

TWO MYCOTIC INFECTIONS IN NIDICOLOUS MITES

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Abstract. Two mycotic infections detected in mites from nests of small terrestrial mammals are described: *Entomophthora* (?) *svalbardense* (Sig Thor, 1930) from *Veigaiu nemorensis* (C. L. Koch, 1839) and a *Histoplasma*-like fungus from *Proctolaelaps pygmaeus* (Müller, 1859). The systematic position of the agents which cause infections in mites and which have been classified by Sig Thor (1930) as *Haplosporidia*, is also discussed.

The more intensive studies on the ecology of mites in recent years have brought to light some data about infections which occur in mites living in free nature. In a number of parasitic and nidicolous species these infections are difficult to identify because the mite material is obtained from nests and detritus by heat effect in thermoelectors, and only those mites which are able to crawl to the collecting vessel are studied. Usually the infected specimens perish on their way out and cannot be detected. Another difficulty presents itself in the processing of material, when clearing media are used which usually dissolve fine structures inside the mites, as well as in their parasites. Such a material is difficult to identify. This is the reason why SIG THOR (1930), who was the first to accumulate data on agents causing infections in mites, has erroneously placed them among *Haplosporidia*. In his paper he describes as new species *Rhagidasporidium svalbardense* from the mite *Rhagidia glida*, *Molgosporidium ellipticum* from *Molgus capillatus*, *Arctosporidium lucidum* from *Arctoseius laterincissus*, *Hermanniasporidium magnum* from *Hermannia reticulata*, *Reticulosporidium globosum* from *Hermannia* sp., *Hermanniasporidium juvenile* from *Hermannia reticulata* and *Zercosporidium incrassatum* from *Zercon triangularis*. Similar material from mites has been reported by Steinhaus and Marsh (1962) under the acquisition No. 610. Below we give a description of the material found in two mites collected from the nests of small terrestrial mammals.

MATERIAL AND METHODS

The infected mites were collected from more than 250 nests of 7 species of small terrestrial mammals during all-year-round studies in the region of Vsetínské Beskydy (1959–1960). Immediately after collection the material was processed in thermoeclectors by current methods (ENGELBRECHT et al. 1965). The method used allowed to select only specimens capable of active movement. As the material was processed gradually, it was impossible to reexamine the rough nest material, whenever positive infection was detected in the live specimens obtained by thermoeclector processing. These mites were mounted in Swan's medium (which is harmless to mycotic elements) and identified after clearing. The acarological evaluation is presented in the paper by MRČIAK, DANIEL and ROSICKÝ 1966.

Material 202/7 was collected from the nest of the mouse *Apodemus flavicollis*, situated in the beech tree stump at Krivý Grůň, near Velké Karlovice (1. 12. 1960). Among parasitiform mites the following species were found in the nest: *Eugamasus* sp., *Euryparasitus emarginatus*, *Cyrtolaelaps mucronatus*, *Veigaia nemorensis*, *Proctolaelaps pygmaeus*, *Eulaelaps stabularis* and *Huemogamasus hirsutus*. One specimen of *Proctolaelaps pygmaeus* was infected.

Material 222/5 represented the inhabitants of the nest of the bank vole *Clethrionomys glareolus* found at the Vranča locality near Halenkov (12. 12. 1960). The following parasitiform mites were

present in the nest: *Eugamasus remberti*, *Eugamasus* sp., *Euryparasitus emarginatus*, *Cyrtolaelaps mucronatus*, *Cyrtolaelaps minor*, *Veigaia nemorensis*, *Geholaspis longispinosus*, *Hypospis heselhausi* and *Eulaelaps stabularis*. One specimen of *Veigaia nemorensis* was infected.

The preparations are not stained and the parasites differ only in their refraction.

