BRAIN DRAIN

HEAL THE TOXIC EFFECTS OF PARASITES AND HEAVY METALS ON BRAIN HEALTH

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Introduction

In western medicine, the approach is always to address the symptoms, but very rarely are the root causes discovered and remedied. Study after study proves that things like heavy metal toxicity and parasitic infections cause a range of brain diseases including anxiety, depression, mood disorders, and neurodegenerative diseases.

And most of the studies emphasize the serious importance of exploring their effects more and finding ways to address these. The good news is that there are actually natural ways to rid your body of all these harmful toxins and parasites.

In this eBook, we'll cover these. We'll also deep dive into the impact of heavy metal accumulation on the brain and central nervous system. And then we'll take a look at how parasitic infections cause neurological symptoms. At the end of each section, we'll share exactly what you can do to detox from them.

It's important to remember that chronic infection or toxicity is what leads to damage in the brain, and so frequently detoxing to get rid of them is absolutely necessary to protect your brain health.

What is Heavy Metal Toxicity?

Heavy metal poisoning is extremely dangerous and is still prevalent today. Our world is becoming more and more toxic. Many heavy metals have been shown to directly impact brain health, causing an onset of neurodegenerative diseases and mental health illnesses.

There are so many different forms of heavy metals that are toxic to the human body. And although there has been a decline in exposure to heavy metals due to measures such as the banning of lead paints, for example, they are still present in many homes.

For instance, many cosmetics such as lipstick and talcum powder are potential sources. Heavy metals such as lead, chromium, arsenic, aluminum, mercury, iron, and zinc can also be found in a wide selection of our foods, such as fish, brown rice, and leafy green vegetables.4

These metals sometimes occur naturally or are added as ingredients. In some cases they are contaminants. The presence of these heavy metals in our foods is more common than we would imagine.

We are also heavily exposed to various toxic heavy metals in our environment. In this section, we'll take a look at some of the most common ones we're exposed to - that have also been shown to seriously affect neurological functioning.

How Do Heavy Metals Impact the Brain?

As the years go by, heavy metals are accumulating in our bodies and brain without us even realizing it. These are extremely toxic and majorly impact the brain. One of the biggest dangers of heavy metal toxicity is it leads to brain inflammation. This gives way to numerous mental health disorders and neurodegenerative diseases.

Let's take a look at some research about the serious impact of heavy metals on the brain, and how they lead to mental illnesses like depression, anxiety, and even psychosis. As well as neurodegenerative diseases like Alzheimer's and dementia.

Heavy Metals, Neurotoxic Insults, and Nervous System Toxicity

Heavy metals have been shown by researchers to cause neurotoxic insults, where the brain is susceptible to serious processes like mitochondrial dysfunction, build-up of damaged molecules, problems with DNA repair, impaired energy metabolism, and more. [1]

These processes all lead to neurological damage and therefore neurodegenerative diseases including Parkinson's disease, Alzheimer's disease, Huntington's disease, and Amyotrophic lateral sclerosis.

Heavy metals have also been shown to affect the nervous system. In fact, research conducted by Syeda Rubina Gilani and colleagues showed that during circulation, heavy metals cross the blood-brain barrier and may retain themselves in it. And brain tumors and biopsy samples of patients with neurological disorders were also analyzed to relate neurotoxicity and heavy metal poisoning. [2]

All of these impacts on the brain and nervous system give rise to a number of mental health illnesses and neurodegenerative diseases.

Symptoms of heavy metal toxicity that have crossed the blood-brain barrier include:

- Changes in mental status or personality
- Nervousness
- Irritability
- Insomnia
- Delirium
- Tremors
- Muscle weakness
- Fatigue
- Poor memory or memory loss
- Numbness and tingling of the arms and legs
- Changes in or loss of hearing, vision, or taste
- Problem with concentration
- Seizures
- Depression
- Anxiety

The Heavy Metals That Cause Toxicity in The Brain Today

Arsenic

Arsenic is one of the most poisonous metals we know of. It is found in two forms — organic and inorganic (this is the most toxic variety). It enters the food chain as a result of pollution. It has even been found in our drinking water. High levels have been found mostly in rice and rice products such as rice crackers, baby cereal, and rice bran.

Rice seems to absorb larger quantities of arsenic than other food crops, probably because it requires large amounts of water to grow in. If the water is contaminated with arsenic, the rice plant will absorb it. White basmati rice from India or Pakistan is safest but brown rice is your healthiest option as it absorbs the least amount of heavy metals plus contains more vitamins and minerals.

Arsenic has been shown to have serious effects on the brain when it accumulates. An article published by Godwill Azeh Engwa and colleagues discusses called the *Mechanism and Health Effects of Heavy Metal Toxicity in Humans* states that arsenic compounds have been shown in an in vitro cell line study to promote genotoxicity in humans and mice Leucocytes. [3] Genotoxicity - damage to DNA from toxins - has a direct impact on brain health.

Other epidemiologic studies in children show that there is a clear link between arsenic exposure and cognitive impairment. An article published by PubMed found that high concentrations of

arsenic exposure can alter growth and development in children, leading to neurological deficits. [4]

Mercury

Mercury is another extremely toxic heavy metal. Fish and shellfish accumulate mercury in their bodies. Fish that live for a long time and are higher up the food chain, such as tuna and shark, will accumulate more mercury than smaller fish.

Humans also collect mercury in their flesh from the food they eat, and high levels are toxic. Mercury is not only found in the water but also in the air. It can pollute crops and groundwater. It originates from sources such as oil refineries and cement factories.

This heavy metal causes damage to the central nervous system - leading to a range of mental disorders and neurodegenerative diseases.

An example of a neurological disease caused by mercury poisoning is Minamata disease. It has been shown to damage the central nervous system. [5] The symptoms of this disease include muscle weakness, loss of vision, and damage to hearing. It also causes numbness in the hands and feet.

Cadmium

Cadmium poisoning can occur from food or water that came from a contaminated source. Apart from cigarettes or industrial exposure, foodstuffs are the main source of cadmium exposure for non-smokers. The foods most likely to lead to cadmium exposure are cereals, vegetables, nuts and pulses, chocolate and cocoa, starchy roots or potatoes, and meat products.

A study published by PubMed shows that heavy metals can easily cross the blood-brain barrier causing mood disorders and neurological decline or disease. They also found that epidemiological data have linked cadmium exposure to neurotoxicity and to neurodegenerative diseases (e.g., Alzheimer's and Parkinson's disease), and to increased risk of developing ALS. [6]

Lead

Lead poisoning can cause problems relating to high blood pressure and can damage the nervous system, reproductive system, kidneys, liver, and brain. Lead poisoning is the result of short or long-term exposure to contaminants.

Lead toxicity directly impacts the brain, leading to mood disorders and neurological disorders.

