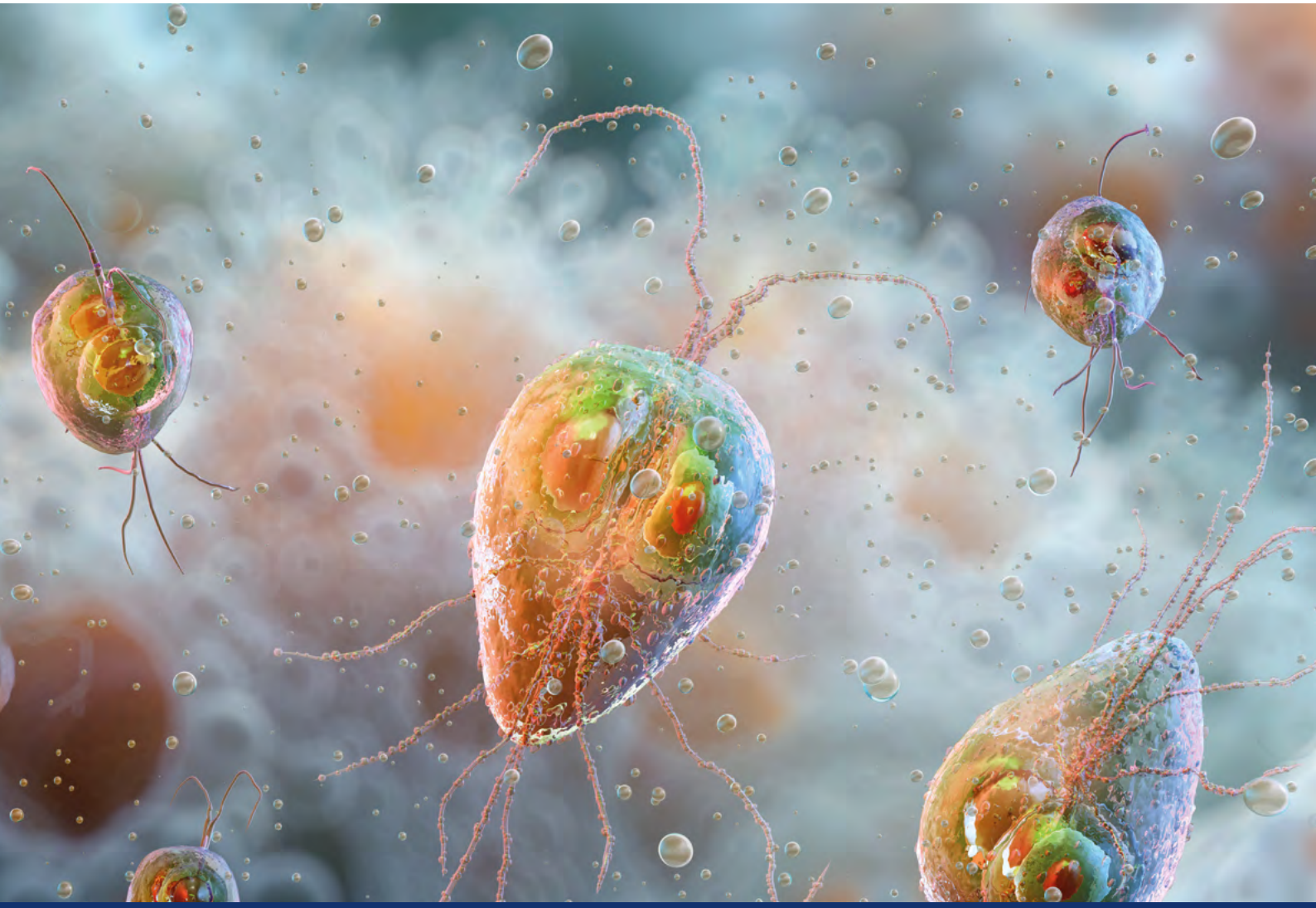
EXPERT INFORMATION **04 / 2025**

biovis' DIAGNOSTICS

Parasites in the Intestinal Tract



A SUMMARY OF COMMONLY DIAGNOSED SPECIES
AND THEIR CLINICAL PICTURES

DIAGNOSTICS AT A GLANCE

At biovis, the following parameters related to parasitic burden can be testet:

A169 Worms, Microsporidia PCR

Tapeworms, roundworms, pinworms (oxyurs), hookworms, New World hookworm, dwarf tapeworms, whipworms, dwarf threadworms, *Enterocytozoon spp./Encephalitzoon spp.*

A178 Parasites Profile, PCR

Giardia lamblia, Entamoeba histolytica, Cryptosporidium spp, Cyclospora cayetanensis, Blastocystis hominis, Dientamoeba fragilis

A178B/A178C Blastocystis Subtypes

Differentiation of pathogenic and apathogenic subtypes

A178N Parasites Control measurement

A170N Worms, Worm Eggs

(Microscopic examination of 3 stool samples from three consecutive days)

The following profiles also include parasite diagnostics:

A713B Microbiome Midi

incl. A178 (Parasites Profile, PCR)

A713BW Microbiome Midi Plus

incl. A178 (Parasites Profile, PCR) & A169 (Worms, Microsporidia PCR)

A713C Microbiome Maxi

incl. A178 (Parasites Profile, PCR)

A713CW Microbiome Maxi Plus

incl. A178 (Parasites Profile, PCR) & A169 (Worms, Microsporidia PCR)

A7130M Microbiome 1.0

incl. A178 (Parasites Profile, PCR)

PARASITIC INFECTIONS ARE WIDESPREAD GLOBALLY

Parasites - for most of us a disgusting term that is all too readily pushed far away from us. Even the mere idea of having worms in our body is alarming – perhaps even shameful – for many people. After all, parasites are associated with dirty conditions and a lack of hygiene and are therefore not an issue for us. Or are they?

