

HELMINTHS AND THEIR SPREAD, HELMINTH- CAUSED DISEASES

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Abstract: The word "helminths" comes from the Greek meaning worm. The parasites that infect humans can be classified as heirlooms or souvenirs. Parasites that are inherited from ancestors in Africa are called Heirlooms, and those that are acquired from the animals during contact through our evolution, migrations, and agricultural practices are called souvenirs. In developing countries, the most common infectious agents of humans are these helminthic infections. More than a quarter of the world's population, that means approximately 2 billion people are affected by the helminthic parasite, and it is one of the major burdens of developing countries, especially in children.

Keywords: nematode, trematode, ascaris lumbricoide, trichuris trichiura, necator americanus, soil-transmitted helminths (STHs).

There are two major phyla of helminths known as nematodes and platyhelminths. Nematodes are also known as roundworms that include soil-transmitted helminths and the filarial worms that cause lymphatic filariasis (LF) and onchocerciasis. Other phyla platyhelminths also called flatworms, which include flukes schistosomes and tapeworms such as the pork tapeworm that causes cysticercosis. Flukes are known as trematodes, and tapeworms are known as cestodes. Soil-transmitted helminthiasis is a roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), and hookworm (*Ancylostoma duodenale* and *Necator americanus*). The soil-transmitted helminths (STHs), enter into the human body from contaminated soil that contains eggs of *A. lumbricoides* and *T. trichiura*. Some helminth can penetrate the skin directly (hookworm larvae). The diseases by helminths are neglected tropical diseases because they usually have insidious effects on growth and development. Also, the study of these diseases receives less than 1% of the global research budget.

Intestinal parasite infections often cause morbidity and mortality, especially in children. The major risk factors of helminthiasis are rural areas, low socioeconomic status, poor sanitation, poor availability of clean water, poor personal hygiene, lack of nail trimming, crowded living conditions,

lack of education, lack of access to health care, and inadequate dwelling conditions.

Ascaris lumbricoides and *Trichuris trichiura* are transmitted through the fecal-oral route. Adult *Ascaris* is a long cylindrical worm, and its larvae can migrate into the pulmonary circulation, but *Trichuris trichiuria* can not.

A. duodenale and *N. americanus* are transmitted by penetration of the skin from where it goes into the lungs and crosses pulmonary capillaries to penetrate into alveolus and then to the intestine through the passing of larynx. *N. americanus* is globally predominant compared to *A. duodenale*. *S. stercoralis* can infect percutaneously and orally.

Poor hygiene of mother or caregiver is also one of the most important risk factors for soil-transmitted helminths infection in preschool children.

Schistosomiasis infection is usually transmitted from contact with freshwater snails during swimming or washing. Schistosomiasis causes chronic inflammation that produces oxygen-free radicals. These free radicals are responsible for different mutations and the formation of carcinogenic N-nitrosamines that cause bladder carcinoma and portal tract fibrosis.

Diphyllobothriasis is most commonly occurs by species being *D. latum* from the ingestion of larva of the fish tapeworm. Direct damage is done by worm activity itself, such as internal organ blockage or direct pressure effects by growing parasites.

Adult *Ascaris* blocks the intestine that leads to small bowel obstruction, volvulus, or intussusception, especially in children, or can invade orifices leading to appendicitis, cholecystitis, pancreatitis, and gastric ascariasis. Migrating *Ascaris* can also block the bile duct and may also alter the intestinal microbiota. Mucosal bleeding from the upper gastrointestinal tract or generalized inflammation leads to anemia.

Trichuris lies in intestinal mucosa and can cause petechial lesions, blotchy mucosal hemorrhage, oozing, and colonic inflammation. It can also cause severe anemia in pregnant women.

Schistosomiasis infection is acquired by contact with contaminated freshwater, especially during swimming or washing. Deposition of schistosome eggs within the liver and bladder may form granulomas around these eggs that can block blood flow in the liver that leads to pathological changes like periportal fibrosis and have been linked with neoplasia. Interestingly, this periportal fibrosis has retained hepatocellular function that is different from other causes of cirrhosis. These liver flukes can also cause bile duct hyperplasia.

Wuchereria bancrofti causes lymphatic obstruction leads to elephantiasis. Hydatid cyst caused by the larval tapeworm infections (*Echinococcus granulosus*) leads to pressure atrophy.

Taenia solium, the pork tapeworm, frequently develops in the intestine leads to taeniasis, and in the central nervous system leads to cysticercosis.

Ancylostoma and *Necator* burrow their teeth into mucosa and submucosa, create negative pressure by contracting their muscular esophagi that lead to rupture of the capillaries and arterioles and actively sucks blood. Blood vessels are ruptured by both mechanical compressions and hydrolytic enzymes secreted by these hookworms. These worms also secrete anticoagulants that lead to prolonged bleeding and, ultimately, significant blood loss. They can cause significant anemia, especially in children and pregnant women, along with schistosomiasis, these can increase neonatal prematurity and maternal morbidity and mortality, also causes protein loss by inflammation.

Diphyllobothrium latum causes vitamin B12 deficiency through interfering with the absorption through the intestine. Migration through body tissue, many helminths cause direct tissue damage and also by hypersensitivity reactions, whereas most affected organs are skin, lungs, liver, and intestines.

Indirect damage is done by the host immune response against helminth.

All helminths are antigenic to the body because they are foreign bodies and stimulate the immune response. Lymphatic blockage by *W. bancrofti* and granuloma formation by schistosomes in

the liver and bladder are associated with hypersensitivity reaction against these helminths.

Strongyloides and *Trichinella* may induce prolonged inflammation of the intestine that causes villous atrophy; in severe cases, it may cause protein-losing enteropathy.

S stercoralis can cause Loeffler syndrome by type 1 hypersensitivity reaction.

Trichuris, which is also known as whipworm, can cause inflammation of the colon that leads to blood loss and rectal prolapse. Indirect damage depends on the severity of the inflammation and the duration of inflammation. If the duration is prolonged, many worms produce extensive inflammatory damage to tissues that is an irreversible and functional loss of the tissues, such as bile duct hyperplasia by long term infection with liver flukes, fibrosis caused by schistosomiasis and skin atrophy caused by onchocerciasis.

In conclusion, The most serious helminth infections are acquired in poor tropical and subtropical areas, but some also occur in the developed world; other, less serious, infections are worldwide in distribution. Exposure to infection is influenced by climate, hygiene, food preferences, and contact with vectors. Many potential infections are eliminated by host defenses; others become established and may persist for prolonged periods, even years. Although infections are often asymptomatic, severe pathology can occur. Because worms are large and often migrate through the body, they can damage the host's tissues directly by their activity or metabolism.

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