Protistology 1, 17-19 (1999)
April, 1999

Protistology

First finding of a microsporidian parasite in the gastrotrich, *Turbanella lutheri* (Gastrotricha: Macrodasyida)

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Summary

A microsporidian parasite is reported for the first time in *Turbanella lutheri* (Gastrotricha: Macrodasyida), a representative of a new host class. Sporonts, sporoblasts, and spores located in host-derived vacuoles within the intestine cells are documented by TEM micrographs. Mature spores, shells of hatched spores, and everted polar tubes occur also in the gut lumen of the host.

Keywords: Microsporidia, new host, Gastrotricha, electron microscopy.

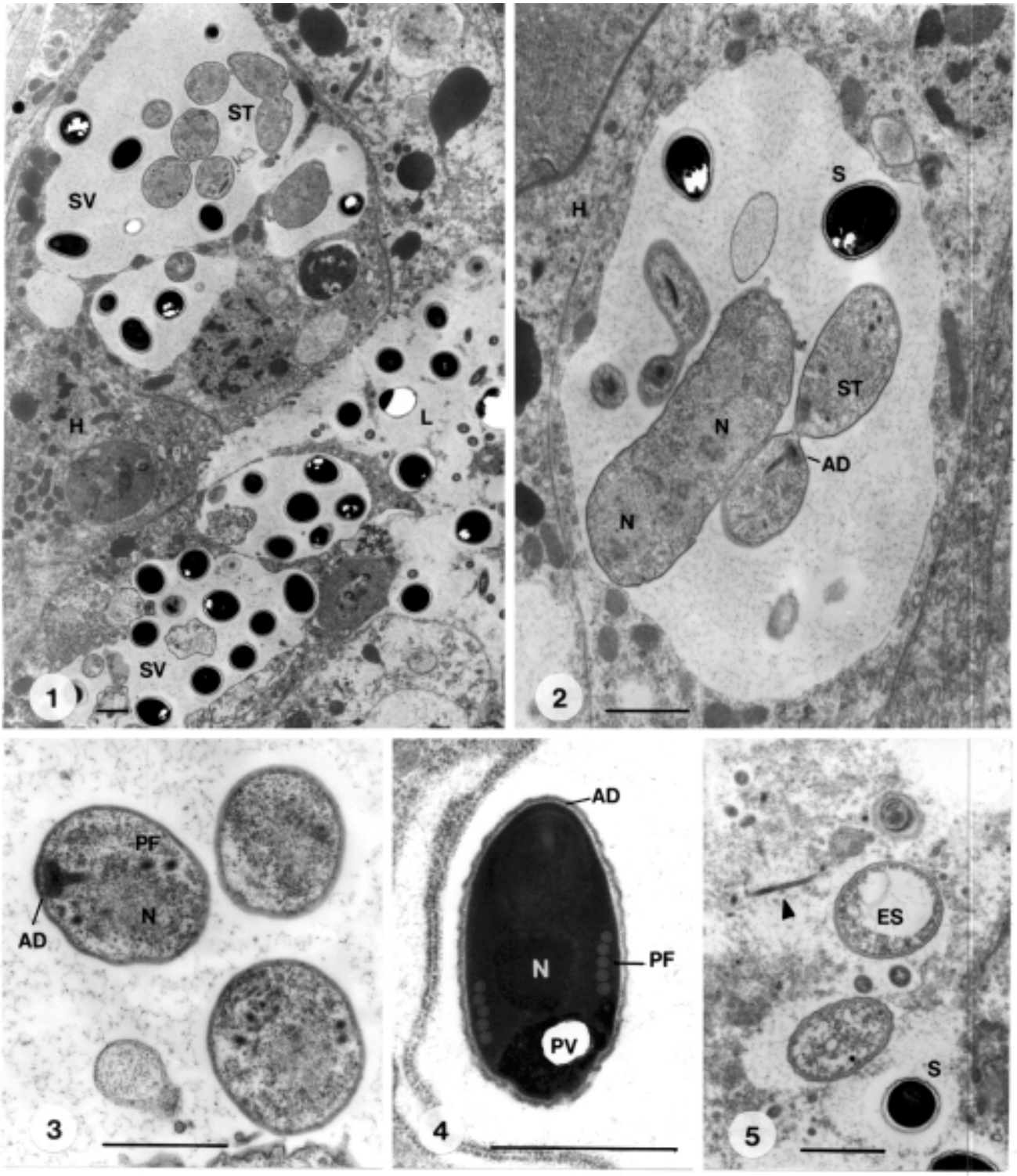
Microsporidia are well known to parasitize a very wide range of hosts (see Larsson, 1988 for review). However, among free-living members of the aschelminth assemblage, these protists have been so far reported only in Kinorhyncha (Adrianov, Rybakov, 1991). In a recent publication, Hummon et al. (1998) figured an immature specimen of *Tetranchyroderma symphorochetum* (Gastrotricha: Macrodasyida), supposedly infected by a microsporidian. The present communication is a first indubitable report of a microsporidian parasite in a gastrotrich host.

