

# Nutrition & Modern Agriculture Negatively Affecting Functional Outcomes in Rehabilitation

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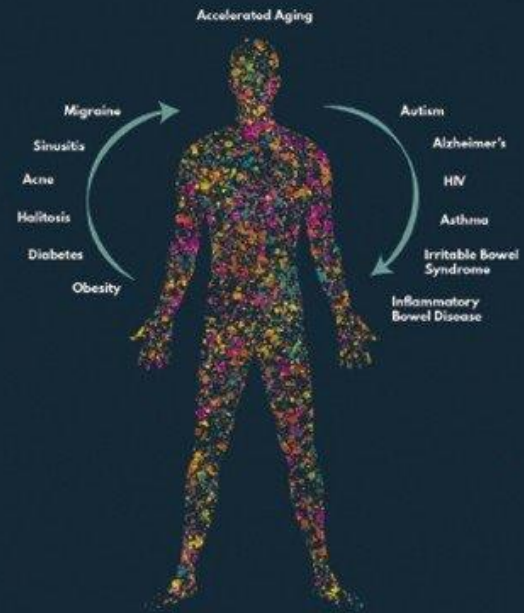
# Gut-Brain Connection, Myth or Reality?

Role of The Microbiome in Health and Disease

*Editor*

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 World Scientific

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Let's Ready

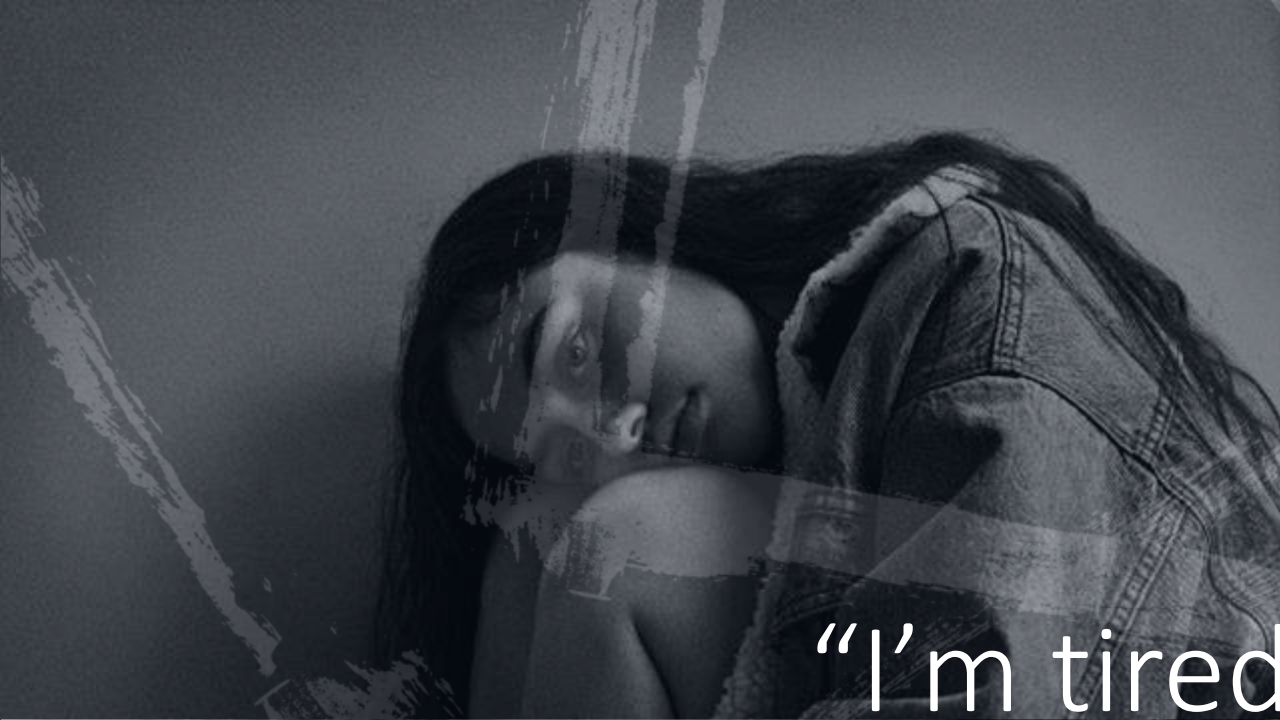


Will life take me  
under?



“My life is unstable!!!”





“I’m tired of it!!!”





# I Wish I was Special

But I'm a creep  
I'm a weirdo  
What the hell am I doin' here?  
I don't belong here

I don't care if it hurts  
I wanna have control  
I want a perfect body  
I want a perfect soul  
I want you to notice  
When I'm not around

I wish I was special







DEPRESSION









- There are more than 264 million people of all ages who suffer from depression worldwide, and it is one of the leading causes of disability
- Depression significantly contributes to the overall global burden of disease



11 Minutes





# World-Wide

Every 40 seconds, someone loses their life to suicide (WHO)





Nearly 80% of  
people who die  
by suicide are  
males

4 times HIGHER than females







# Stop the Cheering... We are NOT #1

- The Commonwealth Fund 2021 Report ranked the US 10<sup>th</sup> out of 11 high-income nations on healthcare access and equity, with concerns about affordability & disparities.
- The US ranks last in treatment of Chronic Stress
- The US ranks last in treatment of Depression




# Poor Healthcare System

- Access to care: US has highest rate of people with unmet mental health needs (costs, lack of insurance, shortage of mental health providers)
- Affordability of care: even with health insurance, it still can be very expensive
- Quality of care: poor in the US
- Outcomes: worst mental health-related outcomes, including highest suicide rate & 2<sup>nd</sup> highest drug-related death rate





The image features a dense field of 3D-rendered question marks. Most are dark grey and recede into the background, creating a sense of depth. In the center, one question mark is highlighted in a bright yellow color, standing out significantly from the others. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the three-dimensional nature of the symbols.

So why is this collapse happening???

