



# Butterflies in your stomach

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The complicated gut-emotion relationship

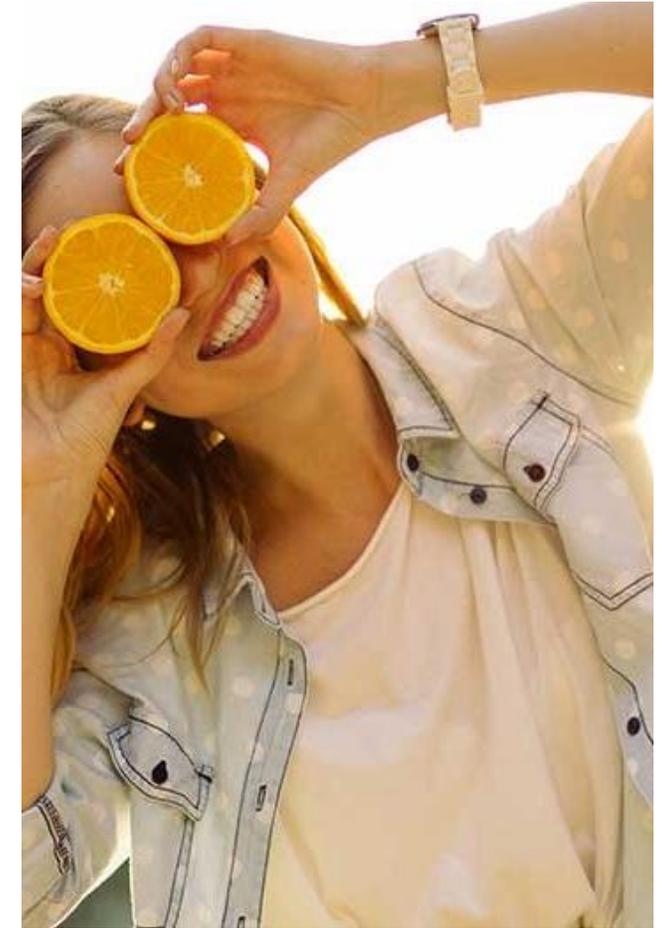
# Agenda

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Identify various correlates of gut health and mental health

Case Examples and Research Studies for Consideration

Consider Practical applications for improving mental health via improvements in the gut brain axis



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The Purkinje Center  
FIRST IN EATING DISORDERS

# You know the saying....

Trust your gut  
Butterflies in my stomach  
Gut wrenching  
Stomach churning  
Go with your gut  
Pit in my stomach  
Can't stomach it  
Hate your guts  
Stomach punch  
Gut reaction  
Stomach tied in knots  
A gut feeling





## Mental Health conditions that may be influenced by diet

Depressive Disorders

Anxiety Disorders

Eating Disorders

ADHD

Alzheimer's Disease

Autism

Schizophrenia

Sleep Disorders



# From Hippocrates

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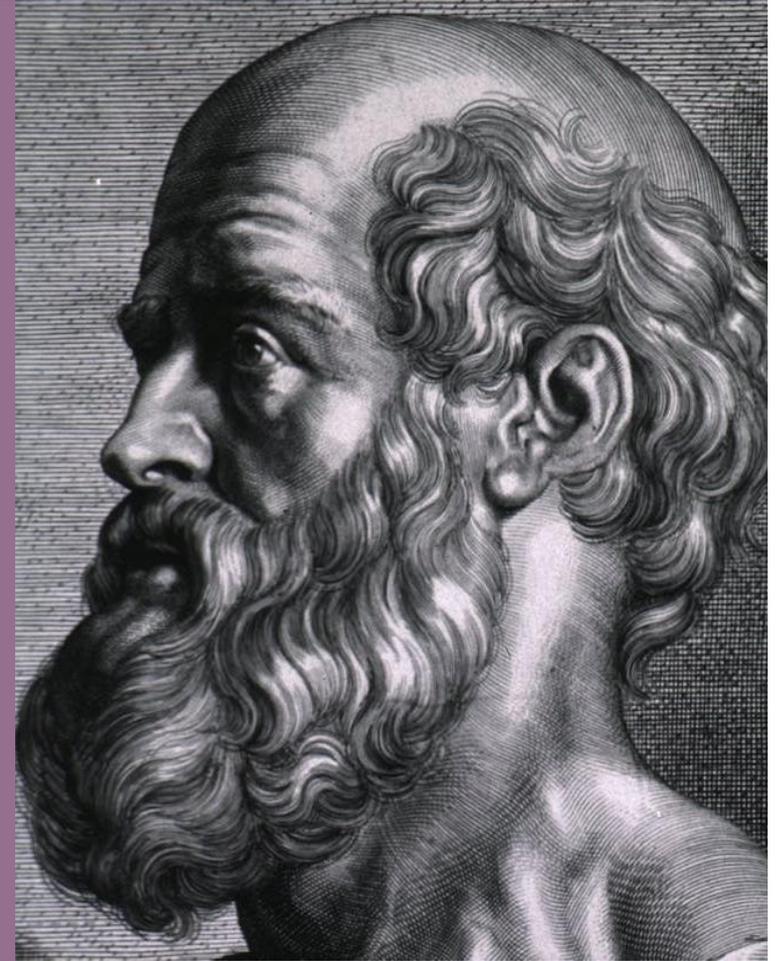
Our food should be our medicine. Our medicine should be our food. All disease starts in the gut.

