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Tropical Diseases: Definition, Geographic Distribution, Transmission, and Classification 195
Alimuddin Zumla and Andrew Ustianowski

The term tropical diseases encompasses all diseases that occur principally in the tropics. This term covers all communicable and noncommunicable diseases, genetic disorders, and disease caused by nutritional deficiencies or environmental conditions (such as heat, humidity, and altitude) that are encountered in areas that lie between, and alongside, the Tropic of Cancer and Tropic of Capricorn belts. In tropical countries, apart from noncommunicable diseases, a severe burden of disease is caused by an array of different microorganisms, parasites, land and sea animals, and arthropods.

Venomous Bites, Stings, and Poisoning 207
David A. Warrell

This article discusses the epidemiology, prevention, clinical features, first aid and medical treatment of venomous bites by snakes, lizards, and spiders; stings by fish, jellyfish, echinoderms, and insects; and poisoning by fish and molluscs, in all parts of the world. Of these envenoming and poisonings, snake bite causes the greatest burden of human suffering, killing 46,000 people each year in India alone and more than 100,000 worldwide and resulting in physical handicap in many survivors. Specific antidotes (antivenoms/antivenins) are available to treat envenoming by many of these taxa but supply and distribution is inadequate in many tropical developing countries.

Transplant-Associated and Blood Transfusion-Associated Tropical and Parasitic Infections 225
Clarisse Martins Machado and José Eduardo Levi

Blood transfusion and transplantation may represent efficient mechanisms of spreading infectious agents to naive populations. In the developed countries, as a consequence of globalization, several factors such as international commerce, tourism, and immigration have acted as important features for the emergence or reemergence of infectious diseases previously referred to as tropical. This article reviews the relevant bacterial, protozoan and viral infections that are more frequently associated with blood transfusion and/or solid organ or marrow transplantation and may affect susceptible populations worldwide.

Malaria: An Update for Physicians 243
Behzad Nadjm and Ron H. Behrens

Malaria remains the most important parasitic infection in humans. There have been significant advances in the treatment of both nonsevere and
severe malaria with the advent of artemisinin combination therapies and parenteral artesunate, but the optimum supportive management of severe malaria is unclear. A broadly acceptable therapy for the prevention of relapses in *Plasmodium* vivax infection has not been discovered. Globally, the priority remains to prevent infection in the vulnerable, to move toward elimination where feasible, and to ensure that effective treatment is available to all. In developed settings, prevention of infection and its early recognition are crucial.

Human African Trypanosomiasis
Reto Brun and Johannes Blum

Human African trypanosomiasis (sleeping sickness) is caused by the unicellular parasite *Trypanosoma brucei* and transmitted by tsetse flies. It occurs exclusively in sub-Saharan Africa, usually in rural areas affected by civil conflicts and neglected health systems. Reported cases are fewer than 10,000/year, which classifies it as one of the most neglected tropical diseases. Because sleeping sickness is fatal if not treated, it has to be included in the differential diagnosis of every febrile traveler returning from a game park in East Africa. Elimination of the disease is considered feasible provided better tools for diagnosis and treatment can be made available.

American Trypanosomiasis (Chagas Disease)
Anis Rassi Jr, Anis Rassi, and Joffre Marcondes de Rezende

Chagas disease, also known as American trypanosomiasis, is a chronic infection caused by *Trypanosoma cruzi*, a protozoan parasite. It is transmitted to human beings mainly through the feces of infected triatomine bugs. The disease affects an estimated 8 to 10 million people in the Americas, putting them at risk of developing life-threatening cardiac and gastrointestinal complications. This article provides a brief update on the epidemiology, clinical manifestations, diagnosis, and treatment of Chagas disease.

Cutaneous and Mucocutaneous Leishmaniasis
Hiro Goto and José Angelo Lauletta Lindoso

Tegumentary leishmaniasis are caused by approximately 15 species of protozoa of the genus *Leishmania*. They prevail in tropical and subtropical areas of the Old and New World but human mobility also makes them a medical problem in nonendemic areas. Clinical manifestations may comprise cutaneous and mucocutaneous forms that may be localized, disseminated, or diffuse in distribution and may differ in Old and New World leishmaniases. Diagnosis and treatment vary according to the clinical manifestations, geographic area, and *Leishmania* species involved. This article highlights the diversity and complexity of tegumentary leishmaniasis, which are worsened by human immunodeficiency virus/*Leishmania* coinfection.