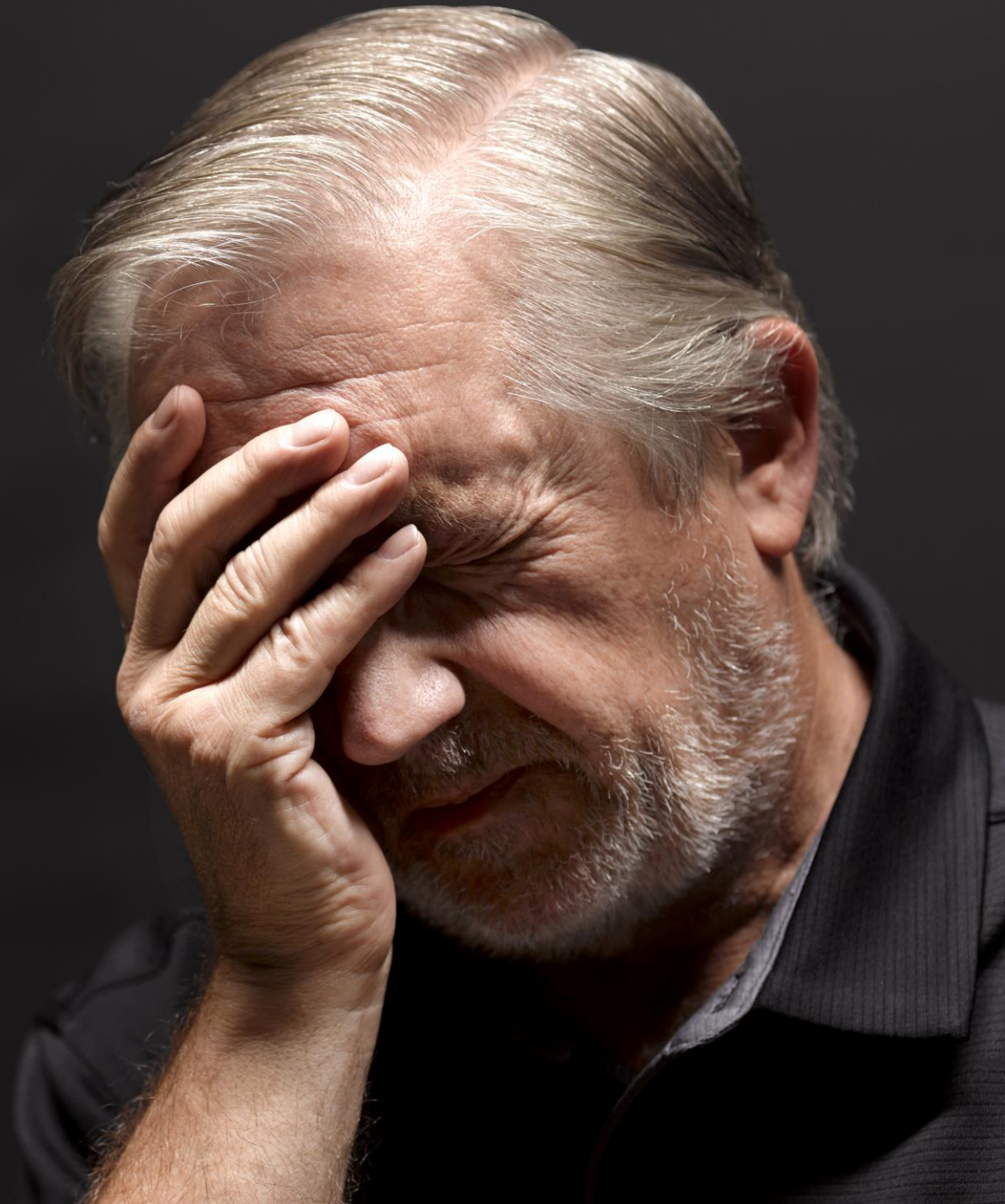


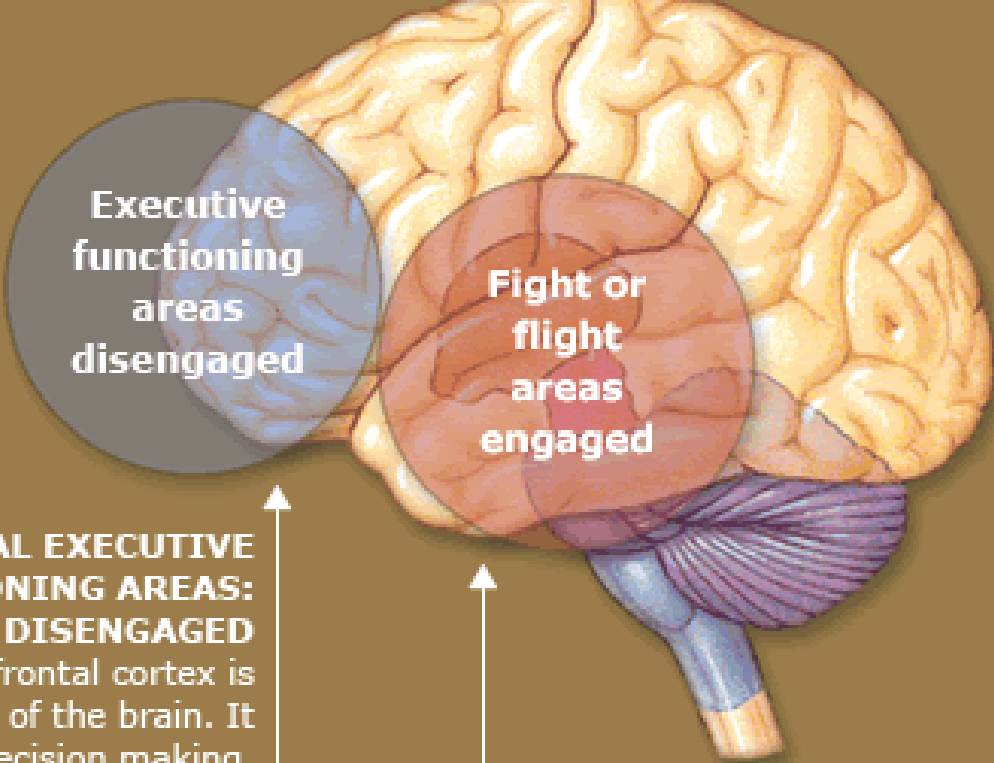






PEOPLE WHO ARE  
CHRONICALLY STRESSED,  
SPEND THEIR TIME IN  
THE SYMPATHETIC,  
FIGHT, FLIGHT, (OR  
FREEZE STATE)





Executive functioning areas disengaged

Fight or flight areas engaged

**FRONTAL EXECUTIVE FUNCTIONING AREAS: DISENGAGED**

The prefrontal cortex is the "CEO" of the brain. It regulates decision making, judgment, planning, moral reasoning, and sense of self. Stressful experiences (academic pressure, sleep deprivation, substance abuse, etc.) disengage the frontal lobes. Over time, this can lead to impulsive, short-sighted, even violent behavior; increased anxiety; depression; alcohol and drug abuse; learning disorders; and increased stress-related diseases.

**SUBCORTICAL FIGHT OR FLIGHT AREAS: ENGAGED**

The subcortical arousal system—thalamus, hippocampus, brainstem, and hypothalamus—mobilizes the body for action, increasing heart rate, respiratory rate, and muscle tone. The nature of this system is to bypass the frontal executive functioning and trigger the fight or flight mode.

## SYMPATHETIC NERVOUS SYSTEM

- Many people with anxiety spend their time in the Sympathetic, Fight or Flight Response.....
- **THEY ARE THEREFORE DISADVANTAGED...**

# HOW **STRESS** AFFECTS THE BODY

## **BRAIN**

Difficulty concentrating, anxiety, depression, irritability, mood, mind fog

## **CARDIOVASCULAR**

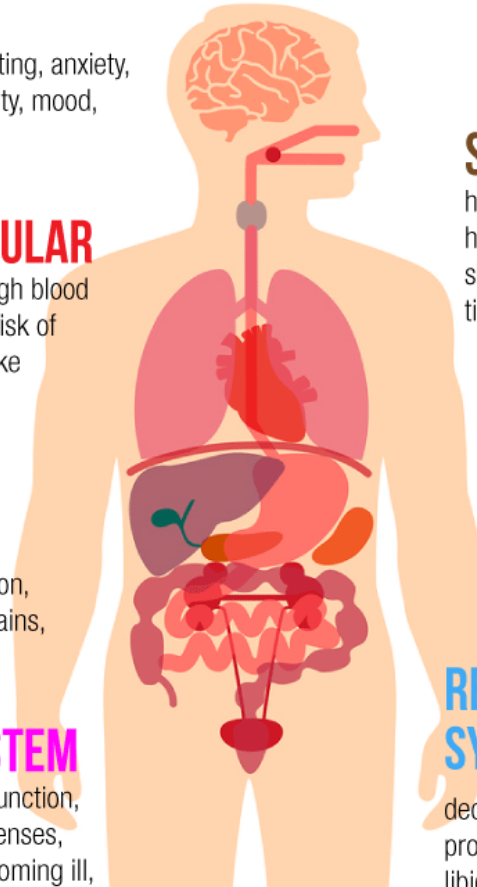
higher cholesterol, high blood pressure, increased risk of heart attack and stroke

## **JOINTS AND MUSCLES**

increased inflammation, tension, aches and pains, muscle tightness

## **IMMUNE SYSTEM**

decreased immune function, lowered immune defenses, increased risk of becoming ill, increase in recovery time



## **SKIN**

hair loss, dull/brittle hair, brittle nails, dry skin, acne, delayed tissue repair

## **GUT**

nutrient absorption, diarrhea, constipation, indigestion, bloating, pain and discomfort

## **REPRODUCTIVE SYSTEM**

decreased hormone production, decrease in libido, increase in PMS symptoms

# Sympathetic Nervous System Dims Executive Function

**Executive function skills help people complete tasks and interact with others. They include a range of skills, such as:**

