

## Detecting Microbes

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Many of us have heard about illnesses caused by *Giardia* and other parasites, but we tend to overlook connections between these microbes and digestive disease. According to the Centers for Disease Control, microscopic parasites probably cause more than 90 percent of all parasitic infections in the United States. Many doctors believe we may be seriously underestimating parasites as contributors to disease. Worldwide, infectious diarrhea due to cholera, amoebas, *Giardia*, and *Blastocystis*, among others, is the second leading cause of death, fatal to 3 million people a year.

### Just A Tropical Disease?

We consider this type of problem an exception in America, a rarity. Most doctors and patients don't usually think of parasites as a common cause of illness. We assume we've eradicated these problems with modern sanitation and water treatment. But research shows that parasitic infection is common, and the incidence is increasing. In many cases these infections underlie familiar digestive illness and other conditions as well. Symptoms of intestinal infection are not isolated or unusual. Opportunities for exposure to and transmission of parasitic infection increase as overseas travel and immigration expand. Parasites are also transmitted in food processed through mass methods of farming, food manufacturing, and shipping from sources all over the world. Water treatment in huge urban systems is unable to totally eliminate contamination and periodically makes it worse. *Giardia*, for instance, is often waterborne, and these infections are on the rise. In 1997, The Wall Street Journal reported an average of 2 million cases annually in the United States. *Giardia* is also

a problem worldwide, even in some modern cities (via the public water systems). *Cyclospora*, a parasite in the news, is tracked as a new or emerging pathogen; sometimes it is transmitted on imported fruit. In 1996 it was found on Guatemalan strawberries and raspberries. However, it is also domestic and common in the United States; like all infectious agents, it can be transferred in stool, on human hands, and as contaminants in food, especially fresh vegetables and fruit, and water. *Cryptosporidium*, another waterborne parasite, caused illness in more than 400,000 people in Milwaukee in 1993. More than 4,000 were hospitalized, and more than 100 died. *Cryptosporidium* is found in the public water systems and reservoirs of many American cities. In some places, such as the San Francisco Bay Area, it is known to be transmitted by the runoff from hillsides where cattle graze, upstream from unprotected reservoirs.

### A Case of Undetected Infection

When he was about 6, Tony started having problems connected with his digestion. Tests for parasites came out negative. The doctor said it was ulcerative colitis and put Tony on a variety of medications, including steroids. However, his condition did not improve; in fact, it actually worsened. More tests were performed and a stool sample was sent to a lab specializing in the detection of parasites. An infection with *Entamoeba histolytica*, a common but virulent amoeba, was detected. Based on the information from the test results, another of Tony's doctors prescribed medication targeted at clearing the parasite, and his symptoms resolved.

It is impossible to determine if the *E. histolytica* infection caused the ulcerative symptoms (which it often does) or if an earlier intestinal condition compromised the integrity of the GI lining, paving the way for the *E. histolytica* to become established. It is clear that the host-parasite relationship was a causal influence, since the elimination of the parasite was instrumental in resolving the ulcerative condition. The key component here is the proper identification of the specific parasite in the test sample

What happened in Milwaukee drew the attention of the media and the public because so many people were affected. But doctors are coming to believe that all over the country this kind of infection happens every day. Most of us live crowded together in big cities, many of us travel overseas, we frequently have contact with

people from all over the world, and we have many opportunities for exposure.

In a survey of 5,792 samples received at the Parasitology Center, Inc., in 2000, of 2,896 patients, 916 (32 percent of) patients were infected with parasites; higher than the previously reported national average of about 20 percent.

### A Sample of Intestinal Infections, in the U.S. (2000)

A survey of 5,792 samples from 2,896 patients, received at the Parasitology Center, Inc., Scottsdale, Arizona

Pathogen	% of Samples Infected	Digestive Symptoms	General Symptoms
<i>Blastocystis hominis</i>	72%	Flatulence, bloating, diarrhea, cramps, constipation, poor digestion/poor absorption	Fatigue, nervous and skin disorders, pain, skin conditions, nausea, allergies, muscle problems
<i>Entamoeba histolytica</i>	7%	Diarrhea, constipation, cramps, bloating, flatulence	Fatigue, nausea, allergies, pain, weight loss, insomnia
<i>Entamoeba coli (E. coli)</i>	5%	Diarrhea, cramps, flatulence, bloating, constipation, irritable bowel	Fatigue, allergies, headache, nausea, depression/irritability, joint/back pain, skin problems
<i>Cyclospora</i>	2%	Sypmtoms that come and go, bloating, flatulence, diarrhea, cramps	Fatigue, itching, nausea, anemia, headache, muscle aches, depression
<i>Entamoeba hartmanni</i>	1%	Diarrhea, bloating, cramps, flatulence, irritable bowl	Nervous system, respiratory, and skin disorders, allergies, pain, nausea

Source: O.M. Amin, "Seasonal prevalence of intestinal parasites in the United States during 2000." *American Journal of Tropical Medicine and Hygiene*, vol 66, no. 6 (2002): pp.799-803

Among this sampled population, we noticed a number of typical characteristics.