The physician treats, but nature heals. Just as food causes chronic disease, it can be the most powerful cure.

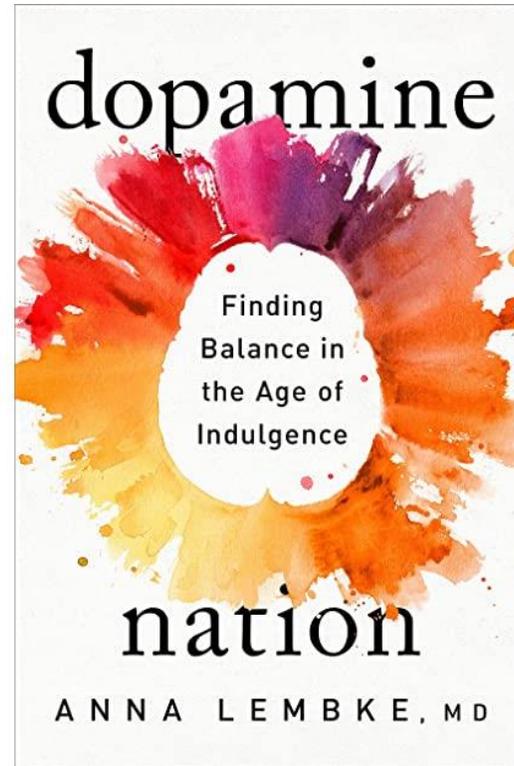
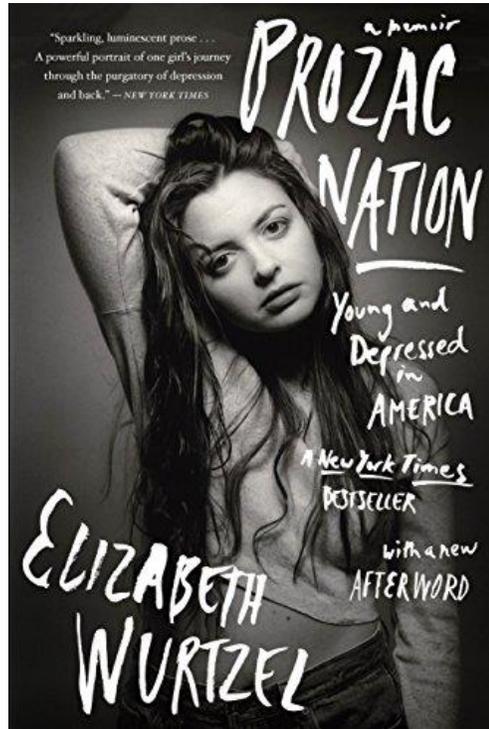
Leave your drugs in the chemist's pot if you can heal the patient with food.

Each of the substances of a man's diet acts upon his body and changes it in some way and upon these changes his whole life depends.

Wine is an appropriate article for mankind, both for the healthy body and for the ailing man.



# To Pill Nation



- **Participants:**

- 36 Conscientious Objectors, Average weight, average health, above average IQ, Demonstrated ability to get along well with other under difficult circumstances

- **Experiment:**

- 3mos baseline, 6mos 1500 cal/day, exercise, educational endeavors, and purposeful work