- ▶ planning and organization
- ▶ concentrating and controlling mental focus
- ▶ analyzing and processing information
- ▶ controlling emotions and behavior
- ▶ remembering details
- ▶ managing time
- ▶ multitasking
- ▶ problem-solving



Physical &  
Structural

Nutritional  
& Chemical

Mental &  
Emotional

Spiritual

Environmental



LEICA

DC VARIO-ELMARIT 1:2.8/6-72 ASPH



# Microbiome-Gut- Immune-Brain Axis

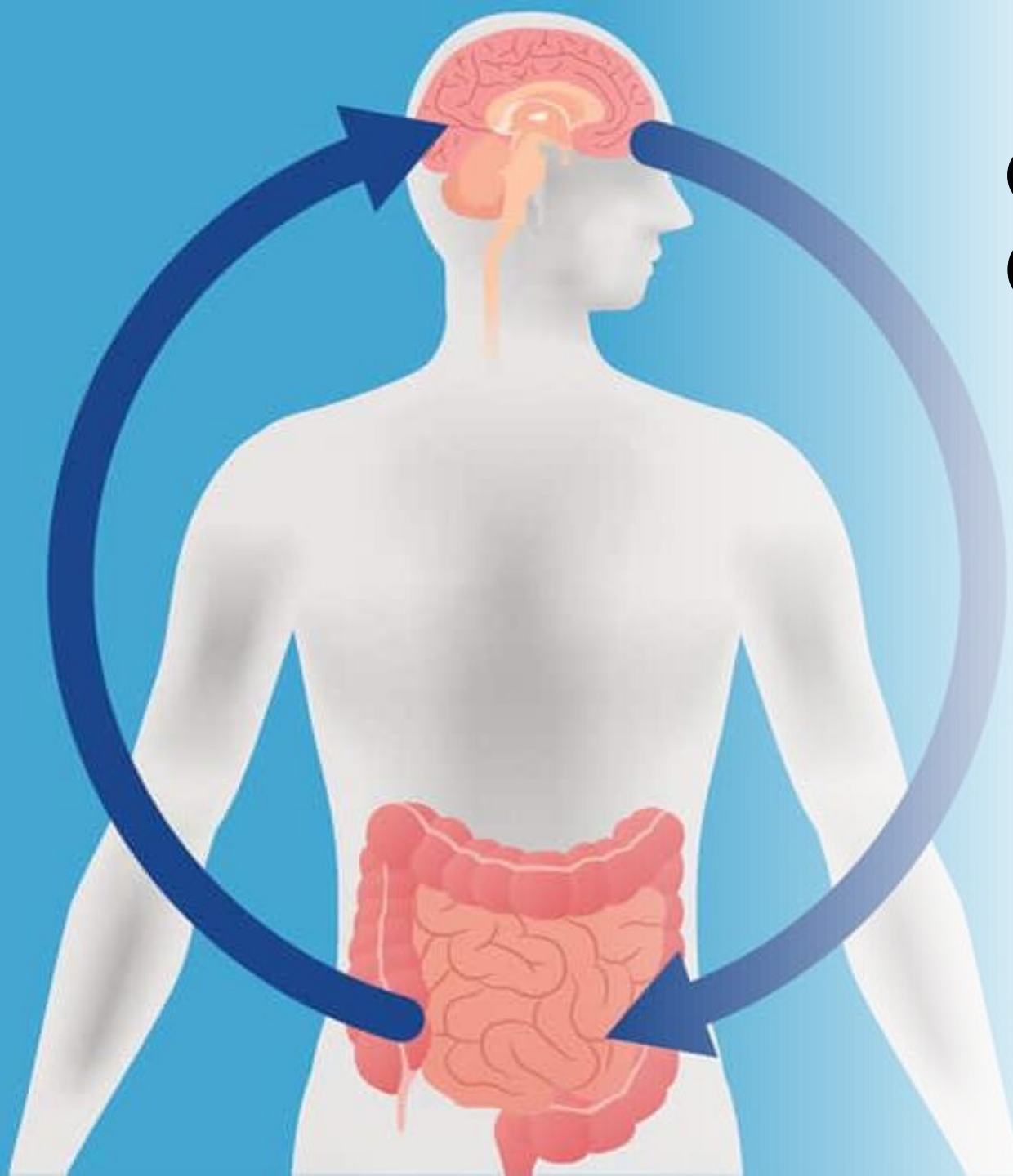
**The ENS has 500,000,000  
individual neurons**

**70% to 80% of our Immune cells  
are in the gut**

**80% to 95% of Serotonin  
produced in the gut**

**Serotonin is a precursor to  
Melatonin**





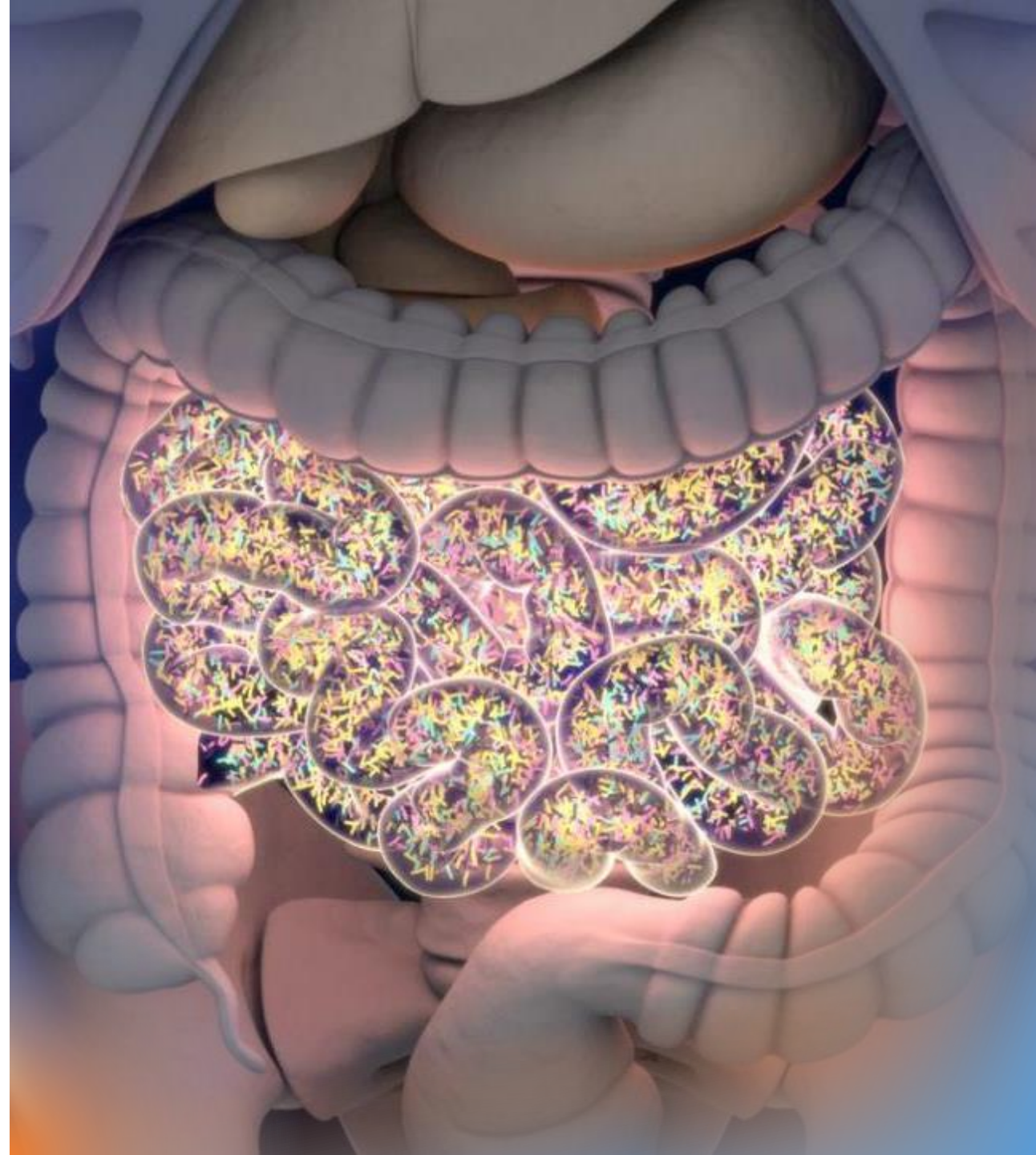
# Gut-Brain Connection

- Healthy gut microbiome influences neuroplasticity
- Healthy gut influences, BDNF, learning, and memory
- Leaky gut = leaky blood brain barrier
- Dysfunction of the gut microbiota can lead to decreased production of GABA & Serotonin resulting in behavioral, emotional, and cognitive dysfunction



# GUT HEALTH MATTERS

There are studies revealing that germ-free mice and humans given fecal transplants from people with depression, Parkinson's disease or schizophrenia take on behavioral features of their donors.