Parasitic infections are widespread across the globe, with significantly higher prevalence in tropical and subtropical regions compared to industrialised nations. According to estimates, around one-fifth of the world's population is affected by worm infections, making them the most common disease worldwide according to the WHO. While parasites are often linked to poor hygiene, gastrointestinal parasitic infections are increasingly observed in Western countries. Contributing factors include frequent international travel, climate change, migration, and globalisation – all of which facilitate rapid transport of food and, in turn, parasites. Even in temperate climate zones, endemic parasites exist and can be transmitted via contaminated soil, drinking water, undercooked food, or direct contact.

The exact prevalence of parasitic diseases in Europe is difficult to determine. Only a few infections are notifiable, and routine diagnostic procedures rarely include parasitological screening. When parasites are not considered a potential cause of symptoms, this may lead to delays in accurate diagnosis and appropriate treatment [1-4].

SA740C Neurodermatitis Complete Profile

incl. A178 (Parasites Profile, PCR) & A178B (Blastocystis Subtypes)

SA710C Irritable Bowel Complete Profile

incl. A178 (Parasites Profile, PCR) & A178B (Blastocystis Subtypes)

THE SYMPTOMS OF PARASITIC INFECTIONS ARE DIVERSE, OFTEN NON-SPECIFIC AND IN SOME CASES EVEN CLINICALLY SILENT.

SYMPTOMS AND INDICATIONS OF A PARASITIC INFECTION

Unfortunately, the symptoms are quite varied, often non-specific and in some cases, there are no clinical signs at all. Many cases are overlooked or diagnosed late because symptoms are misinterpreted or certain differential diagnoses are not considered. Detailed questioning about living conditions, occupation, hobbies, eating habits, travelling, and possible contact with sick people or animals can provide crucial clues. This enables a faster and more targeted diagnosis, reduces unnecessary tests and costs, and helps to contain the spread of infections. Potential sources of infection such as contaminated playgrounds should also be taken into account, especially in children.

Requires clarification:

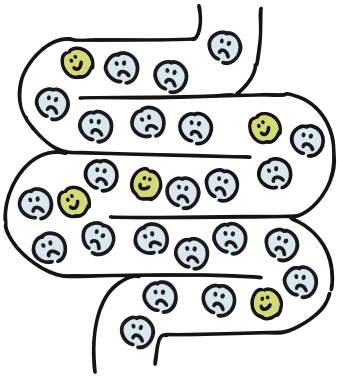
- **increased stool frequency or constipation**
- **abdominal pain and cramps**
- **meteorism**
- **feeling unwell**
- **nausea and vomiting**
- **feeling of fullness**
- **weight loss**
- **inappetence or ravenous appetite**

Laboratory-based:

- **eosinophilia**
- **leucocytosis**
- **anaemia**
- **iron deficiency**
- **increased IgE**

Warning signs:

- **bloody diarrhoea**
- **severe vomiting**
- **fever**
- **acute abdomen**



IMPORTANT DIFFERENTIAL DIAGNOSES

There are a whole range of possible causes for the symptoms mentioned. It is therefore important to rule out or confirm a parasitic infestation. Common differential diagnoses that need to be differentiated are bacterial or viral gastrointestinal infections, food intolerances, lactose intolerance, irritable bowel syndrome, coeliac disease, antibiotic-associated diarrhoea, other inflammatory bowel diseases (IBD) or malignancies [4].

MISDIAGNOSIS OF IRRITABLE BOWEL SYNDROME

The misdiagnosis of 'irritable bowel syndrome' is not uncommon in cases of unrecognised parasite infestation. It is therefore essential to check the parasites before making this diagnosis of exclusion.

WITH THE MULTIPLEX REAL TIME PCR, EVEN THE SMALLEST AMOUNTS OF PARASITIC DNA FRAGMENTS CAN BE RELIABLY DETECT IN STOOL SAMPLES.

HOW ARE GASTROINTESTINAL PARASITES DIAGNOSED QUICKLY AND EASILY?

Different stages of gastrointestinal parasites are excreted in the faeces, albeit in different frequencies and quantities. For many decades, microscopy has been the most widely used instrument for the detection, identification, and enumeration of parasites. Due to the intermittent excretion of intestinal parasites, three stool samples taken on different days are generally used for so-called coproscopy. In addition, the examination is supplemented by various enrichment methods. Despite such optimisation attempts, the sensitivity of these laboratory diagnostics remains in need of improvement. The quality of the sample, morphological irregularities, and the expertise of the laboratory staff in identifying the parasites exacerbate the problem [5]. Advances in molecular biology and genomics offer very good opportunities to solve these problems and improve test results, which is why they are becoming increasingly important in parasitology. With multiplex real-time PCR (multiplex quantitative real-time PCR), even the smallest amounts of parasitic DNA fragments can be reliably detected in stool samples. The method not only provides more reliable results with very low infestations, but is also significantly faster [6].

DID YOU ALREADY KNOW?

Parasites are masters of adaptation: intestinal parasites can survive in extreme environments, for example in acidic gastric juice or in low-oxygen areas of the intestine.

