connection that affects mental and physical health.



What is The Gut Microbiome?

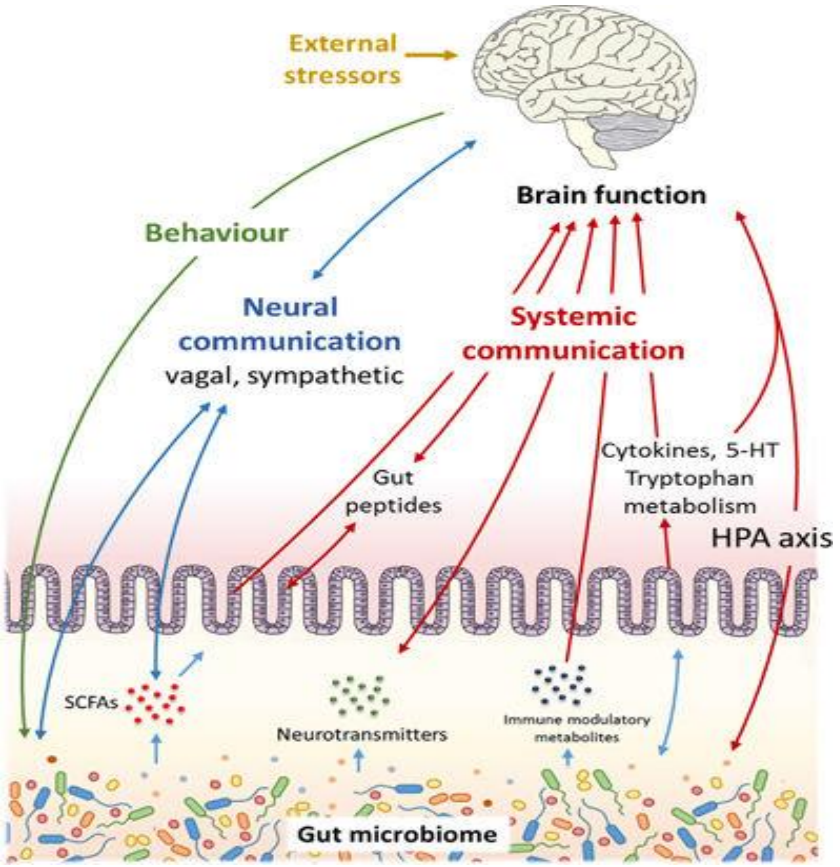
- This complex network connects the central nervous system (CNS)—(the brain and spinal cord)—and the enteric nervous system (ENS) within the gut using biochemical and physical pathways

- Diverse ecosystem of microorganisms: yeasts, fungi, viruses, protozoa, and bacteria, collectively called the microbiome

- Colonization begins at birth with vaginal and fecal microbes being transmitted to the infant's gut.
- Gut Bacteria = the number of human cells in the body and gut microbiome is estimated to include 232M genes

- Plays such a critical role in human health and disease that it has been called the **"forgotten organ"**

Pathways in the Gut-Brain Highway



Two-way communication highway

- Microbial by-products: ie. short-chain fatty acids (SCFAs)
- Neuropeptides and neurotransmitters
- Proinflammatory cytokines, tryptophan metabolism, and immune cell activation
- Neural networks, including vagus nerve
- Hypothalamic-pituitary-adrenal (HPA) axis modulation

