

1 *Blastocystis*

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8 **Summary** (996/1000 characters)

9 *Blastocystis* colonizes the large intestine and divides by binary fission. *In vitro*, *Blastocystis* can
10 adhere to intestinal mucin and secrete cysteine proteases that contribute to pathogenesis through
11 degradation of secretory IgA, Rho/ROCK-mediated tight junction compromise, NF-κB-mediated
12 secretion of inflammatory cytokines and host cell apoptosis. It is currently unknown whether this
13 occurs *in vivo*. Most gut microbiota studies that include *Blastocystis* report that *Blastocystis* is a
14 common constituent of the healthy gut microbiota and associated with higher bacterial richness,
15 and that long-term asymptomatic carriage is common. In contrast, a couple of recent studies have
16 suggested that *Blastocystis* decreases beneficial gut bacteria, leading to a dysbiotic state. Such
17 discrepant observations have led to confusion on the clinical relevance of the parasite. *Blastocystis*
18 is relatively rare in patients with inflammatory bowel disease, and its role in irritable bowel
19 syndrome is still controversial.

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22 (1440/1450 characters)

23 **KEY FACTS:**

24 *Blastocystis* from mammals and birds can be classified into at least 17 subtypes (STs) currently
25 based on SSU rRNA genes. STs are as divergent as species or even genera.

26 Humans can host ST1–9 and 12; more than 90% of human *Blastocystis* belong to ST1-4.

27 Reservoir hosts have been identified for all subtypes except ST9; cryptic host specificity exists for
28 at least some of them.

29 Two genomes: a nuclear genome of 12.9–18.8 Mb (depending on subtypes) encoding 5,713–6,544
30 proteins, and a mitochondrial genome of 27.7–29.3 Kb.

31 *Blastocystis* can be cultured easily in Jones' and other media with faecal bacteria. Genetic
32 manipulation method for ST7 has been described recently.

33 Subtype nomenclature was introduced when it became clear that previous species names were
34 invalid or represented multiple very distinct entities.

35 **DISEASE FACTS:**

36 Despite more than 1 billion carriers worldwide, the public health significance remains unknown.

37 *Blastocystis* is recently found more common in gastrointestinal-healthy individuals.

38 Gut bacterial diversity and richness are mostly higher in *Blastocystis*-positive individuals. ST7 has
39 been shown to decrease levels of beneficial gut bacteria such as *Bifidobacterium* and
40 *Lactobacillus*.