- **Outcomes:**

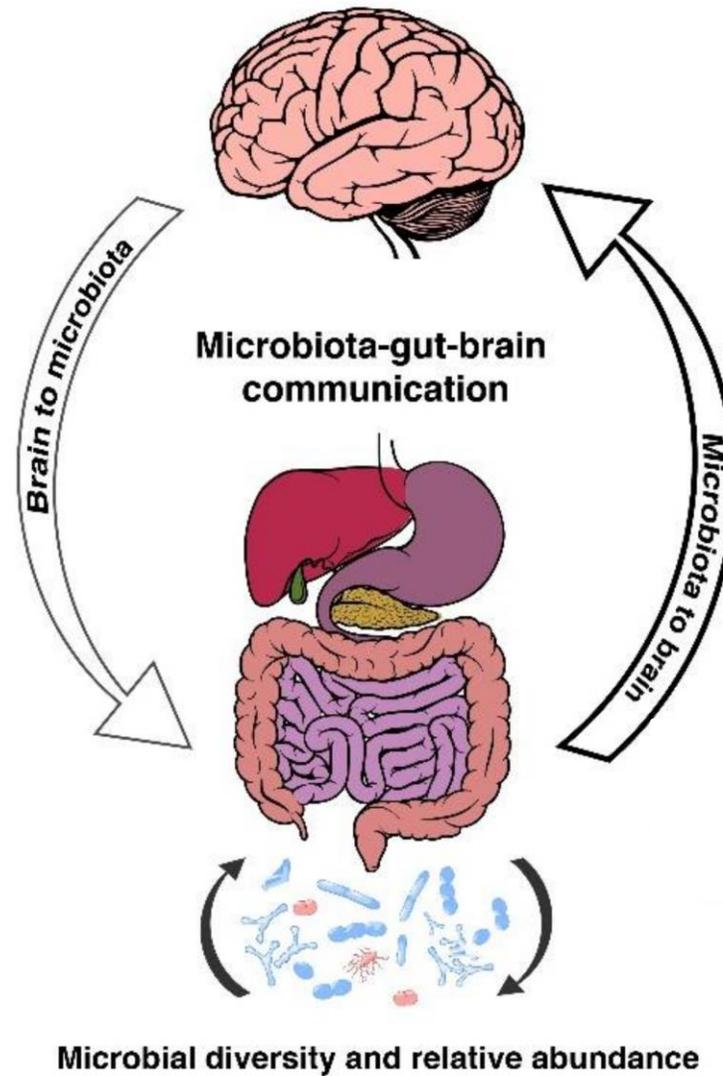
- Isolation, Irritability, Aggression, Obsession with Food, Lack of Interest in Food, Intense Mood Swings, Anxious behaviors, Suicidal Ideation, Self-Mutilation

# Walkerton Canada



Garg, A., Macnab, J., Clark, W. et al. Long-term Health Sequelae Following E.coli and Campylobacter Contamination of Municipal Water. *Can J Public Health* 96, 125–130 (2005).

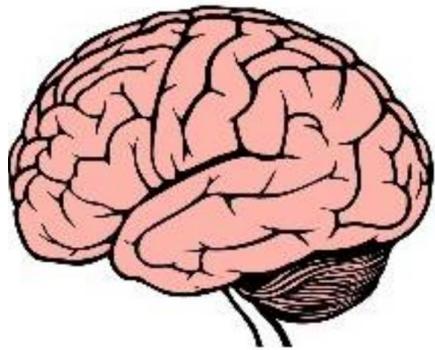
# Correlation or Causation?



# What do we know?

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# The Brain



- Neurotransmitters
  - Acetylcholine – Mental clarity neurotransmitter
  - Serotonin – Happy neurotransmitter
  - Dopamine – Reward neurotransmitter
  - GABA – Calming neurotransmitter
- Structural Changes
  - Beta-Amyloid Plaques -Alzheimer's Disease
  - Gray Matter loss - Anxiety Disorders, Schizophrenia and Depressive Disorders
- Myelination - Omega 3 Fatty Acids