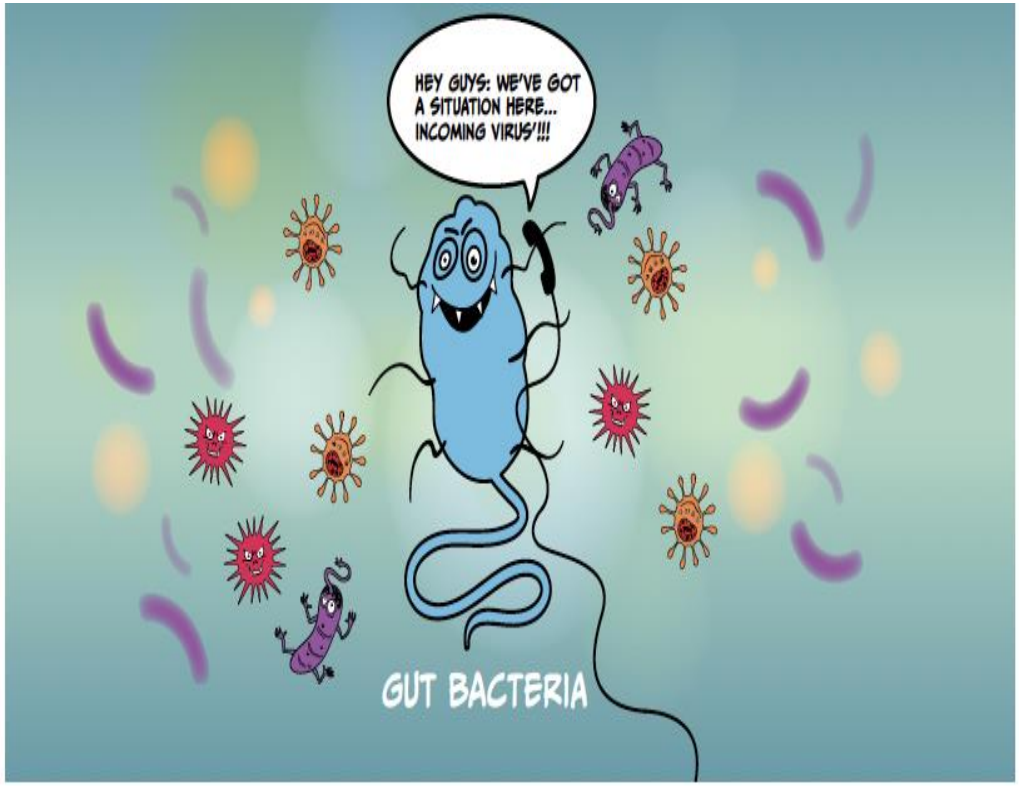
Gut microbes produce various neurotransmitters, hormones, and metabolites that **protect** or **disrupt** neurological function and influence physical and mental health.

Dysregulation of the gut microbiota (dysbiosis) leads to alterations in these pathways

What Does the Gut Microbiome Do?

- Produces SCFAs: (ie. butyrate, propionate and acetate) regulate immune function, maintain gut barrier integrity, play a role in metabolic health, promotes the growth of good bacteria
- Development of the immune system - contains 70–80% of the immune cells
- Produces neurotransmitters: 90% body's serotonin; 50% dopamine; GABA and more.
- Lactobacillus and Bifidobacterium strains influence neurotransmitter levels, including GABA, serotonin, and dopamine, which can positively impact mood, stress, and cognitive functions
- Activates pathways in the gut-brain axis that support development/function of the brain
- Antimicrobial activity
- Gut-organ axis: influences the microbiomes of other organs and systems

Causes of Gut Dysbiosis



We each house a unique microbiome that can change because of several factors, including:

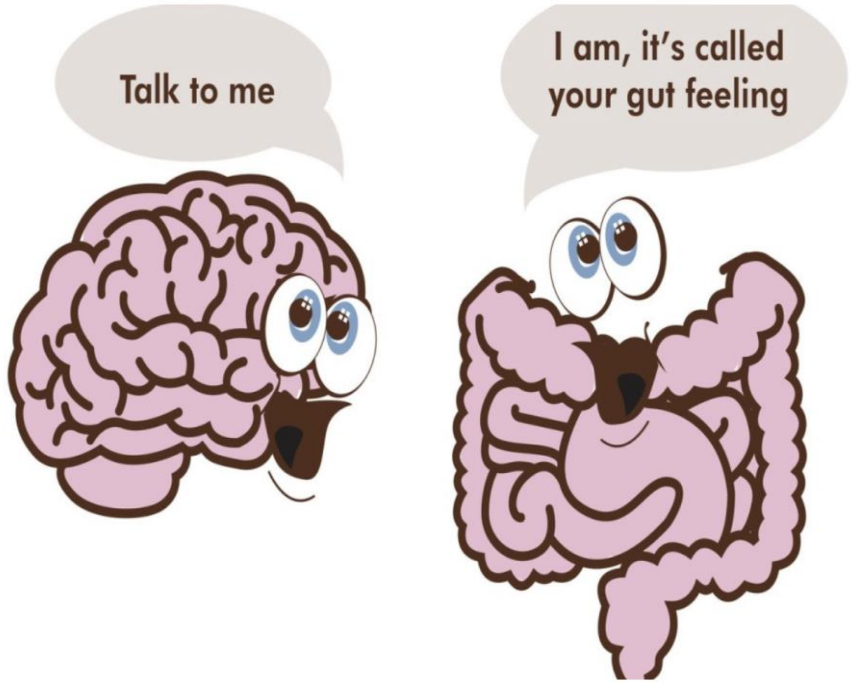
- Diet**:** ultra-processed foods, bad fats and refined carbs**,** sugar
- Certain medications- antibiotics, PPIs, statins….
- Chronic stress
- Environmental factors
- Lack of pro and prebiotics in the diet
- An unregulated immune response can increase gut permeability - 'leaky gut - allows substances that should remain in the gut to enter the bloodstream - cross BBB resulting in inflammation and the onset of various mental health and neurological disorders.

