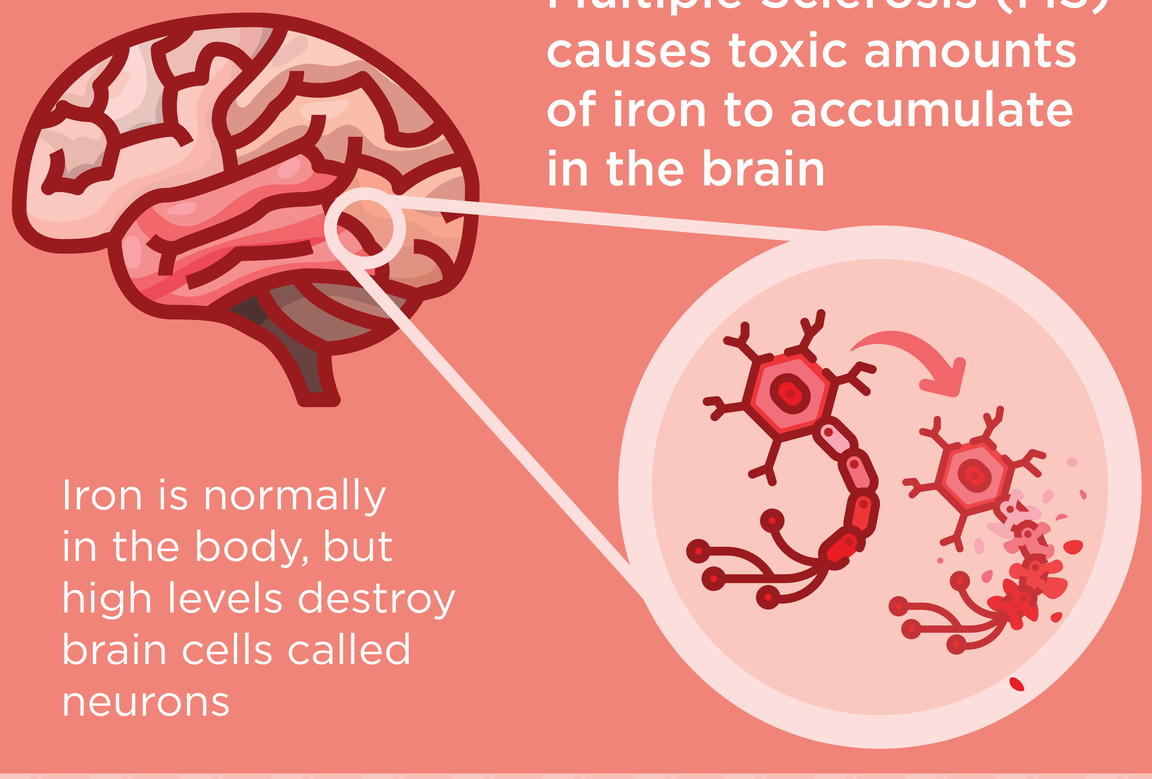
Tapping Into Nature to Treat Multiple Sclerosis

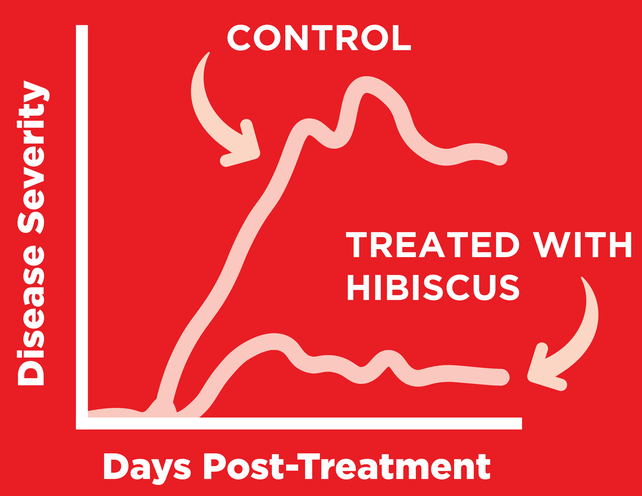


Multiple Sclerosis (MS) causes toxic amounts of iron to accumulate in the brain

Iron is normally in the body, but high levels destroy brain cells called neurons

Current MS treatments overlook iron toxicity

Novel research at the HBI has found a hibiscus flower extract that decreases the impact of iron toxicity in an MS model



This hibiscus extract is unique from commercial suppplements

Store bought hibiscus capsules sold for cardiovascular support:

- Don't protect neurons
- Don't decrease disability

Successes From the HBI Multiple Sclerosis Team

Multiple Sclerosis (MS) is a chronic degenerative disorder where the immune system attacks the nervous system

Minocycline reduces the risk of second attacks by **50%**

Hydroxychloroquine reduces disease progression of MS by **40%**

The MS team and HBI has discovered new drugs that are drastically decreasing costs of MS medications

$60,000	$600	$300
Average cost of MS medication	Minocycline	Hydroxy chloroquine

Aspirations of the MS team

Ongoing research seeks to identify and turn the active hibiscus chemicals into therapeutics

- Cure
- Promote Repair
- Prevent Brain Injury

The Mysteries of Brain Processing

How does the brain process information?

This complex question is being researched by scientists all over the world

Each neuron encodes very specific information, like the face of your grandma

Your brain has

86,000,000,000

neurons

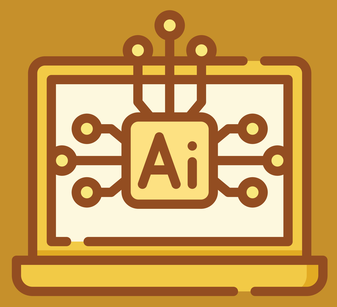
The brain works like a giant orchestral symphony

Different neuronal networks work together like sections of instruments to decode and remember unique information

Neural Symphonies of the Brain

Artificial Intelligence runs on machine learning

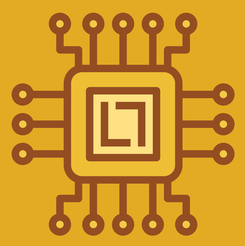
This method of learning is far more simple than the human brain, and takes much more energy



Brain-based processing can decrease the energy consumption of machines

Our brain only needs 20 watts of power to function, the same as a lightbulb

An AI processor can take up to 5 cars worth of energy to function



Neuromorphic chips are machine processors that mimic the brain's architecture and processing

HBI Researchers have modeled individual neurons and created their own network to allow the neurons to problem solve in specific ways

Researchers trained their own 'symphony' of neurons to collectively remember and recite music like "Ode to Joy"

Understanding how neuronal networks communicate will help optimize technology like neuromorphic chips

Our 'Second Brain': The Gut

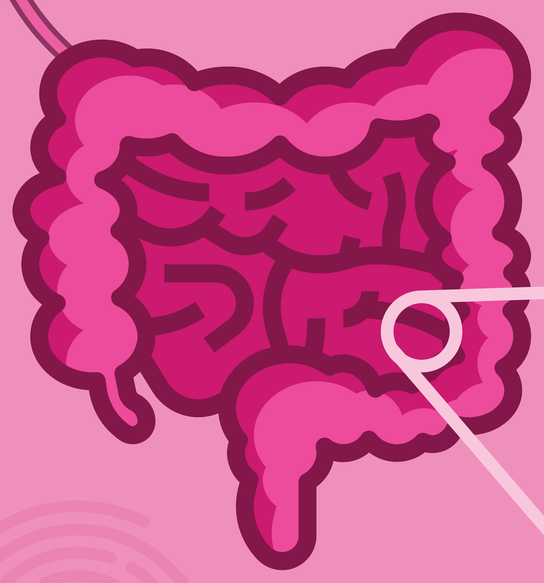
Your gut and brain are connected by the vagus nerve, which directly communicates between the two systems

The gut has it's own nervous system called the **ENTERIC NERVOUS SYSTEM**

The human body has more microbes than there are stars in the galaxy

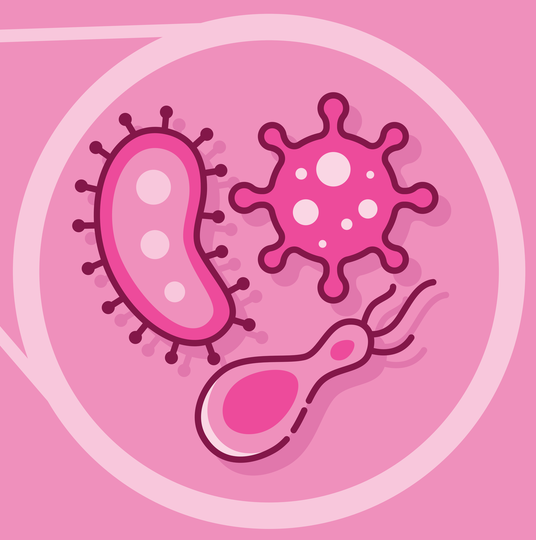
Gut microbes produce most neurotransmitters found in the human brain

Neurotransmitters are the body's chemical messengers.



