Worms for Your Health --

In this Dr.'s Q&A, Joel Weinstock, M.D., explains why he tells his patients to drink a glass full of worm eggs.

Tell me a little about inflammatory bowel disease.

Dr. Weinstock: There are a variety of diseases that have been emerging in developed countries, and we call these immunological diseases. One of these immunological diseases is called inflammatory bowel disease. This is a condition that comes on in young people, usually beginning when they're teenagers or in their early 20s. These people develop inflammation of the colon or small bowel that results in severe diarrhea, crampy abdominal pain, rectal bleeding, fatigue, and other medical problems. Inflammatory bowel disease, once it begins, continues usually for a lifetime. So young people develop these conditions and they have to put up with them for most of their lives. There are two basic types. One is called Crohn's Disease, and one is called ulcerative colitis.

What are the symptoms?

Dr. Weinstock: What people suffer with is diarrhea, weight loss, abdominal pain, and fatigue. They have to take many, many pills. They often have to have surgery. The symptoms of this nature will come and go through a lifetime.

How common are inflammatory bowel diseases?

Dr. Weinstock: These diseases used to be very rare and in the 1930s, they began to be recognized. Now they have become relatively common -- at least they're common in industrialized countries. In some regions where they have an accurate count, such as Manitoba, Canada, some regions of the [United States], the frequency of this disease is now approaching 1 in about 250 people. It used to be a disease that was considered to be about 1 in 5,000. So it has increased substantially.

What are these worms you are using doing?

Dr. Weinstock: Let me give you some background into why we think this is happening. The condition, as I said, was very rare in the 1930s, and by the 1950s, it was recognized to be common in the northern part of the United States and rare in the south. The same thing happened in Europe. It was common in northern Europe and rare in southern Europe. In the 60s, it was said that at first it was thought to be predominantly a disease that affected Jewish people. Then it became a disease that affected white people, but never African Americans. Now it is a disease that affects all races, or ethnic groups, I should say. The condition is still extremely rare in underdeveloped countries. It doesn't seem to occur in Mexico, its rare in South American, its extremely rare in Africa. Most areas of Asia its very rare, except in Japan, in South Korea, where industrialization is going on.

A few years back, we were trying to figure out what could be causing these diseases. Everybody was looking for factors that could be causing it. Is it genetics? Is it something we're eating? Is it vaccinations? What are we being exposed to that could be causing these diseases? However, the epidemiological studies that were done over the years have not found the factor that causes these diseases. So, we took a different approach. We said that if it first started to emerge in the 30s, and it's been emerging in societies where quality of life is going up, perhaps it is related to something we're not being exposed to.

If you think about traditional human race, how we lived, right now many of us every night turn on the TV to watch Afghanis walking around their villages and children walking on dirt roads in fairly dirty clothing. That was the way the whole human race lived up until 70 or 80 years ago. We lived close to the soil. Hygiene was not nearly as good as it is today. It occurred to us that perhaps certain organisms that were in the soil were important to us and that not being exposed to certain organisms may be leading us to becoming more ill.

The intestinal tract of all animals contains billions of living organisms. When you go to the bathroom and have a bowel movement, half the weight of the stool is living bacteria. You are fertile bugs. Those bugs are important to you. They produce vitamins. They help you to digest your food. They help tone your immune system. We know that if we sterilized your intestine, if we took all the bacteria out of your gut, that you would die. You would become unhealthy and you would die. You need your intestinal organisms to be healthy. This is true of cats, dogs, mice and humans. We're no different.

One of the organisms that we have been limiting our exposure to is a group of organisms called helminths. Helminths are worm-like organisms that live in the GI tract. They can live elsewhere in the body, but the GI tract is the common place for them to live. These are not worms that live in the soil. They are not the type you get on fish hooks to catch fish. These worms live in the intestines.

Starting in the 1930s, we began to deworm our population. Traditionally, children would get worms from playing in the dirt. There were eggs in the soil, and when you play in the dirt, some of those eggs you can swallow. If you swallow, those eggs can hatch and grow into worms. With good sanitation, the soil is a lot cleaner. Kids still play in the soil anymore. They play in very sterile environments. They go off in sidewalks. The food supply is cleaner. The air is cleaner. The water is cleaner. Your ability to be exposed to these special organisms has gone way, way down.

Worms are organisms that live in the human body and they live in all animals. They can live in cats, dogs, and cows. Most of these wormlike organisms fall into a family called helminths. Most of them live in the GI tract. Some can live in the muscles or bloodstream. These worms are acquired mostly through sitting or being exposed to soil that contains the organism. The organisms either penetrate the skin, or you take it in your mouth through having dirty hands and touching your mouth with it or eating food that has a little dirt on it that contains some of these eggs. The eggs then hatch inside the body and grow into worms.