The gut microbiome can respond to dietary changes in as little as 3 days

Dysbiosis and Mental Health

- **Dysbiosis** alters the stress response, neurotransmitter systems, immune function, and the inflammatory response.
- Dysbiosis is associated with mental health and learning disorders including: ADHD, ASD, PTSD, anxiety, depression
- Major Depressive Disorder (MDD): SCFAs (acetate, butyrate, and propionate) were reported to be depleted in patients with MDD – butyrate in particular, had antidepressant affects by improving intestinal permeability and HPA reactivity.
- L. rhamnosus has been shown to suppress gamma amino butyric acid (GABA) receptor over expression in depressive disorders and improve symptoms of anxiety
- The gut microbiome also plays a role in the development of metabolic disorders (diabetes and obesity), cardiovascular diseases, and neurological diseases.

The Gut-Brain & Those Gut Feelings

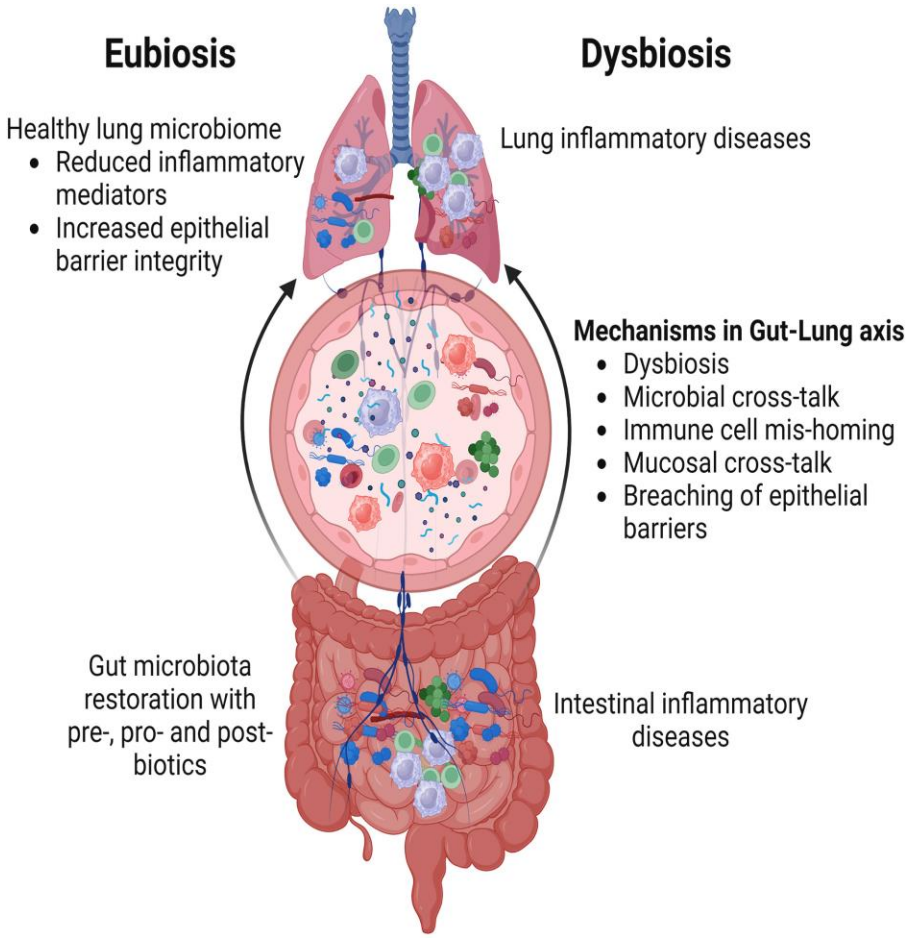


The gut-brain and its network of nerve cells, neurotransmitters influences our emotions, intuition and decision making. “trust your gut”, “gut feeling”