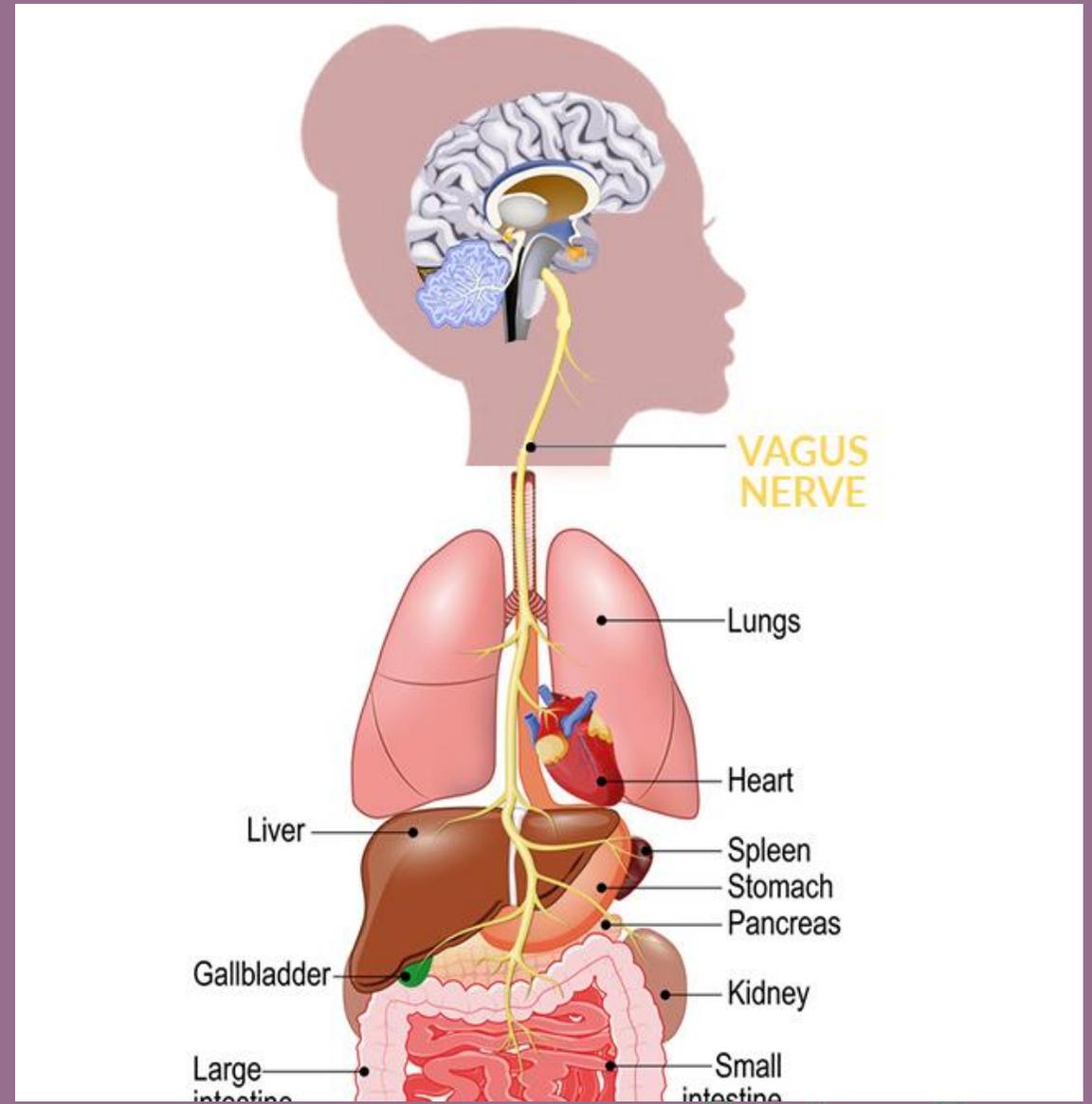
# THE GUT: OUR SECOND BRAIN



- Gut microbes support Antioxidants
- Neurotransmitters produced in gut
  - Micronutrients ie., Magnesium, Polyphenols, Vitamin B6, C, D Selenium, Folic Acid, Tryptophan
- Inflammation/Anti-Inflammatory
- Immune System
- Sleep Cycles