A systematic review published by Science Direct aimed to determine the impact of cadmium and lead poisoning on mental and neurological health. They concluded that nine studies

demonstrated an association between depressive symptoms and blood lead concentration. High lead levels may be associated with anxiety and neurobehavioral deficits. [7]

How to Test for Heavy Metal Toxicity

Heavy metal poisoning is a serious concern and can lead to a variety of autoimmune diseases. If one suspected heavy metal poisoning, they could get tested with a simple blood test. Thanks to research and testing measures, people and food organizations are becoming more aware of the effects these have on our bodies.

Testing for heavy metal exposure can be done as follows:

- Blood testing
- Hair/nail samples
- Urine

How to Detox Your Body And Brain From Heavy Metal Poisoning

There are steps to doing a safe heavy metal detox. You'll first need to prepare your body before you start detoxing.

Steps to Prepare Your Body For Detox

1. First of all, remove all sources of heavy metal exposure (e.g., amalgam fillings safely removed, aluminum cooking pans replaced with non-aluminum, etc.).

2. Testing of detox pathways is recommended to be sure the liver, kidneys, gut, and lymph system are open and functioning well. You want them to be able to excrete the toxins quickly when they are released from the tissues in your body and not have them floating around causing damage. If any of the pathways are not functioning well, take whatever steps are necessary to correct that before starting a heavy metal detox.

3. Supplement with folate and B vitamins, and eat sulfur-containing foods like broccoli, kale, garlic, onions, and daikon radish to help open the pathways.

4. Supplement with essential minerals to ensure that your tissues have the correct minerals they need to function well. If they are short on the correct minerals (calcium, zinc, magnesium, etc.), the released heavy metals may substitute for them instead of being excreted.

5. Increase your glutathione. Glutathione is a powerful antioxidant that protects you from heavy metal damage, according to studies in both human and rat cells. This powerful antioxidant also supports liver enzymes that break down mold toxins and heavy metals. Your digestion will destroy normal glutathione, so opt for a liposomal glutathione supplement that makes it through your stomach.

You can also supplement with N-acetylcysteine (NAC) and alpha-lipoic acid, which your body can use to build glutathione on its own.

Healing with Cilantro

"Yoshiaki Omura", a doctor and director of Medical Research at the Heart Disease Foundation in New York, discovered by accident that cilantro could help chelate mercury, aluminum, and lead from the body. [8] He had treated certain eye infections with antibiotics, and the infections would completely subside, but then return again a few months later. His investigation found the infectious organisms hiding in parts of the body that had large concentrations of heavy metals.

Since heavy metals are excreted in the urine, Dr. Omura began testing the patients' urine. After one patient ate a meal containing cilantro, his urine tested with increased levels of mercury. So Dr. Omura began testing cilantro for its chelating properties and found that it accelerated the removal of heavy metals from his patients' bodies.

The antibiotics then eliminated the infections for good. A year later, a patient had three mercury-based amalgam fillings removed, resulting in a build-up of mercury in his lungs, liver, kidneys, and heart. Dr. Omura prescribed regular cilantro consumption, and after a few weeks, the levels of mercury had significantly decreased.

To use cilantro for its chelating properties, consume a quarter cup of its leaves and stems per day. It's a good idea to avoid exceeding this amount during the first two weeks since you'll risk releasing more heavy metals than your body can efficiently remove. Once the initial deposits are cleared, however, you can increase this amount.

You could even combine the cilantro with other chelating foods, such as spirulina and chlorella, for a more potent detox.

Two teaspoons of this cilantro pesto daily for three weeks is purportedly enough to increase the urinary excretion of mercury, lead, and aluminum, thus effectively removing these toxic metals from our bodies. Consider doing this cleanse for three weeks at least once a year.

Supplements to Remove Toxins From Your Body & Brain

Well Of Life's Toxibinder

While it's impossible to completely avoid heavy metals and toxic exposures, you can take a big step to reduce the toxic overload in your body by using Well of Life's doctor-formulated ToxiBinder.

ToxiBinder promotes detoxification of chemicals and heavy metals, reduces free radical damage by increasing antioxidant defenses, supporting the liver, kidneys, and immune health, and it promotes energy. The Toxibinder contains the following organic ingredients:

Humic and Fulvic Acid Powder: These bioactive compounds help chelate or bond with toxic and inorganic metals to remove them from the body. They also work as powerful free radical scavengers.

Organic Cordyceps Mushroom: Promotes the excretion of water-soluble toxins via the kidneys. Also offers support for immune health.

Organic Silymarin: This powerful herb helps detoxify the liver and provides potent antioxidant protection.

Organic Uva Ursi Leaf Powder: Used traditionally to support liver and kidney health

Organic Yucca Root: High in antioxidants to defend against free radical damage and support immune health.

Organic Dandelion Root: Helps cleanse the liver and fights free radical damage.

Organic Rhodiola Rosea: Adaptogenic herb used in traditional healing to detoxify the body, increase energy, and offer antioxidant protection.

Lipase: Digests fats and plays a role in liver detoxification.

Expert Insights

Dr. Daniel Nuzum

Hello, I am Dr. Dan Nuzum, and I am a naturopathic physician, an osteopath, and a doctor of Oriental medicine. And today we are discussing Alzheimer's. Alzheimer's is a degenerative condition of the brain, which affects a person's ability to remember. They lose their memory. They lose their short-term memory and then, with time, they lose all memory, altogether. Alzheimer's is a deadly condition. It can be fatal. As the brain degenerates, so does control of bodily functions, and when it gets to a certain point, it can be fatal.

But talk about the brain, let's talk about what affects the brain by way of degeneration. What causes the brain to start to fall apart like this. Let's see what different contributing factors that we know exist here. So, number one. Number one is nutritional deficiency. In Alzheimer's, you have brains that are devoid of very key nutrients, like essential fatty acids, B vitamins, certain minerals. In conjunction with the nutritional deficiencies, there's also increased amounts of heavy metals that are deposited in the brains of people with Alzheimer's. And these heavy metal deposits seem to be a major contributing factor to the amyloid protein deposits that happen in the brains with people with Alzheimer's. My favorite analogy of what heavy metals do to tissues is, heavy metals do to your cells what a splinter does to the bottom of your foot. Consider a splinter stuck in your foot. It hurts. It causes inflammation. It causes infection. It causes irritation and the area swells up. It gets all irritated, infected, inflamed, all these all at one time.

So, let me give you an analogy here. Heavy metals affect your cells the same way a sliver would affect the bottom of your foot. If you have a sliver in the bottom of your foot, it causes irritation, inflammation and then infection. Infection sets in. Right? You have this cycle, as the infection clears up, your immune system clears that up, reduces the inflammation. The irritation's still there, so with time it becomes inflamed again. Then it gets infected again. And then, that whole cycle just keeps going and going and going as long as the sliver's there. Until you pull the sliver out, you're gonna have irritation, your gonna have inflammation, your gonna have infection. It's gonna be a cycle. You're gonna just continually get these three I's, as I call them.