Visceral Leishmaniasis
Johan van Griensven and Ermias Diro

Visceral leishmaniasis (VL) is a vector-borne parasitic disease targeting tissue macrophages. It is among the most neglected infectious diseases.
Classical manifestations of VL include chronic fever, hepatosplenomegaly, and pancytopenia. Most cases can be detected through serologic and molecular testing. Although therapy has historically relied on antimonials, newer therapeutic options include conventional or liposomal amphotericin B, paromomycin and miltefosine. Coinfection with human immunodeficiency virus (HIV) is increasingly reported and comes with additional diagnostic and therapeutic challenges. This article provides an up-to-date clinical review of VL focusing on clinical presentation, diagnosis, management, and issues related to HIV coinfection.

Protozoan Infections of the Gastrointestinal Tract

Stephen G. Wright

The review provides current views on human protozoan parasites of the gut. The recognition of the importance of cryptosporidium, cyclospora and microsporidia over the last three decades emphasises the possibility that more pathogenic intestinal protozoa are presently unrecognized. Each of these is a zoonotic infection and the potential for a zoonotic element to the transmission of giardiasis has been recognized. A common theme in increased understanding of the biology and pathological mechanisms involved in causing disease is the application of molecular techniques to the various stages of the parasite life cycle. Molecular methods are increasingly contributing to laboratory diagnosis of these conditions with increased yields of positive results though in the tropics it is likely that fecal microscopy will remain the standard for some time to come. The nitroimidazole compounds are the mainstay of treatment for giardia and amebiasis with no major advance in therapeutics since their role was appreciated. Nitazoxanide was shown to be effective for cryptosporidiosis in the 1990s.

Nematode Infections: Soil-Transmitted Helminths and Trichinella

Stefanie Knopp, Peter Steinmann, Jennifer Keiser, and Jürg Utzinger

Infection with soil-transmitted helminths occurs via ingestion of nematode eggs with contaminated food and water, via hands, or inhalation of dust, or by penetration of larvae through the skin. Trichinella infections are caused by the ingestion of larvae contained in undercooked meat. In highly endemic areas, preventive chemotherapy (ie, regular administration of anthelminthic drugs to at-risk populations) is the key strategy against soil-transmitted helminthiasis. Integrated control approaches, including improved hygiene, sanitation, and water, are required for lasting effects. Because of growing tourism, travel, and migration, clinicians and specialized travel clinics must remain aware of the diagnosis, prevention, and treatment of soil-transmitted helminth and Trichinella infections.

Nematode Infections: Filariases

Stefanie Knopp, Peter Steinmann, Christoph Hatz, Jennifer Keiser, and Jürg Utzinger

More than 150 million people, mainly in developing countries, are affected by filarial nematode infections that cause debilitating and disfiguring diseases. Although transmission is restricted to the tropics and subtropics, imported infections sometimes occur in Europe and North America among immigrants and refugees from endemic countries, and rarely among
long-term travelers. This article reviews the epidemiology of the most important human filarial nematodes, their current distribution, life cycles, clinical features, and disease burden. Diagnosis, treatment, and tools for prevention and control are discussed. Protective measures for travelers are summarized, and vulnerable groups and case numbers in North America identified.

Schistosomiasis
Bruno Gryseels

Schistosomiasis is a tropical parasitic disease, caused by blood-dwelling worms of the genus *Schistosoma*. The main human species are *S. mansoni* (occurring in Africa and South America) and *S. japonicum* (South and East Asia) causing intestinal and hepatosplenic schistosomiasis, and *S. haematobium* (Africa) causing urinary schistosomiasis. Severe symptoms develop in predilected people with heavy and long-standing infections. Acute schistosomiasis, a flulike syndrome, is a regular finding in travel clinics. Although prevalences can be high, most infected people show limited, intermittent, or aspecific symptoms. The diagnosis of schistosomiasis relies on microscopic examination of stools or urine, serologic tests, and imaging. Praziquantel is the drug of choice, active against all species in a single or a few oral doses. Current control strategies consist mainly of preventive therapy in communities or groups at risk.