PREVENTIVE STRATEGIES

The prevention of parasitic infections is mainly based on precaution, as no vaccine is yet available. An effective strategy to prevent such infections includes various measures. A major advantage of well-developed regions is proper sanitary conditions and proper waste disposal, which can interrupt the development cycle of many parasites and prevent their spread. Other important hygiene measures include washing hands thoroughly, brushing fingernails if necessary and cleaning contaminated objects. Special hygiene standards apply to the handling and preparation of food. Thorough cooking of pork, beef, lamb, game, or fish reliably kills parasites, while smoking or drying is ineffective. Fruit and vegetables should also be carefully washed and prepared. The golden rule for international travellers is: 'Boil, fry, peel - or forget it.' Families with small children in particular are advised to have their pets regularly checked and treated for parasites. In short, careful hygiene measures are the basic building blocks of any effective parasite prophylaxis.

FREQUENTLY OCCURRING HUMAN GASTROINTESTINAL PARASITES

Gastrointestinal parasites can initially be divided into three groups: helminths, protozoa, and microsporidia. **Protozoa** are unicellular organisms and are among the oldest parasites in terms of evolutionary history. They multiply by cell division inside their human or animal host. *Giardia duodenalis, Cryptosporidium spp.*, and *Entamoeba spp.* are among the most frequently diagnosed intestinal-associated pathogen groups.

Helminths, on the other hand, are multicellular, highly differentiated intestinal worms that can be divided into nematodes (threadworms) and platyhelminthes (flatworms) based on their macroscopic appearance. To reproduce, they produce eggs or larvae, which are excreted in faeces and must first develop further in the environment before they are capable of infection. An animal can also be involved in this stage of development, as a so-called intermediate host.

Microsporidia are less easy to categorise. Their taxonomic affiliation is frequently discussed and repeatedly revised. Today, they are regarded as a very large group of obligate intracellular, spore-forming, eukaryotic parasites that are closely related to fungi or even belong to them [7]. To date, more than 1400 species belonging to over 200 genera have been described. Of these, at least 15 species have been identified as human pathogens.

Protozoa:

- *Giardia lamblia*
- *Entamoeba histolytica*
- *Cryptosporidium spp.*
- *Cyclospora cayetanensis*
- *Blastocystis hominis*
- *Dientamoeba fragilis*

Helminths (intestinal worms):
Nematoda (roundworms):

- hookworm
- pinworm
- roundworm
- dwarf threadworm
- whipworm

Platyhelminthes (flatworms):

- tapeworm
- dwarf tapeworm

Microsporidia

PROTOZOA

Giardia lamblia – giardiasis/lambliasis/ lamblia dysentery [7-9]

- most common notifiable parasitic intestinal disease
- protozoa *Giardia lamblia*, also known as *G. intestinalis* or *G. duodenalis*
- at least 8 genetically distinguishable groups, types A and B are pathogenic for humans

Transmission:

- mainly through contaminated water
- also, through food or direct contact between people

Acute giardiasis:

- development after about 7 days
- duration: 1-3 weeks
- often asymptomatic but severe diarrhoea and malabsorption also possible
- children particularly affected

Chronic giardiasis:

- recurring symptoms
- malabsorption of fat and sugar
- possible consequences: debilitation, weight loss, developmental disorders in children

Therapy:

- antiparasitics: metronidazole or tinidazole
- alternative medication for pregnant women

Entamoeba histolytica – amoebic/amoebic dysentery [10,11]

- several species of the genus Entamoeba colonise the intestine
- morphologically *E. histolytica*, *E. dispar* and *E. moshkovskii* cannot be distinguished from each other
- only *E. histolytica* is pathogenic for humans

Transmission:

- classical route of infection: faecal-oral
- also, through food or direct contact between humans (mainly oral-anal)

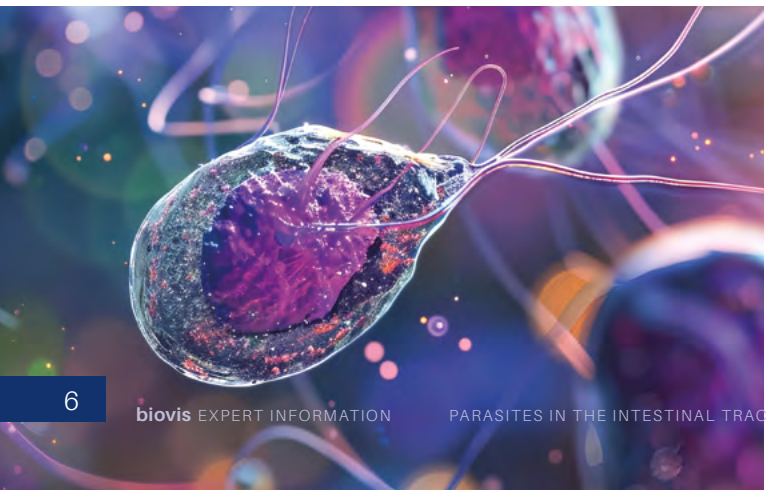
Symptoms of amoebic dysentery:

- intermittent diarrhoea (often bloody and slimy)
- constipation
- flatulence
- abdominal pain
- many infections are asymptomatic
- in the case of invasive infection, amoebae can enter other organs via the portal vein system and form abscesses there, especially in the liver