In your cells, a similar thing happens if they're toxic with heavy metals. Heavy metals act as that irritant and keep causing the cells to become inflamed. And as they become inflamed, they become more easy to infect, and when they become infected, they die off. And this same process happens in all of our cells. If our cells - all of our cells, whether they're neurons in our brain, or tissue in our finger, that process will go on, if they are toxic. There's two particular heavy metal toxin compounds that massively affect our brains and nervous system. One is the combination of fluoride and mercury. The other one is the combination of fluoride and aluminum.

These compounds, when they come into contact with each other and create a compound in our body, and they float up into our brain, they cause neuron death. They kill brain cells. As they kill those brain cells, proteins are deposited in those areas and we have what are called the amyloid protein deposits. And those amyloid protein deposits don't contain memories, and they don't allow us to access memories, either. And so they cause memory dysfunction, and we call that Alzheimer's disease. That's one of the methods, one of the processes that can cause Alzheimer's.

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Parasites and Their Impact on Mental Health and Neurological Function

While most people don’t know it, many of the common parasitic infections that you can get lead to neurological symptoms. This ranges from mild to severe, depending on the type of infection and where.

Some parasites like Toxoplasmosis, have the ability to cross the blood-brain barrier and infect the central nervous system and the brain. This results in all kinds of neurological disturbances leading to psychiatric disorders and neurodegenerative diseases.

In this next section, we’ll be going into detail about the common parasites that are prevalent in the US and how they impact the brain. We’ll also share the natural solutions to safely cleanse

your body from parasitic infections. But first, let's talk about what parasites are and why everyone needs to know about them.

What are Parasites?

Parasites that affect human health can be categorized into three main groups: protozoa, helminths, and ectoparasites.

Protozoa are single-celled organisms that usually live in bodies of water and soil however, some are parasitic, which means they live in other plants and animals including humans, where they cause disease. *Plasmodium*, for example, causes malaria. [9]

While not all protozoa species are able to infect and harm humans, there are other types that cause infections that range from asymptomatic to life-threatening, depending on the species and strain of the parasite and the resistance of the host. [10]

Next, we will discuss helminths - parasitic worms - which we know well because they are common. These parasites feed on a living host to gain nourishment and protection while causing poor nutrient absorption, weakness, and disease in the host. These worms and larvae live in the small bowel and are referred to as intestinal parasites. [11] We will take a detailed look at the different types of intestinal parasites later on.

Lastly, ectoparasites are parasites that - as "ecto" suggests - live outside of their host.

For example, ticks are ectoparasites. It is important to note that most ectoparasites do not carry disease-causing agents; they are, instead, the direct cause of disease. [12] A study that investigated the effects of ectoparasites on animals, including horses, has shown that ectoparasites such as ticks and lice can cause anemia, as well as weight loss, which can even be fatal if parasite burdens are particularly high. [13]

Furthermore, arthropod ectoparasites not only cause direct harm to humans by sucking blood but, moreover, are important vectors of infectious diseases affecting our species. [14]

This leads us to ask why parasitic infections have been neglected, especially in first-world countries. The first thing to consider is that Big Pharma promotes the myth that a course of antibiotics is enough to clear a parasite infection.

It is also very common for people to go on these antibiotics frequently. When antibiotics are used to get rid of the parasites, most will grow back with eggs if you do not follow the proper procedures. [15]

We often want a magic pill that will sort the problem out quickly, but when it comes to parasite infections we need to follow a holistic approach and practice patience. One reason our experts recommend using this approach is that, as parasites die, they give off noxious fumes that could

cause you to feel horrible. Sometimes our bodies can't deal with the toxic overload of all these harmful substances being released in such a short span of time. [16]

Western doctors and Big Pharma usually give medications that kill parasites within a day or two. This could lead to horrible side effects. Additionally, as we mentioned earlier, anti-parasitic drugs promoted by pharmaceutical industries work by preventing the worms from absorbing the sugars they need for survival. They kill the worms but not the eggs. [17]

What happens then is the eggs lead to reinfestation. This is why using an ongoing approach works better compared to a one-day kill cure.

We need to work on promoting an anti-parasitic environment in our bodies, avoid common risk factors, and follow the correct parasite cleansing protocols for the recommended amount of time. We will discuss the proper protocol later on in this eBook.

Why Everyone Needs to Know About Parasites

According to an article by the CDC (Centres for Disease Control and Prevention), "A parasite is an organism that lives on or in a host organism and gets its food from or at the expense of its host". [18]

There are several parasites in the environment that can get into the body and cause chronic health problems. [19] Currently, there are six known parasites that infect people living in the US.

In fact, let's start by discussing one of the biggest misconceptions: that parasites only infect people in third-world countries.

Most people living in developed countries have no idea how susceptible they are because the medical community has largely neglected the topic of parasitic infections in humans, particularly in the US, and so they have not been treated effectively.

According to the CDC Director, Tom Frieden, "Parasite infections are more common in the US than people realize, and yet there is so much we don't know about them. We need research to learn more about these infections and action to better prevent and treat them". [20]

This is evident when we look at one of the most common parasitic infections prevalent in the US known as Toxocariasis. Research has estimated that millions of Americans have been exposed to the Toxocara parasite. [21]

What Increases the Risk of Parasitic Infections?

We've established that pretty much everyone, everywhere is susceptible to parasite infections. Besides being relatively easy to contract, parasites exist around the world and can afflict

anyone, regardless of their socioeconomic status and whether they live in a rural or urban environment. [22] No one is exempt because it's almost impossible to avoid all of the risk factors.

Contaminated Water

This is one of the common ways that someone can become infected with a parasite. What's frightening is that many of these parasites are present in tap water. This is why it is a great idea to get some sort of water filtration system to ensure that your drinking water is clean.

Parasites can, however, be picked up through other contaminated water sources. Cryptosporidium, for example, is a parasite present in lakes and rivers through sewage and animal waste. [23] Dracunculus Medinensis is a type of roundworm and when people swallow these parasites found in drinking water, larvae move from the intestines to the skin, where they cause sores. [24]

There are many other parasites that can be found in water bodies like lakes, ponds and even moving water bodies like rivers and streams.

Giardia infection (giardiasis), for example, is one of the most common causes of waterborne disease in the United States. [25] Additionally, Giardia parasites are found in lakes, ponds, rivers, and streams worldwide, as well as in public water supplies, wells, cisterns, swimming pools, water parks, and spas. [26]

Contaminated food

Contaminated foods are one of the biggest contributors to parasite infections and are considered a health concern worldwide. Animal products are one of the food sources that may be contaminated which includes pigs, cattle, fish, crabs, crayfish, snails, and aquatic plants. [27]

The parasites responsible for their contamination include trichinella, Gnathostoma, Angiostrongylus, Anisakis, Paragonimus, Clonorchis, Opisthorchis, Fasciola, Fasciolopsis, Echinostoma, Taenia, Spirometra, and Toxoplasma. [28] We will look at these in more detail later on.

