

# PARASITES INVOLVED!



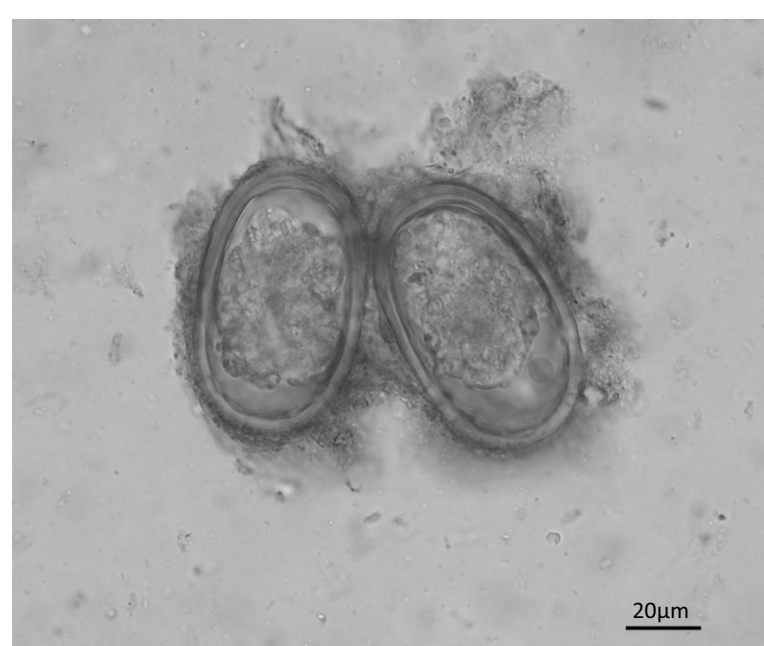
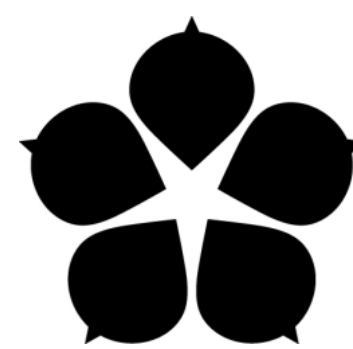
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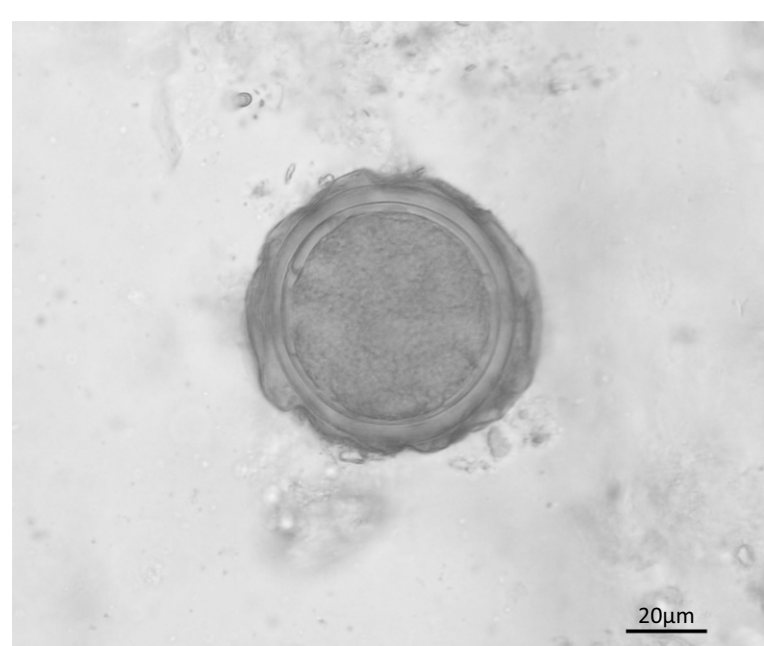
*Uncinaria stenocephala* (*Vulpes lagopus*)