41 Zoonotic contribution to human *Blastocystis* colonization is probably low.

42 **TAXONOMY AND CLASSIFICATION:**

43 KINGDOM: Sar

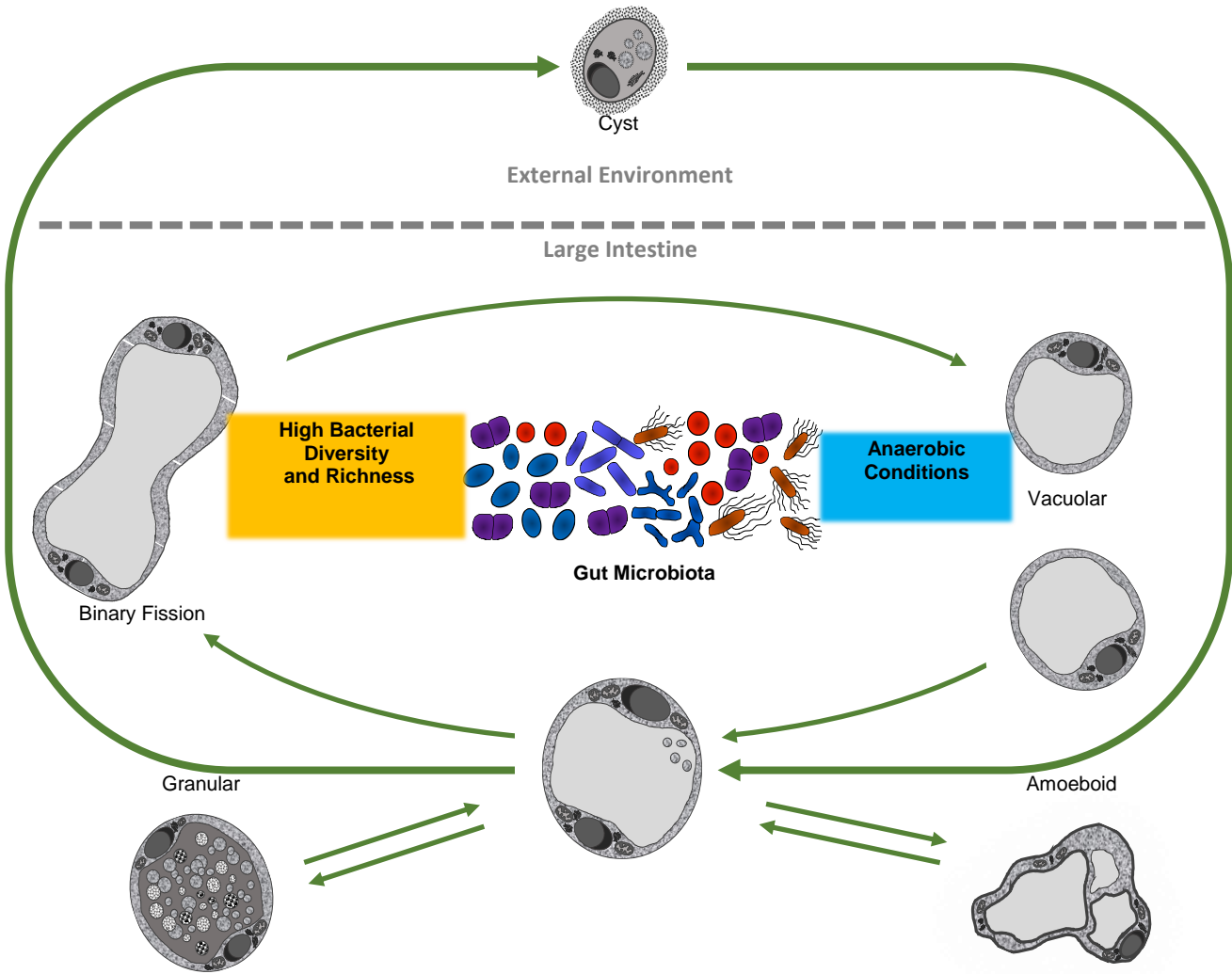
44 PHYLUM: Stramenopiles

45 CLASS: Bigyra

46 ORDER: Opalinata

47 FAMILY: Blastocystidae

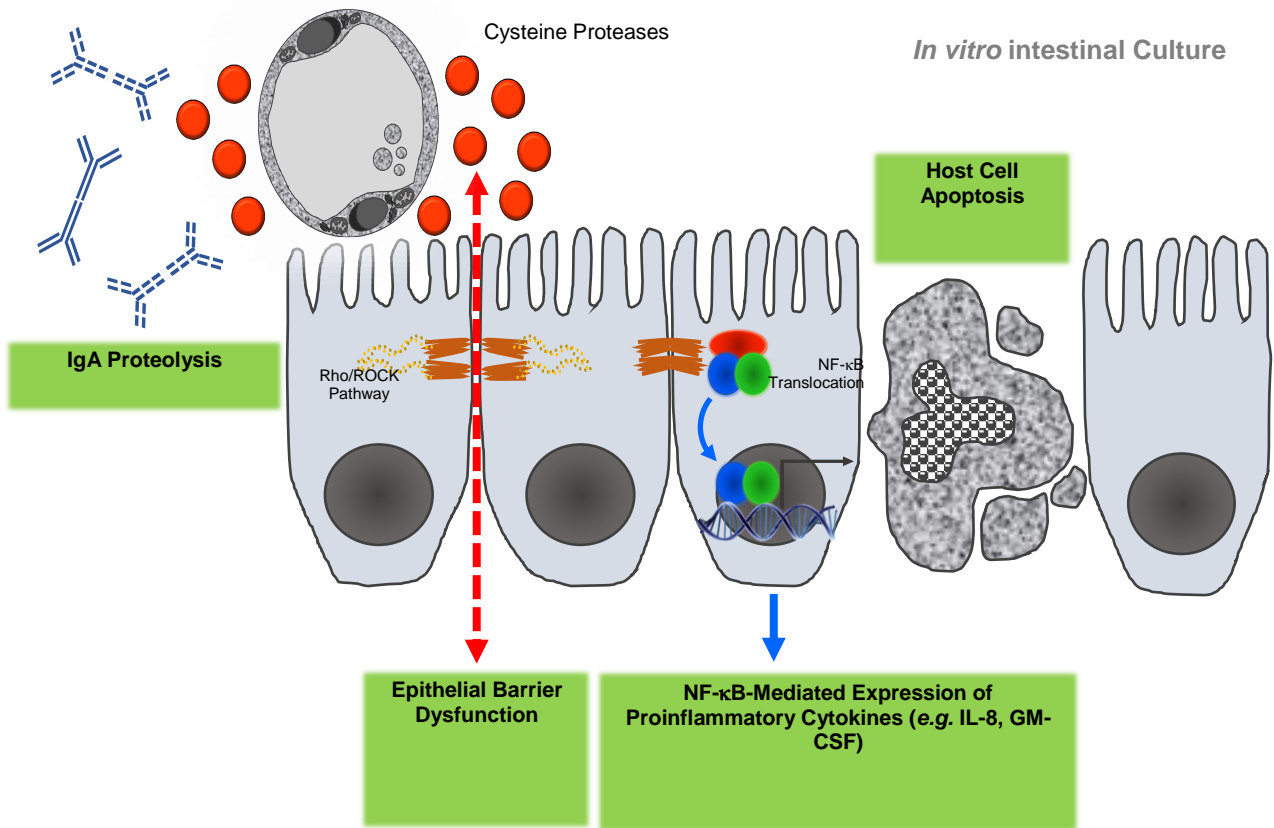
48 GENUS: *Blastocystis*



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53 **RESOURCES:**

54 www.pubmlst.org/blastocystis

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56 **REFERENCES:**

57 1. Stensvold, C.R. et al. (2007) Terminology for Blastocystis subtypes - a consensus. Trends in Parasitology
58 23 (3), 93-96.

59 2. Adl, S.M. et al. (2019) Revisions to the Classification, Nomenclature, and Diversity of Eukaryotes. J
60 Eukaryot Microbiol 66 (1), 4-119.

61 3. Clark, C.G. et al. (2013) Recent developments in Blastocystis research. Adv Parasitol 82, 1-32.

62 4. Tito, R.Y. et al. (2018) Population-level analysis of *Blastocystis* subtypes prevalence and variation in the
63 human gut microbiota. Gut. doi: 10.1136/gutjnl-2018-316106 [Epub ahead of print]

64 5. Denoeud, F. et al. (2011) Genome sequence of the stramenopile *Blastocystis*, a human anaerobic
65 parasite. Genome Biol 12 (3), R29.

66 6. Gentekaki, E. et al. (2017) Extreme genome diversity in the hyper-prevalent parasitic eukaryote
67 *Blastocystis*. PLoS Biol 15 (9), e2003769.

68 7. Silberman, J.D. et al. (1996) Human parasite finds taxonomic home. Nature 380 (6573), 398.

69 8. Li, F.J. et al. (2019) Successful Genetic Transfection of the Colonic Protistan Parasite *Blastocystis* for
70 Reliable Expression of Ectopic Genes. Sci Rep 9 (1), 3159.

71 9. Yason, J.A. et al. (2019) Interactions between a pathogenic *Blastocystis* subtype and gut microbiota: in
72 vitro and in vivo studies. Microbiome 7 (1), 30.

73 10. Beghini, F. et al. (2017) Large-scale comparative metagenomics of *Blastocystis*, a common member of
74 the human gut microbiome. ISME J 11 (12), 2848-2863.

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