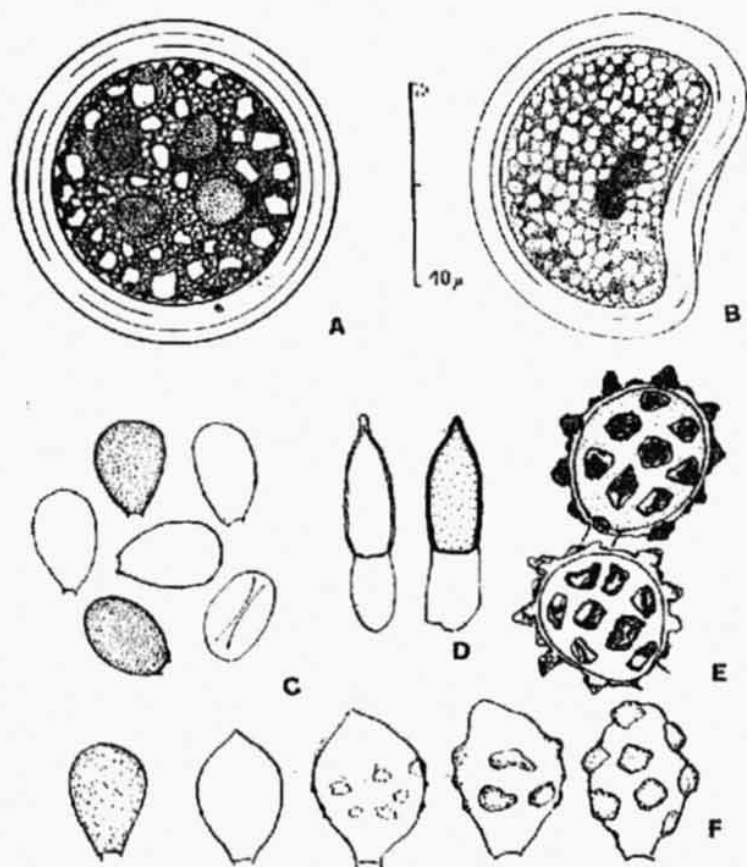


Fig. 1. A, B — *Entomophthora svalbardense*, resting spores. C—F. Fungus from *Proctolaelaps pygmaeus*: C—conidia, D—hyphal bodies, E—chlamydospores with well developed warts, F—origin of chlamydospores from pear-shaped stages.

sometimes the inside facing wall is more refractive. The central space is filled up with a germ having 4 nuclei which are globular, regularly distributed and 2.5μ wide. They are placed in a thickly granulated plasma, where a great many rectangular and irregular granules, besides a small number of fat droplets, are deposited cor-

1. *Entomophthora* (?) *svalbardense* (Sig Thor, 1930)

Syn. *Rhagidiasporidium svalbardense*
Sig Thor, 1930

Host: *Veigaia nemorensis* (C. L. Koch, 1839), nest 222/5, Vranča, Halenkov, 12. 12. 1960, ČSSR

The whole hysterosoma of the mite is filled up with globular resting spores of fungus, which penetrate all organs. They are usually globate, $15-17 \mu$ in diameter, with wall $1-3 \mu$ thick and consisting of slightly discernible layers. Some-

responding with glycogen in other similar stages. Apart from resting spores other stages of the fungus are dissolved by preparation and no conidiophores or hyphal bodies protrude from the body wall of the mite. Besides the fully ripened thick-walled resting spores there are also younger spores with a thinner wall about $1\ \mu$ thick. These spores also contain 4 nuclei, but much less reserve granules. The wall of a spore is often pressed inside or adjusted to the pressure of surrounding specimens. There are no patterns or irregularities on the surface of the spores. The infection occurred in one mite specimen only and in others not even hyphal stages of infection could be found (Fig. 1 A, B).

2. *Histoplasma*-like fungus

Host: *Proctolaelaps pygmaeus* (Müller, 1859), nest 202/7, Krivý Grůň, Velké Karlovice, 12. 12. 1960, ČSSR

In the mite's hysterosoma there are two groups of fungal stages: the larger group is in the region of the anal opening, the other in the mid-intestine. They are spread out, so that they clearly turn away from the area where the intestinal lumen of the specimen has been located. The hyphal filaments are missing, but there is a mixture of three fungal stages present. There are numerous conidia, which are egg- or pear-shaped, $4\ \mu$ long, $3\ \mu$ wide, with papilla $1\ \mu$ broad (Fig. 1). The margin of the papilla bears traces of hyphal filament. The interior of conidia is finely granulated, nuclei are indiscernible, in some of them a crystal-like inclusion can be distinguished. Apart from the conidia there is a lesser number of cone-shaped hyphal bodies abruptly tapered at end, $7\ \mu$ long and $2.5\text{--}3\ \mu$ wide, fusing with a short hypha. The wall of these bodies is brownish, relatively thick, homogenous (Fig. 1 D).

The third stage present in hysterosoma are egg- or pear-shaped chlamydospores, $7\text{--}8\ \mu$ long and $5\text{--}6\ \mu$ wide (Fig. 1 E), with a trace of hypha and with a short irregular collar. On their exosporium there are relatively regularly distributed clog-like outgrowths of conical or irregular shape. The interior of chlamydospore is homogenous, without any structures and discernible nuclei, of smoky brown colour. In the material there occur transitional forms from the thin-walled smooth conidium to the warty chlamydospore. The warts originate in the median part of the conidium, first as inconspicuous thickenings which later grow larger and become more numerous until they cover the whole surface of the spore (Fig. 1 F).

DISCUSSION

Both cases of infection occurred in live, mobile mites and were single findings. Therefore, they cannot be fully evaluated. The organism designated by us as *Entomophthora* (?) *svalbardense* is most probably identical with the organism described by SIG THOR 1930 as *Rhagidiosporidium svalbardense*. He described a stage with

globular thick-walled spores, of similar size to our material (16 μ) and filling up the whole body of the mite. In SIG THOR's material some spores were darker, in others the interior was coming off the wall and made a sickle-shaped formation. In our material the preparation made it impossible to differentiate the colour shades. Also other species recorded by SIG THOR, such as *Arctosporidium lucidum* or *Zercosporidium incrassatum*, probably belong to the same genus or even species of parasite. Due to the fact that the vegetative stages are missing, a more accurate classification of the organism is rather difficult. Yet SIG THOR's classification of these infectious agents as *Haplosporidia* is surely not well founded.

The second fungus whose development outside the digestive tract of the mite cannot be sufficiently demonstrated, is also difficult to define. Because of the presence of warty chlamyospore we classify it near the genus *Histoplasma*, without intending to draw any further conclusions. However, these eventual conclusions are the very reason why this fungus should be studied in detail on mite colonies collected from infected nests.

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