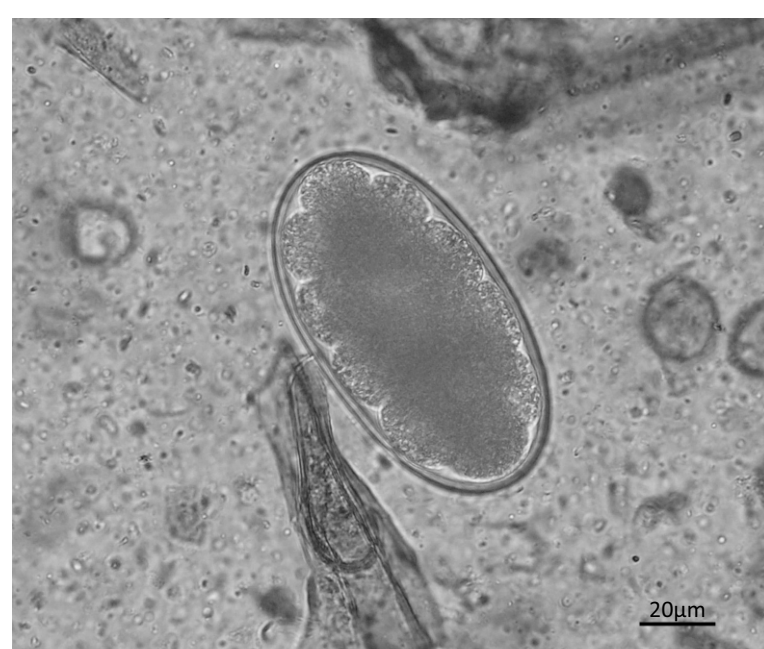
*Toxascaris leonina* (*Vulpes lagopus*)



*Eucoleus aerophilus* (*Vulpes lagopus*)



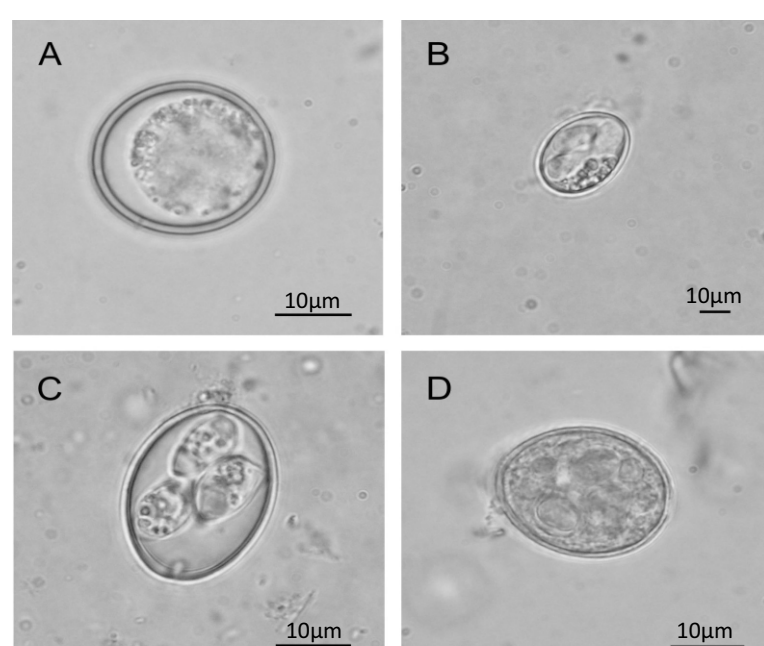
*Baylisascaris transfuga* (*Ursus maritimus*)



Trichostrongyloidea



*Moniezia benedeni* (*Rangifer t. platyrhynchus*)



*Eimeria* spp. (*Vulpes lagopus*)

Whether this idea is pleasant to us or not, parasites are inseparable and often very important part of all systems on the planet, not excluding the Arctic. They help us connect the threads of the story about their mysterious life and coexistence with their hosts in terms of historical, ecological and biogeographical dispersal. With rapidly changing climate in the High latitude it is very important to know what we are dealing with. Therefore first we need to obtain more information about these creatures and only then we can predict the impact on populations of hosts and what is important for people, a potential zoonotic risk.

