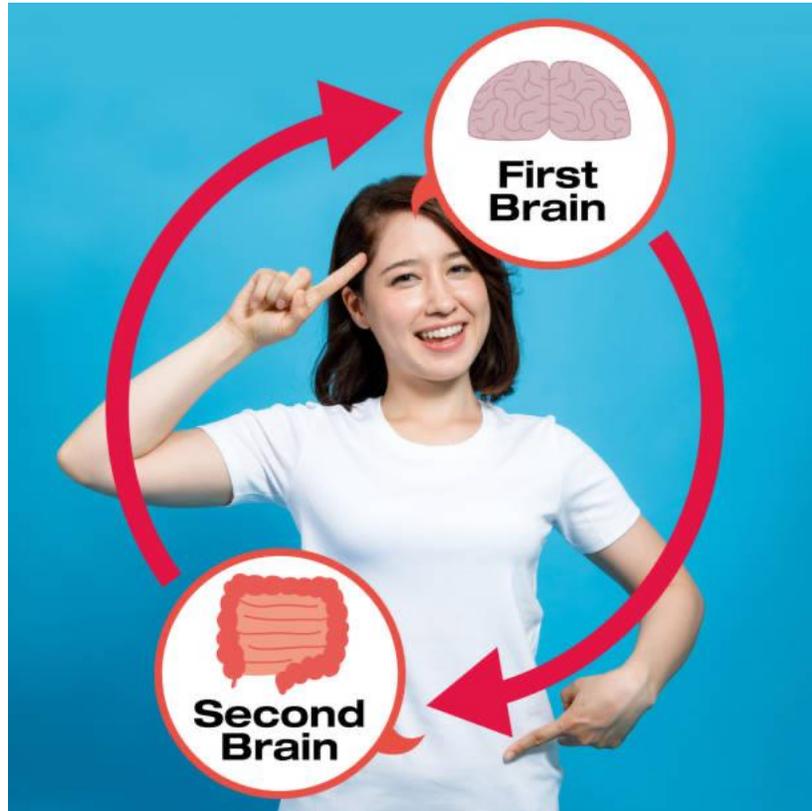




## The Second Brain

( By: Courtney Humphrey )

VAKT Materials ( 2 Q-Tips and a device to watch youtube videos )



It has been said that we are more BACTERIA than we are human. That is because we possess more bacteria cells in our body than human cells. Bacteria are living cells that are so tiny we cannot see them with our eyes. Normally, we associate bacteria with illness. However, bacteria are dangerous only if they cause a disease. Most bacteria in and on our bodies are BENEFICIAL(good, or helpful) for our health. Most of the time our immune system is able to control the “bad bacteria”. One way we can help our bodies control the growth of bad bacteria is by making sure we have enough good bacteria. The good bacteria help prevent the overgrowth of bad bacteria to keep a healthy balance of bacteria in our bodies.

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Spell: CELL Spell: HEALTH Spell: BALANCE

It has been said that we are more bacteria than \_\_\_\_? HUMAN

One way we can help our bodies control the growth of bad bacteria is to make sure we have enough \_\_\_\_\_ bacteria ? GOOD

Bacteria are dangerous only if they cause \_\_\_\_\_. DISEASE

What is one synonym I mentioned for the word beneficial? GOOD, HELPFUL

What is another word for disease? ILLNESS, SICKNESS, AILMENT, CONDITION

When the immune system fails to control the bad bacteria, we may get sick. A doctor may decide we need ANTIBIOTICS, which are drugs that will kill the bacteria. Antibiotics will kill our good bacteria along with the bad bacteria. This can lead to an imbalance of good and bad bacteria, which is called GUT DYBIOSIS . Gut dysbiosis can cause many other health problems so it is important to only use antibiotics when absolutely necessary. However, when it is medically necessary to take antibiotics, we can prevent depletion of good bacteria by taking PROBIOTIC supplements. Probiotic supplements are good bacteria that we can take in either pill, liquid or powder form .

Spell: PILL Spell: IMPORTANT Spell: DRUGS

What kind of drugs kill bacteria ? ANTIBIOTICS

An imbalance of good and bad bacteria in the gut is called? GUT DYSBIOSIS

What type of supplement did the text say can improve or prevent gut dysbiosis ? PROBIOTIC

What is one type of bacteria that bacteria kill? GOOD BACTERIA, BAD BACTERIA

What would you say to your doctor if they prescribed you antibiotics?