Common Symptoms of Dysbiosis in Kids & Teens

- Stool: less than once day, pain or discomfort
- Gas, bloating, diarrhea
- Stomachaches
- Fatigue
- Moods, depression or anxiety
- Concentration problems
- Skin disorders
- Frequent colds and flu, asthma

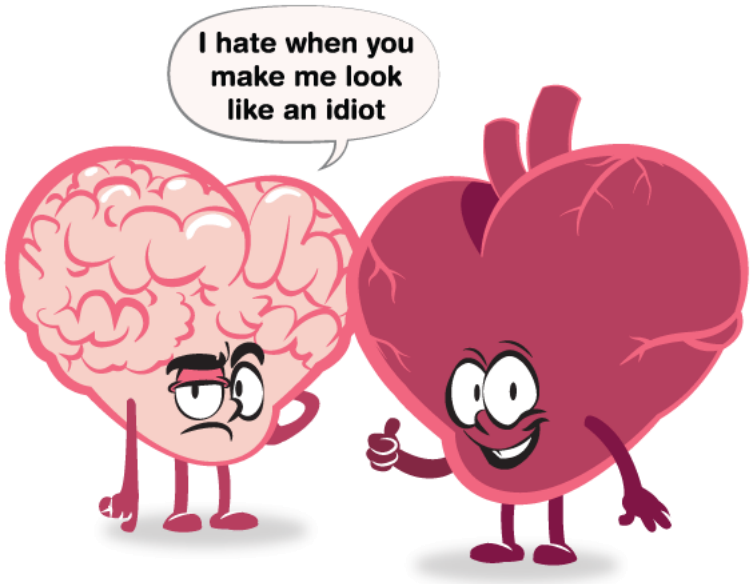
The Gut-Lung Axis



- Preliminary evidence shows an association with the development of asthma, and other respiratory conditions due to gut- lung dysbiosis.

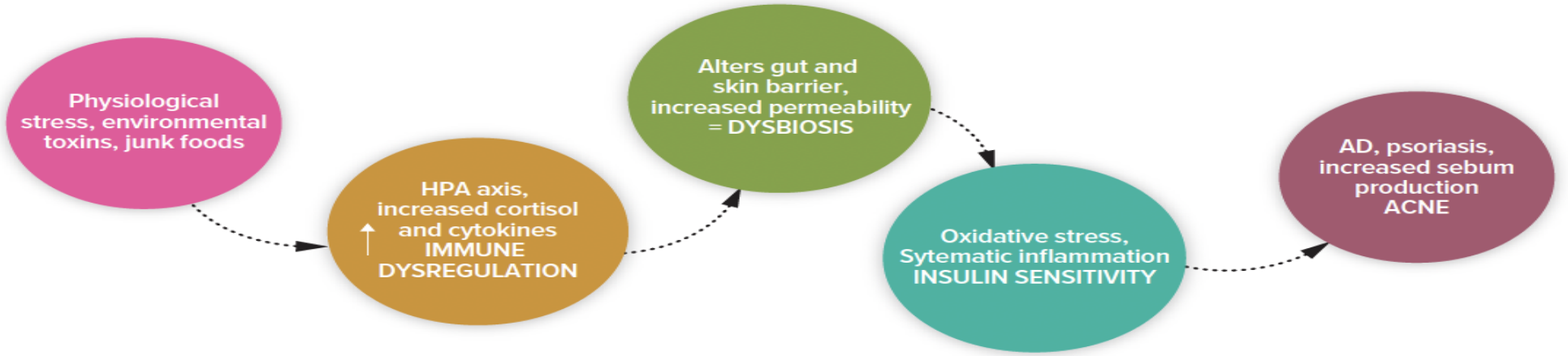
- Antibiotics given during infancy produce changes in the microbiome that may raise the risk for childhood asthma by 30%

The Gut-Heart Axis



- Gut-Heart Axis is a complex interplay of inflammatory markers, hormones, gut microbiota and environmental factors
- Dysbiosis lowers microbial diversity = ^ permeability = systemic inflammation - observed in atrial fibrillation, congestive heart failure, atherosclerosis, and hypertension.
- Uncontrolled hypertension damages the brain's structure and function even in younger children and teens
- 3% and 5% of children and adolescents have hypertension and 10% and 14% have elevated BP levels (“prehypertension”)