Many people believe that they can only get parasites from eating meat but raw fruit and vegetables can also be contaminated. According to an article by *Science Direct*, the consumption of raw vegetables without proper washing is an important route in the transmission of parasitic diseases. [29]

Additionally, there are parasites that are responsible for contaminating both meat and fruits and vegetables, these may include the eggs of a variety of nematodes (e.g., *A. lumbricoides*) and cestodes (e.g., *E. granulosus*), together with oocysts (e.g., *Cryptosporidium*, *Cyclospora*, *T. gondii*) and cysts (e.g., *Giardia* spp.) of a variety of protozoans. [30]

For this reason, it is important to make sure that all your meat products are cooked well and fruit and vegetables are washed thoroughly and peeled when they have an outer skin that can be removed.

Contaminated soil

Leading to the transmission of parasites from fruits and vegetables, contaminated soil is one of the main causes. Many people are led to believe that only the poorest and most vulnerable people are susceptible to parasite infections due to contaminated soil.

This is not true and statistics show that in the Americas, soil-transmitted helminths are present throughout the Region. It is estimated that one out of every three people is infected with geohelminths. [31]

Unclean fruit and vegetables grown in contaminated soil are not the only sources of infection. There are other ways that soil contaminated with helminths can lead to parasite infections. According to the CDC, hookworm infection is mainly acquired by walking barefoot on contaminated soil. [32]

Even though it is unrealistic to say that you should wear shoes each time you go out in the garden or other places with dirt, it is possible to be more cautious and practice hygiene such as hand washing after gardening and being mindful of the places you walk barefoot.

Poor hygiene and sanitation

There is no time like the present to remind us of the importance of frequent hand washing. This is especially important after doing activities such as changing a diaper, cleaning out the cat box, using the toilet, touching your pet, gardening, or any other task that has the potential to carry parasites. It is also important to wash your hands before preparing food.

One should also consider warnings or guidelines under certain circumstances. An example is that expectant mothers are urged to avoid cleaning their cat's litter box and should be careful when handling raw meat as well. The risk of toxoplasmosis infection is higher if pregnant women eat raw or undercooked meat, or handle raw meat without immediately washing their hands. [33]

Age

This factor differs in that it does not directly lead to a parasite infection but it does determine your risk of getting one. Children are considered to be most at risk for parasite infections because they are more likely to put their contaminated fingers in their mouths.[34]They also play in areas like sandpits or in sandy areas in the garden that put them at risk.

According to the CDC, Parasitic infection or infestation can occur in children of all ages. Infants, toddlers, and very young children in daycare settings are at risk for the parasitic disease called giardiasis that causes diarrhea and is spread through contaminated feces. [35] Additionally,

Children can also be born with this infection if their mother was infected during pregnancy. [36] It is important to note that all ages are susceptible to parasite infections and precautions should always be taken.

Immunocompetence

Having a lowered immune system can increase the chances of being infected with parasites. This is especially true for pregnant women where parasitic infections are common due to reduced body immunity. [37]

Not only are immunocompromised individuals most at risk for getting infected but studies have shown that immune compromise can modify the severity and manifestation of some parasitic infections. [38]

Other factors leading to immunocompetence includes:[39]

- Chronic medical conditions, such as heart disease, lung disease, diabetes, HIV and AIDS, and cancer
- Autoimmune diseases, such as lupus, multiple sclerosis, and rheumatoid arthritis
- Medications or treatments, such as radiation therapy
- Undergoing transplants, such as bone marrow or organs
- Advanced age
- Poor nutrition

How are parasites linked to Mental Health and Neurodegenerative Diseases?

Parasites are foreign to the body. This means that the body recognizes that they should not be there and inflammation levels increase. Inflammation caused by a parasitic infection can send the immune system into overdrive. [40]

Healthy individuals may have no symptoms at all but those with genetic predisposition, along with other risk factors such as poor diet, are likely to experience an autoimmune response or one that is worsened by the presence of parasites.

A journal published by Biomedical states that, in the parasite-host relationship, the host gets nothing in return but harm or damage [41] This is because parasites suck the nutrients from your body. When you have an autoimmune disease, getting enough nutrients is key.

Parasites cause an autoimmune response when they cause inflammation in the body. When activated, regulatory proteins such as interleukins, other cytokines, and dendritic cells are set in motion. [42] These are responsible for the inflammatory response in the body. This response can affect the joints, eyes, lungs, and brain.

This increase in inflammation in the body and brain is the precursor for the onset of mental illnesses and neurodegenerative diseases.

The Mental Health Illness and Neurodegenerative Diseases Triggered by Parasitic Infections

Parasitic infections have been shown to lead to a range of different diseases. Different people manifest various symptoms depending on their immune response and other factors that we discussed above.

To get an idea of how severely parasites can impact your neurological functioning, consider the fact that there is a dedicated branch of biology that studies this called Neuroparasitology. These scientists actually study how parasites can control the nervous system of the host - but not in a Sci-Fi kind of way.

This is seen more in how they can alter the behavior of their host. A study published in 2011 by Emese Prandovszky and colleagues concluded that a parasite can directly alter dopamine signaling to mediate host behavior changes. [43] It is suggested that this is how T. gondii causes behavioral changes in those infected.

And when it comes to symptoms like brain fog, fatigue, depression, and other mood disorders, there are so many factors that may play a role. However, many studies have linked parasitic infections to these symptoms. A study published by Michigan State University looked at the link between toxoplasma gondii parasitic infections and suicide attempts.

The study found that if you are positive for the parasite, you are seven times more likely to attempt suicide. [44] Researchers also found the link between brain inflammation and suicide attempts.

The study concludes that inflammation, possibly from an infection or a parasite, likely causes changes in the brain's chemistry, leading to depression and, in some cases, thoughts of suicide. [45]

A very interesting article posted by Frontiers in Psychology examines the way parasites alter mental functioning in their hosts. One of the concepts they outline is that some parasitic fungi and worms manipulate their host's navigational system in strange ways. Such manipulation ends with the suicide of the host. [46]

Brain fog is a symptom that people experience that is characterized by the feeling of functioning at a lower mental capacity than usual. One may feel sluggish or unable to focus. An article published by PubMed reviews the effects of parasites on cognitive function in children. The study found that poor performance on the attention task showed a significant association with parasite status. [47]

A big warning sign of parasitic infection is chronic fatigue. In fact, parasites steal your nutrition. It's exactly because of the fact that some creepy crawlers are depending on the nutrients in the food you eat that you tend to feel tired and fatigued all the time. [48]

Parasites That Cause Infection in the US

We mentioned earlier that there are parasites that are common, even in first-world countries like the US. Knowing about the risk factors that may lead to an infection is a great way to take precautions so that you can limit your exposure. It also helps us to understand how to go about treating these.