Today we are going to discuss the role of the bacteria in our GUT. Gut is another word for the GASTROINTESTINAL TRACT. Other terms include the abbreviation GI TRACT and DIGESTIVE TRACT. All these terms are referring to the pathway our food takes as it goes through our body. The most understood job of our GI tract is DIGESTION of our food. Digestion is the body's process of breaking

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down food into smaller molecules that the body can absorb and use for energy, growth, and repair. From digestion, the human body obtains nutrients, such as proteins, sugars, fats.

Spell: JOB Spell: FOOD Spell: BODY

What was the three letter word for gastrointestinal tract discussed in the text?  
GUT

What is the breakdown of food into substances that can be used by the body called? DIGESTION

I named 4 terms for the pathway our food takes as it goes through our body , name one of them. GUT , GASTROINTESTINAL TRACT , GI TRACT , DIGESTIVE TRACT.

Name 1 of the 3 things I said our body uses our food for after it is broken down. ENERGY , GROWTH , REPAIR

What is one organ or body part that is involved in digesting food? TONGUE, STOMACH, INTESTINES, ESOPHAGUS

Bacteria even play a role in our digestion. Bacteria in our gut help with digesting food and produce some of these nutrients. In fact, gut bacteria produce around 10% of the energy that the body uses. Certain good bacteria such as BIFIDOBACTERIA and *LACTOBACILLI*, which are found in probiotics and yogurt, can help seal gaps between intestinal cells and prevent a disorder called LEAKY GUT. Leaky gut is a digestive condition where bacteria and toxins are able to leak through the intestinal wall.

Spell: FOUND Spell: ENERGY Spell: PRODUCE

What is the name of the digestive condition that allows bacteria and toxins to leak through the intestinal wall? LEAKY GUT

What percentage of energy does gut bacteria produce for our bodies? 10



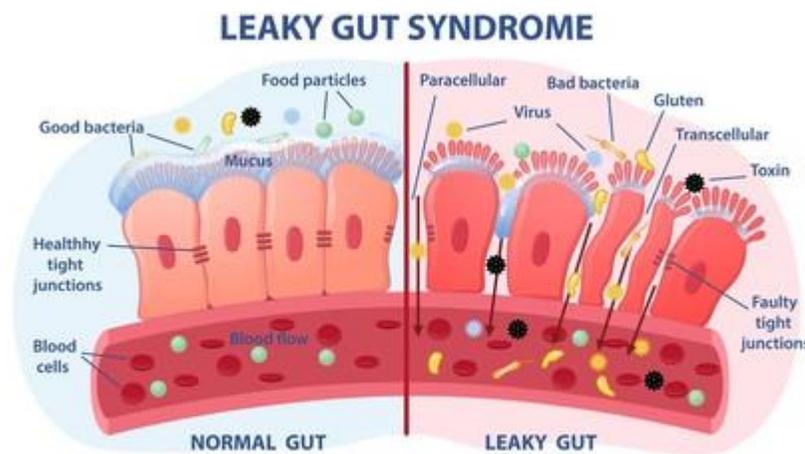
What is one of the things a leaky gut allows to leak through your intestines?

BACTERIA , TOXINS

Where is one place listed in the text that you can get bifidobacteria and lactobacilli ?

YOGURT ,PROBIOTICS

VAKT : Either you or your CRP pretend your fingers are the junctions in the intestinal lining, squeeze your finger together as tightly as possible while the other person tries to push a Q-Tip in between the fingers- this represents a healthy gut lining. Now allow your finger to loosen up some and have the other person push the Q-tip through to represent what happens with a leaky gut.



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As soon as our nose smells food it sends signals to the brain that tell the SALIVARY GLANDS in our mouth to start producing SALIVA (spit). Saliva contains ENZYMES that help break down our food. Enzymes are molecules that help to convert something into another thing very quickly. The bacteria in our gut help produce these enzymes. Some individuals lack the necessary enzymes to break down particular ingredients or food groups, which could lead to MAL-DIGESTION , bloating, gas and irregular bowel habits. For those individuals, taking digestive enzymes in pill form can aid the gut in properly breaking down food molecules to be digested more easily.

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Spell: SPIT Spell: MOUTH Spell: NOSE

What is another word for spit ? Saliva

What type of molecules , that are found in saliva, help break down our food?