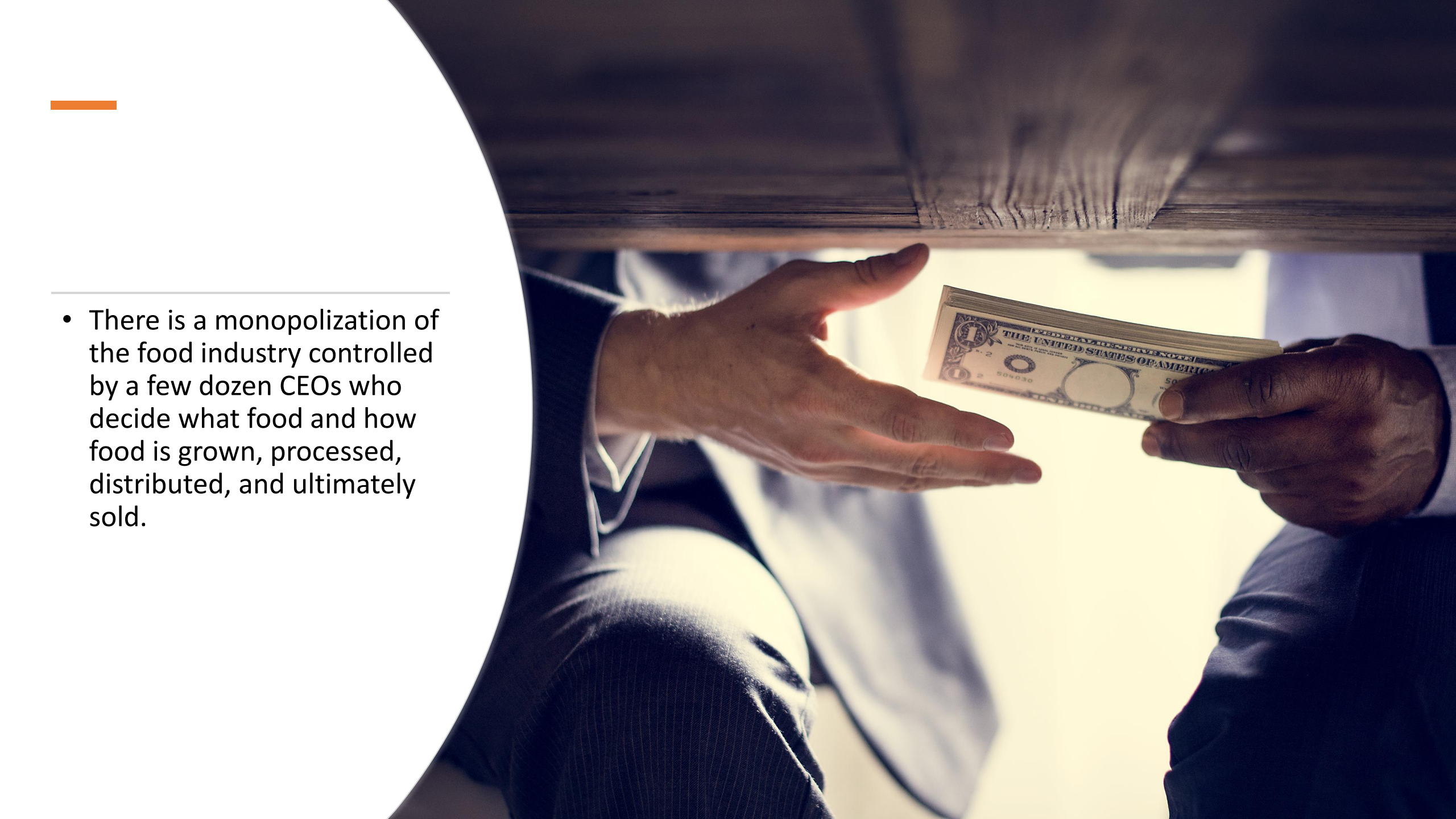


Our diet is a leading contributor in the cause of death, disability, and suffering in the world


- Lifestyle-caused diseases including heart disease & diabetes kill approximately 50 million people every year
- 1 in 2 Americans & 1 in 4 teenagers are pre-diabetic or have type 2 diabetes





- 
- A circular inset image showing a hand holding a stack of US dollar bills, with another hand reaching out towards them. The background is dark, and the lighting is dramatic, highlighting the texture of the wood and the details of the money.
- There is a monopolization of the food industry controlled by a few dozen CEOs who decide what food and how food is grown, processed, distributed, and ultimately sold.



- 
- A photograph of two young girls in a science classroom. They are both wearing safety goggles and smiling. The girl on the left is wearing a white lab coat and looking at a beaker of blue liquid. The girl on the right is wearing a dark blue polo shirt and looking at a flask with a large amount of blue foam overflowing from it. The background is a blurred classroom setting with other students and lab equipment.
- 50% of schools in the United States service brand-named fast foods in the cafeterias and up to 80% have contracts with soda companies.
  - Food companies target children with “smart” marketing schemes





# Poor Diet Impacts the “Bottom- Line”

- Most diseases increasing healthcare costs are linked to obesity & poor diet including: type 2 diabetes, stroke, cancer, Alzheimer’s disease, high blood pressure, abnormal cholesterol, and kidney failure.



Approx. 60% of  
calories in the USA  
come from ultra-  
processed foods

- Leads to obesity & disease
- Left with micronutrient deficiencies
- Malnutrition
- Mostly affect the young, poor, minorities, less educated



# Fourth National Report on Human Exposure to Environmental Chemicals

- CDC found traces of 212 chemicals in typical urinary output
- Over 200 different industrial chemicals in babies' umbilical cord
- Our bodies are fighters, but we are being overwhelmed, leading to: anxiety, depression, irritability, joint & muscle pain, chronic fatigue, weight gain, headaches, allergies, GI issues



# Glutamate Excitotoxicity

- Often caused by consumption of processed foods including aspartic acid in aspartame diet sweeteners, glutamate flavor enhancers such as glutamic acid & monosodium glutamate (MSG).
- All stimulate glutamate activity
- Being in an excitotoxicity state can drive inflammation in cells and will eventually lead to cell death







## Coping with Excessive Glutamate

- Body produces opioid compounds to try to counteract the toxicity
- Body will use the master antioxidant, glutathione, which over time becomes depleted, leading to more inflammation and cell damage



# Mitochondria

Mitochondria are tiny structures located within nearly all cells of the body. They are the parts of the cell that are primarily responsible for creating energy. They do this by generating adenosine triphosphate (ATP), which is the essential “fuel” that drives all of the body’s functions. For this reason, mitochondria are often described as the “powerhouse” of the cell.

A single cell can have up to several thousands of mitochondria. Cells of the brain and muscle are among those that require a lot of energy, so they have a particularly high density of mitochondria to support their energy needs. When mitochondria aren’t working well, these are often the parts of the body to show signs of poor function.