More than half the people with infections had traveled overseas in the past five years.

- ◆ People traveling to Mexico and Europe had the highest risk of infection.
- ◆ People living in households where someone was infected had twice the risk of infection.
- ◆ Of people who were infected, some had no symptoms.
- ◆ This implies that some people unknowingly act as carriers. Since they have no symptoms, they might be unaware of the problem, go untreated, and unknowingly pass it on to others.
- ◆ People infected by more than one parasite had symptoms similar to those with single infections.
- ◆ Women were twice as likely to be infected as men and to be more heavily infected.
- ◆ The most prevalent pathogen was *Blastocystis hominis* (72 percent), with *Cryptosporidium* (13 percent) and *Entamoeba* species (8 percent) ranking second and third, respectively.

#### Greatest Risk Factors – Primary Factors

##### Foreign Travel

- ◆ Having a partner or someone in the household with a parasite problem
- ◆ Previous parasitic infection (implying relapse or reinfection)
- ◆ Not washing fresh vegetables adequately

##### Other Risks

###### *Drinking tap water*

- ◆ Poor hygiene
- ◆ Dining out often
- ◆ Frequenting salad bars
- ◆ Having pets
- ◆ Going camping (or drinking the water from streams or even fountains)
- ◆ Working at an infant-care center
- ◆ Living in an institutional setting or group home

#### Parasites And Damage To The Body

Parasitic infection can be damaging to humans by direct injury to the tissue of the digestive tract or the liver, among other organ systems. In addition the most destructive

effects may not be caused by the parasite itself, but by its toxic by-products, which are produced unintentionally as a part of its living process. Parasites can disrupt digestive activity, can cause malabsorption, and can interfere with the action of digestive enzymes and nutrients. In addition, parasites can compromise the human immune system in order to promote and ensure their own survival.

### Difficulties In Diagnosis

Parasitic infection have long been considered diseases of the tropics, so physicians often don't consider them when diagnosing common illnesses. Parasitology is seldom discussed in the mainstream medical journals, and traditionally there has been little reporting of parasite incidence. For example, Giardia has been widely tracked by the Centers of Disease Control (CDC) only since 1987. When physicians received their training, very little information is provided on parasitology in medical school and in professional journals. Given the lack of information and minimal clinical exposure, doctors don't usually consider parasites as a possible cause of illness, especially when the symptoms aren't confined to the digestive tract.

### Difficulties in Detection

Parasites have complex life cycles and are often not shed at regular intervals. In fact, three of the major parasites in the United States and worldwide (amoebas, Giardia, and Cyclospora) tend to be shed at irregular intervals. This means that the parasite may be present in the stool for two, three, or four days a week, but not the rest of the week. Entamoeba histolytica is active for one or two days, and then is not typically active or detectable the next day or two. When E. histolytica migrates to the liver it disappears from the gut and becomes undetectable in fecal specimens. If the stool sample is collected from a patient with one of these cyclical parasites on a day when the pathogen is not active, it won't be in the stool and obviously won't be detected by testing. However this doesn't mean that there's no infection present. At the current time this is a limitation for which no modern technology can compensate. Consequently repeated samples are very important. Generally, to make testing practical, we recommend at least two or three samples be taken on different days.

### Emerging Pathogens

Another problem we encounter in detection is the fact that there are so many emerging pathogens. These are new parasites, which remain insufficiently studied. For example, Cyclospora was formally classified as a human parasite for the first time just a few years ago. Before that the labs were probably seeing it, but didn't know what it was because it hadn't been described as such. Other pathogens are reclassified as they become better understood or as their virulence is observed to change.

Only in the 1990s has Dientamoeba fragilis come to be considered capable of causing disease (pathogenic). In addition there are some life forms in nature that make detection extremely difficult. Bacteria have been identified that can exist without a cell wall and therefore can take on many shapes. These elusive pathogens make diagnosis extremely difficult.

### Optimal Detection

The, most effective method of detecting parasites continues to be stool sampling. The optimal approach involves taking samples every other day, a minimum of 48 hours apart, collecting at least two or three samples.

Although some microbes such as E. histolytica reside in the large intestine, many are harbored in the small intestine. Pathogens such as Giardia reside primarily in the small intestine, where they strongly adhere to the intestinal lining and therefore cannot usually be detected in samples from stool further down the digestive tract. For this reason the test must include matter from the small intestine in order to test as accurately as possible. The best specimen is a sample of soft stool taken during the occurrence of a diarrheal episode, because it usually contains material from the small intestine. In the patient who has constipation, the purge test is most optimal.

### Other Methods of Testing

Elevated white blood count (eosinophil level) may be used as a screening tool to indicate the need for further testing.