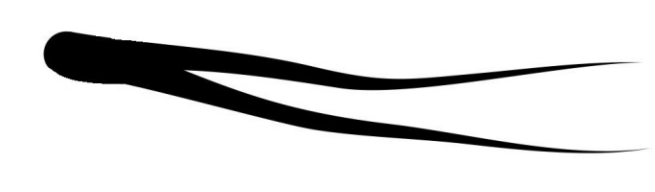
In this study we tried noninvasive method (examination of faeces of vertebrates of Svalbard) as a source of information about parasitofauna of this ecosystem by using combination of microscopic and molecular methods. We identified 9 parasitic groups infecting vertebrates both unicellular and multicellular. Some of these parasites have already been recorded for these species in Svalbard however, there were also parasites that have not yet been diagnosed there.

**Arctic Fox**  
*Vulpes lagopus*



*Eimeria* spp.  
*Eucoleus aerophilus*  
*Toxascaris leonina*  
*Uncinaria stenocephala*  
*Enterocytozoon bieneusi*  
genotype EbpC

**Polar Bear**  
*Ursus maritimus*



*Baylisascaris transfuga*  
*Encephalitozoon cuniculi* genotype II

**Svalbard Reindeer**  
*Rangifer tarandus platyrhynchus*



*Eimeria* spp.  
Trichostrongyloidea  
*Capillaria* sp.  
*Moniezia benedeni*  
*Enterocytozoon bieneusi*  
genotype new

**Pink-footed Goose**  
*Anser brachyrhynchus*



*Eimeria* spp.  
*Enterocytozoon bieneusi*  
genotype EbpC

**Barnacle Goose**  
*Branta leucopsis*



*Eimeria* spp.

**Black-legged kittiwake**  
*Rissa tridactyla*



*Enterocytozoon bieneusi*  
genotype EbpC, CAF1, new

**Sled dog**  
*Canis lupus f. familiaris*



*Encephalitozoon cuniculi* genotype II

List of detected parasites for each host species; ● microscopy, ● molecular analysis

Example is the hookworm (*Uncinaria stenocephala*) in faeces of polar fox and ascarian parasite in the polar bear (*Baylisascaris transfuga*). The latter is the first recorded gastrointestinal parasite of free living polar bear. Several of diagnosed species have zoonotic potential: roundworms *Toxascaris leonina* and *B. transfuga* can cause syndrome larva migrans visceralis in paratenic hosts; hookworm *U. stenocephala* can cause syndrome larva migrans cutanea; *Eucoleus aerophilus* can cause serious pulmonary infection in human.

We also detected for the first time DNA of microsporidia, namely *Encephalitozoon cuniculi* in faeces of polar bear and sled dogs and DNA of *Enterocytozoon bieneusi* in polar fox, Svalbard reindeer, pink-footed goose and black-legged kittiwake by a molecular tools. Source of these infections is unknown because identified genotypes are host-nonspecific. However, in case of sled dogs it is probably caused by food or there is a probability of direct introduction with dogs from mainland. Both *E. cuniculi* and *E. bieneusi* can infect animals as well as people. In immunodeficient people the infection can be serious (lethal).

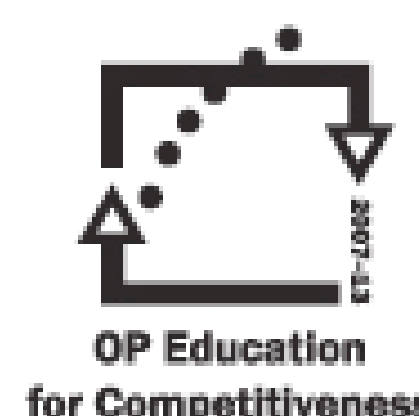
Systematic study, simplifying and speeding up and streamlining of diagnostics would help with main question “What are we dealing with?”. This can be useful for prevention and shows a potential to avoid bigger threats which can come with changing climate and human intervention. Molecular methods in combination with microscopy can increase detection rate of parasites; these methods allow noninvasive sampling and precise identification and therefore expand our knowledge about diversity and epidemiology of parasites in the Arctic ecosystem with higher speed and on larger scale.



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Supported by the project "Creating of the Working Team and Pedagogical Conditions for Teaching and Education in the Field of Polar Ecology and Life in Extreme Environment", reg. No. CZ.1.07/2.3.00/20.0064 co-financed by the European Social Fund and the state budget of the Czech Republic

