



# The Complex Relationship between *Blastocystis* and Gastrointestinal Symptoms

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## DESCRIPTION

*Blastocystis* is a unicellular protist that has long intrigued scientists due to its enigmatic nature and diverse impact on human health. This microscopic organism inhabits the gastrointestinal tracts of various animals, including humans. *Blastocystis* is part of a diverse group of single-celled eukaryotic microorganisms known as protists. Protists encompass a wide range of unicellular organisms that do not fit neatly into other biological categories. It was first identified in the late 19<sup>th</sup> century but has since undergone multiple reclassifications based on advances in molecular biology and genetics.

*Blastocystis* is classified within the stramenopile kingdom, specifically in the stramenopile subgroup Heterokonta. Within this subgroup, it is grouped under the class Blastocystea and the genus *Blastocystis*. The species *Blastocystis hominis* is commonly associated with human infections, but several other species have been identified in various animals. *Blastocystis* exhibits a polymorphic nature, meaning it can take on various forms and sizes. In its cyst form, *Blastocystis* is often spherical, with a thick, rigid cell wall that protects it from harsh environmental conditions and allows it to survive outside the host. Inside the cyst, the organism is metabolically dormant.

When *Blastocystis* is actively replicating, it transforms into a more dynamic, amoeboid form characterized by a central nucleus, a vacuolar system, and various filamentous structures known as pseudopodia. These pseudopodia are used for movement and feeding. The amoeboid form is thought to be involved in the colonization of the host's intestinal tract.

The lifecycle of *Blastocystis* is still not fully understood, and there is ongoing research aimed at elucidating its various stages. The lifecycle begins when a host ingests *Blastocystis* cysts, typically through contaminated food or water. Once inside the host's digestive system, the cysts are exposed to the acidic environment of the stomach. In response to the stomach's acidic conditions, the cysts excyst, releasing the amoeboid form of *Blastocystis*. This form is believed to be involved in colonization and multiplication within the host's intestines. Within the host's

intestines, *Blastocystis* undergoes binary fission, a form of asexual reproduction, where the organism splits into two identical daughter cells. This process can lead to the proliferation of *Blastocystis* within the host. Under certain conditions, *Blastocystis* may revert to its cyst form. Cysts are excreted in the host's feces, where they can survive outside the host for varying periods.

It is a widespread organism found in the gastrointestinal tracts of humans and numerous animals. Its prevalence varies depending on geographic location, socio-economic factors, and sanitation practices. *Blastocystis* infections are often more common in regions with poor sanitation and limited access to clean drinking water.

The organism has been identified in individuals of all age groups, with higher prevalence rates reported in children in some studies. Additionally, it has been found in both healthy individuals and those with gastrointestinal symptoms. The reasons for these variations in prevalence and clinical significance are still being investigated.

The pathogenicity of *Blastocystis* remains a subject of debate among researchers and clinicians. While some individuals infected with *Blastocystis* remain asymptomatic, others may experience gastrointestinal symptoms, such as diarrhea, abdominal pain, and bloating. In some cases, it has been associated with more severe conditions, such as Irritable Bowel Syndrome (IBS) and Inflammatory Bowel Disease (IBD).

However, establishing a direct causal relationship between *Blastocystis* and gastrointestinal symptoms has proven challenging. It is genetically diverse, with multiple Subtypes (STs) identified. Some studies suggest that specific STs may be more likely to cause symptoms, but this relationship is not well-defined. Individuals infected with *Blastocystis* often harbor other pathogens, making it difficult to attribute symptoms solely to *Blastocystis*. Individual host factors, such as immune status and genetic predisposition, may play a role in determining whether *Blastocystis* infection leads to symptoms. Environmental factors, including diet and the composition of the gut microbiota, may influence the clinical outcome of *Blastocystis* infection. *Blastocystis* has been found to produce various molecules with

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potential virulence properties, but their role in pathogenicity is not fully understood. Due to these complexities, the pathogenicity of *Blastocystis* remains a topic of ongoing research, and its clinical significance varies among individuals.

Research on *Blastocystis* continues to evolve, with scientists exploring various aspects of its biology, including its genomics, metabolism, and interaction with the host's immune system. Further characterization of *Blastocystis* subtypes and their associations with clinical outcomes. Investigating how it interacts with the human immune system and the gut microbiota. Identifying specific molecules produced by *Blastocystis* that may contribute to pathogenicity. Developing effective treatment options for *Blastocystis* infections, which are

currently challenging to treat due to the lack of universally accepted therapeutic guidelines. Assessing the public health significance of *Blastocystis* infections, particularly in regions with high prevalence rates.

In conclusion, it is a fascinating unicellular protist that inhabits the gastrointestinal tracts of humans and animals. Its complex lifecycle, polymorphic nature, and variable clinical impact make it a subject of ongoing research and debate in the fields of microbiology, parasitology, and gastroenterology. As our understanding of *Blastocystis* continues to evolve, we may gain insights into its role in human health and potential therapeutic interventions for associated gastrointestinal symptoms.