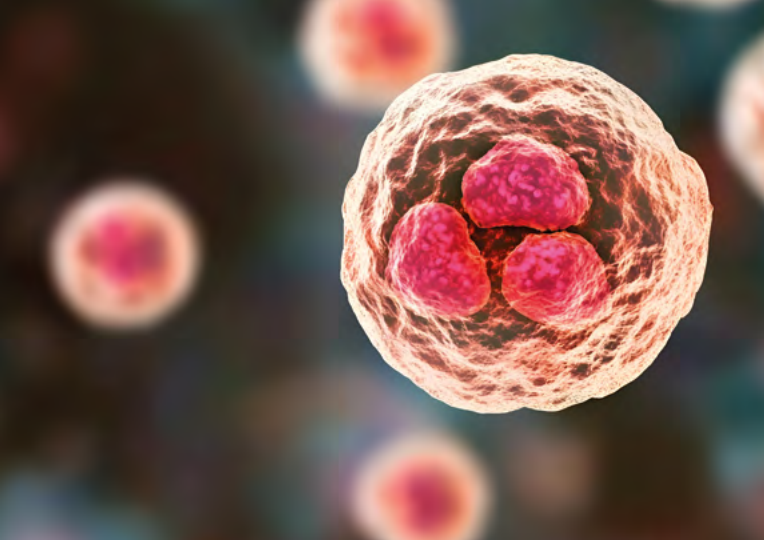
Therapy:

- against trophozoites: metronidazole or tinidazole
- to eliminate the cysts: paromomycin, iodoquinol or diloxanide furoate

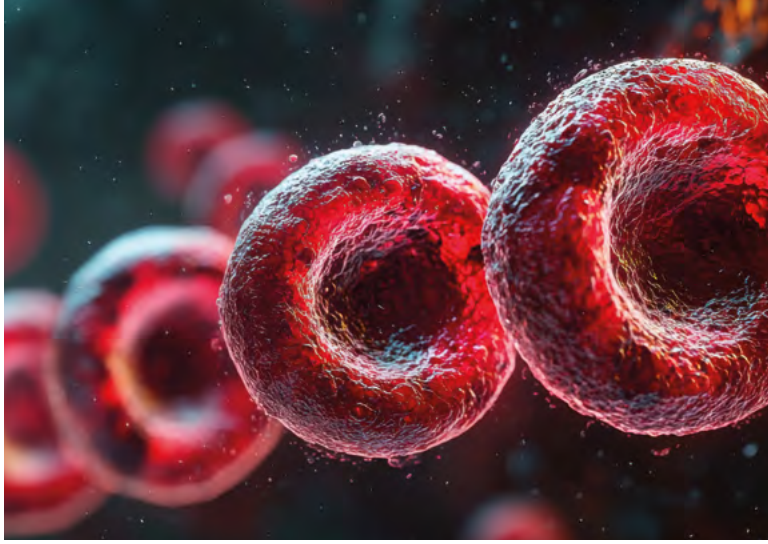
Giardia lamblia



Entamoeba histolytica



Cryptosporidium spp.



Cyclospora cayetanensis

Cryptosporidium spp. – cryptosporidiosis [12-14]

- main causative agent in humans *C. parvum* and *C. hominis*

Transmission:

- contaminated water from swimming pools, whirlpools, water parks, lakes, or streams
- contact with infected animals, especially cattle

Symptoms:

- main symptom: severe, watery diarrhoea
- accompanying symptoms: fatigue, fever
- in immunocompetent animals: self-limiting within 9-15 days
- pathogen excretion several weeks after the end of symptoms

Therapy:

- in the EU mostly symptomatic
- specific antiparasitic drugs not authorised

Cyclospora cayetanensis – Cyclosporiasis [15,16]

Transmission:

- mainly via contaminated food or water
- cyclospora oocysts only sporulate after a few days to weeks in the environment at 20-30 °C and are only then infectious
- therefore, no direct faecal-oral transmission possible

Symptoms:

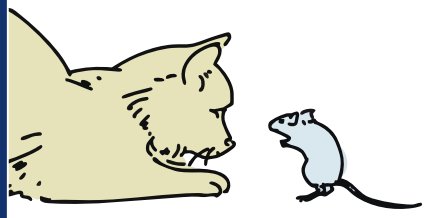
- watery diarrhoea
- fever
- abdominal cramps
- lack of energy
- weight loss
- self-limiting in immunocompromised patients
- duration: several weeks

Therapy:

- only in the absence of spontaneous healing
- trimethoprim and sulfamethoxazole

DID YOU KNOW?

Parasites can influence behaviour: Some parasites, such as *Toxoplasma gondii*, are known to manipulate the behaviour of their hosts. In mice, for example, this parasite can reduce fear of cats to facilitate transmission to the final host (the cat).