Specimens of *Turbanella*, tentatively assigned to *T. lutheri* Remane, 1952 and probably representing a new subspecies, were collected in upper littoral sediments from a moderately exposed sandy beach of Sredny island (Chupa Inlet, the White Sea) in August 1991. After relaxation in an isotonic $MgCl_2$ solution, adult worms were fixed with 4.2% glutaraldehyde in 0.1 M phosphate buffer with addition of tannic acid and traces of $CaCl_2$, postfixed with 1% OsO_4 in the same buffer, dehydrated, and embedded in Epon-Araldite. Sections obtained with a Reichert Ultratome (50 - 70 nm) were stained with uranylacetate and lead citrate and examined in Zeiss 902 microscope at 80 kV. A total of 6 *T. lutheri* specimens from the same sediment sample were studied using TEM; all of them contained parasites.

The parasites occur in the intestine cells located in the posterior half of the gut. Sporonts, sporoblasts, and mature spores are contained in spacious host-derived sporophorous vacuoles, delimited from the host cell cytoplasm by a fine membrane (Figs. 1, 2). Early sporonts are elongate multinucleate cells with moderately dense cytoplasm; as many as 4 nuclei were observed in a single section. Late sporonts and sporoblasts are oval or rounded cells about 1.5 µm long, showing the development of anchoring discs and polar filaments. These stages appear to be mononucleate (Fig. 3). Late sporonts are united in pairs by thin strands of cytoplasm, indicating incomplete cytotomy. No stages intermediate between sporoblasts and mature spores were observed in the sections available.

All spores are similar in shape and size, oval or ellipsoid, 1.5 - 1.7 µm long and 0.8 - 1.0 µm in diameter (Fig. 4). The spore wall is about 60 nm thick and has the same look in transversal and longitudinal sections, being clearly divided into electron-dark exospore and electron-lucent endospore. The exospore appears rugous which may represent a preparation artifact. The maximal number of spores observed in a section within a single host cell was 14.

Structures best visible within mature spores are the anchoring disc and polar filament. The polar filament is 55 - 65 nm in diameter throughout its entire length and arranged in 4 - 5 turns, usually restricted to the posterior half of the spore and positioned at an angle of about 65° to the longitudinal axis. The morphology of the polaroplast and nucleus was not studied in sufficient detail; the former



Figs. 1 - 5. A microsporidian parasite in the gut of *Turbanella lutheri*. 1. Gut wall of the infected host showing sporonts and mature spores in vacuoles within the intestine cells and free spores in the gut lumen. 2. Sporophorous vacuole containing sporonts and mature spores. 3. Enlarged view of sporoblasts showing an anchoring disc and polar filaments. 4. Near-longitudinal section through a mature spore. 5. Hatched spore shells and a fragment of everted polar tube (arrowhead) in the gut lumen. Scale bars = 1 µm throughout.

AD: anchoring disc
ES: hatched spore shell
H: host intestine cells
L: gut lumen
N: nucleus
PF: polar filament
PV: posterior vacuole area
S: spore
ST: sporont
SV: sporophorous vacuole

appears to consist of 10 - 12 lamellae, and the latter is most probably a unikaryon. The area apparently occupied by the posterior vacuole was often lost from sections owing to imperfect embedding, and its structure remains obscure.

Mature spores are observed, besides intestine cells, also in the gut lumen. Occasional sections reveal oval-rounded hollow structures about 1.4 μm in diameter, believed to represent shells of hatched spores, and fragments of everted polar tubes (Fig. 5).

Because of unsatisfactory preservation of key ultrastructural details, the data obtained are insufficient for precise identification of the microsporidian parasite or description of a new species. Nevertheless, these findings demonstrate that the class Gastrotricha is to be added to the vast list of microsporidian host taxa. It is interesting to note that in our material, sporogonial stages and mature spores were often observed in the same sporophorous vacuole; this feature was also reported for Microsporidia parasitizing intestine cells of Kinorhyncha (Adrianov, Rybakov, 1991). Mature spores are evidently released into the gut lumen and may directly infect new host cells. The high prevalence of infection, quite unusual in Microsporidia, is probably related to the gregarious mode of life typical of the interstitial host. The morphological and biological aspects of this new host-parasite system invite further research.

Acknowledgments

The TEM study was carried out during a research stay at Institute for Zoology and Limnology, University of Innsbruck, supported by a scholarship from the Academic Exchange Program (Russia - Austria).

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The manuscript is presented by I.V.Issi