Trematode Infections: Liver and Lung Flukes
Thomas Fürst, Urs Duthaler, Banchop Sripa, Jürg Utzinger, and Jennifer Keiser

Food-borne trematodiases are an emerging public health problem in Southeast Asia and Latin America and of growing importance for travel clinics in Europe and North America. The disease is caused by chronic infections with liver, lung, and intestinal flukes. This article focuses on the most important liver and lung flukes that parasitize man, namely *Clonorchis sinensis*, *Fasciola gigantica*, *Fasciola hepatica*, *Opisthorchis felineus*, *Opisthorchis viverrini*, and *Paragonimus* spp. The article describes the epidemiology of major liver and lung fluke infections, including current distribution, burden, life cycle, clinical signs and symptoms, diagnostic approaches, and current tools for prevention, treatment, and control.

Cestode Infestations: Hydatid Disease and Cysticercosis
Enrico Brunetti and A. Clinton White Jr

Although humans can be definitive hosts for cestodes (tapeworms), major pathologic conditions occur during cestode larval stages when humans serve as the intermediate host for these parasites. The most relevant forms of human disease caused by cestode larvae are echinococcosis, caused by *Echinococcus granulosus* (cystic echinococcosis) and *Echinococcus multilocularis* (alveolar echinococcosis), and cysticercosis, caused by *Taenia solium*. These infections occur worldwide, but their relevance is particularly high in developing countries, where poor hygiene conditions facilitate the transmission of the parasites. The therapeutic approach is often complex, requiring surgery and/or chemotherapy or, in the case of cystic echinococcosis, percutaneous treatments.
Tropical Bacterial Gastrointestinal Infections

Sadia Shakoor, Anita K.M. Zaidi, and Rumina Hasan

The bacterial gastrointestinal infections cholera, salmonellosis, shigellosis, campylobacteriosis, and diarrheagenic *Escherichia coli* are prevalent in tropical regions. These diseases impose an immense cost and contribute significantly to childhood morbidity and mortality. Management is hampered by limited access to diagnostic facilities and by antimicrobial drug resistance. Rapid point-of-care assays aim to reduce treatment delay and encourage rational use of antimicrobial agents. Control through safe drinking water, good sanitation, and vaccination against typhoid and cholera in high-risk populations is recommended. Vaccines against other *Shigella* and diarrheagenic *E. coli* infections are under development.

Vector-Borne Rickettsioses in North Africa

Tahar Kernif, Cristina Socolovschi, Idir Bitam, Didier Raoult, and Philippe Parola

The purpose of this article is to overview vector-borne rickettsioses in North Africa, focusing on epidemiologic aspects, clinical features, diagnosis procedures, and treatment. The protective measures, the exposure to risk, and the dynamics of endemic emerging and re-emerging diseases in the region are detailed to minimize the risk when traveling in this area. In addition, the article describes the scientific contribution on the rickettsial field of North-African researchers from the beginning of the 20th century until today.

Arboviruses and Viral Hemorrhagic Fevers (VHF)

Eyal Meltzer

The viral hemorrhagic fever (VHF) syndrome is a potentially life-threatening infection typified by a combination of a capillary leak syndrome and bleeding diathesis. Most but not all agents causing VHF are arboviruses, with transmission to humans resulting from an arthropod bite. Agents of VHF affect humans on all continents. Population growth, urbanization, human activities, and even climate change all contribute to a continual flux in the epidemiology of many arboviruses. This review provides an overview of the epidemiology of arboviral infections and VHF, the main clinical syndromes, and their diagnosis and treatment.

Tropical Fungal Infections

Li Yang Hsu, Limin Wijaya, Esther Shu-Ting Ng, and Eduardo Gotuzzo

Fungal infections are more common and diverse in the tropics but are also increasingly seen in returning travelers and migrants as international travel becomes easier. They are conventionally classified into superficial, cutaneous, subcutaneous, and systemic mycoses. This article provides an overview of superficial, cutaneous, and subcutaneous mycoses that are more prevalent and/or geographically restricted to the tropics and briefly discusses fungal infections in returning travelers. Systematic data on such infections as travel-associated diseases are currently lacking, and enhanced surveillance for fungal infections may lead to early diagnosis and an understanding of the epidemiology of the fungal infections among travelers.
Laboratory Diagnosis of Tropical Infections 513
Bryan H. Schmitt, Jon E. Rosenblatt, and Bobbi S. Pritt

This article covers the laboratory diagnosis of infections that occur predominantly in the tropics. The discussion includes diagnosis of blood and tissue parasites, intestinal parasites, and tropical infections caused by fungi, bacteria, and mycobacteria. The laboratory performance of techniques for the identification of intestinal parasites and special requirements for the collection of specimens for virology testing are also discussed. Images demonstrating the characteristic features of selected tropical parasites and fungi are included for reference.

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