Notes brèves

A MICROSPORIDIAN PARASITE OF *NEOAPLECTANA GLASERI* (STEINERNEMATIDAE : RHABDITIDA)

George O. Poinar, Jr.

Department of Entomological Sciences, University of California, Berkeley, CA 94720, USA

Insect parasitic nematodes of the genus *Neoaplectana* attack a wide range of insects and have been used successfully for the control of several insect pests (Poinar, 1986). These nematodes are now being mass produced *in vitro* with the intention of large scale use by several commercial firms.

Laboratory studies have shown that the infective stages of several *Neoaplectana* species, including *N. glaseri*, are susceptible to fungal infections and the latter certainly could be important mortality factors in the field (Poinar & Jansson, 1986). However, the presence of a microsporidian infection in a population of *N. glaseri* presents a potential threat not only to the efficiency of infected nematodes that might be released in the field, but also to the culture of these nematodes. The present report discusses a microsporidian parasite of *N. glaseri* and its effect on nematode vitality.

Materials and methods

The population of infected *Neoaplectana glaseri* Steiner was received from Dr. Marineide M. Aguillera of the Planalsucar Experiment Station in Araras, Brazil. This strain of *N. glaseri* was originally discovered parasitizing the cerambycid beetle, *Migdolus fryanus* in the Usina Amália area in the state of Sao Paulo, Brazil (Pizano *et al.*, 1985).

Upon receipt, the nematode population was reared on larvae of *Galleria mellonella*. Adult nematodes were dissected out the insects five days after initial infection. Infective juveniles were collected as they emerged from the cadaver twelve days after initial infection. The nematodes were carried into glycerin for microscopic observations. For extrusion of the polar filament, infected adult nematodes were placed on a microscope slide in a 1.0 % Na Cl solution and squashed. The slide was then gently heated over a Bunsen burner.

Results

When the nematodes were initially used to infect *Galleria* larvae, it was noted that reproduction was poor and very few infectives (only about 1 000/*Galleria* larvae) emerged. Many of the infectives were hyaline and smaller than normal juveniles of *N. glaseri*. Upon microscopic examination, a microsporidian parasite was observed in the tissues of all stages of the nematode, including the eggs and infective juveniles. Plasmodia (Fig. 1 a) and spores (Fig. 1 b) of the microsporidian could be observed in the hypodermis, intestine and reproductive system (uterus, oviduct, eggs and testis) of *N. glaseri*. One interesting aspect of the infection was its apparent effect on the development of the infective juveniles. This stage is a third-stage juvenile which has a closed mouth, collapsed intestine and gonad anlage. Many of the infective-stage juveniles which were parasitized by the microsporidian contained an almost normal, open intestine and a developing gonad in spite of possessing a closed mouth. Frequently the intestinal lumen of these infected juveniles were packed with microsporidian spores (Fig. 1 d), along with their symbiotic bacteria.

The number of spores/pansporoblast varied from 10 to 28 (n = 20) (Fig. 1 b). The spores were quite small, averaging 2.36 µm (1.92-4.48) in length (n = 25) and 1.16 µm (0.96-1.28) in width (n = 25). Some polar filaments were extruded during the heat treatment and these averaged 20.17 µm (16.52-22.42) in length (n = 6) (Fig. 1 c). It was noted that when the polar filament had extruded, the spore appeared empty and frequently, a minute mass of protoplasm appeared at the distal tip of the filament.

Effects of the microsporidian on *N. glaseri* depended on the degree of infection. Aside from the above-mentioned modified from of the infective stages, the effects varied from little apparent damage to mortality. In cases of the latter, which were more common in the adults and infective juveniles than the other stages, the protozoan had spread through the majority of the tissues and destroyed the nematode. There was frequently a partial and sometimes complete parasitic castration in both sexes. This explains why the number of progeny was drastically reduced in infected populations of *N. glaseri*. Parasitized infective juveniles did not survive even short periods of storage at 22° since the microsporidian continued to develop and destroyed the infectives (Fig. 1 d).