# How are they Connected?

## Vagus Nerve

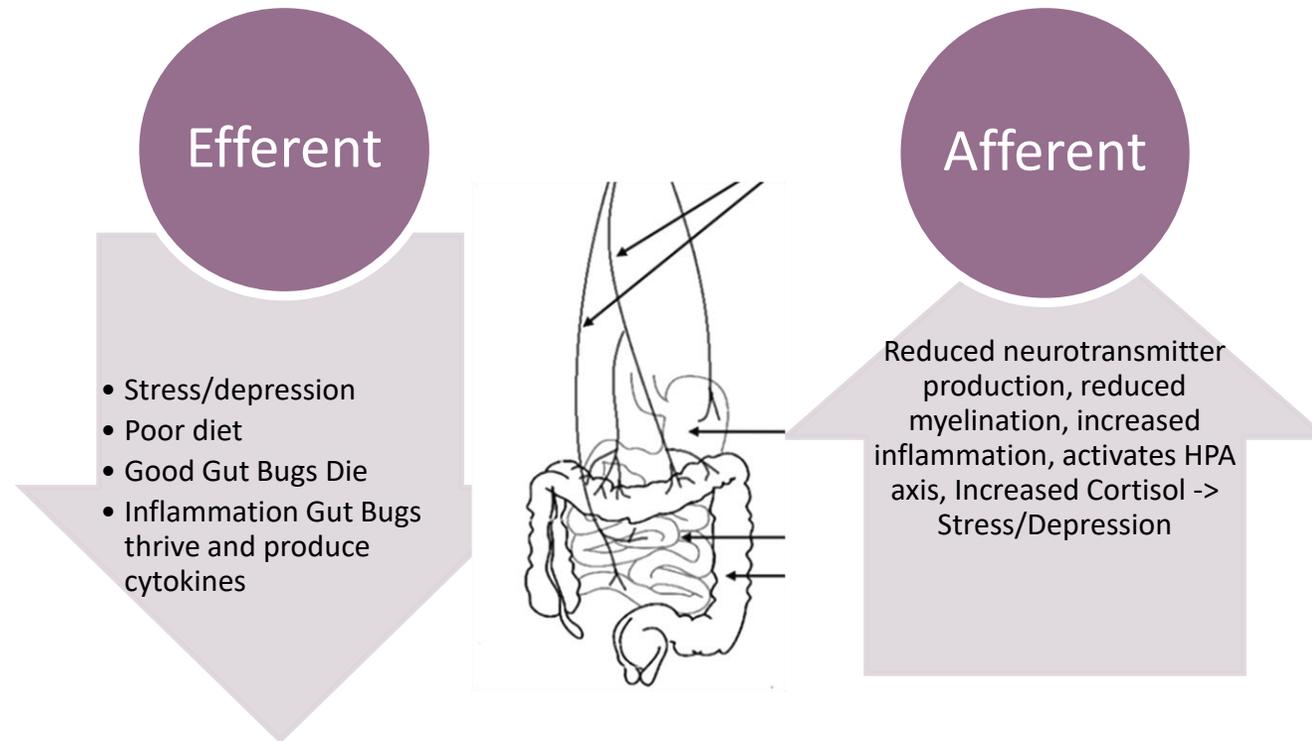


# The Master Control Switch

Carries information from gut, liver, heart, lungs to brain

Mediates the PARAsympathetic Nervous System

# Gut Brain Communication via the Vagus Nerve



# Increasing Vagal Tone

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Salamander Exercise

Yoga

Breathwork

Connection with Others

Loving Kindness Meditation

Prebiotics

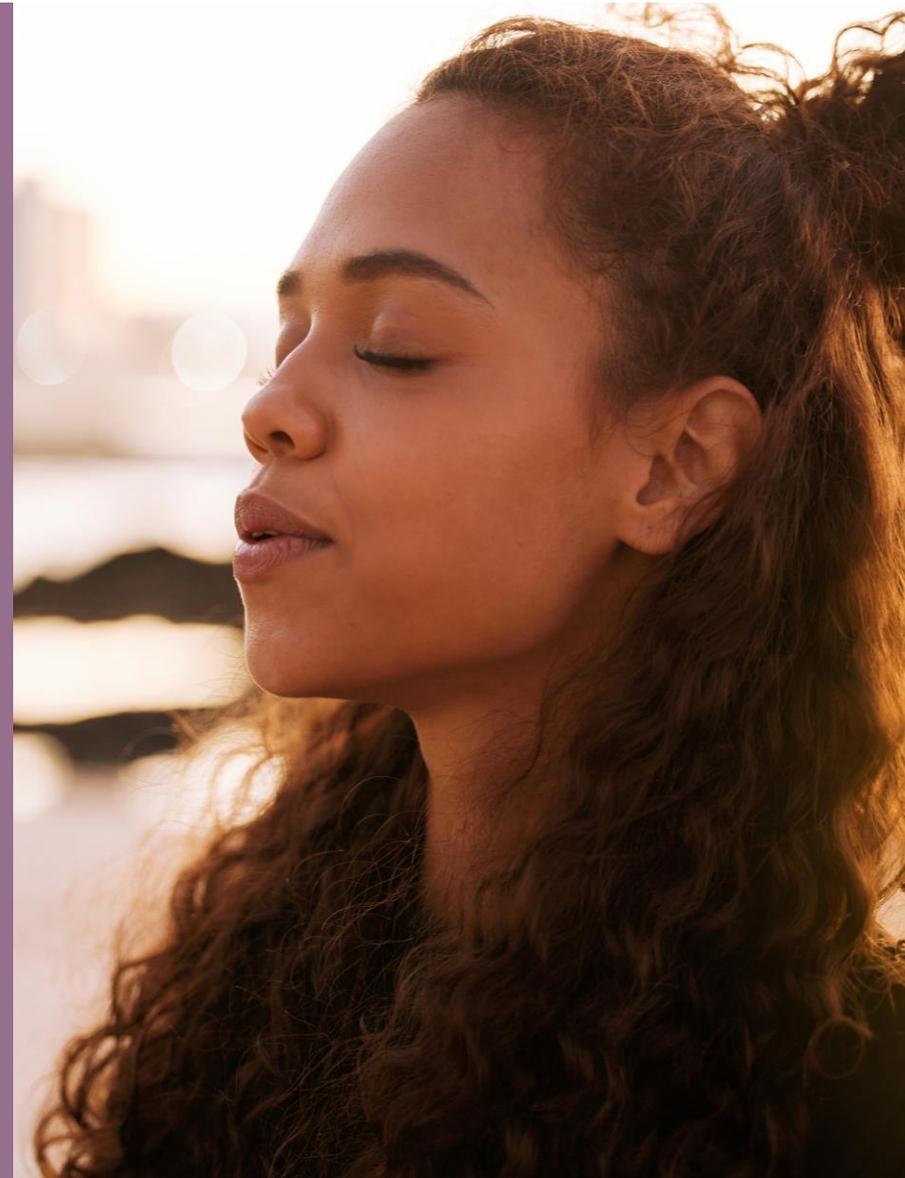
Probiotics

Omega 3 Fatty Acids

Social Connection

Singing

Vagus Nerve Stimulation (VNS)