95%

of our microbiota is located in the GI tract



Each individual has a unique microbiota, as personal as a fingerprint

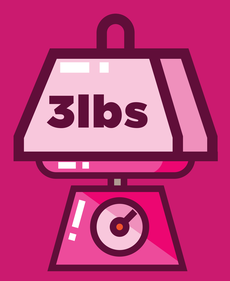
The Gut Microbiome is Directly Linked to Mental Health

Gut problems commonly coexist with autism, schizophrenia, and parkinsons disease among others

Appropriate diversity in gut microbiota is essential for brain health

A probiotic mix of gut bacteria has been shown to reduce symptoms of depression and anxiety

All the bacteria on and in your body weighs about the same as your brain



Researchers at the HBI are using fecal transplants from healthy microbiomes to improve mental health outcomes in deficient guts

Sleep keeps your gut bacteria healthy

and an imbalanced microbiome can disrupt sleep

Stress, Anxiety & Brain Trauma

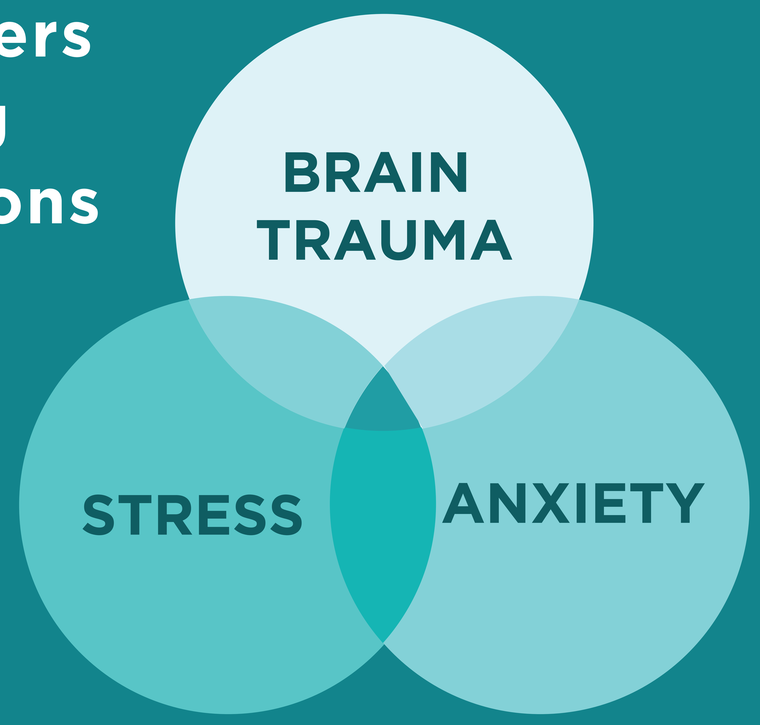
Mental Health Initiative for Stress & Trauma (MIST)

Stress is

CONTAGIOUS

Researchers at the HBI are figuring out how

HBI researchers are exploring the connections between:



Feeling like you are in control during stressful situations, decreases the impact of the stress

1/3 of people will experience significant mental health issues in their lifetime

Females can buffer their stress by interacting with others

Brain Trauma + Unmanaged Stress = ↑ Likelihood of Depression and Anxiety

400,000 concussions occur every year in Canada

Concussions affect your thinking, emotions, and sleep

Males are more vulnerable to suicide, which is the 9th leading cause of death in Canada

Females have more severe post-concussion symptoms

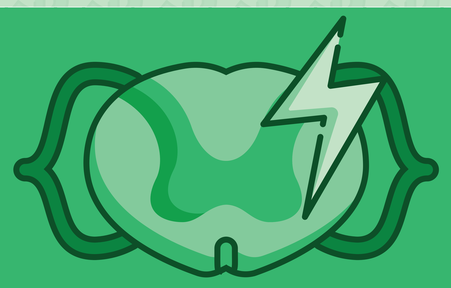
More research is needed to determine the parts of the brain that are affected by stress and concussion

Spinal Cord Injury in Canada

Spinal cord injuries can be caused by physical trauma, tumours, cysts, bacterial and viral infections, and genetics

