

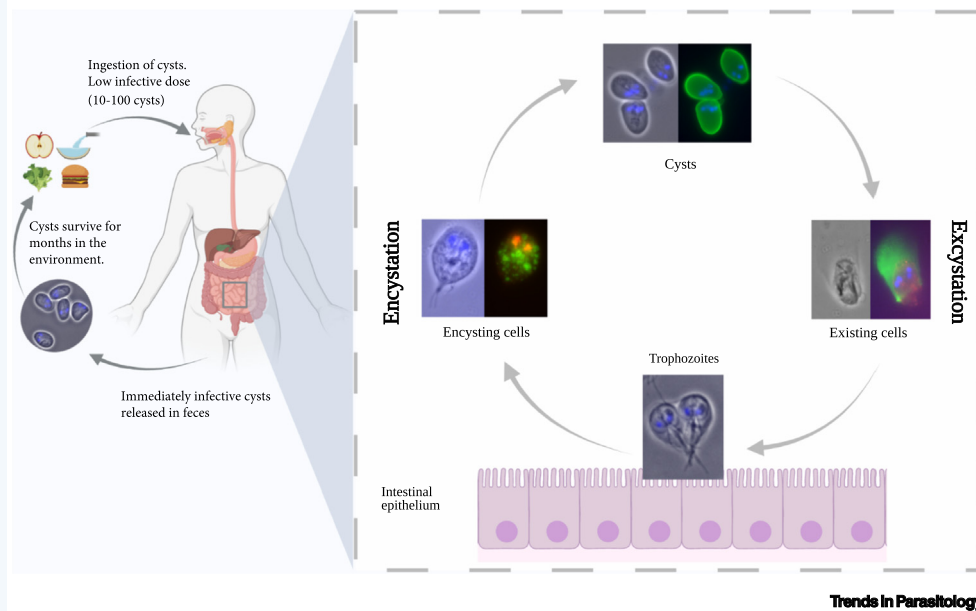
Giardia duodenalis

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Giardia duodenalis life cycle



KEY FACTS:

G. duodenalis is grouped into eight different assemblages (genotypes A–H) based on host specificity and genetic differences. Assemblages A and B infect humans, and certain subgenotypes have zoonotic potential.

A small genome (12.6 Mbp with 4963 protein-encoding genes), divided on five different chromosomes in two nuclei (tetraploid organism). The highly reduced mitochondria-like organelles (mitosomes) lack DNA.

Recent advances: complete reference genomes, tractable life cycle *in vitro*, genetic engineering producing knockouts (Cre/LoxP, CRISPR/Cas9) and knockdowns (morpholinos and CRISPRi), culture with organoids and mouse and gerbil models to study immunity and pathogenesis.

DISEASE FACTS:

Giardia infections can result in a wide range of symptoms, including profuse, fatty diarrhea, abdominal cramps, nausea, and wasting; however, infections can also be subclinical.

Chronic infection may cause a disturbed intestinal balance with changes in the microbiota, villus blunting, leaky gut, nutrient malabsorption, and stunted growth.

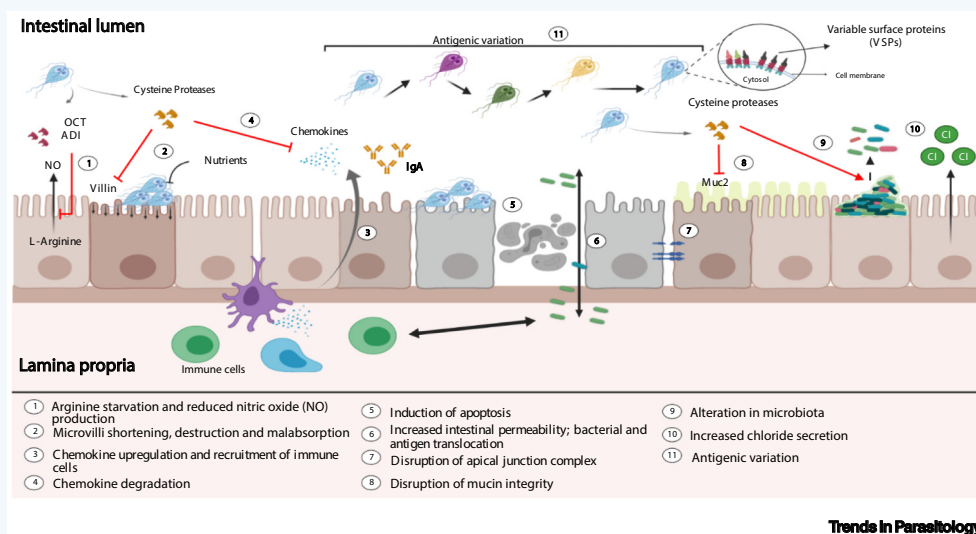
Postinfectious problems include food allergies, irritable bowel syndrome, and chronic fatigue syndrome.

Giardia infection induces robust innate and adaptive immune responses, but in contrast to most other intestinal infections, it causes low level or no inflammation.

TAXONOMY AND CLASSIFICATION:

PHYLUM: Metamonada
CLASS: Fornicata
ORDER: Diplomonadida
FAMILY: Hexamitidae
GENUS: *Giardia*
SPECIES: *G. duodenalis*

Giardia duodenalis (syn. *Giardia lamblia* and *Giardia intestinalis*) is a major cause of parasite-induced diarrheal disease. It is found worldwide but the prevalence is higher in low-income countries. Transmission occurs via the fecal–oral route, and sources of *G. duodenalis* infection include contaminated water or food, or direct contact with infected people or animals. Cysts are immediately infectious upon excretion in feces. After ingestion of the cysts, motile trophozoites emerge (excystation) and attach to intestinal epithelial cells of the upper small intestine where they replicate extracellularly. *Giardia* completes its life cycle by forming cysts (encystation) in the lower intestinal region. Replication of the parasite can result in profuse, fatty diarrhea in infected individuals, but asymptomatic infections are also common. The major drug used for treatment is metronidazole, but resistance is an emerging problem.



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Declaration of interests

The authors declare no competing interests.

Resources

www.cdc.gov/parasites/giardia/index.html

<https://giardiadb.org/giardiadb/>

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