- ◆ Antibody testing is also available. Antibody levels of immunoglobulin (IgG) can indicate infection, but not whether the infection is current or previous. Repeated testing for IgM levels will show if the infection is currently active.
- ◆ Samples of blood serum can be evaluated to detect parasites found in the blood. However, this method is useful only for parasites of the circulatory system, not those most typically found in the GI tract.
- ◆ Tissue samples from biopsies of the colon or duodenum can be tested for parasitic infection, as well as tumors or pathology.

### Testing for Yeast

A correlation exists between the presence of parasites and the presence of Candida (and other forms of fungus as well). In addition when there is excessive Candida present, the levels of beneficial bacteria tend to be lower. If there are factors present such as parasites that promote the growth of Candida, it consumes the resources and the space that would have originally been allotted to the beneficial microflora (the Lactobacillus and Bifidus). Yeast overgrowth is also documented as a significant factor in some cases of attention deficit disorder and autism (based on the work of Dr. William Shaw and others).

## Dental Toxicities

Digestive health starts in the mouth: For many patients, dental and digestive health seem to go hand in hand. Currently there are a multitude of procedures and materials that have been developed by the dental industry to promote dental health, not to mention to ward off infections and improve oral hygiene. Manufacturers of dental materials spare no effort to provide dentists with the widest array of amalgams, composites, sealants, varnishes, cements, adhesives, pastes, etc. We all know about mercury and heavy metal toxicity; see for example, Ziff (2002). What we did not know about is the involvement of dental sealants (liners in the causation of a newly discovered disorder called neurocutaneous syndrom (NCS) (Amin, 2003, 2004).

NCS is a disorder that degrades the skin (cutaneous tissue) and neurological system of patients who have been treated with sealants during filling or root canal procedures. Patients sensitive to sulfa are especially susceptible to experiencing the neurological and dermatological toxicity symptoms of NCS. Neurological symptoms include but are not limited to pinprick and/or creeping, painful, and irritating movement sensations, often interpreted as loss of memory, and light sensitivity may also be experienced. The cutaneous aspects include the development of small itchy sores or inflamed, elevated, pimples that may eventually evolve into painful open lesions with a tendency to spread. General symptoms include compromised immune system, fatigue, and psychological trauma.

A complete description of NCS symptoms, the syndrome, compounding factors, and the toxic sealants, with case histories and treatment protocols, is given by Amin (2003, 2004) Dental practitioners should be aware of the adverse effects of using sealants, and employ this knowledge to safeguard the well being of their patients.

### SOURCES

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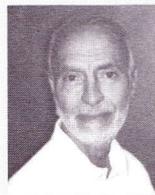
## A Note From The Lab

*It has been our experience that some people with symptoms of digestive disease may also have an underlying parasitic infection.*

*Detecting and treating parasitic infections can be a complex process. For example, some organisms are classified as commensals, microorganisms that are present but don't actually cause disease (nonpathogenic). In the past, parasites thought to be harmless have included *H. pylori*, *Blastocystis hominis*, *Dientamoeba fragilis* and even *Giardia lamblia*. In the past ten years they have been reclassified, because we now recognize that these organisms and numerous others can cause serious infections. In fact, some can contribute to illness that can linger for years if untreated. Once the infection is found and treated, patients often improve quite rapidly.*

*We've also noticed that parasitic GI infections don't cause symptoms in the digestive tract alone. The effects of many pathogens are experienced throughout the body, in any of the major organ systems. Associated illnesses can include fatigue, difficulties with mental concentration, depression, and neurological symptoms, as well as allergies, asthma, arthritis, skin disorders, and other chronic health problems. ❀*

### About the Author



*Dr. Amin earned his B.Sc. in Botany and Zoology and M. Sc. in Medical Entomology from Cairo University, and Ph.D. in Parasitology from Arizona State University. His professional training started at the US Naval Medical Research Unit #3 (NAMRU-3), Cairo as a Research Assistant in Medical Zoology. His post-doctoral work was at Old Dominion University, Norfolk. He subsequently worked at the University of Wisconsin as a Professor of Parasitology, Allied Health and Biology for 20 years. In 1992, he founded the Institute of Parasitic Diseases (IPD) (for research and clinical testing of human parasites). He has a joint laboratory facility in Mexico and Mali, West Africa as well as continued research association with NAMRU-3 in Cairo.*

*Dr. Amin is a nationally and internationally recognized authority in Parasitology. He specializes in the systematics, ecology and pathology of protozoans, helminths and arthropods. He has published over 185 major articles/book chapters/teaching videos on parasites from North America, Peru, Chile, North, South and East Africa, Persian Gulf, the Middle East, Taiwan, Japan, Thailand, Vietnam, Inner Mongolia (China), Russia and India. He is an active lecturer on parasitological and related disease topics to health care professional, allied health workers and medical students in seminar and workshop settings.*

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