The worms in the GI tract can be a half-inch long or there are some types of worms that you can acquire that can be up to a foot long living in the GI tract of humans. Around the world today, most of the human race has worms as part of their GI. Worms can live in the small intestine, large intestine, depending on the nature of the worm.

As we clean up our environment, as we drink cleaner water, as we eat cleaner food, as we develop better sewer systems for ourselves, stool is not in the soil anymore, which is a way of transmitting eggs. People get less and less exposure. Back in the 20s, essentially all the children in the United States would be exposed to worms. Today, very few children in the United States are exposed to worms. In Africa, in South American, in Mexico, in most regions of the world, helminths and worms in the GI tract are normal. Through millions of years of evolution, all humans had worms. For the first time in history, starting about 70 years ago, we began having children being raised without worms in their GI tract. So it occurred to us that perhaps deworming was a negative thing to do and may have led to the development of some of these immunological diseases.

There is another reason we think these worms are important. Unlike the bacteria in your GI tract, the worms do something to our immune system that other organisms don't do. They tend to dampen immune responses. Inflammatory bowel disease is a disease of a hyperreactive immune system where your intestinal immune system starts reacting to your intestinal bacteria in an abnormal way. A heightened immune response leads to damages of the intestine. The immune system doesn't need to react that strongly to control the organisms in our GI tract. When we result in a hyperactive immune response, we damage the lining of our intestine and it results in Crohn's Disease and ulcerative colitis. When you have a worm, that reactivity of your immune system in the inner lining of your gut is dampened way, way down. This is a not hypothesis; this is known. We speculated that deworming led to hyperactive immune reactions and led to the development of many of the cases of inflammatory bowel dieses that we are seeing today.

That is interesting. You studied this then?

Dr. Weinstock: We've been studying for years the immune reaction of worms, how worms affect our immune system. We've been studying inflammatory bowel disease and we made the connection about five years ago that perhaps they were related to each other.

Are you only studying one worm?

Dr. Weinstock: We study helminths and how they live.

In other words there are worms that are dangerous to our health?

Dr. Weinstock: Yes, not all worms are healthy. Most of them have a low pathogenic potential. Some can cause disease.

What does that mean, low pathogenic potential?

Dr. Weinstock: What it means is just like the bacteria in your GI tract is good for you, but every now and then people get sick from their gut bacteria. Worms usually don't cause significant disease, but occasionally they do. They usually do. There are some types of worms that could be much more likely to cause disease. There are worms like pinworms that don't cause any disease at all. So it depends. There are different organisms like there are different bacteria.

Do you think helminths are healthy?

Dr. Weinstock: We think the helminths are particular organisms that the body needs, and when we eliminated them from the body, we affected our immune systems that has not been healthy. Nothing else compensates for the loss. So, its perhaps losing these organisms, particularly during childhood, resulted in the development of abnormal immune systems. Your immune system that you have today came from your lifelong exposures. How you react to organisms, how you react to things in your environment is a learned process; it's an educated process. So, what you're exposed to as a child will determine how your immune system will be as a teenager and in your 20s. If you're not exposed to a traditional environment, it's very likely that you'll grow up with an immune system that won't be like children of old. Lack of exposures to certain things may not be healthy. Maybe you can be too clean.

Do you think this is the main link with IBD, or is it also genetics?

Dr. Weinstock: This is unknown at this time. Genetics plays a role -- that is you're born with genes that predispose you to things. We think that 70 percent of the story is environment and how we're raised and what we're exposed to. Whether the worms are the critical link or an important link or one of the links that leads to this disease is what's currently being studied. It is our strong belief that we're beyond the stage of saying well, do they do anything at all? No. I think it is becoming clearer and clearer that they are going to be a factor in the development of this disease.

What have your studies shown so far?

Dr. Weinstock: We've done two levels of studies. One series of studies has been done with animals. We've developed a variety of animal models, particularly mouse models, of inflammatory bowel disease, where we give them helminths and it can protect those mice from inflammatory bowel disease. We also did a series of open label studies with patients to see whether helminths would likely to be safe and perhaps beneficial for these patients. The open label studies were approved. We didn't just do it from nowhere; we have to get strict approval to do such studies. But, we found a helminth in the animals that seemed to be safe to use in humans. We got permission originally to do six patients as a safety study. That's where the patients know what they're getting; the doctor knows what they're giving the patients. Just to see if it would make them sick or have no effect at all. We gave it to the patients. None of the patients got sick, but to our surprise, after about two to four weeks, five of the six original patients went into complete clinical remission. The remissions lasted at the longest up to five months. Since then, we now have over 40

patients under treatment and we have a variety of double-blind studies underway to determine the efficacy -- whether this really does work.