ENZYMES

What is one of the symptoms I listed that can occur if you do not have enough enzymes to break down all the types of food you eat? MAL-DIGESTION, BLOATING , GAS, IRREGULAR BOWEL HABITS

What changes happen in your body when you smell a food that you like ?

So now we know a little background about how the gut digests our food, let's talk about why the gut is known as the second brain. Our body has two main nervous systems: the CENTRAL NERVOUS SYSTEM (or CNS) which consists of the brain and spinal cord, and the PERIPHERAL nervous system (or PNS) which is made up of nerves that branch off from the spinal cord and extend to all parts of the body. A large part of the PNS is found in the gut and is called the ENTERIC nervous system (or ENS). The ENS is made up of even more neurons than the spinal cord. Because the ENS can do parts of its job without communicating with the CNS(which includes the brain in our head) it has been given the title the second brain.

Spell: HEAD Spell: NERVES Spell: BACKGROUND

The C in CNS stands for what ? CENTRAL

In this section I said the gut is known as the \_\_\_\_\_ brain ? SECOND

The Enteric Nervous system is part of which of the two main nervous systems?

PERIPHERAL NERVOUS SYSTEM

What is one of the three types of nervous systems I just listed ? CENTRAL NERVOUS SYSTEM(CNS), ENTERIC NERVOUS SYSTEM (ENS) PERIPHERAL NERVOUS SYSTEM (PNS)

What is one of the parts of the body included in the CNS? BRAIN, SPINAL CORD

What are your thoughts about a large part of our nervous system being in the gut ?

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Though the ENS can do some parts of its job without communicating with the CNS, we know they do often communicate. If you have ever experienced having butterflies in your belly when you're nervous, or making a decision based on a gut feeling you have experienced the GUT BRAIN AXIS. The gut brain axis is communication between the CNS and ENS. The gastrointestinal tract is connected to the brain through an important nerve called the VAGUS NERVE. The Vagus Nerve looks like a cable that connects the gi tract, lungs, and heart to the brain. The Vagus Nerve links to an area of the brain called the HYPOTHALAMUS, which is an area of the brain that controls hunger and emotions.

Spell: HUNGER Spell: NERVOUS Spell: FEELING

Communication between the CNS and the ENS is called ? GUT BRAIN AXIS

The nerve that connects the gut to the brain is called? VAGUS NERVE

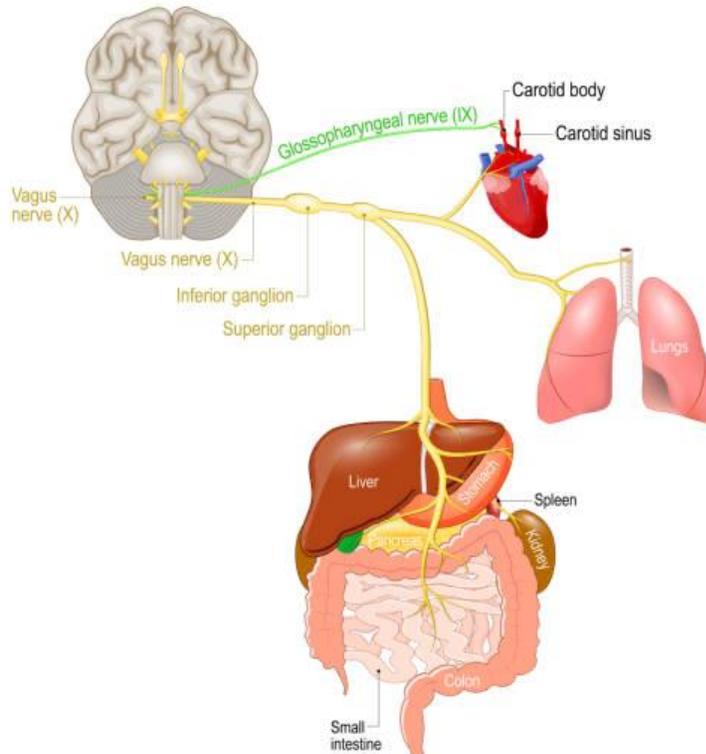
The vagus nerve connects to what area in the brain? HYPOTHALAMUS

Name one of the parts of the body that I read the vagus nerve connects to the brain ? GI TRACT , LUNGS, HEART

What was one of the two things I said the hypothalamus controls? HUNGER, EMOTIONS

What is another example of how you experience the gut-brain-axis? STOMACH GROWLS WHEN I SEE FOOD, GUT FEELING ABOUT SOMEONE WHEN I FIRST MEET THEM, UPSET STOMACH WHEN STRESSED OR SAD ...