According to the CDC, parasitic diseases in the United States that are priorities for public health action are based on the number of people infected, the severity of the illnesses, and our ability to prevent and treat them. [49]

In America, there are five known parasites that cause infection and are listed as neglected infections by the CDC: Trypanosoma cruzi, taenia solium tapeworm, Toxocara, toxoplasma gondii, and trichomoniasis. We will discuss these in detail and look at the effects that these parasites have on the body.

Trypanosoma cruzi

This parasite is a protozoan, meaning that it lives in the blood or tissue of humans and is transmitted to other humans by an arthropod vector (for example, through the bite of a mosquito or sandfly). [50]

This parasite causes Chagas' disease which causes potentially life-threatening diseases of the heart and gastrointestinal tract. [51] Trypanosoma cruzi is also referred to as American trypanosomiasis due to its prevalence in America.

One of the main routes of transmission is through the triatomine bug, widely known as the kissing bug. The parasite is transmitted to hosts through the kissing bug when they bite their host and subsequently defecate near the site of the bite. The parasites live in the digestive tract of the bugs and are shed in the bug feces. [52]

There are other modes [53] of transmission including transmission to infants during pregnancy when their mother is infected, through blood transfusions where the donor is infected, through organ transplants where the donor is infected, and oral transmission.

There are two reported phases of infection; the acute phase and the chronic phase.[54] [55]

The chronic phase of the disease sees the parasites hidden mainly in the heart and digestive muscles.[56]According to the WHO (the World Health Organisation), up to 30% of patients

suffering from cardiac disorders, and up to 10% suffer from digestive (typically enlargement of the esophagus or colon), neurological or mixed alterations. [57]

It is also good to be proactive by using control and prevention methods to avoid being infected. These include blood screening to prevent infection through transfusion and organ transplantation and to increase detection and care of the affected population, doing antiparasitic treatment [58][59]in the event of pregnancy, screening newborns of infected mothers, ensuring the environment is clean and use natural pesticides to prevent contact with kissing bugs.[60]

A study published by Ezequiel Córdova and colleagues showed that in the chronic phase, isolated cases of central nervous system involvement include dementia, confusion, chronic encephalopathy, and sensitive and motor deficits.[61]

Taenia solium tapeworm

This particular parasite is found in pork. The infection occurs when the infected pork is not cooked adequately and is consumed. Cysticercosis is the infection that occurs in this instance and, according to a journal published by the US National Library of Medicine, has been increasingly recognized as a cause of severe but preventable neurologic disease in the United States. [62]

Cysticercosis is a parasitic tissue infection caused by larval cysts of the tapeworm - *Taenia solium.* [63] This disease can have devastating effects because the larvae (cysticerci) may develop in the muscles, skin, eyes, and the central nervous system. [64]When these cysts develop in the brain they lead to neurocysticercosis. Recurring seizures occur in 50–70% of people with neurocysticercosis.[65]This disease can be fatal and can be recognized by additional symptoms, other than epileptic seizures, such as: [66]

- Chronic headaches
- Increased pressure in the brain
- Neurological problems that affect the function of the spinal cord, brain, or nerves
- Reduced ability to think and remember

If one suspects they are infected they can consult with their doctor. Testing involves neuroimaging technology which has advanced that neurocysticercosis diagnoses have become more accurate over recent years. [67]

Symptoms may occur when the tapeworms become fully developed in the intestine, approximately 8 weeks after ingestion of meat containing cysticerci. [68]

There are other modes of infection, apart from consuming undercooked pork, which include drinking contaminated water and interacting with contaminated animals and contaminated soil. [69]

In the instance of mild infection where the infected person has little or no symptoms and the tapeworm grows into an adult in the intestine, the tapeworm can live as long as 20 years, be up to 50 feet long, and attach themselves to the walls of the intestine without treatment. [70] While surgery is sometimes needed in the case of neurocysticercosis, it is rarely necessary. We will discuss treatment options later.

Toxocara

Toxocara is a roundworm that is a helminth and there are two types of Toxocara parasites. *Toxocara Canis* comes from dogs and, less commonly, *Toxocara cati* from cats. [71]These parasites are responsible for an infection called Toxocariasis. According to the CDC, approximately 5% of the U.S. population has antibodies to *Toxocara*. This suggests that tens of millions of Americans may have been exposed to the *Toxocara* parasite. [72]

This parasitic infection is picked up from soil that has been contaminated by Toxocara parasites through the feces of cats or dogs. Additionally, it is listed among the five most neglected parasitic infections according to the US Centers for Disease Control and Prevention (CDC). [73]

A study published by Any Docu Axelerad and colleagues shows that… [74]

"Toxocariasis that is located in the nervous system is a chronic disease that may recur for a considerable amount of time and may interfere with the functions of the nervous system, characterized by a decrease in cognitive capacity, neuropsychological impairment, depression, behavioral alteration, and neurodegenerative diseases.""

Toxoplasma gondii

This parasite causes an illness called Toxoplasmosis. It falls under the protozoan classification. Toxoplasmosis has become widely known due to how dangerous the infection is for pregnant mothers and unborn children.

This is referred to as congenital toxoplasmosis. For pregnant mothers, it can cause miscarriage or stillbirth. [75] For children, it can cause progressive visual, hearing, motor, cognitive, and other problems. [76]

Not only is this parasitic infection dangerous to pregnant women but, again, Toxoplasma gondii is a leading cause of severe foodborne illness in the United States. [77] There are four ways that this parasite can be passed on: through food, transmission from animals, from mother to

child in pregnancy, and through rare instances such as through organ transplants or blood transfusions where the donor was infected.

Cats are mostly responsible for carrying the infection. Cats can become infected by eating infected rodents, birds, or other small animals. The parasite is then passed in the cat's feces in an oocyst form, which is microscopic. [78] For this reason, it is highly recommended that pregnant women do not handle litter boxes and wash their hands after handling their feline friends.

Apart from pregnant women, the CDC notes that more than 40 million men, women, and children in the U.S. carry the *Toxoplasma* parasite, but very few have symptoms because the immune system usually keeps the parasite from causing illness. [79]

Infection with this parasite has been shown to impact the brain and neurological functioning. A study published in the *Journal of Neuroinflammation* found that in outbred mice, chronic, adult acquired T. gondii infection caused neurologic and behavioral abnormalities secondary to inflammation. As well as loss of brain parenchyma - the brain cells and neurons, resulting in the loss of cognitive ability and cognitive decline. [80]

Again, prevention is the best option when it comes to toxoplasmosis. Ensuring great hygiene practices with your household cat such as keeping your cat indoors whenever possible, not allowing the cat to hunt and eat birds or other wildlife, and feeding your cat canned or dry foods, instead of raw meat. [81]

Trichomonas vaginalis

Unlike the previous parasitic infections that we've discussed, trichomoniasis is transmitted sexually. According to the CDC, In the United States, there were an estimated 2.6 million trichomoniasis infections in 2018. [82] This infection is caused by a one-celled protozoan organism called *Trichomonas vaginalis*. [83]This parasitic infection is more common in females and is transmitted through unsafe sex practices.