PROTOZOA

Blastocystis hominis – blastocystis infection /blastocystosis [17-20]

- anaerobic protozoa from the stramenopile group
- common in the intestines of humans and animals, but pathogenic potential is less clear
- 17 genetic subtypes (ST)
- ST 1-9 detected in humans
- ST 3 most common
- clinical relevance of *Blastocystis* controversial

Transmission:

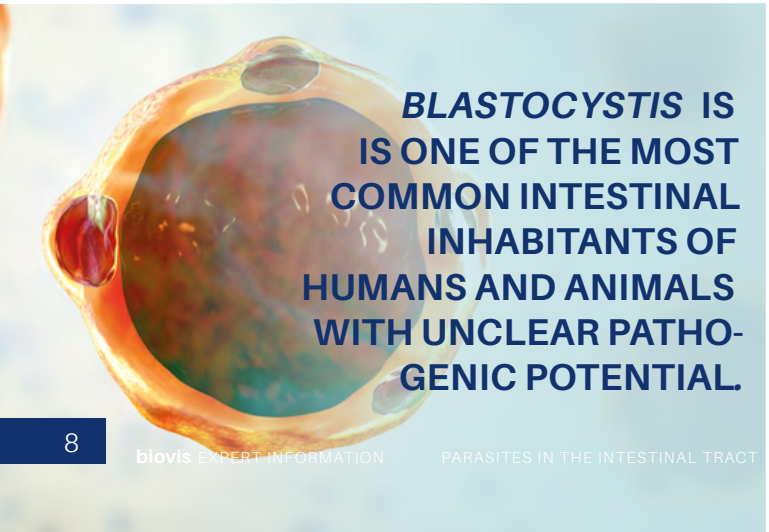
- faecal-oral via infectious cysts

Symptoms of the amoeboid form:

- diarrhoea
- abdominal pain
- flatulence
- irritable bowel syndrome
- skin reactions

Therapy:

- treatment only for symptoms
- exclusion of other causes necessary
- initial treatment: often metronidazole or iodoquinol
- alternative approaches (partly successful study results): nitazoxanide and herbal extracts (e.g. garlic, ginger)



Dientamoeba fragilis – dientamoebiasis [21-24]

- occurs worldwide, high prevalence in industrialised countries
- pathogenicity controversial
- however, cases of gastrointestinal symptoms in infected patients have been documented for > 100 years
- two genotypes identified, with genotype 1 being more common

Transmission:

- largely unknown
- transmission by helminths as well as directly by trophozoites is discussed

Symptoms:

- diarrhoea (especially in acute cases)
- abdominal pain and cramps (especially in chronic cases)
- flatulence
- nausea
- irregular bowel movements
- asymptomatic courses possible
- in approx. 32% of affected children: peripheral eosinophilia

Therapy:

- medication: iodoquinol, paromomycin, metronidazole, 5-nitroimidazole derivatives
- challenges: limited studies on efficacy
- recommendation: Carefully monitor therapeutic effect and toxicity

HELMINTHES (intestinal worms)

Nematoda (roundworms)

***Ancylostoma duodenale, A. ceylanicum* – and *Necator americanus* – hookworm – ancylostomiasis** [25-27]

- hookworm infections are mainly caused by *Ancylostoma duodenale* and *Necator americanus*
- increasing number of infections with *A. ceylanicum* observed

Transmission:

- largely unknown
- transmission by helminths as well as directly by trophozoites is being discussed

Symptoms:

- often asymptomatic
- possible symptoms:
  - itchy skin rash
  - eosinophilic pneumonia
  - abdominal pain
  - nausea
  - loss of appetite
- chronic blood loss: iron deficiency anaemia (depending on worm burden and iron intake)
- rare: eosinophilic enteritis in infections with *A. caninum* and *A. ceylanicum*

Other hookworm species:

A. caninum, A. braziliense, U. stenocephala

- causes cutaneous larva migrans
- humans as false hosts

Therapy:

- anthelmintics such as albendazole, ivermectin, mebendazole, or pyrantel pamoatet

***Enterobius vermicularis* – pinworm – enterobiasis/oxyuriasis** [28,29]

- mainly affects children of pre-school and school age

Transmission:

- smear infection
- self-infection through scratching and hand-to-mouth behaviour

Symptoms:

- main symptom: Itching in the anal area, especially at night
- other symptoms
  - sleep disturbances
  - abdominal pain
- rare: secondary bacterial infections, vaginitis

Therapy:

- anthelmintics: mebendazole, pyrantel pamoate, albendazole
- due to the high prevalence and frequent reinfection, only recommended for severe symptoms

HELMINTHES (intestinal worms)

Nematoda (roundworms)

***Ascaris lumbricoides* and *A. suum* – roundworm – ascariasis** [30-33]

- most common intestinal helminth infection worldwide

Transmission:

- oral ingestion of embryonated eggs via:
  - contaminated food (e.g. with faecal manure)
  - contact with pigs

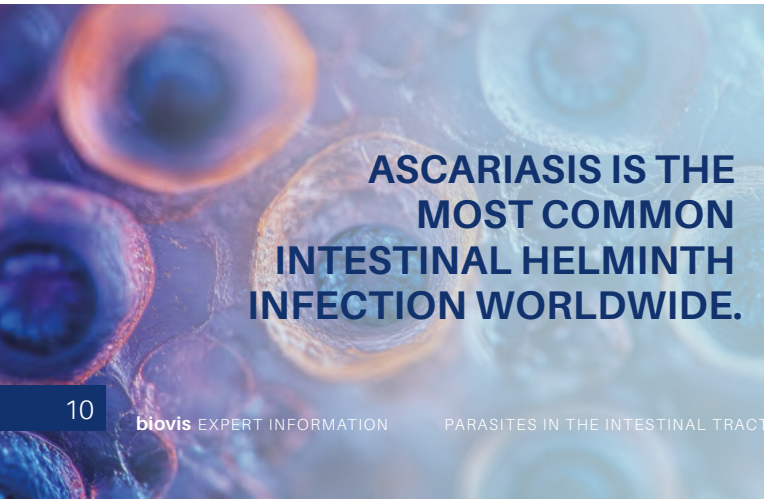
Symptoms:

- variable depending on worm burden and stage of development:
- mild: asymptomatic
- severe:
  - Löffler syndrome (eosinophilic pneumonitis)
  - urticaria
  - hepatomegaly
  - bile duct or intestinal obstructions
  - especially in children: acute abdominal pain and risk of acute intestinal obstruction
- complications:
  - intestinal rupture, ileus, intussusception (intestinal engorgement)
- pancreatitis, cholecystitis, liver abscesses

Therapy:

- anthelmintics such as albendazole or mebendazole

Eggs of *Ascaris lumbricoides*



***Strongyloides stercoralis* – dwarf threadworm – Strongyloidiasis** [34-36]

Transmission:

- skin penetration of infective larvae (L3) from contaminated soil

Symptoms:

- asymptomatic to chronic:
  - skin: itchy rash (especially anal area), urticaria
  - lungs: cough, wheezing, Löffler syndrome (eosinophilic pneumonitis)
  - gastrointestinal: abdominal pain, diarrhoea, nausea, weight loss
- hyperinfection syndrome (with immunodeficiency):
- intestinal obstruction, sepsis, lung/kidney failure, meningitis

Therapy:

- first: ivermectin (higher cure rate)
- alternative: albendazole (especially in Germany, as ivermectin is not authorised for this indication)
- treatment of all infected persons required (risk of autoinfection)

Strongyloides stercoralis

Trichuris trichiura – whipworm – trichuriasis [37,38]

- trichuriasis caused by whipworms of the genus *Trichuris*, especially *Trichuris trichiura*
- however, it is possible that several *Trichuris* species can infect humans
- zoonoses are also possible

Transmission:

- oral ingestion of embryonated eggs
- eggs develop in moist soil

Symptoms:

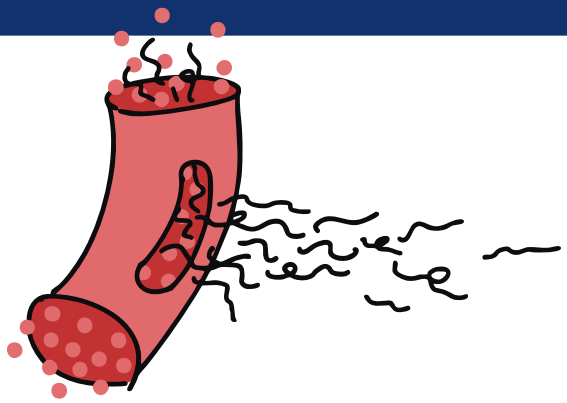
- mostly asymptomatic
- severe cases (especially in young children):
  - gastrointestinal problems
  - anaemia
  - growth retardation
- rare: rectal prolapse

Therapy:

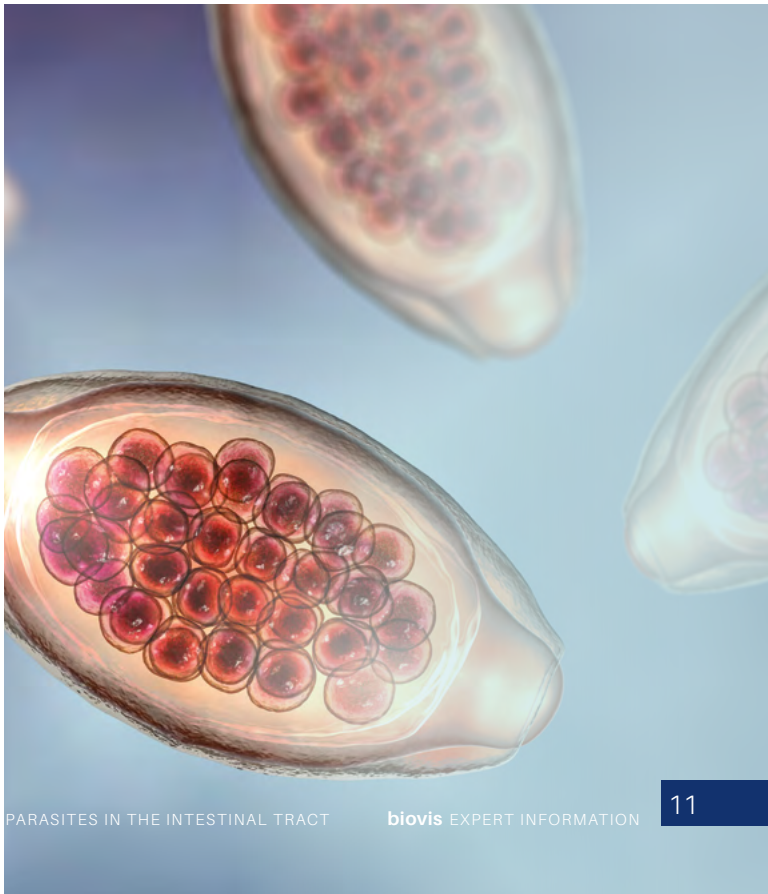
- anthelmintics such as mebendazole, albendazole or ivermectin

DID YOU KNOW?

Parasites travel through the body: Some intestinal parasites, such as roundworms, undergo complex migrations in the body. They enter the bloodstream via the skin, travel to the lungs, trigger a cough and are then swallowed before finally ending up in the intestine.