The Gut-Skin Axis

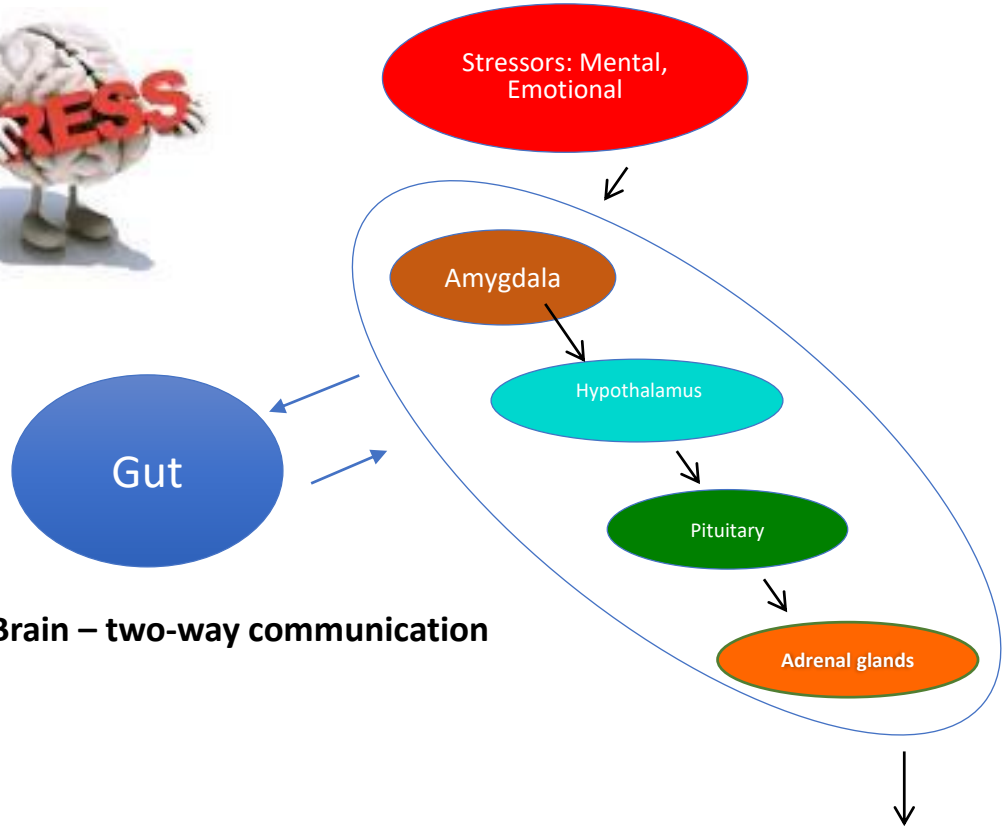


1. Psychological distress alone or in combination with environmental toxins and high-fat, low-fibre foods
2. Activation of the HPA axis, increase in cortisol and inflammatory cytokines, immune dysregulation
3. Alterations to the motility and composition of gut microbiota leads to increased permeability, and dysbiosis leads to (4)
4. Systemic inflammation, increased oxidative stress, and decreased insulin sensitivity, which causes (5)
5. AD, psoriasis, and an increase in sebum production and acne

Psychological Effects of Skin Disorders in Teens

- The effect of skin disorders on kids mental health - anxiety, depression and suicidal behaviours are common. Those with psoriasis experience the greatest psychological effects
- Prebiotics and probiotics can reduce markers of inflammation in the skin, and provide benefits in the treatment of acne, eczema, and psoriasis.
- Omega-3, vitamin D, also provide benefits.

Stress and the Gut-Brain Axis?