Preventing trichomoniasis is routed in sexual abstinence or ensuring safe sexual practices. It cannot be spread through sharing saliva, eating or drinking utensils, or toilet seats.

Infection with this parasite also impacts the brain. A nationwide population-based cohort study conducted by Hsin-Chung Lin and colleagues found that the study subjects infected with Trichomonas had a higher risk for developing an individual psychiatric disorder, including depression, anxiety, bipolar disorder, schizophrenia, and substance abuse. [84]

How to Test For Parasites

Testing can be done in the following ways:

- Stool samples before taking any treatments
- The “Scotch tape” test
- For more severe infections, the doctor may do x-rays with a barium solution

How To Remove Parasites From Your Body

Parasites love to clog up the liver bile duct. Bugs and pathogens in general love to cause stagnation of the body fluids because it gives them an environment in which they can thrive. A lot of great natural products are available that can really change lives and help people with parasites.

Herbs

These three herbs kill over one hundred different parasites: green/black walnut hull, fresh ground clove powder, and wormwood. All three herbs must be used together to kill the worms, larvae, and eggs all at once. Tinctures and capsules are the most common forms available.

Mimosa Pudica from the seed, which is the fat-soluble portion, works really well against parasites. It releases tannins and alkaloids that help kill parasites, and its sticky gel grabs parasites and moves them out of the body.

It works best to take it on an empty stomach, and don’t take binders, such as clay, bioactive carbon, or diatomaceous earth, within one hour of taking Mimosa Pudica.

Well Of Life’s Purify 360

ParaPurify helps eliminate parasites from your body naturally. It supports digestive, colon, immune, and liver health, promotes a balanced inflammatory response and detoxification, and provides antioxidant support. It contains potent anti-parasitic natural Ingredients, including:

Organic Mimosa Pudica: Works its way through the intestinal walls, pulling out parasites, toxins, heavy metals, biofilms, and other unwanted elements to provide immune and digestive support.

Organic black walnut hull powder: Black walnut contains juglone, which has been shown effective at expelling parasites from the body.

Fulvic mineral powder: This nutrient-rich soil-based compound supports detoxification, parasite removal, digestive health, and immune health.

Humic acid powder: This mineral-rich substance made from humus supports intestinal health and detoxification.

Organic triphala powder: This staple of Ayurvedic healing nourishes the digestive tract, supports colon cleansing and detoxification, supports a healthy inflammatory response, and provides antioxidant benefits.

Organic neem leaf powder: Another Ayurvedic healing nutrient that supports parasite removal, detoxification, immune function, gastrointestinal health, and liver and skin health.

Organic wormwood herb powder: A natural herb containing compounds such as artemisinin, that help cleanse the body of harmful organisms such as parasites. Also supports liver and digestive health.

Additional ingredients include organic clove powder, organic aloe vera extract, and organic garlic extract.

Expert Insight

Dr. Cathleen Gerenger

A lot of times when you have that tight junction, it becomes loose like this and you have protein seeping through, not only the protein seeping through, you have food allergens. And then it creates this autoimmune response where it weakens your immune system so more parasites, more fungus, things start to invade your gut lining, so it causes an imbalance in your microbiome. In order for us to really create this whole system and rebalance that gut microbiome, you have to detoxify. Get rid of those parasites. Get rid of those toxins. And how can you do it? Number one, move your bowels. That's so simple. Try to poop every day, or even twice a day.

Slippery elm is one of the great things to move your bowels. Marshmallow root. That's another herb that you're able to take to really help you move your bowels because once when you move your bowels, it's not sitting in your stomach anymore. And I often have patients that say, "But Dr. Gerenger, I move my bowels every day. How come I still have these issues?" Going back, remember how long your small intestine is? It's about 23 feet long.

Your large intestine can be approximately 25 to 27 feet long. So maybe you're just dumping only the lower half of your large intestine and not the upper half. So that's why, when you introduce new food in, you're burping, you're belching because it's been fermented. It's fermented right in your gut. And yes, so that's just disgusting. So I was like you have to make sure that you put the right nutrients back in there and get that bowel movement going.

So one of the important ingredients that really helps your body detoxify is Rhodiola Rosea and also silymarin. What's silymarin? It's milk thistle. Actually, I've seen on laboratory results where I see AST and ALT, those are liver enzymes. Once we're able to balance and detoxify their body, their liver enzymes start to decrease so that conversion finally is occurring.

That means that the thyroid, at a cellular level, is able to repair itself. What we need to do is that, if we're able to get rid of these parasites and really get rid of this heavy metal that's bombarding your body and your thyroid on a regular basis, you're able to heal your glands properly so your body can actually function normally, so your immune system finally can rest, so it's not always in that fight or flight response constantly.

Glutathione is one of the major detoxifiers. Sometimes our body is low in glutathione. So what happens is that when your body's low in that it cannot go through that detoxification process. So you need the help that your body is able to push through it by supplementing yourself with the right herbs and the right nutrients so it can shut down the right pathway.

Going back to autism and Alzheimer's, we're talking about the gut and the brain again. For patients that have low glutathione, what happens is that they are more prone to autism, or even Alzheimer's, dementia, or senility. So it's so important for us to boost that immune system, and really detoxify the body and also nutrify that body. Put the right nutrients back in there so your body's immune system can function at its optimum level, because 80% of your immune system is in your gut.

Jonathan Otto:
So let's talk about some of the key tools that people can use in cleansing from parasites and even toxic heavy metals.

Dr. Cathleen Gerenger:
Exactly. So these are the tools and these are the solutions that you can actually take charge before all this stuff happens. Number one, detoxify. How do you detoxify? Simply, get rid of those parasites. Research shows that black walnut actually helps to get rid of these little creeps, and also Mimosa Pudica is another ingredient that really helps to fight these little parasites. What we want to do is that we want to also add in the right minerals. Fulvic acid is shown that it has about 71 different kinds of minerals, and it's kind of like what's on our periodic table.

Your body has all the stuff it needs in order for it to heal itself, so if you're able to put those nutrients back in your body, your body has the ability to heal from the inside out so your intestinal lining, so that tight junction, can actually be nice and tight, and not loose again, to prevent your body from cascading to autoimmune disease number two, autoimmune disease number three. Once, when you're diagnosed with one autoimmune disease, your chance of having multiple types of autoimmune disease just goes on a rampage because that immune system is so overworked and it is so tired. Make sure you're able to detoxify, get rid of the parasites, lay a really good lining in your digestive tract so then you're able to nutrify, fortify, and use a positive mindset to reset everything.

Jonathan Otto:
Dr. Gerenger, there's a couple more there that you are thinking about, so why don't you just explain a couple more of those tools that someone can use?