Eggs of *Trichuris trichiura*



HELMINTHES (intestinal worms)

Platyhelminthes (flatworms)

***Taenia saginata, T. solium* and *T. asiatica* – cestoda/tapeworms – taeniasis** [39,40]

- *T. saginata* (cattle tapeworm), *T. solium* (Swiss tapeworm), *T. asiatica* (Asian tapeworm)
- can survive for years in the human intestine
- special form: cysticercosis caused by *T. solium*
  - can develop in various organs and tissues
  - neurocysticercosis in the central nervous system is particularly dangerous

Transmission:

- consumption of raw or undercooked meat containing fins

Symptoms:

- usually asymptomatic or mild gastrointestinal symptoms

Therapy:

- praziquantel or niclosamide

***Hymenolepis nana* or *H. diminuta* – dwarf tapeworms – hymenolepiasis** [41,42]

- hymenolepiasis is widespread worldwide
- *H. nana* can also cause an internal auto-infection

Transmission:

- faecal-oral through smear infection
- contaminated food or water
- ingestion of infected arthropods as intermediate hosts
- *H. nana:* possibility of internal auto-infection

Symptoms:

- mostly asymptomatic
- in case of heavy infestation: gastrointestinal symptoms (abdominal pain, diarrhoea)
- general complaints: weakness, loss of appetite

Therapy:

- anthelmintics: praziquantel or niclosamide

Cestoda/tapeworms

Hymenolepis nana

MIKROSPORIDIA

Enterocytozoon bieneusi and *Encephalitozoon species* – microsporidios [44-46]

- microsporidia: group of obligate intracellular, fungus-related parasites
- > 1400 species
- at least 15 infect humans, mainly *Enterocytozoon bieneusi* and *Encephalitozoon* species

Transmission:

- via spores
- routes: contaminated food, contact, inhalation, eye exposure

Symptoms:

- opportunistic disease
- immunocompetent: often subclinical or self-limiting
  - symptoms: watery diarrhoea, keratoconjunctivitis
- immunocompromised (e.g. AIDS patients): severe systemic courses
  - complications: encephalitis, possible death

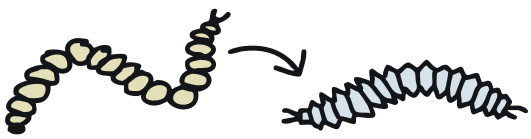
Therapy:

- depending on the type of pathogen and immune status
- *Encephalitozoon intestinalis:* albendazole
- *Enterocytozoon bieneusi:* oral fumagillin
- side effects: including thrombocytopenia
- restoration of immune function can contribute to healing
- expert consultation for patients at risk

Mikrosporidien

DID YOU KNOW?

Survival strategies: Some parasites regularly change their surface structure to avoid being recognised by the immune system. Others release substances that suppress the immune system and promote their development.



PARASITE OVERVIEW

	Disease	Causative parasite	Symptoms	Conventional medicine	Additional measures
Protozoa	giardiasis	*Giardia lamblia*	often asymptomatic, severe diarrhoea, malabsorption	metronidazole, tinidazole	oregano oil, *Thymbra capitata* [47, 48]
	amoebic dysentery	*Entamoeba histolytica*	intermittent diarrhoea, constipation, flatulence, abdominal pain	against trophozoites: metronidazole or tinidazole elimination of cysts: paromomycin, iodoquinol or diloxanide furoate	oregano oil, *Morinda morindoides* leaves, wormwood [49-51]
	cryptosporidiosis	*Cryptosporidium parvum, C. hominis*	leading symptom: severe, watery diarrhoea accompanying symptoms: Fatigue, fever	mostly symptomatic specific antiparasitics not authorised in the EU	strengthen the immune system, garlic extract [52, 53]
	cyclosporiasis	*Cyclospora cayetanensis*	watery diarrhoea, fever, abdominal cramps, lack of energy, weight loss	only in the absence of spontaneous healing: trimethoprim-sulfamethoxazole	
	blastocystosis	*Blastocystis hominis*	diarrhoea, abdominal pain, flatulence, irritable bowel syndrome, skin reactions	treatment only if symptoms occur; exclusion of other causes necessary; initial treatment: often metronidazole or iodoquinol	oregano oil, ginger, garlic, *Saccharomyces boulardii*, sweet basil, thyme [54-58]
	dientamoebiasis	*Dientamoeba fragilis*	diarrhoea, abdominal pain and cramps, flatulence, nausea, irregular bowel movements	iodoquinol, paromomycin, metronidazole, 5-nitroimidazole derivatives; carefully monitor therapeutic effect and toxicity	
Helminths	hookworm - ancylostomiasis	*Ancylostoma duodenale, A. ceylanicum* and *Necator americanus*	often asymptomatic, itchy skin rash, eosinophilic pneumonia, abdominal pain, nausea, loss of appetite, iron deficiency anaemia	albendazole, ivermectin, mebendazole or pyrantel pamoate	pro- and prebiotics, pumpkin seeds, coconut [59-61]
	pinworm - enterobiasis/ oxyuriasis	*Enterobius vermicularis*	itching in the anal area, especially at night, sleep disorders, abdominal pain	due to high prevalence and frequent reinfection only with pronounced symptoms: mebendazole, pyrantel pamoate, albendazole	pro- and prebiotics, pumpkin seeds, coconut [59-61]
	roundworm - ascariasis	*Ascaris lumbricoides* and *A. suum*	mild infestation: mostly asymptomatic severe infestation: Löffler syndrome, urticaria, hepatomegaly, bile duct and intestinal obstruction, acute abdominal pain	albendazole or mebendazole	pro- and prebiotics, papaya seeds, pumpkin seeds, coconut, wormwood [59-63]
	dwarf threadworm - strongyloidiasis	*Strongyloides stercoralis*	asymptomatic to chronic; skin: itchy rash (especially anal area), urticaria lungs: cough, wheezing, Löffler syndrome (eosinophilic pneumonitis) gastrointestinal: abdominal pain, diarrhoea, nausea, weight loss	first: ivermectin (higher cure rate) alternative: albendazole (especially in Germany, as ivermectin is not authorised for this indication); treatment of all infected persons required (risk of autoinfection)	pro- and prebiotics, pumpkin seeds, coconut [59-61]

