

# Genetic subtypes in unicellular intestinal parasites with special focus on *Blastocystis*

**Joakim Forsell**

## Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i Hörsal D, byggnad 1D, Norrlands universitetssjukhus, fredagen den 7:e april, kl. 09:00.  
Avhandlingen kommer att försvaras på engelska.

Fakultetsopponent: Associate Professor, Tom van Gool,  
Section of Parasitology, Department of Microbiology, University of Amsterdam, Academic Medical Centre, Amsterdam, Netherlands.



**Department of Clinical Microbiology**  
Umeå University  
Umeå 2017

**Organization**

Umeå University  
Department of  
Clinical Microbiology

**Document type**

Doctoral thesis

**Date of publication**

17 March 2017

**Author**

Joakim Forsell

**Title**

Genetic subtypes in unicellular intestinal parasites with special focus on *Blastocystis*

**Abstract**

The development of molecular tools for detection and typing of unicellular intestinal parasites has revealed genetic diversities in species that were previously considered as distinct entities. Of great importance is the genetic distinction found between the pathogenic *Entamoeba histolytica* and the non-pathogenic *Entamoeba dispar*, two morphologically indistinguishable species. *Blastocystis* sp. is a ubiquitous intestinal parasite with unsettled pathogenicity. Molecular studies of *Blastocystis* sp. have identified 17 genetic subtypes, named ST1-17. Genetically, these subtypes could be considered as different species, but it is largely unknown what phenotypic or pathogenic differences exist between them. This thesis explores molecular methods for detection and genetic subtyping of unicellular intestinal parasites, with special focus on *Blastocystis*.

We found that PCR-based methods were highly sensitive for detection of unicellular intestinal parasites, but could be partially or completely inhibited by substances present in faeces. A sample transport medium containing guanidinium thiocyanate was shown to limit the occurrence of PCR inhibition.

The prevalence of *Blastocystis* in Swedish university students was over 40%, which is markedly higher than what was previously estimated. *Blastocystis* ST3 and ST4 were the two most commonly found *Blastocystis* subtypes in Sweden, which is similar to results from other European countries.

*Blastocystis* sp. and *Giardia intestinalis* were both commonly detected in Zanzibar, Tanzania, each with a prevalence exceeding 50%. *Blastocystis* ST1, ST2, and ST3 were common, but ST4 was absent. While *G. intestinalis* was most common in the ages 2-5 years, the prevalence of *Blastocystis* increased with increasing age, at least up to young adulthood. We found no statistical association between diarrhoea and *Blastocystis* sp., specific *Blastocystis* subtype or *G. intestinalis*.

Metagenomic sequencing of faecal samples from Swedes revealed that *Blastocystis* was associated with high intestinal bacterial genus richness, possibly signifying gastrointestinal health. *Blastocystis* was also positively associated with the bacterial genera *Sporolactobacillus* and *Candidatus Carsonella*, and negatively associated with the genus *Bacteroides*.

*Blastocystis* ST4 was shown to have limited intra-subtype genetic diversity and limited geographic spread. ST4 was also found to be the major driver behind the positive association between *Blastocystis* and bacterial genus richness and the negative association with *Bacteroides*.

**Keywords**

Intestinal parasites, *Blastocystis*, *Entamoeba*, *Giardia*, molecular detection, PCR, subtype, intestinal microbiota, Sweden, Zanzibar.

**Language**

English

**ISBN**

978-91-7601-682-4

**ISSN**

0346-6612

**Number of pages**

61 + 4 papers