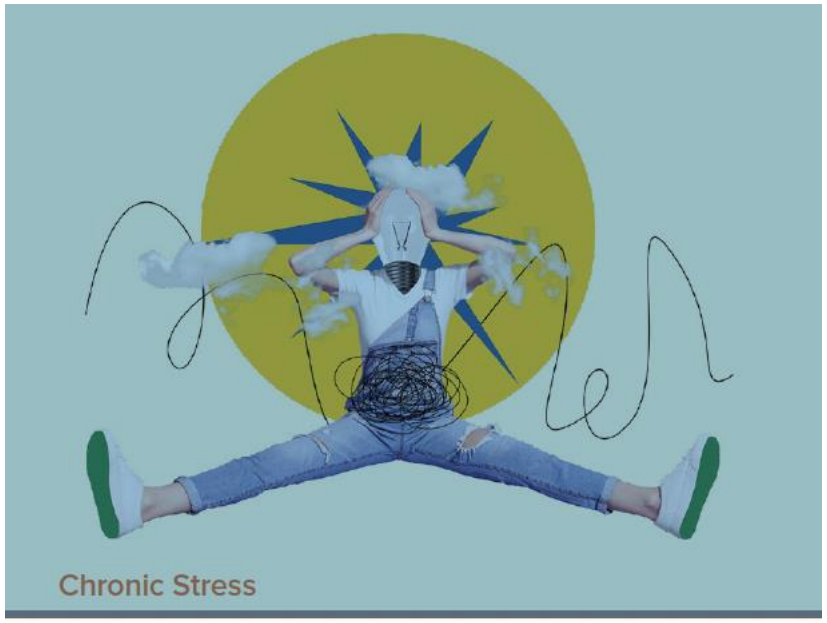
Gut-Brain – two-way communication

- Exposure to stress alters the gut microbiome = "leaky gut" allowing pathogens and toxins into bloodstream = systemic inflammation.
- Gut microbiota influence stress reactions by directly affecting the HPA activity and the release of stress hormones.
- When the gut is recolonized with healthy gut bacteria = normalization of stress hormones

Stress hormones: cortisol, epinephrine, norepinephrine

Even minute changes in stress hormones can have a significant effect on our mental, emotional and physical health

Gut-Brain Busters: Stress in Children and Teens



- 8 in 10 teenagers in UK feel they suffer with mental health challenges - **Stress and anxiety are the most common**
- Chronic stress increases risk for: depression, anxiety, ADHD, ASD, insomnia

Gut-Brain Busters - Ultra-processed Foods

- **UK toddlers 67% of their calories from UPF by age 7**
- UPFs disrupt the gut microbiome and increase gut permeability and inflammation
- Adolescents are more sensitive than any other age group to UPFs. Studies show the direct relationship between the intake of UPFs and mood disorders, behavioural issues and learning problems

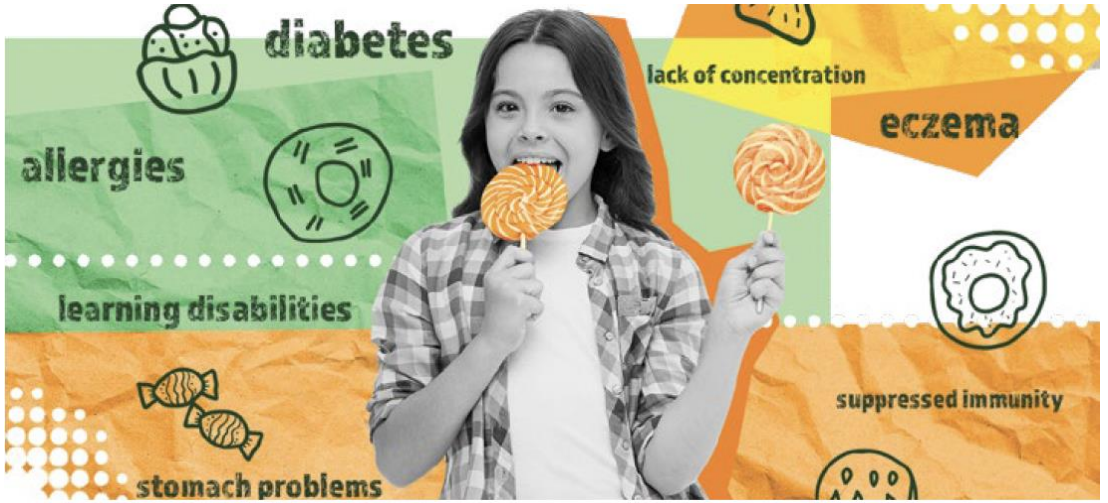
Ultra-Processed Food Addiction

- **Yale Food Addiction Scale —** a tool diagnosing ultra-processed food addiction— 14% of adults and 12% of children show clinically significant signs of addiction similar to alcohol and tobacco
- UPF, sugar etc increase dopamine, feel good hormone – reward centre
- Consumption of processed foods leads to nutrient deficiencies in people of all ages, but because the brain is still developing and is more vulnerable until our mid-20's, it puts kids more at risk
- Current evidence highlights the adverse effects of UPF, not only due to the lack of nutrients but also to the effect they have on gut health and chronic low-grade inflammation.