Disease		Causative parasite	Symptoms	Conventional medicine	Additional measures
Helminths	whipworm - trichuriasis	*Trichuris trichiura*	usually asymptomatic; severe cases (especially in small children): gastrointestinal problems, anaemia, growth retardation rarely: rectal prolapse	mebendazole, albendazole or ivermectin	probiotics and prebiotics, pumpkin seeds, coconut [59-61]
	tapeworms - taeniasis	*Taenia saginata, T. solium* and *T. asiatica*	mostly asymptomatic or mild gastrointestinal symptoms	praziquantel or niclosamide	probiotics and prebiotics, pumpkin seeds, coconut [59-61]
	dwarf tapeworms - hymenolepiasis	*Hymenolepis nana* or *H. diminuta*	mostly asymptomatic in case of heavy infestation: gastrointestinal symptoms (abdominal pain, diarrhoea) general complaints: weakness, loss of appetite	praziquantel or niclosamide	probiotics and prebiotics, pumpkin seeds, coconut [59-61]
Microsporidia	microsporidiosis	*Enterocytozoon bieneusi* and Encephalitozoon species	immunocompetent: often subclinical or self-limiting symptoms: watery diarrhoea, keratoconjunctivitis	*E. intestinalis:* albendazole *E. bieneusi:* oral fumagillin; expert consultation for patients at risk	

BIBLIOGRAPHY

[1] Harhay, Michael O et al. "Epidemiology and control of human gastrointestinal parasites in children." Expert review of anti-infective therapy vol. 8,2 (2010): 219-34. doi:10.1586/eri.09.119

[2] Bialek, R., and G. Dostal. "Parasitosen, Mykosen, Tropen- und Reisemedizin." Pädiatrie (2019): 371–399. doi:10.1007/978-3-662-57295-5_16

[3] Beglinger, Christoph "Gastrointestinale und biliäre Parasitosen – Update," Gastroenterologie up2date, vol. 11, no. 02, (2015): 101–117. doi: 10.1055/S-0034-1392228.

[4] Majer, Sabine, and Andreas Neumayr. "Parasiten des Gastrointestinaltraktes." Swiss medical forum= Schweizerisches Medizin-Forum. Vol. 15. No. 11. EMH Schweizerischer Aerzte-Verlag, 2015.

[5] Papaiakovou, Marina et al. "Quantitative PCR-Based Diagnosis of Soil-Transmitted Helminth Infections: Faecal or Fickle?." Trends in parasitology vol. 35,7 (2019): 491-500. doi:10.1016/j.pt.2019.04.006

[6] Autier, Brice et al. "Evaluation of the Allplex™ GI-Helminth(I) Assay, the first marketed multiplex PCR for helminth diagnosis." "Évaluation du kit Allplex™ GI-Helminth(I) Assay, la première PCR multiplex commercialisée pour le diagnostic des helminthes." Parasite (Paris, France) vol. 28 (2021): 33. doi:10.1051/parasite/2021034

[7] Breathnach, A S et al. "Prevalence and clinical correlations of genetic subtypes of Giardia lamblia in an urban setting." Epidemiology and infection vol. 138,10 (2010): 1459-67. doi:10.1017/S0950268810000208

[8] Schnell, Kerry et al. "Giardiasis in the United States - an epidemiologic and geospatial analysis of county-level drinking water and sanitation data, 1993-2010." Journal of water and health vol. 14,2 (2016): 267-79. doi:10.2166/wh.2015.283

[9] Nash, T E. "Treatment of Giardia lamblia infections." The Pediatric infectious disease journal vol. 20,2 (2001): 193-5. doi:10.1097/00006454-200102000-00015

[10] Taherian, Mehran, et al. "Amebic Colitis." StatPearls, StatPearls Publishing, 24 October 2022

Weitere Literaturquellen auf Anfrage.

FURTHER INFORMATION CAN BE FOUND ON OUR HOMEPAGE.

biovis' DIAGNOSTICS

biovis Diagnostik MVZ GmbH
Brüsseler Str. 18
65552 Limburg-Eschhofen
Phone: +49 6431 21248 0
Fax: +49 6431 21248 66
info@biovis.de

www.biovis.de

Picture credits:

©Corona Borealis - adobe.stock.com
© Kosamtu - istock.com
©stefanamer - istock.com
©jarun011 - adobe.stock.com
©Jafree - adobe.stock.com
©singgih - adobe.stock.com
©janya - adobe.stock.com
©Magnimage - adobe.stock.com
©Dr_Microbe - adobe.stock.com
©Satjawat - adobe.stock.com
©Nijat - adobe.stock.com
©sinhyu - adobe.stock.com
©Dr_Microbe - adobe.stock.com
©Supittra - adobe.stock.com
©dDenVil - adobe.stock.com
©nyul - adobe.stock.com