

TREATMENT DRACUNCULIASIS

Gradual extraction of the worm by winding of a few centimeters on a stick each day remains the common and effective practice. Worms may be excised surgically. No drug is effective in treating dracunculiasis.

PREVENTION

Prevention, which remains the only real control measure, depends on the provision of safe drinking water.

ZOONOTIC FILARIAL INFECTIONS

Dirofilariae that affect primarily dogs, cats, and raccoons occasionally infect humans incidentally, as do *Brugia* and *Onchocerca* parasites that affect small mammals. Because humans are an abnormal host, the parasites never develop fully. Pulmonary dirofilarial infection caused by the canine heartworm *Dirofilaria immitis* generally presents in humans as a solitary pulmonary nodule. Chest pain, hemoptysis, and cough are uncommon. Infections with *D. repens* (from dogs) or *D. tenuis* (from raccoons) can cause local subcutaneous nodules in humans. Zoonotic *Brugia* infection can produce isolated lymph node enlargement, whereas zoonotic *Onchocerca* can cause subconjunctival masses. Eosinophilia levels and antifilarial antibody titers are not commonly elevated. Excisional biopsy is both diagnostic and curative. These infections usually do not respond to chemotherapy.

259 Schistosomiasis and Other Trematode Infections

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Trematodes, or flatworms, are a group of morphologically and biologically heterogeneous organisms that belong to the phylum Platyhelminthes. Human infection with trematodes occurs in many geographic areas and can cause considerable morbidity and mortality. The dependence on one drug—praziquantel—for treatment of most infections caused by trematodes raises the specter of developing resistance in these worms; several instances of reduced drug efficacy have already been reported. The widespread use of oxamniquine in the 1970s to reduce the impact of schistosomiasis resulted in the development of significant resistance. Recently, a single quantitative trait locus on schistosomal chromosome 6 was identified as the genetic basis for resistance.

ETIOLOGIC AGENTS AND THEIR LIFE CYCLES

For clinical purposes, significant trematode infections of humans may be divided according to the tissues invaded by the adult stage of the fluke, whether bloodstream, biliary tree, intestines, or lungs (Table 259-1). Trematodes share some common morphologic features, including macroscopic size (from one to several centimeters); dorsoventral, flattened, bilaterally symmetric bodies (adult worms); and the prominence of two suckers. Except for schistosomes, all human parasitic trematodes are hermaphroditic. Their life cycles involve a definitive host (mammalian/human), in which adult worms initiate sexual reproduction, and an intermediate host (snail), in which asexual multiplication of larvae occurs. More than one intermediate host may be necessary for some species of trematodes. Human infection is initiated either by direct penetration of intact skin or by ingestion. Upon maturation within humans, adult flukes initiate sexual reproduction and egg production. Helminth ova leave the definitive host in excreta or sputum and, upon reaching suitable environmental

TABLE 259-1 MAJOR HUMAN TREMATODE INFECTIONS

Trematode	Transmission	Endemic Area(s)
Blood Flukes		
<i>Schistosoma mansoni</i>	Skin penetration by cercariae released from snails	Africa, South America, Middle East
<i>S. japonicum</i>	Skin penetration by cercariae released from snails	China, Philippines, Indonesia
<i>S. intercalatum</i>	Skin penetration by cercariae released from snails	West Africa
<i>S. mekongi</i>	Skin penetration by cercariae released from snails	Southeast Asia
<i>S. haematobium</i>	Skin penetration by cercariae released from snails	Africa, Middle East
Biliary (Hepatic) Flukes		
<i>Clonorchis sinensis</i>	Ingestion of metacercariae in freshwater fish	Eastern Asia
<i>Opisthorchis viverrini</i>	Ingestion of metacercariae in freshwater fish	Eastern Asia, Thailand
<i>O. felineus</i>	Ingestion of metacercariae in freshwater fish	Eastern Asia, Europe
<i>Fasciola hepatica</i>	Ingestion of metacercariae on aquatic plants or in water	Worldwide
<i>F. gigantica</i>	Ingestion of metacercariae on aquatic plants or in water	Sporadic, Africa
Intestinal Flukes		
<i>Fasciolopsis buski</i>	Ingestion of metacercariae on aquatic plants	Southeast Asia
<i>Heterophyes heterophyes</i>	Ingestion of metacercariae in freshwater or brackish-water fish	Eastern Asia, North Africa
Lung Flukes		
<i>Paragonimus westermani</i> and related species	Ingestion of metacercariae in crayfish or crabs	Global except North America and Europe

conditions, they hatch, releasing free-living miracidia that seek specific snail intermediate hosts. After asexual reproduction, cercariae are released from infected snails. In certain species, these organisms infect humans; in others, they find a second intermediate host to allow encystment into metacercariae—the infective stage for humans.

The host-parasite relationship in trematode infections is a product of certain biologic features of these organisms: they are multicellular, undergo several developmental changes within the host, and usually result in chronic infections. In general, the distribution of worm infections in human populations is *overdispersed*; i.e., it follows a negative binomial statistical distribution in which most infected individuals harbor low worm burdens while a small percentage are heavily infected. It is the heavily infected minority who are particularly prone to disease sequelae and who constitute an epidemiologically significant reservoir of infection in endemic areas. Recent evidence indicates that the prevalence of morbidity in infected populations is greater than was previously thought. Morbidity and death due to trematode infections reflect a multifactorial process that results from the tipping of a delicate balance between intensity of infection and host reactions, which initiate and modulate immunologic and pathologic outcome. Furthermore, the genetics of the parasite and of the human host contribute to the outcome of infection and disease. Infections with trematodes that migrate through or reside in host tissues are associated with a moderate to high degree of peripheral-blood eosinophilia; this association is of significance in protective and immunopathologic sequelae and is a useful clinical indicator of infection.