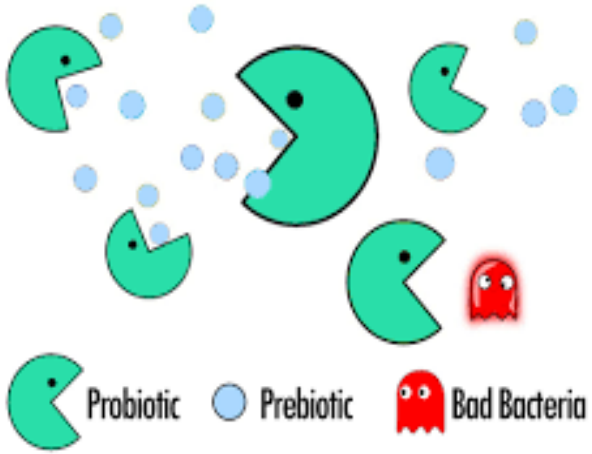
Sugar Blues & Moods

WHO recommends maximum of 5-10% of our daily calories from sugar –5% would be about 6 teaspoons or 26 g of sugar per day. One soft drink contains 10 teaspoons

- Sugars increase insulin levels = proinflammatory state; cause blood sugar to rise and fall rapidly = fatigue, mood swings, crying spells, irritability, anxiety, temper tantrums and angry outbursts. Some studies have linked sugar to depression, anxiety, learning problems
- Excess sugar and synthetic sweeteners significantly alter the microbiome
- **What about Fruit juice?** A single glass of apple juice contains same amount of sugar as 4-5 apples. 28g fructose. **The American Academy of Pediatrics "fruit juice has absolutely no role in a healthy diet"**



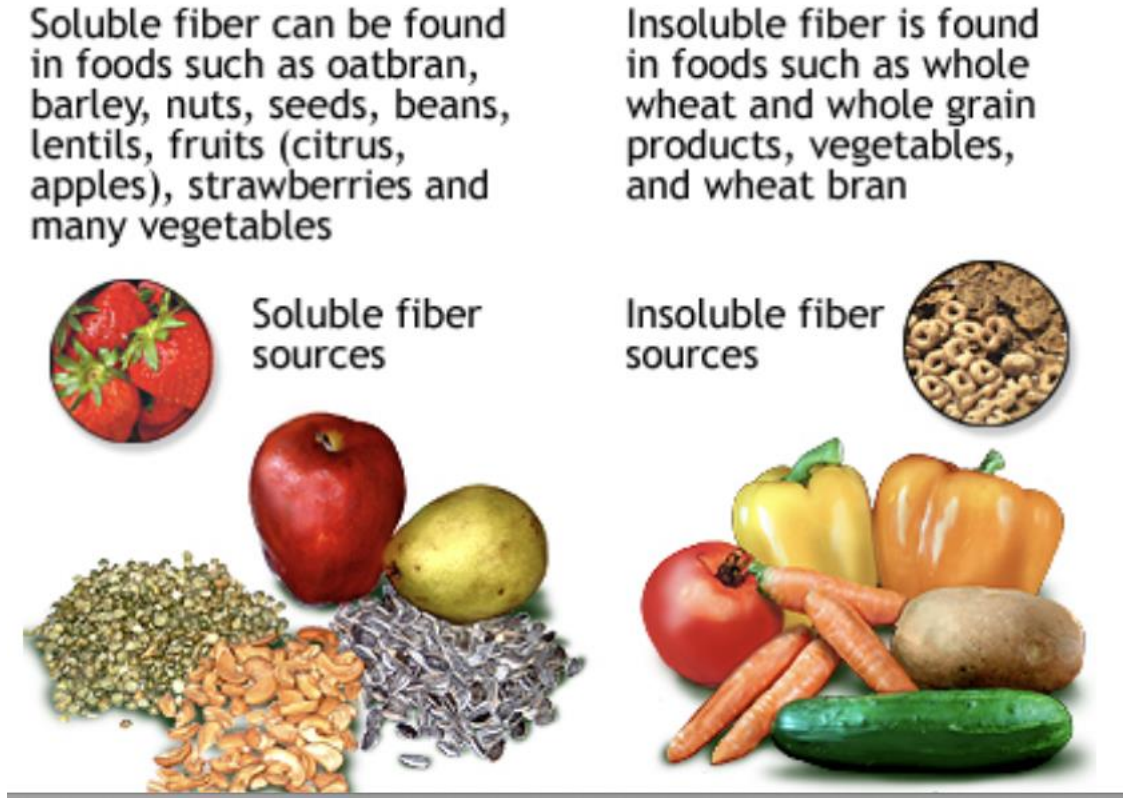
The “Biotics”