## The vagus nerve



VAKT : Watch one or both of the short videos below about techniques to stimulate the vagus nerve as a coping mechanism for stress. Then practice the techniques together .

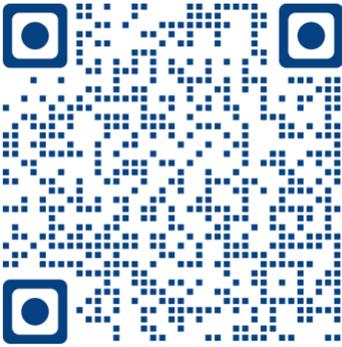
Vagus Nerve Massage for Stress & Anxiety Relief (1min 54s-3 techniques)

<https://youtu.be/MMaWEUwoZY>

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How To Do A Vagus Nerve Massage (2min56 secs - 2 techniques)

<https://www.youtube.com/watch?v=9uZ1rnKF5DU>



Why is our gut the only organ in our body that needs its own “brain”? Is it just to manage the process of digestion? Or could it be that one job of our second brain is to listen to the trillions of MICROORGANISMS residing in the gut and deliver their messages to the brain in our head? Microorganisms include bacteria, viruses, and FUNGI living in our body. Microorganisms living in the GI tract are called the gut MICROBIOTA. The bacteria in our gut live in a MUCOSAL layer called BIOFILM. Biofilm is made of a sticky MATRIX, similar to the slimy film you develop overnight that covers your teeth and causes you to brush them in the morning. The biofilm in our gut sometimes needs to be broken up too, to rid of the infections and bad bugs. Since we cannot “brush” the gut like we do our teeth, there are high dose enzymes that can serve the same purpose.

Spell: MUCOSAL Spell: MANAGE Spell: MATRIX

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Microorganisms living in the GI tract are called the gut \_\_\_\_\_? MICROBIOTA

What is the name of the mucosal layer that our gut bacteria live in? BIOFILM

The text provided 3 types of cells included in the category of Microorganisms , name one of them? BACTERIA, VIRUSES, FUNGI

What are some of the changes you notice in your mouth when you wake up in the morning ?

It is becoming clearer that the influence of our microbiota reaches far beyond the gut to affect an aspect of our biology few would have predicted- our mind. For example, the gut microbiota influences the body's level of the potent neurotransmitter SEROTONIN, which regulates feelings of happiness. Our microbiota also produces a hormone called OXYTOCIN, which influences our desire to socialize and bond with others. Oxytocin is created in the gut by a specific bacteria called L-REUTERI. There are also PATHOGENIC (harmful) bacteria that can cause certain neurotransmitters to reach dangerous levels. For example, an infectious bacteria called CLOSTRIDIA can produce DOPAMINE toxicity. When dopamine levels are too high, this can lead to symptoms of ADHD, addictions, and psychiatric disorders.

Spell: DOPAMINE Spell: BOND Spell: MIND

What neurotransmitter did we read about that regulates feelings of happiness ?  
SEROTONIN

What hormone did we read about that influences our desire to socialize and bond with others? OXYTOCIN

What harmful bacteria causes dopamine toxicity ? CLOSTRIDIA

List one of the negative effects listed in the text that may occur when dopamine levels are too high? ADHD, ADDICTIONS, PSYCHIATRIC DISORDERS

What is your reaction to the fact that our gut health affects our mind and our moods?



As we know, most of the human microbiota reside in the gut, and as it turns out, so does 70-80% of the body's immune system. Gut immune cells are known as PEYER'S PATCHES and protect the small intestines against infection by releasing white blood cells to fight the infection. The immune system is a complex system, responsible for protecting us against harmful invaders called PATHOGENS, which make us sick. The immune system has two components. The INNATE immune system, which acts very quickly and responds non-specifically—meaning it responds the same way to every pathogen that invades the body. The ADAPTIVE immune system acts more slowly, but in a stronger way that is uniquely tailored to each specific pathogen. This is called IMMUNOLOGICAL memory, which means it will attack the pathogens harder and faster next time it sees them.