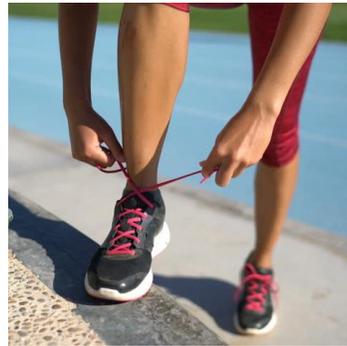


# Gut- Emotion Relationships

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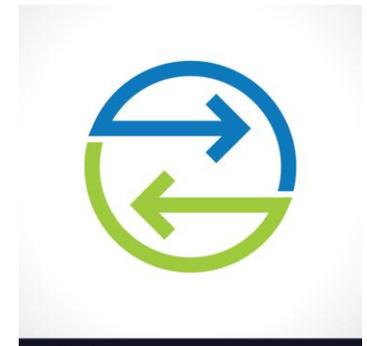
**Nutrition Influencing Mental Health**



**Correlational Life Choices**



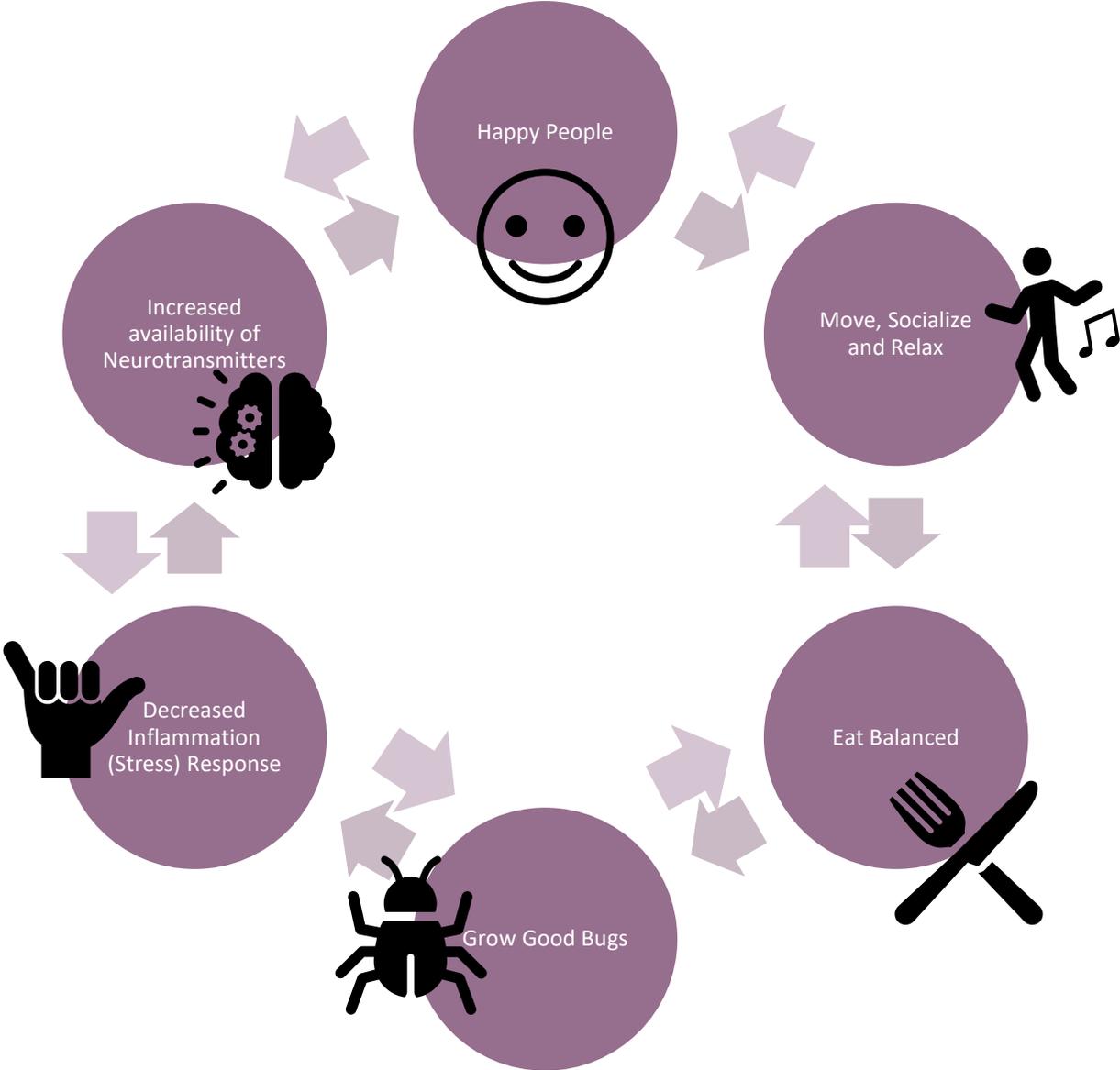
**Mental Health/Coping Skills impacting behavioral Nutrition**