A double-blind study is where neither the patient nor the doctor knows what the patient is getting. The patient is either getting a dummy pill, a sugar pill, or something that contains the real agent. People are not swallowing worms. There is nothing wiggling. They're swallowing microscopic eggs in a small drink, and there's no side effects, northing crawls out of them. It's proven to be very safe. Until the double-blind studies are done, we will not be able to say for sure whether this is a highly effective treatment, though we are very optimistic that this is going to be quite an advantage to patients in the future, particularly because they only have to take it once every two to three weeks and it is extremely safe. We suspect that it is going to be highly beneficial.

Do you suspect that it will be a lifelong treatment, or will they be treated for a year?

Dr. Weinstock: If we change the dose or a different agent. This is brand new. This has never been done before. This is a new concept, so that's why its attracted attention because the thought that you could be too clean, that being dirty can be healthy in some ways, that changing what lives in you could be bad for you by eliminating things. The thought that reintroducing things into the GI tract that are good for you is a new concept. Nobody has ever used these things before, so we don't know if giving a bigger dose, or a smaller dose, a more frequent dose, will ultimately result in cures. We do have long term remissions for people who have been in relatively good health; we've done that out to two years. There are other diseases to think about also. Another major one is multiple sclerosis, which is a degenerative disease of the brain. It follows the same pattern as inflammatory bowel disease. Common in the north, not in the south, industrialized countries, and probably is another disease affected by environment and the way we're living.

As a child, think about if you ever watched Little Rascals movies from the 30s and kids were playing in the mud and the soil and the food wasn't watched and people lived that way. That's the way people lived. Now, think of how you were raised as a child. You played in plastic playgrounds. Your backyard was perfectly manicured. How many people were raised with an outhouse or pooping in the fields. When you think about underdeveloped countries, children go to the riverbank and they have to relieve themselves, where do you think they go, to the bathroom? Then who plays in the soil after you? The next kid. So your exposure to things that in the cattle and the dogs and the horses and everything is all around you.

So it's found in just common soil, but not so much anymore as we've gotten cleaner. These worms really exist in common soils?

Dr. Weinstock: Right. They've evolved to be there. Now, worms can be very species specific. A human worm won't necessarily colonize a cat and a cat worm won't necessarily colonize you. So, the most common exposure is through stool. The worms are in you. They produce eggs. The eggs come out of you in your stool and then the stool fall into the soil. The stool would decay; the

eggs would remain and they can survive in the soil for a couple of years. They remain dormant in the soil for several years until somebody comes along and either digs in the soil, touches it, sits in it, or brings it to their mouth -- if you grew lettuce in it. Night soil is human waste thrown on fields. In underdeveloped countries, the less developed countries, they use human waste to fertilize fields. If there are eggs in there and you take the lettuce and you make a lettuce sandwich and these eggs are so small -- a single egg you wouldn't be able to see it; it would be less than a grain of sand -- that egg will hatch in you and form a worm. That's how you get worms. Or, if its one of the types that hatches in the soil and you don't wear shoes and walk through the dirt, it will come in through the skin. You won't feel it; it won't make you sick. But its something that enters your body, circulates in your bloodstream, and end up eventually getting into your GI tract.

Forever, or do they just live continually?

Dr. Weinstock: They have a lifespan of several years and so they can't multiply within you. So, that means that you have to be re-exposed to them in the soil every now and then to keep colonized. Children through the ages of 3 and 12 or 13 are constantly in the soil. As they get a little older, even in less developed countries, people are less close to the soil. So, worm colonization -- carrying worms, is a little less in adults than in children. But, your immune system is being educated, just like you're learning to read and learning to do math, your immune system is being educated as you're growing up as an adult.

We don't get those exposures anymore. We're not learning about those organisms. As a result, our immune function, if you compare our immune system to children who were raised in, let's say, Mexico or other countries, is very different. Our reactivity. We're prone to allergies; we're prone to hay fever. In many countries, there's no such thing as hay fever. Twenty-five percent of the American population sniffles. So, why? Its because we have a different immune system and we're prone to these immunological diseases. I would want to say very carefully that living in filth is not necessarily healthy. There's a lot of bad things you can pick up too. We are living longer and we are healthier than humans have ever been. But you can pick up salmonella and other bad organisms that could make you sick. So, good sanitation overall has been a plus, but in eliminating our exposure to some organisms, we are also eliminating our exposure to other organisms.

END OF INTERVIEW

your physician on medical matters.

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