Current annual economic impact of spinal cord injury in Canada is approximately

$3,600,000,000

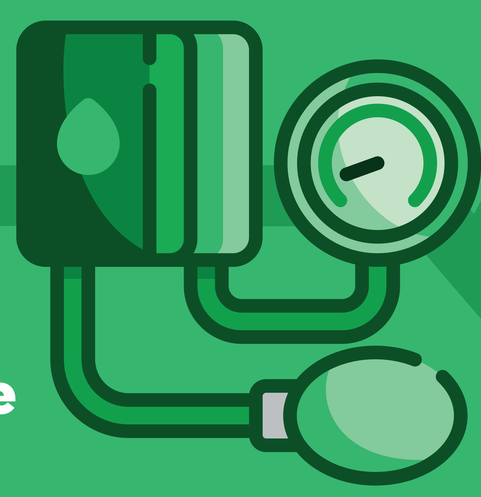


cross-section of a vertebrae

People with spinal cord injuries are 4x more likely to have a stroke and/or heart disease

An estimated 85,556 people in Canada have a spinal cord injury

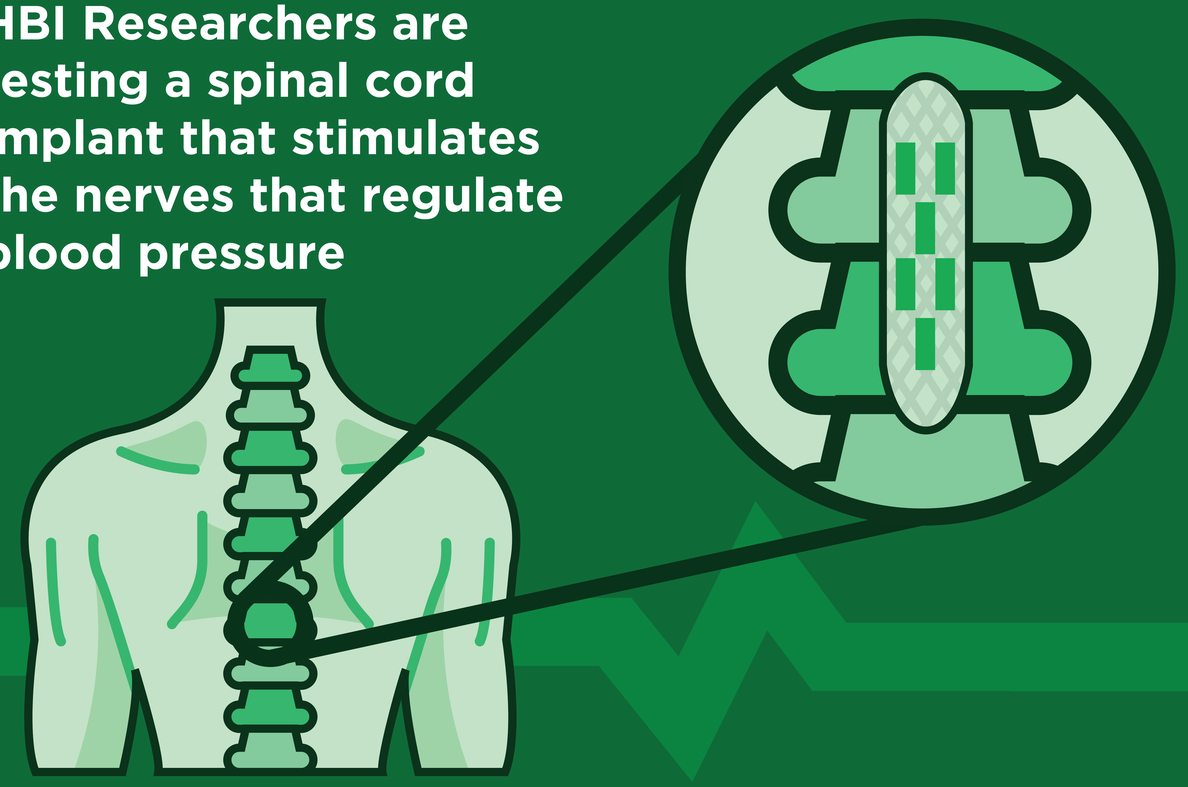
Extreme blood pressure fluctuations are one of the greatest challenges facing people with spinal cord injuries



Neuroprosthetics: The Future of Spinal Cord Injury Treatment

Disruptions to the body's automatic control of blood pressure cause higher risk of stroke and heart disease

HBI Researchers are testing a spinal cord implant that stimulates the nerves that regulate blood pressure



The implant cures blood pressure instability, like a pacemaker for your spine

After years of study

The first clinical implant is taking place this summer