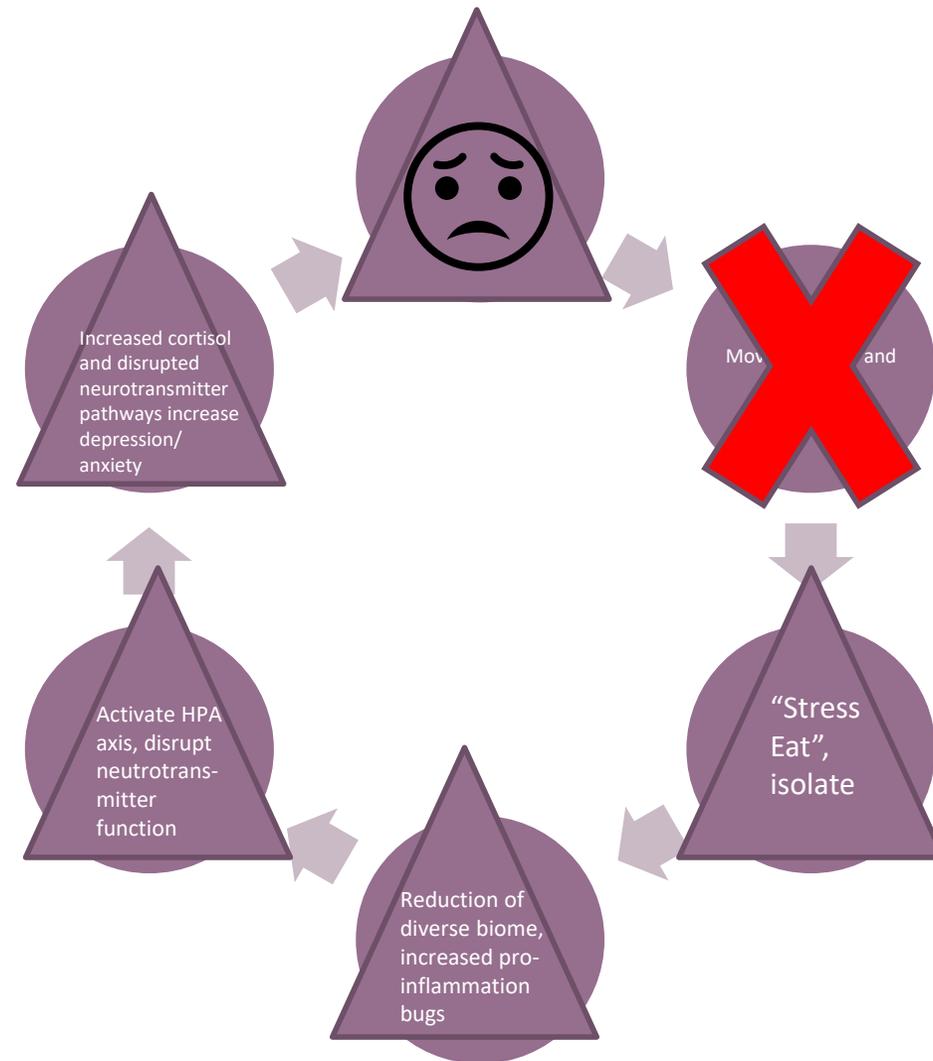


**Bi-Directional Influences of Nutrition/Gut & Mental Health**



# Food, Bugs, and Lifestyle





# Correlational Life Choices

Those who are likely to engage in purposeful eating may also be more likely to choose other lifestyle activities such as exercise, socialization, and mindfulness