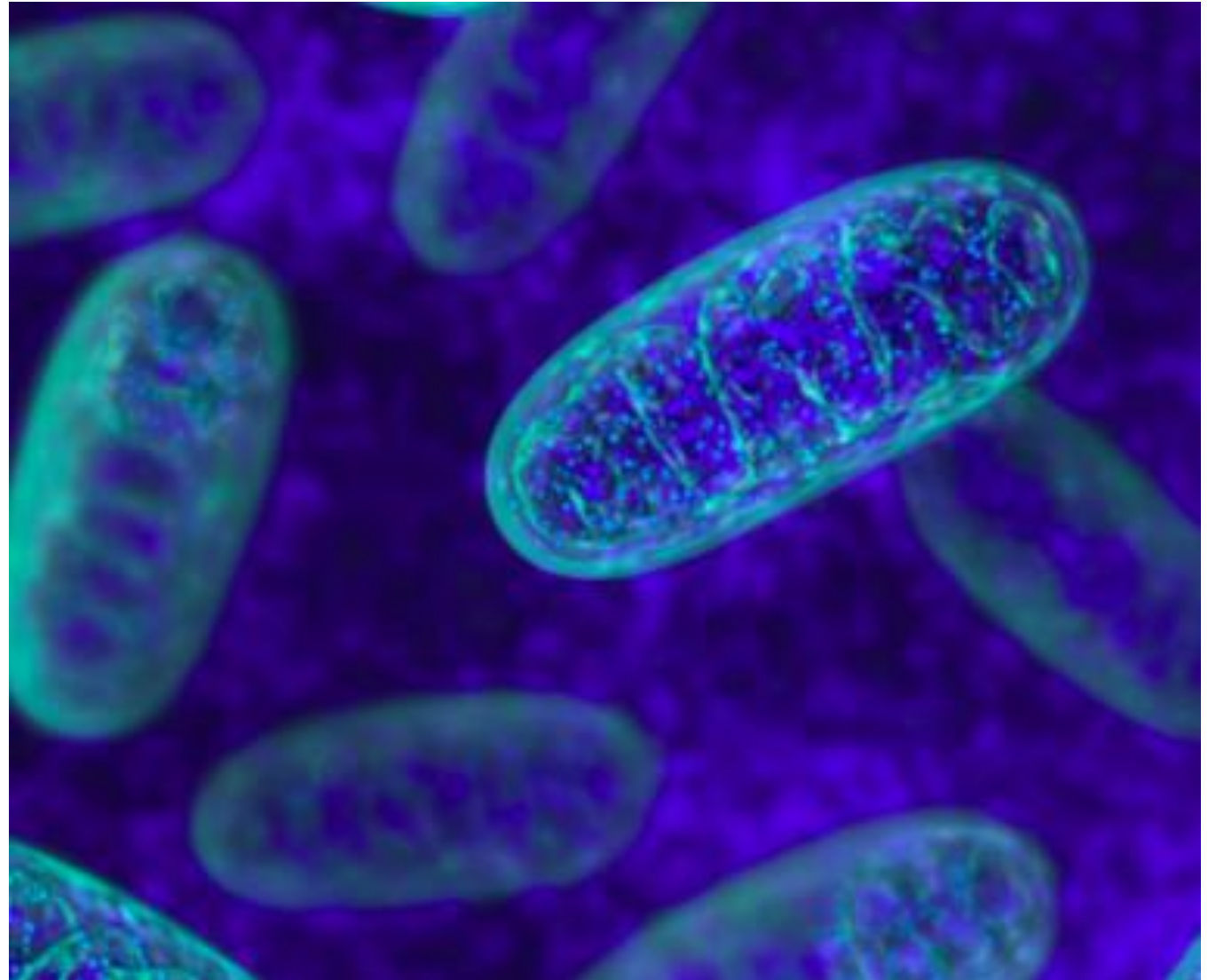
► Researcher Douglas Wallace, director of the Center for Mitochondrial and Epigenomic Medicine at the Children’s Hospital of Philadelphia stated, “Our brains, which are 2 percent of our body weight, use 20 percent of all the mitochondrial energy in our body. So, a very subtle change in mitochondrial energy is going to radically affect the brain,” he says.



# Mitochondria Dysfunction

**When mitochondria are not functioning well, a wide variety of symptoms can emerge, including:**

- ▶ Developmental delay or regression
- ▶ Language impairment
- ▶ Social impairment
- ▶ Intellectual disability
- ▶ Neuropsychiatric symptoms (ADHD, anxiety, OCD, depression)
- ▶ Seizures
- ▶ Headaches
- ▶ Hearing impairment
- ▶ Weakness
- ▶ Small stature
- ▶ Fatigue
- ▶ Gastrointestinal symptoms
- ▶ Endocrine disturbance
- ▶ and many others







## Mechanisms at Play that Negatively Impact the Mitochondria

- **Nutrient Deficiencies:** Ultra-processed foods often lack essential vitamins and minerals needed for optimal mitochondrial function. Deficiencies in B vitamins, magnesium, and CoQ10 can hinder mitochondrial energy production.
- **Sugar Overload:** Excessive intake of refined carbohydrates and added sugars can lead to chronically high blood sugar levels. This, in turn, can increase oxidative stress, which damages mitochondria and reduces their efficiency in producing energy.
- **Inflammation:** Processed ingredients and unhealthy fats found in these foods can contribute to chronic low-grade inflammation. This inflammation can damage mitochondrial membranes and hinder their function.
- **Advanced Glycation End Products (AGEs):** Ultra-processed foods often contain high levels of AGEs, formed during high-heat processing. AGEs can accumulate in cells and damage mitochondria, further impairing their function.



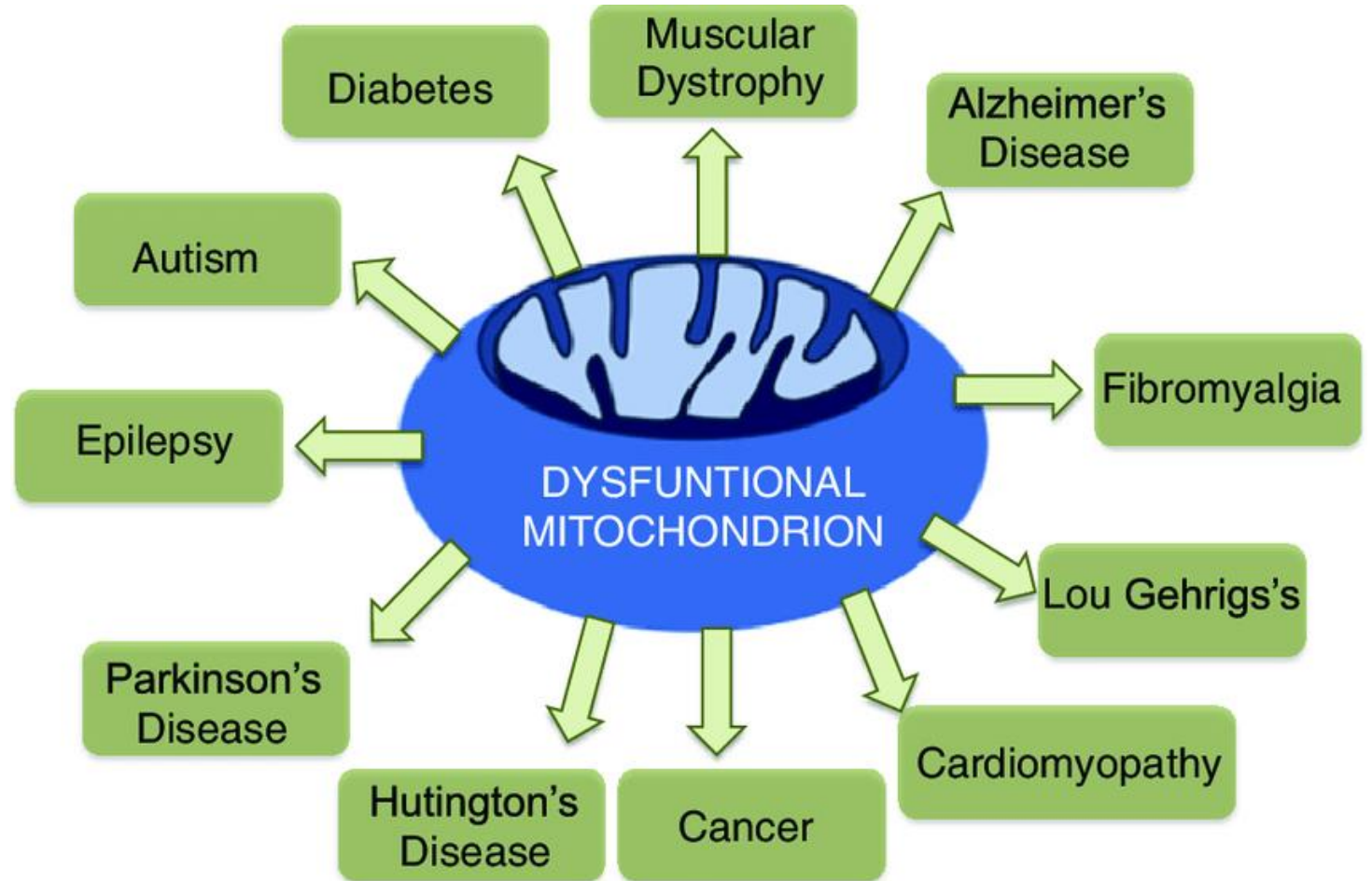
# Overall Impact:

- **Reduced energy production:** Mitochondria are responsible for cellular energy production. When they malfunction, cells struggle to function properly.
- **Increased cellular damage:** Mitochondrial dysfunction can lead to the buildup of harmful free radicals, further damaging cells.
- **Higher risk of chronic diseases:** Mitochondrial dysfunction is implicated in various chronic conditions like diabetes, heart disease, and neurodegenerative diseases.



## KEEP OR CAUSE MITOCHONDRIA TO REACH OPTIMAL LEVELS

- Fasting
- Exercise (creates biogenesis = makes new mitochondria)
- Reduce Caloric Intake





# Poor Diet Increases Cancer Risk

- Up to 90-95% of cancers are linked to exposures from the environment including our lifestyle.
- Cancer deaths: estimated 30% linked to diet





# JAMA Internal Medicine Study

For every 10% increase in the intake of ultra-processed food, risk of death increased by 14%



# Antibiotics in Animal Feed

- Most antibiotics are not prescribed by physicians
- They are given to livestock in factory farms





# Agriculture is Failing Us

- Conventional meat production in confined animal feeding operations (CAFO) use: growth hormones, antibiotics, & mismanaged feces.
- All contribute to chemical toxicity in water systems



# Cheap Food is really NOT CHEAP

- The World Economic Forum estimated: by 2030 the global health care costs for chronic disease will exceed \$47 trillion
- Other analysis from McKinsey stated the global cost of obesity is \$2 trillion a year, which is basically the same impact as armed violence, war, terrorism, & smoking.
- The McKinsey report also stated: obesity accounts for \$2 million in lost productivity.







# Processed Fructose Disrupts Brain's Ability to Function

- These toxins interfere with neurons' ability to communicate with each other, rewire connections, record memories, and produce enough energy to fuel basic functions



## Processed Foods; A Numbers Game You Don't Want To Be a Player In...

- ▶ Experiments with cultured neural stem cells have revealed that very high **PPA (propionic acid)** levels reduce the number of cells that go on to differentiate into neurons and increase the number of cells that go on to become glial cells.
- ▶ PPA is a naturally occurring short-chain saturated fatty acid with antifungal properties. Also, **many manufacturers use it as a food preservative and flavoring agent for packaged and processed products.**
- ▶ **PPAs increases glial cells.** Although glial cells can support neuronal function, **an excessive buildup of glial cells (gliosis) can lead to inflammation in the brain and disrupt the connectivity between neurons.**
- ▶ **Too much PPA also damaged the molecular pathways that normally enable neurons to send information to the rest of the body.**



# Poor Metabolic Health

- An estimated 93% of U.S. adults struggle with poor metabolic health: excessive abdominal fat, elevated triglycerides, low HDL cholesterol, elevated fasting blood sugar, or high BP.
- It is associated with insulin resistance, prediabetes, type 2 diabetes, heart attack, & stroke.



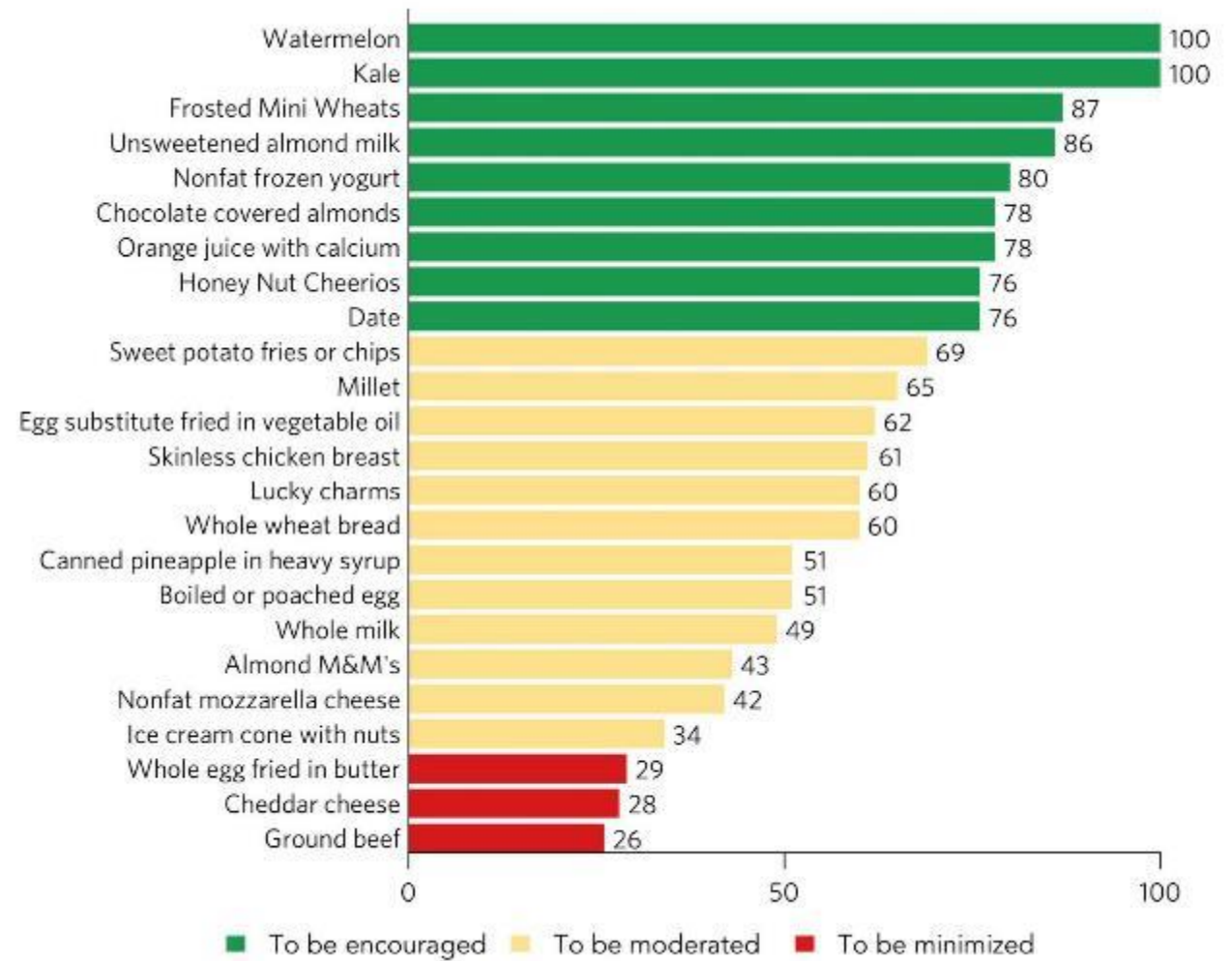




***Let Food Be Thy  
Medicine***  
*Hippocrates*



SAD...indeed







US consumes  
more GMO  
crops than the  
rest of the world

- US allows many chemicals in our foods which are banned in other developed countries
- Including: additives, flavor enhancers, stabilizers, etc.
- All part of the SAD Diet