Dr. Cathleen Gerenger:
Another one that I absolutely love is wormwood. That's another great parasitic detoxifier. What that does is that it actually kills those eggs. These parasites, they have hatchlings, they keep hatching. That's why it's so important for you to go through it. When you go to your doctor and your doctor places you on the antibiotics, what does the doctor say? "Make sure you take your antibiotics for 21 days or 30 days." Why? Because it's trying to kill all that ... Well, they think it's trying to kill all that microbes. That same analogy can go to parasites. However, antibiotics means anti the good biome. So a patient that goes through a round of antibiotics, I would always tell them "Make sure you detoxify your body and put all that good microbiome and balance that microbiome again."

The next thing that I usually love to help the body to get rid of parasites and support your body from the inside out is clove. Clove is one of the highest antioxidants, it's actually an antioxidant, and it's also an herb that it's able to actually try to get rid of these parasites. So it supports your microbiome and balances that intestinal mucosal membrane so your body can heal properly. Another great ingredient that we usually love when it comes to supporting your intestinal tract to prevent your body from having these parasitic infections or even parasites, is what we call neem. In ancient history, people always used neem as one of their antibiotics. It's like a natural antibiotic. And, of course, you heard of neem leaf, or sometimes you find it in toothpaste instead of fluoride, they used neem for that. And that really helps to safeguard your microbiome by having these parasites invade it. "But why? Why does my body have parasites?" you would ask. Well, because if your immune system is compromised, there has a higher chance of it being sick, being ill, and being invaded by all these microbes such as parasites.

So it's really important for us to understand that your immune system is 80% in your gut, in your microbiome. So what you want to do is that you really want to fortify your body. First, you want to detoxify it. Make sure you are able to find something that's able to support your gut microbiome by preventing those parasitic invasions. What can you do? Make sure that that particular product has black walnut in there, Mimosa pudica, wormwood, clove, and neem. Those are really, really important to safeguard your body from these parasitic invasions. And what it does is that it helps to heal your gut lining from the inside out. So what we want to do is that first we want to detoxify your body, so you have to take action in order for you to really support your microbiome with the right kind of nutrients.

So what you want to do is that you want to be able to nutrify your body. The things that I find that really helps to really reline that intestinal wall is Slippery elm, marshmallow root, L-glutamine. Also, what we want to do is that we want to have the right type of aloe in order for you to move your bowels. It's so important for you to rebuild that gut. So a really good formulation for a gut rebuilder is so important because that's the second step. That second step is really, really critical. You already got rid of those toxins. Let's go ahead and put all the good food back into your body so your body, your intestinal tract, can heal from the inside out. So make sure you take action and really start somewhere instead of sitting there being so confused and not know what to do because that autoimmune process is happening right now. So you have to take control and really balance that gut flora.

So what I really love about this gut rebuilder is that it really helps to seal that gut junction. It reduces that inflammation process that's happening inside your gut lining. One great thing about the gut rebuilder is that it's able to really help to stop that cellular process from attacking your glands. So what you want to do is that you want to take control of your health because you live in it. So take action and just try that gut rebuilder because it really helps you and it heals your body from the inside out, by nourishing your body with the right ingredients that helps your body heal from the inside.So don't forget 80% of your immune system is actually in your gut. So we have the solutions for you. These ingredients that actually really help to fortify your body in order for that tight junction not to break loose where it creates this inflammatory process where it starts attacking you at a cellular level. So what's the next step? It's going to attack your glands.

So take action. You live in your body, you know your body best, so you know that there's something going on in there, so be proactive and really fortify your body by putting the right nutrients back in. And the gut rebuilder is such a great product, and I love the fact that Jonathan is so passionate in what he's doing, and all the formulations, all the ingredients are placed together to provide the solution that you actually need in order for your intestinal mucosa membrane, that permeability, in order for that to really be healthy again, you have to address all of this. So what I want you to do is take action, take control of your health, and really change your life because in order for you to heal, it has to be from within.

Conclusion

We only get one life and one body. One of our greatest responsibilities is to take care of our health. Too many people are unaware of the serious danger that prolonged build-up of toxins can actually do to their bodies.

When it comes to the brain, much of the damage caused by heavy metals and parasites can’t be reversed. The ongoing instance of both leads to neurological damage and manifests in symptoms of mental illness in many cases.

More serious cases lead to more intense harm to the brain and nervous system and easily cause neurodegenerative diseases. And while you can try to limit your exposure to heavy metals, parasites, and other harmful toxins, you cannot completely avoid them.

This means that everyone should be taking action to frequently detox their bodies. Consistently doing so will protect your brain from damage, lowering your risk of developing mental illnesses and neurodegenerative disease. In this instance, prevention is most certainly always better than cure.

References:

1. https://pubmed.ncbi.nlm.nih.gov/33210961/#:~:text=Accumulation%20of%20metals%20renders%20the,neurogenesis%2C%20and%20impaired%20energy%20metabolism
2. https://pubmed.ncbi.nlm.nih.gov/26142507/#:~:text=During%20circulation%2C%20toxic%20metals%20passes,neurotoxicity%20and%20heavy%20metal%20poisoning.
3. https://www.intechopen.com/chapters/64762
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4026128/#:~:text=A%20number%20of%20studies%20have,the%20most%20affected%20cognitive%20skill.
5. https://www.med.or.jp/english/pdf/2006_03/112_118.pdf
6. https://pubmed.ncbi.nlm.nih.gov/31738976/#:~:text=Epidemiological%20data%20have%20linked%20cadmium,thus%20exerting%20its%20toxic%20effects.
7. https://www.sciencedirect.com/science/article/pii/S0147651321003225
8. https://www.researchgate.net/publication/275116480_Cilantro-Culinary_Herb_or_Miracle_Medicinal_Plant
9. https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology/protozoa.html
10. https://www.ncbi.nlm.nih.gov/books/NBK8325/
11. https://www.news-medical.net/health/What-are-Helminths.aspx#:~:text=Helminths%20are%20parasitic%20worms%20that,referred%20to%20as%20intestinal%20parasites.
12. https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/ectoparasite
13. https://royalsocietypublishing.org/doi/10.1098/rstb.2017.0207
14. https://royalsocietypublishing.org/doi/10.1098/rstb.2017.0207
15. https://www.doctoroz.com/blog/parasites-2649598275
16. https://www.thepearldayspa.com/blog/not-worried-about-parasites-you-should-be#:~:text=As%20parasites%20die%2C%20they%20give,a%20short%20span%20of%20time.
17. https://patient.info/skin-conditions/itchy-bottom-pruritus-ani/worm-medicines-anthelmintics#:~:text=Book%20now-,How%20do%20medicines%20for%20worms%20work%3F,worms%20but%20not%20the%20eggs.
18. https://www.cdc.gov/parasites/about.html#:~:text=A%20parasite%20is%20an%20organism,protozoa%2C%20helminths%2C%20and%20ectoparasites.
19. https://www1.health.gov.au/internet/publications/publishing.nsf/Content/ohp-enhealth-manual-atsi-cnt-l~ohp-enhealth-manual-atsi-cnt-l-ch1~ohp-enhealth-manual-atsi-cnt-l-ch1.5#:~:text=Some%20parasites%20enter%20the%20body,skin%20mites%20(scabies)
20. https://www.cdc.gov/media/releases/2014/p0508-npi.html
21. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4015569/
22. https://www.westchesterhealth.com/blog/10-signs-you-may-have-a-parasite-2/#:~:text=Not%20restricted%20to%20underdeveloped%20countries,that%20yes%2C%20they%20are%20treatable.
23. https://theberkey.com/blogs/water-filter/parasites-in-drinking-water-and-how-to-remove-them
24. https://theberkey.com/blogs/water-filter/parasites-in-drinking-water-and-how-to-remove-them
25. https://www.mayoclinic.org/diseases-conditions/giardia-infection/symptoms-causes/syc-20372786