Spell: MEMORY Spell: REMEMBER Spell: FIGHT

70-80% of the body's \_\_\_\_\_ is found within the gut? IMMUNE SYSTEM

What are the immune cells of the GI tract called? PEYER'S PATCHES

Which component of the immune system has an immunological memory?

ADAPTIVE

Name one of the components to the immune system ? INNATE, ADAPTIVE

What illnesses come to mind that you know can be experienced more than one time. FLU , COLDS, RHINOVIRUS, COVID

The immune system is particularly interconnected with gut bacteria. Some types of bacteria activate PRO-INFLAMMATORY cells, which are immune cells that cause inflammation (swelling). While other bacteria stimulate the activity of ANTI-INFLAMMATORY immune cells, which balance the immune response, so inflammation does not get out of control. It is important to understand that inflammation is a healthy response of the immune system—our bodies produce inflammation because inflammatory conditions help the body to fight off the foreign invader. Sometimes, when the inflammatory response is too strong, it can lead to the development of inflammatory diseases. So, it is important to have a



healthy balanced gut microbiota in order to have a healthy balanced immune system.

Spell: BALANCE Spell: IMMUNE Spell: ACTIVITY

Immune cells that cause inflammation are called? PRO INFLAMMATORY

Immune cells that balance the immune response so inflammation does not get out of control are called? ANTI INFLAMMATORY

Explain the purpose of inflammation given in the text ? INFLAMMATORY CONDITIONS HELP THE BODY TO FIGHT OFF THE FOREIGN INVADER.

Explain what the anti-inflammatory cells do ? BALANCE THE IMMUNE RESPONSE SO INFLAMMATION DOES NOT GET OUT OF CONTROL

Acute injuries cause inflammation/swelling that we can visibly see, what kind of injuries might cause this type of inflammation ? BROKEN BONES, BIG FALL, SURGERY , SPRAINED ANKLE, CUTS, BRUISES, BUG BITES, ALLERGIC REACTION

The communication between microbiota and the immune system is important for preventing diseases related to improper immune system functioning, or AUTOIMMUNE conditions, which occur when our immune system attacks our bodies own healthy cells instead of pathogens. For example, bacteria teaches immune cells called T-cells to distinguish foreign entities from our own tissue. Boosting the action of the immune cells are certain strains of gut microbiota that prevent pathogens from being absorbed. This is why it is so important to have colonies of “good” bacteria in the gut. In fact, without the right balance of GUT FLORA (gut bacteria, or microbiota) your body cannot maintain good health.

Spell: TISSUE Spell: GOOD Spell: TEACHES

A condition that causes the immune system to attack itself is called ? AUTOIMMUNE

The example in the text said that bacteria teaches immune cells called \_\_\_\_ to distinguish pathogens from our own tissue? T-Cells

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Some types of good gut bacteria prevent pathogens from being \_\_\_\_? ABSORBED

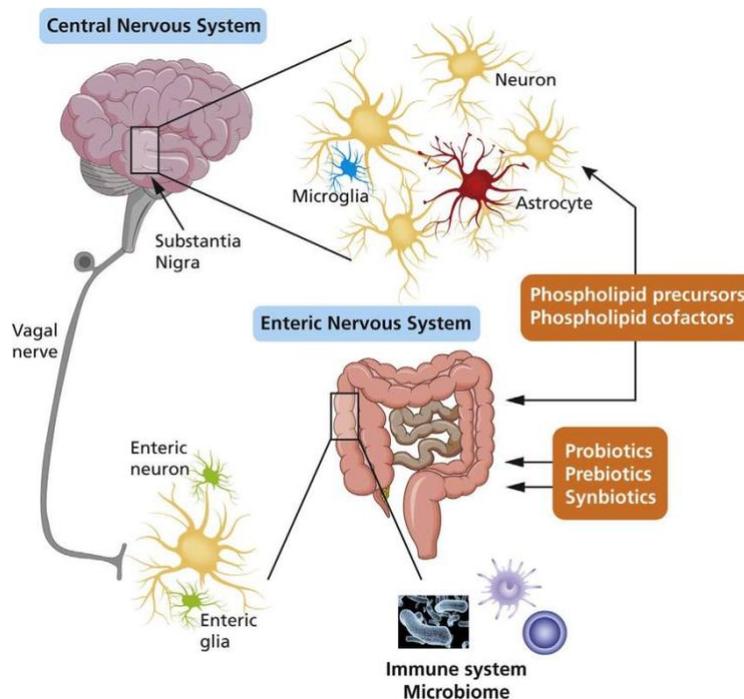
Gut Flora is another phrase for, name one? GUT BACTERIA, GUT MICROBIOTA

In your own words tell me what an autoimmune response is.