# Nutrition Affecting Mental Health

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Gut Health

Anti-Inflammatory Responses

Antioxidative Processes



## Mental Health Disturbances and Coping Skills Affecting behavioral nutrition

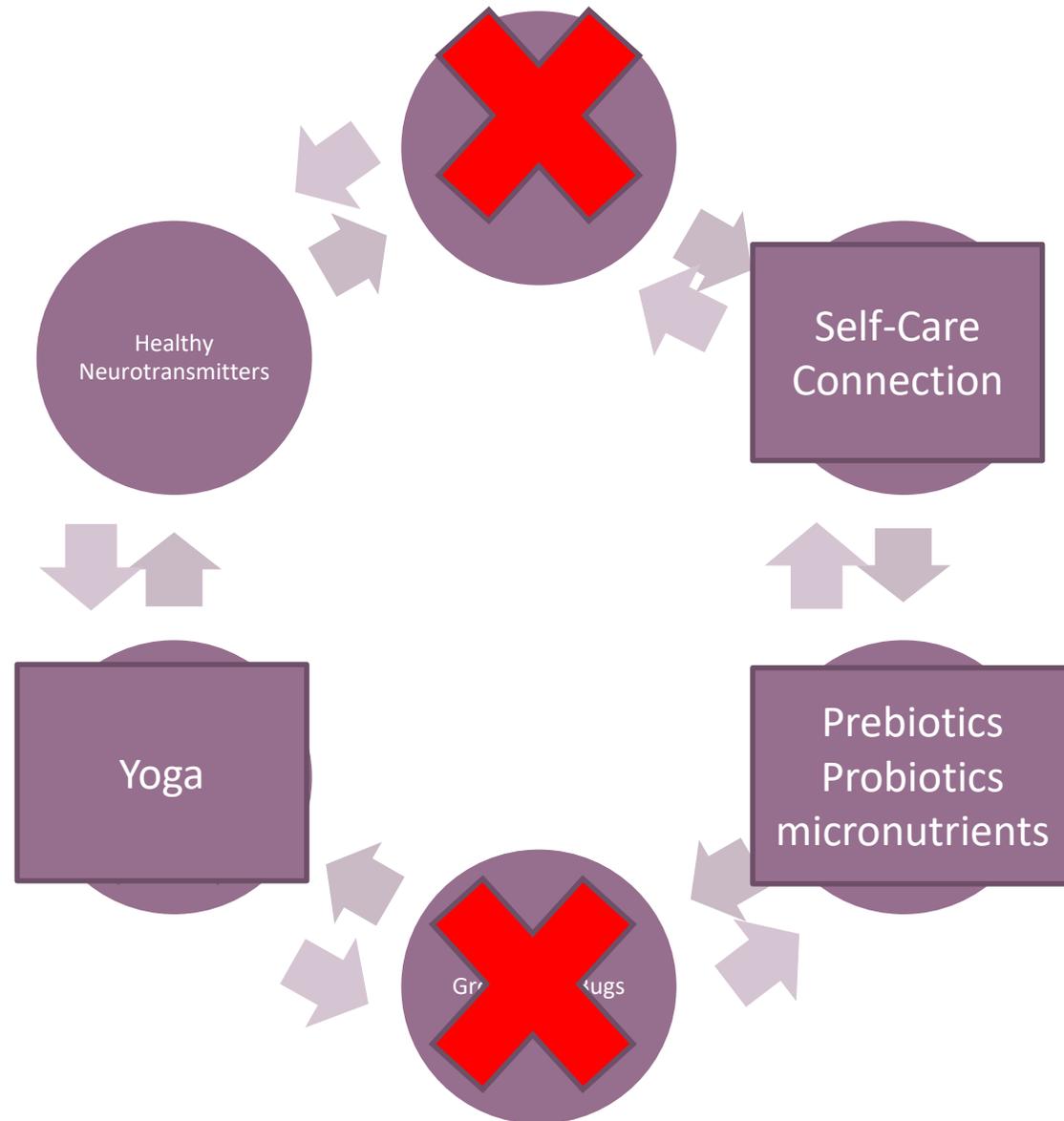
Alcohol  
poor diet  
excessive caffeine



# Bi-Directional Influences of Nutrition/Gut Health and Mental Health

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# Anxiety - Cindy

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31 year old, vegetarian, practices yoga 1-2 times a month, divorced two years ago after a sexually abusive marriage, has always been a “worrier” but anxiety is stronger and more pervasive than ever before. Experiencing symptoms of IBS. Psychiatrist prescribed hydroxyzine for anxiety and to aid in sleeplessness.

What factors in the gut brain axis could be relevant?

GABA

Acetylcholine

Inflammation

# Depression - Joey

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38 y/o, divorced three years ago, two daughters, relatively good premorbid mental health, complicated bereavement and depression since the loss of his younger brother to suicide 6 months ago

What factors in the gut brain axis could be relevant?

Probiotics

Serotonin

GABA

Vagal Nerve Stimulation via Social Connection,  
Enjoyable activities

# Caitlynn – Eating Disorders

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21-year old college junior, began dieting prior to a beach trip 6 months ago, began counting macros and micronutrients and reducing her caloric intake to under 1000 calories a day. She find excuses not to join her friends for meals and often lies about her intake to her family

What factors in the gut brain axis could be relevant?

- Acetylcholine
- Serotonin
- Dopamine
- Low Vagal Tone

# Practical Applications for Practical People

- Starting....
  - Small
  - Sustainable
  - Sensible
  - Sensory oriented



Thank you!

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