26. https://www.mayoclinic.org/diseases-conditions/giardia-infection/symptoms-causes/syc-20372786
27. https://pubmed.ncbi.nlm.nih.gov/12041594/#:~:text=Sources%20of%20food%2Dborne%20products,frogs%2C%20snakes%20and%20aquatic%20plants.
28. https://pubmed.ncbi.nlm.nih.gov/12041594/#:~:text=Sources%20of%20food%2Dborne%20products,frogs%2C%20snakes%20and%20aquatic%20plants.
29. https://www.sciencedirect.com/science/article/pii/S2090506812000504#:~:text=The%20consumption%20of%20raw%20vegetables,the%20transmission%20of%20parasitic%20diseases.&text=There%20has%20been%20an%20increase,illness%20linked%20to%20fresh%20vegetables.
30. https://www.sciencedirect.com/topics/food-science/foodborne-parasite
31. https://www.paho.org/en/topics/soil-transmitted-helminthiasis
32. https://www.cdc.gov/parasites/hookworm/index.html#:~:text=Hookworm%20infection%20is%20mainly%20acquired,with%20hookworms%20have%20no%20symptoms.
33. https://www.winchesterhospital.org/health-library/article?id=156973#:~:text=While%20some%20cat%20feces%20do,lower%20the%20risk%20of%20toxoplasmosis.
34. https://www.stlouischildrens.org/conditions-treatments/roundworm-infections
35. https://www.cdc.gov/parasites/children.html#:~:text=Parasitic%20infection%20or%20infestation%20can,is%20spread%20through%20contaminated%20feces.
36. https://www.cdc.gov/parasites/children.html#:~:text=Parasitic%20infection%20or%20infestation%20can,is%20spread%20through%20contaminated%20feces.
37. https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-016-1413-6#:~:text=Parasitic%20infections%20are%20common%20among,complications%20%5B2%2C%203%5D.
38. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3109637/
39. https://www.healthline.com/health/immunocompromised-how-to-know-if-you-have-a-weakened-immune-system#What-can-cause-me-to-become-immunocompromised?
40. https://www.luminexcorp.com/blog/are-parasites-the-cause-of-excessive-tiredness-leaky-gut-syndrome-and-other-mystery-illnesses/
41. https://biomedres.us/fulltexts/BJSTR.MS.ID.002188.php
42. https://www.luminexcorp.com/blog/are-parasites-the-cause-of-excessive-tiredness-leaky-gut-syndrome-and-other-mystery-illnesses/
43. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3177840/
44. https://www.sciencedaily.com/releases/2012/08/120816170400.htm#:~:text=Brundin's%20research%20indicates%20a%20reduction,thoughts%20of%20suicide%2C%20she%20said.
45. https://www.sciencedaily.com/releases/2012/08/120816170400.htm#:~:text=Brundin's%20research%20indicates%20a%20reduction,thoughts%20of%20suicide%2C%20she%20said.
46. https://www.frontiersin.org/articles/10.3389/fpsyg.2018.00572/full
47. https://pubmed.ncbi.nlm.nih.gov/1809249/
48. https://www.geelongmedicalgroup.com.au/2018/03/signs-you-might-have-a-parasite-in-your-body
49. https://www.cdc.gov/parasites/npi/index.html

50. https://www.cdc.gov/parasites/about.html#:~:text=Protozoa%20that%20live%20in%20the,%E2%80%93%20the%20ameba%2C%20e.g.%2C%20Entamoeba
51. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3194829/#:~:text=cruzi.,are%20thought%20to%20go%20unrecognized.
52. https://kissingbug.tamu.edu/
53. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3194829/#:~:text=cruzi.,are%20thought%20to%20go%20unrecognized.
54. https://kissingbug.tamu.edu/
55. https://kissingbug.tamu.edu/
56. https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
57. https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
58. https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
59. https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
60. https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
61. https://pubmed.ncbi.nlm.nih.gov/20406601/#:~:text=In%20the%20chronic%20phase%2C%20it,and%20sensitive%20and%20motor%20deficits.
62. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2725874/#:~:text=Cysticercosis%2C%20a%20parasitic%20infection%20caused,States%20(1%E2%80%935).
63. https://www.cdc.gov/parasites/cysticercosis/index.html#:~:text=Cysticercosis%20is%20a%20parasitic%20tissue,in%20most%20low%2Dincome%20countries.
64. https://www.who.int/news-room/fact-sheets/detail/taeniasis-cysticercosis
65. https://www.medicalnewstoday.com/articles/neurocysticercosis#symptoms
66. https://www.medicalnewstoday.com/articles/neurocysticercosis#symptoms
67. https://www.medicalnewstoday.com/articles/neurocysticercosis#complications
68. https://www.who.int/news-room/fact-sheets/detail/taeniasis-cysticercosis
69. https://www.medicalnewstoday.com/articles/170461#treatments
70. https://www.medicalnewstoday.com/articles/170461#treatments
71. https://www.cdc.gov/parasites/toxocariasis/index.html
72. https://www.cdc.gov/parasites/toxocariasis/gen_info/faqs.html
73. https://thenativeantigencompany.com/toxocara/
74. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8014984/#:~:text=Toxocariasis%20that%20is%20located%20in,depression%2C%20behavioral%20alteration%20and%20neurodegenerative
75. https://www.healthline.com/health/congenital-toxoplasmosis#:~:text=Congenital%20toxoplasmosis%20is%20a%20disease,other%20problems%20in%20a%20child.
76. https://www.healthline.com/health/congenital-toxoplasmosis#:~:text=Congenital%20toxoplasmosis%20is%20a%20disease,other%20problems%20in%20a%20child.
77. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4015566/
78. https://www.cdc.gov/parasites/toxoplasmosis/epi.html

79. https://www.cdc.gov/parasites/toxoplasmosis/index.html
80. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2588578/
81. https://www.betterhealth.vic.gov.au/health/ConditionsAndTreatments/toxoplasmosis
82. https://www.cdc.gov/std/trichomonas/stats.htm#:~:text=States%2C%201966%2D2017-,Prevalence,participated%20in%20NHANES%202013%2D2016.
83. https://www.healthline.com/health/trichomonas-infection#causes
84. https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-019-3350-x