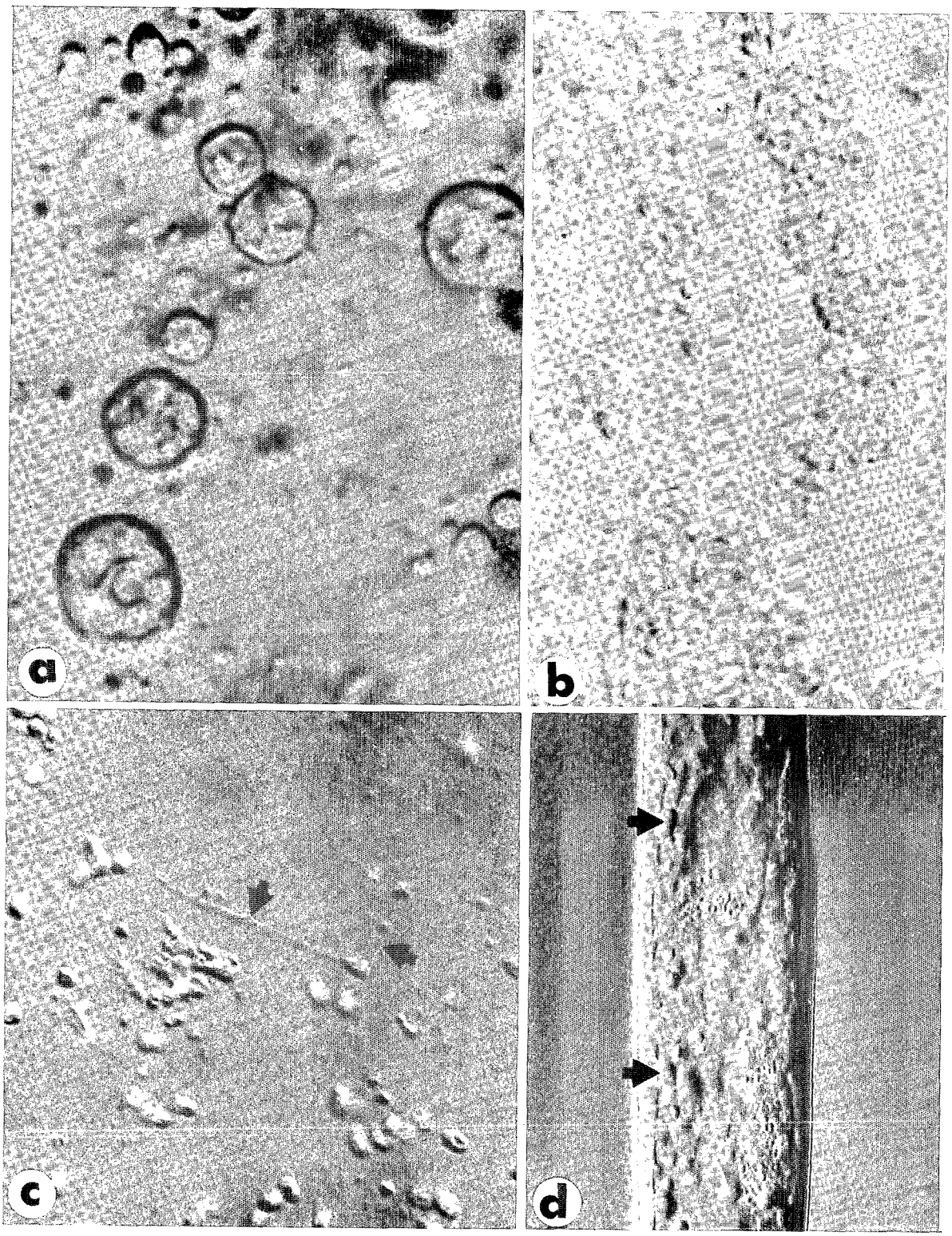

Fig. 1. A microsporidian parasite of *Neoaplectana glaseri*. a : Plasmodia developing in the hypodermal chords of a male *N. glaseri;* b : Pansporoblasts containing spores in the oviduct of a female *N. glaseri;* c : Individual spores with the extrusion of two polar filaments (arrows) after heat treatment; d : Plasmodia (arrows) and spores in the intestinal cells of an infective stage juvenile.

Discussion

Reports of microsporidian infections of nematodes are rare but their occurrence in nature is undoubtedly more widespread than realized. Previous natural occurrences include *Thelohania reniformis* in the gut epithelial cells of the house mouse parasite, *Protospirura muhis* (Kudo & Hetherington, 1922) and *Microsporidium rhabdophilium* from the microtrophic nematode, *Rhabditis myriophila* (Poinar & Hess, 1986). Other possible natural infections are cited by Poinar & Hess (1988). Veremtchuk & Issi (1970) were able to experimentally infect *Neoaplectana carpocapsae* with the microsporidians *Nosema mesnili* and *Plistophora schubergi* respectively after passing the nematodes through insects which contained these infections. The authors did not mention whether the infection could be continued indefinitely in the nematodes when the latter were transferred to healthy hosts. This raises the question of whether in the present case with *N. glaseri*, the infection was initially obtained from an infected insect. Since microsporidian infections are normally obtained *per os* and the feeding stages of neoaplectanids occur in the hemocoel of dying and dead insects, it is highly probable that the infection was originally obtained from an infected insect. However it is clear that the parasite was highly virulent for the nematode and that it is now being carried within the nematode population. It is unlikely that the microsporidian could complete its development in the insect host since with the relatively short period between being released in the host and death of the insect, its development could not be completed.

Aside from seriously reducing a particular nematode population in nature, the microsporidian could have serious consequences if it was inadvertently introduced into a mass culture facility. Thus, care should be excercised before introducing nematodes from nature into an *in vitro* development system.

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A NEW RECORD OF A NEMATODE PARASITE (MERMITHIDAE) OF A SCORPION

George O. Poinar, Jr. and Scott A. Stockwell

Division of Entomology and Parasitology, University of California, Berkeley, CA 94720, USA.

Scorpions represent one of the oldest groups of extant terrestrial arthropods and are among the most primitive of all land arachnids. The now extinct Paleozoic scorpions (suborder Branchioscorpionina K.-W., 1985) lived in water together with representatives of their supposed ancestors, the eurypterids. The oldest known Neoscorpionina Thorell and Lindstrom, 1885 (pulmonate scorpions) are *Paleopisthacanthus* and *Compsoscorpus* from the Carboniferous (Kjellesvig-Waering, 1986).

In contrast to relatively numerous reports of mermithid nematodes from spiders (Poinar, 1985) few nematode parasites have ever been reported from representatives of the order Scorpionida. Millot and Vachon (1949) reported finding two juvenile nematodes in the body cavity and alimentary tract of a male *Parabuthus granimanus* from East Africa. Vachon (1952) also observed juvenile nematodes inside East African scorpions but further details on the above associations are lacking and neither of the reports provides any taxonomic information on the supposed parasites. Thus it was of great interest when a specimen of *Paruroctonus utahensis*