WHEN OUR IMMUNE SYSTEM ATTACKS OUR BODIES OWN HEALTHY CELLS RATHER THAN PATHOGENS

Name one autoimmune disease. CROHNS , ARTHRITIS , PANDAS, DIABETES, LUPUS, MS , CELIACS

VAKT : Looking at the picture below lets touch some pictures of the things we have been learning about and notice the connections . To start lets touch the “ First Brain” now touch the “second brain” and trace that line that leads us to the picture of the Enteric neuron , now lets trace our finger from that enteric neuron up the vagus nerve and back up to the first brain.



Typically, if you're in a stressful situation that is then diffused, your body returns to a state of HOMEOSTASIS. Homeostasis is when the body is in a healthy, and

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well balanced state of being. However, if you're in a constant state of stress for a prolonged period of time, your body will get stuck in that FIGHT-OR-FLIGHT mode - physical reaction our body goes through when it senses an extreme threat to our safety. Our gut also plays an important role in how we respond to stress since it is connected to the hypothalamus which controls emotions. Our bodies are unable to tell the difference between physical and mental stress. So, your body responds the same way if a bear shows up in your home as it does when you realize you hate your job — it tries to combat the stress. The body reacts to the stress as a type of infection and tries to overcome it.

Spell: HATE Spell: EMOTIONS Spell: STRESS

A healthy well balanced state of being is called? HOMEOSTASIS

The physical reaction our body goes through when it senses extreme danger is called? FIGHT OR FLIGHT

From the text what is the reason given for the gut playing an important role in how we respond to stress? ITS CONNECTED TO THE HYPOTHALAMUS

What is an example of a physically stressful situation that may cause a fight or flight response? SEEING A DANGEROUS ANIMAL, SOMEONE YELLING AT YOU , BEING TRAPPED UNDER SOMETHING

What is an example of a mentally stressful situation that may cause a fight or flight response? HATING SCHOOL OR WORK, RELATIONSHIP TENSIONS,

In conclusion, our gut health heavily influences many systems of our body: from how we think, to how we feel mentally/emotionally, how often we get sick, and how efficiently our immune system responds to infections. Because most of our body relies on the good bacteria in our gut, it is important that we eat a DIVERSE(variety) and healthy diet to keep our body running smoothly and to help our brain work its best. In the words of Hippocrates, "Let food be thy medicine".

Spell: HEAVILY Spell: RESPONDS Spell: SYSTEMS

Another word for variety given in the text is ? DIVERSE



Hippocrates said Let food be thy \_\_\_\_\_? MEDICINE

What is one way this section said our gut health influences many systems of our body? HOW WE THINK , HOW WE FEEL, HOW OFTEN WE GET SICK , HOW WELL OUR IMMUNE SYSTEM RESPONDS TO INFECTIONS

What are your thoughts on Hippocrates' statement that food is medicine?

Creative Writing:

- 1.) Write a newspaper article about an interesting experience (made up or true) that caused someone to enter into the fight or flight response.
- 2.) Write a weeklong menu with a diverse variety of foods that you think would support a healthy gut microbiota.



Courtney Humphrey is a practitioner in training , living in eastern Kentucky . She has a degree in education, but her dream is to start a S2C center to serve the non-speaking community in her area. Courtney has 4 young children , the oldest of whom is also a speller. S2C has forever changed her family's lives and it is now her passion and her mission to share this gift with others.

<https://gilbertlab.com/immune-system/gut-microbiome-symbiosis/>

<https://www.news24.com/health24/Medical/Flu/Preventing-flu/your-gut-is-the-cornerstone-of-your-immune-system-20160318>

<https://www.britannica.com/science/human-digestive-system/The-gastrointestinal-tract-as-an-organ-of-immunity>

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<https://www.hopkinsmedicine.org/health/wellness-and-prevention/the-brain-gut-connection>

<https://www.health.harvard.edu/staying-healthy/what-is-inflammation-and-why-is-it-dangerous>

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