- **Prebiotics**: fermentable **soluble** fibres - source of food for gut bacteria.
- **Probiotics** add good bacteria to gut microbiome – Source: fermented foods or probiotic supplements. Probiotics enhance antioxidant status - can reduce oxidative damage and scavenge free radicals.
- **‘Psychobiotics’** are probiotics that provide mental health benefits by influencing the brain-gut axis.
- Bacterial strains improve mental health disorders: ie. anxiety and depression- L. acidophils, B. Bifidum: ASD - L. acidophilus, L. rhamnosus, B. longum: ADHD – B. Bifidum, L. rhamnosus
- **Postbiotics:** produced by probiotics as they metabolize prebiotics. ie. short-chain fatty acids (SCFAs)- butyric acid is the most studied postbiotic

Role of Fibre and the Gut-Brain Axis

- **Insoluble Fibre** provides bulk, prevents constipation
- **Fermentable Soluble Fibre** – also referred to as **prebiotics** = feed good bacteria; Lower fat absorption & cholesterol, stabilize blood sugar, reduce CVD risk, improves cognition
- 30% of dietary fibre from grain products is available for microbial metabolism - 75% to 90% of fibres from fruit and vegetables are metabolized by the gut microbiota

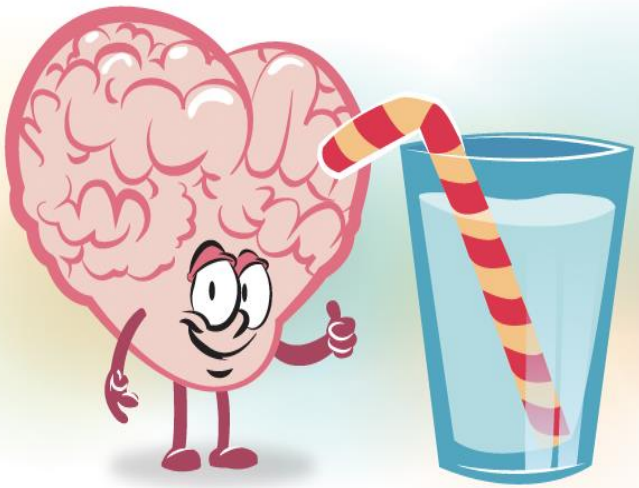


Are Kids and Adults Getting Enough Fibre?

- UK NHS fibre recommendations: 2–5 years 15g, 5–11 years 20g, 11–16 years 25g, 16–18 years 30g
- NHS, children aged 11 to 18 consume around 16 grams of fibre per day - significantly below the recommended amount.
- On average, adults in UK consume about 20g per day instead of recommended 30 g. Current recommendations might actually be too low to produce significant physiological effects and levels closer to 50 g per day are required

How to Increase Fibre in the Diet

- Eat wholefoods – wholegrains (brown rice over white), legumes (lentils, peas) beans, nuts, seeds, fresh fruit and vegetables for both kinds of fibre
- Fruits and vegetables with their skins on
- Unrefined grain and cereal products regularly
- Whole fruits and vegetables rather than juices
- Nuts, seeds, or dried fruits as snacks, or sprinkling them over cereals, salads, or yogurt.
- Eat fermentable soluble fibre rich foods
- Add chia or flax seed to smoothies



Please drink, I need water to help me think!

- Crucial for overall health
- The brain is approximately 73% water - it depends on proper hydration to function optimally.
- **NHS: 2.0-2.5 L day**

The Attitude of Gratitude

"Attitude of Gratitude" has been linked to better health, sounder sleep, less anxiety and depression, higher long-term satisfaction with life, and kinder behaviour toward others.

Gratitude positively influences the gut-brain axis, promoting mental and physical well-being

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