# Food Chemists: the New Chefs

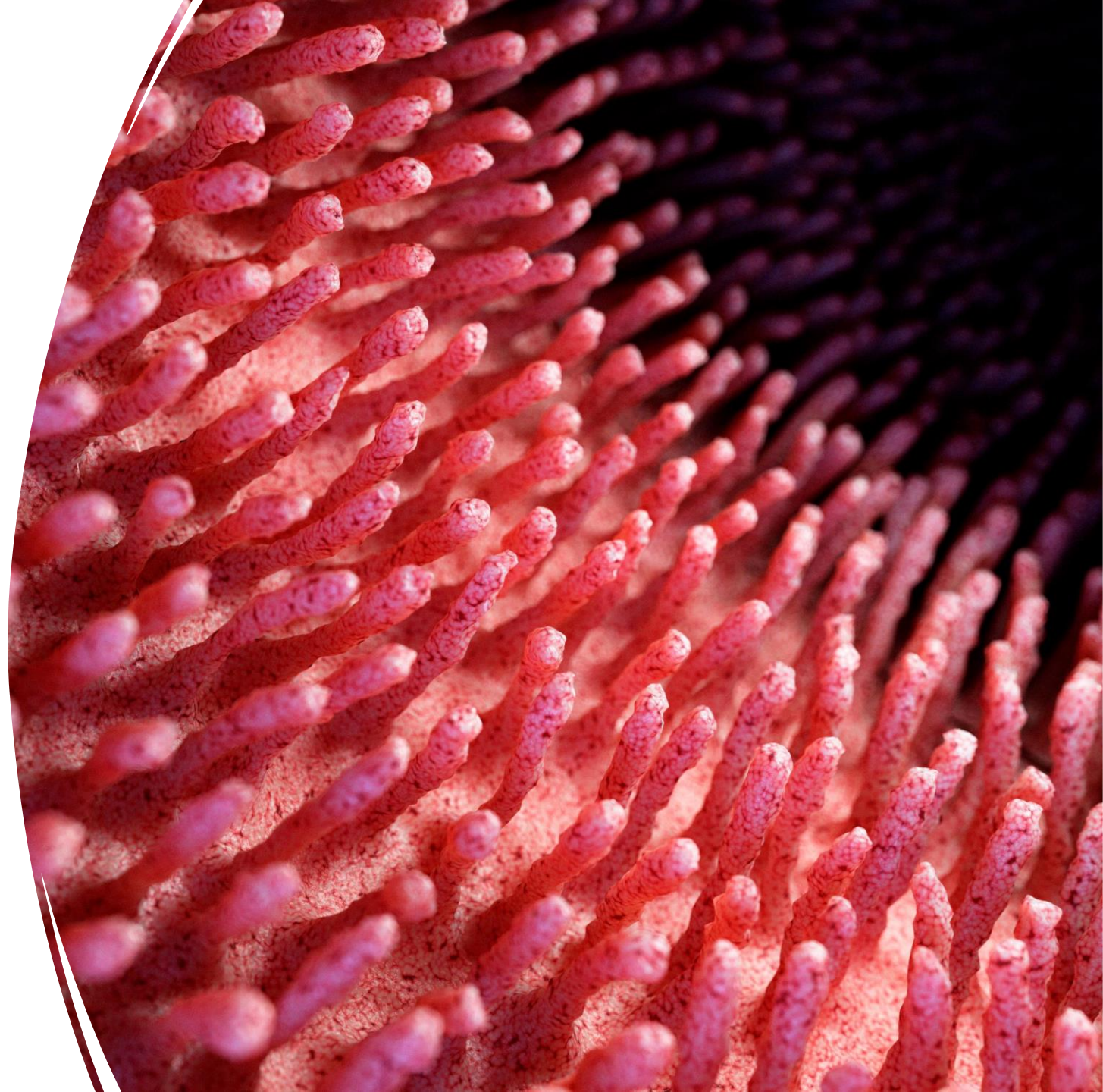
- Leptin is a hormone that decreases your appetite
- Ghrelin is a hormone that increases appetite (& plays a role in body weight)
- Satiety signals interact directly with our brain, crossing the BBB. They are integrated with environmental information, including eating culture, social situation, and stress levels.
- CCK (Cholecystokinin) is more impactful in being a satiety signal when the stomach is distended
- An ultra processed diet is more calorie-dense, consumed faster, therefore, throwing off our satiety signaling.



# Poor Diet Causes Leaky Gut

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- Bacteria & infections in our bodies play a major role in our gut integrity
- Specific T helper cells (Th17, Th22) help maintain the epithelial lining of the gut by producing interleukin-22 (IL-22) [optimized in healthy, balanced gut]
- A distressed immune system will reduce IL-22 production, driving leaky gut







# Glyphosate Causes Leaky Gut

**EVEN IF YOU EAT MOSTLY FRUITS AND VEGETABLES, YOU ARE STILL PRONE TO DEVELOPING GUT DYSBIOSIS. WHY? PESTICIDES AND ROUND-UP READY CORN (GLYPHOSATE). 32 COUNTRIES HAVE ALREADY BANNED GLYPHOSATE; BUT NOT THE UNITED STATES**





# Glyphosate Sprayed on more than 70 different crops

- Increasing cancer risk
- Causes epigenetic changes that lead to disease
- Negatively effects microbiome
- Causes negative behavior changes in animal models
- 2019 study: can have transgenerational effects

# GMO seeds sold to farmers by Big Ag seed monopolies

- Four big companies give less choices to farmers, which make them dependent on their seeds and their chemicals.
- Yes, they own both the seeds and the pesticides/herbicides







# Health & Academic Achievement (CDC)

- Clear link between poor nutrition & academic performance.
- Poor food = lower test scores, lower grades, poor cognitive function, less alertness, attention, memory, processing of visual information, problem solving, and increased absenteeism.

# Azucar.....

- Children average 34 teaspoons of sugar every day
- Affects cognition and behavior







- 
- **"Sometimes you crave junk food, but remember, you're not a garbage truck."**



Food is  
Information





## Studies Exploring the Link Between Diet and Behavior in Juvenile Detention Centers

- The New Hampshire Study (2015):
- Researchers provided a group of incarcerated youth with a modified diet rich in fruits, vegetables, whole grains, and lean protein for three weeks.
- Compared to a control group receiving the standard institutional diet, the intervention group showed:
  - Decreased aggression and hyperactivity.
  - Improved impulse control.
  - Enhanced cognitive function.
  - Reduced disciplinary infractions.



# The Texas Study (2019):

- This study explored the feasibility and potential benefits of implementing a whole-foods, plant-based diet in a juvenile detention center.
- Preliminary results suggested that the intervention led to:
  - Improved mood and emotional regulation.
  - Reduced feelings of anger and frustration.
  - Increased feelings of well-being.



# Food & Mental Health

- The Lancet Psychiatry reported how nutritional medicine is key to mental health.
- Diet quality all drive mental illness or wellness



## Research suggests a growing link between ultra-processed foods and an increased risk of anxiety

- Several studies have observed a correlation between high consumption of ultra-processed foods and higher anxiety levels in adults.
- Examples of ultra-processed foods include sugary drinks, packaged snacks, instant noodles, and pre-made meats.

\*Individual variations exist. People have different sensitivities to dietary changes, and anxiety can have various causes.





## While the exact reasons aren't fully understood, some potential explanations include:

- **Nutrient Deficiencies:** Ultra-processed foods often lack essential vitamins and minerals like B vitamins, magnesium, and zinc, which play a role in neurotransmitter function and can be depleted during anxious states.
- **Blood Sugar Spikes:** Refined carbohydrates and added sugars in processed foods can cause rapid blood sugar swings, which can contribute to feelings of anxiety and mood swings.
- **Inflammation:** Processed ingredients and unhealthy fats might promote chronic low-grade inflammation, which has been linked to anxiety disorders. (**Gut Microbiome:** Ultra-processed foods might negatively affect the gut microbiome, the gut bacteria community that communicates with the brain through the gut-brain axis. Disruption in this communication could be a factor in anxiety. ([invalid URL removed]))





We Must be Sensitive to...

- Time
- Skill
- Expense
- Effort

Required to prepare meals from minimally processed foods





## How About the Packaging of Foods & Beverages?

- Rates of obesity, type 2 diabetes, & other metabolic disorders have significantly increased in recent decades, coinciding with the rise in plastic use.

# Potential Culprits

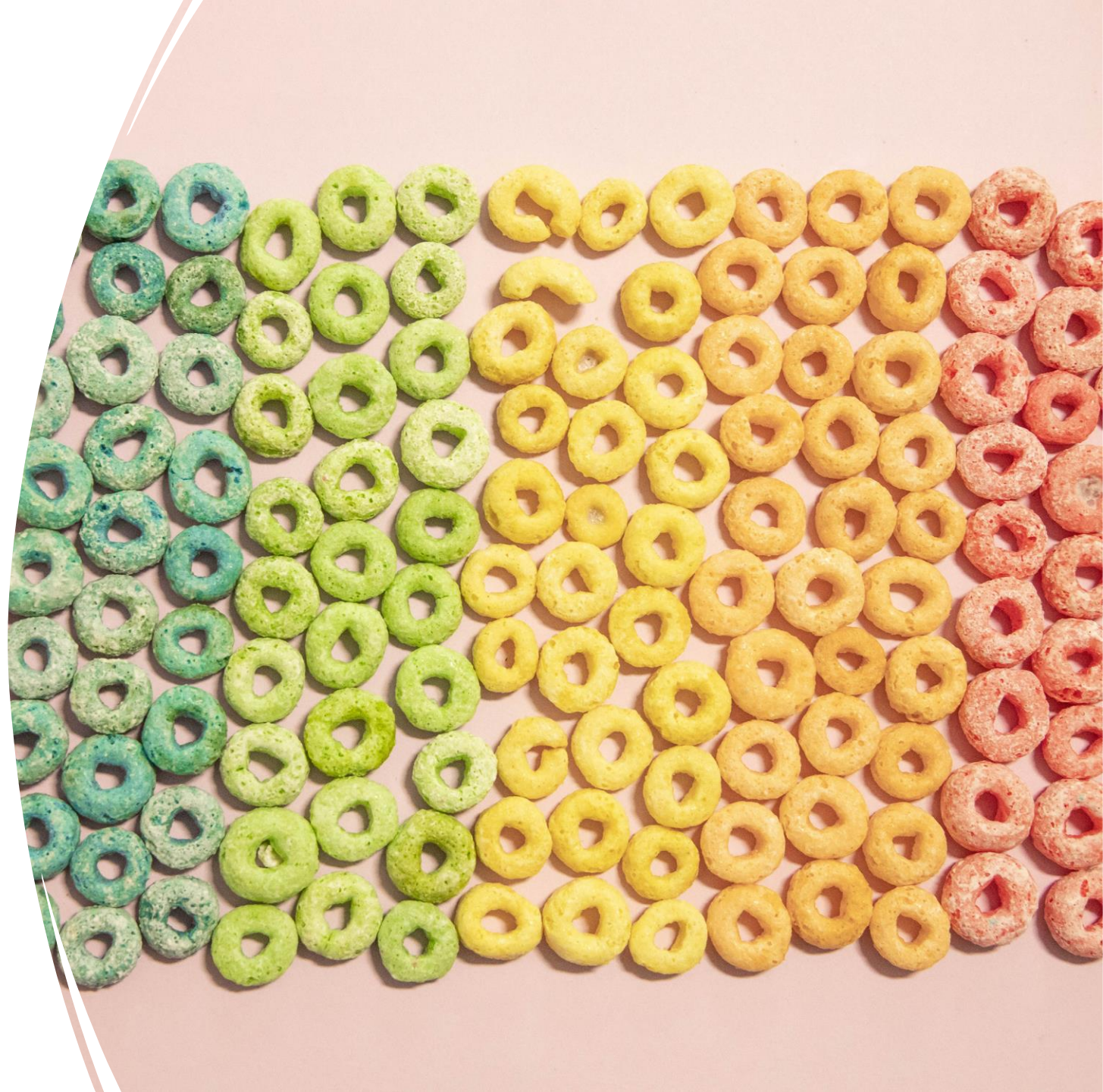
- Endocrine Disrupting Chemicals (EDCs): many plastics contain this, which can mimic hormones & interfere with their normal functions, potentially impacting metabolism & insulin sensitivity.
- Microplastics: can leach harmful chemicals into food & water, potentially disrupting gut health & inflammation
- Bisphenol A (BPA): linked to hormonal imbalances & metabolic issues





# Health Damaging PLASTIC CHEMICALS found in Popular Products

- Cheerios  
(10,9980 ng phthalates)
- Banquet Chicken Pot Pie  
(12,494 ng phthalates)
- Campbell's Chunky Classic  
Chicken Noodle Soup  
(6,768 ng phthalates)
- Jell-O Chocolate Pudding Snacks  
(1,756 ng phthalates)





# Health-Damaging PLASTIC CHEMICALS found in Drinks

- Brisk Iced Tea Lemon (can) (7,467 ng phthalates)
- Coca-Cola Original (bottle) (6,167 ng phthalates)
- Pepsi Cola (can) (2,938 ng phthalates)
- Poland Spring 100% Spring Water (4,217 ng phythalates)







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## Food and Beverages

- **Prioritize fresh, whole foods:** Opt for fruits, vegetables, whole grains, and lean protein sources over processed foods, which often contain phthalates used in packaging and processing.
- **Limit packaged foods:** Choose fresh or frozen alternatives whenever possible. If buying canned goods, look for BPA-free options.
- **Minimize fast food:** Fast food outlets often rely heavily on processed ingredients and plastics, potentially increasing phthalate exposure.
- **Store food in glass or stainless-steel containers:** Avoid using plastic wrap or containers, especially for hot or greasy foods, as these can leach phthalates into your food.
- **Wash fruits and vegetables thoroughly:** Remove any potential phthalate residues from the surface of produce.





# We Must Protect Our 5 Defense Systems

- Angiogenesis
- Regeneration
- Microbiome
- DNA Protection
- Immunity



# Let's Make the Change Today

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- Regular exercise, good quality sleep, stress management, strong social bonds, and our diets will help us live to our fullest potential!





“People are fed by the food industry, which pays no attention to health, and are healed by the health industry, which pays no attention to food.”

-Wendell Berry



**"Skip the  
grease, embrace  
the green, a  
healthy body is  
a beautiful  
scene."**













Life I wonder, will it take me under?



NO!!!!!!!





A flicker, a spark, a flame barely fanned,  
Life's fragile like sand slipping through your  
hand.  
Nourish the fire, with greens, seeds, and  
fruit,  
For health is the fuel that grants life its  
pursuit.  
With empty calories, the flame burns so  
low,  
Missing the power to dance, watch, and  
grow.  
Choose wisely, my friend, let each vibrant  
bite,  
Fill your body with sunshine and make your  
life shine bright.







Can You  
Do it??????







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