FIRST OCCURRENCE OF SCHISTOSOMATIDAE INFECTING *Aplexa hypnorum* (GASTROPODA, PHYSIDAE) IN FRANCE

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Summary:

Due to the recrudescence of cercarial dermatitis in the world, larval Schistosomatidae have been researched during 20 months in gastropods of stagnant fresh waters in a wetland. Brevifurcate ocellate cercariae have been detected after crushing in a species of Physidae, *Aplexa hypnorum*, with a prevalence of 6.52 %. Up to now, this species had never been found infected by larval trematodes. Lymnaeidae, Planorbidae and other Physidae didn't harbour schistosomatids. Cercariae of *A. hypnorum* present furcal fin-folds and the length of the tail stem is inferior to that of the body. Only cercariae of *Heterobilharzia americana*, Schistosomatidae of Carnivora in America, have also these two features. This species, not described in Physidae, is an agent of the human cercarial dermatitis. Schistosomatid cercariae in american species of Physidae have been compared with that of *A. hypnorum*. Brevifurcate ocellate cercariae of *A. hypnorum*, possible agent of the cercarial dermatitis, probably belong to a new species with unknown genus.

KEY WORDS : *Aplexa hypnorum*, Schistosomatidae, Physidae.

Résumé : PREMIÈRE OCCURRENCE DE SCHISTOSOMATIDAE INFESTANT *Aplexa hypnorum* (GASTROPODA, PHYSIDAE) EN FRANCE

Suite à une recrudescence mondiale de la dermatite cercarienne, des Schistosomatidae larvaires ont été recherchés pendant 20 mois chez les gastéropodes des eaux douces stagnantes d'une zone humide. Des cercaires ocellées brévifurquées ont été détectées après dissection chez une espèce de Physidae, *Aplexa hypnorum*, avec une prévalence de 6,52 %. Jusqu'à présent, cette espèce n'avait jamais été trouvée parasitée par des trématodes larvaires. Les Lymnaeidae, Planorbidae et autres Physidae n'hébergeaient pas de Schistosomatidae. Les cercaires d'*A. hypnorum* présentent de fines nageoires sur leurs fourchons et la longueur du tronc caudal est inférieure à celle du corps. Seules les cercaires de *Heterobilharzia americana*, Schistosomatidae de mammifères carnivores aux États-Unis, possèdent ces deux caractères. Cette espèce, non décrite chez les Physidae, est un agent de la dermatite cercarienne humaine. Les cercaires de Schistosomatidae parasites d'autres espèces de Physidae en Amérique ont été comparées à celles de *A. hypnorum*. Les cercaires ocellées brévifurquées de *A. hypnorum*, agent possible de la dermatite cercarienne, appartiennent probablement à une nouvelle espèce de genre inconnu.

MOTS CLÉS : *Aplexa hypnorum*, Schistosomatidae, Physidae.

Cercarial dermatitis constitutes a problem of Public Health in Europe due to its recrudescence in fresh waters for several years (De Gentile *et al.*, 1996). In France, since 1993, the total number of annual cases of cercarial dermatitis has increased from only ten to thousands (Bayssade-Dufour *et al.*, 2002). The known causative agents in Europe are cercariae of *Trichobilharzia*, bird schistosomes released by lymneid snails: *T. franki* Müller & Kimming, 1994, *T. regenti* Horak, Kolarova & Dvorak, 1998 and *T. szidati* Neuhaus, 1952 (for review: Horak *et al.*, 2002). According to Blair & Islam (1983), *Trichobilharzia* is the largest genus of the family of Schistosomatidae, comprising about 40 species. Because of a problematical discrimination of cercariae and a narrow

specificity towards the snail host, it is possible that other species of avian schistosomes exist in Europe. In order to find larval Schistosomatidae, trematode fauna of a gastropod community has been studied during three years in stagnant waters of a wetland in the Mont-Saint-Michel Bay (France). The study revealed the occurrence of brevifurcate ocellate cercariae in the physid *Aplexa hypnorum* (Linné 1758).

MATERIALS AND METHODS

Malacological samplings were made monthly from June 2000 to June 2001, from March 2002 to June 2002, and from March 2003 to June 2003 in the shallow stagnant waters in the wetland of Pleine-Fougères, corresponding to the remnant of the stream "Le petit Hermitage" (France, Brittany, Ille-et-Vilaine). During the study, water temperature and depth were varying respectively between 3 and 18° C, and between 0.05 and 0.65 m. A total of 46 *Aplexa hypnorum* were collected from June 2000 to

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June 2001, with great fluctuations of abundance (from 0 to 14 individuals); no individuals of this species were found during winter 2000-2001 and in the 2002 and 2003 collections. *A. hypnorum* is a freshwater pulmonate with an extensive palaearctic range including North America, Europe and North Asia. This species is considered rather uncommon with a curious habit of suddenly appearing and disappearing (Den Hartog & De Wolf, 1962). It often occurs in shallow waters like the study-site, which may dry out in summer (for instance in September 2002) and be frozen in winter (for instance in January 2003), to the difference of the other physids living in more permanent waters.

Samplings were made using a pond-net during six minutes, and the pond-net contents were examined in the laboratory. All the collected *A. hypnorum* were systematically measured to 0.1 mm with calipers, then crushed under a stereoscopic microscope to obtain larval trematodes. When present, parasites were observed alive in water under cover glass pressure using light and phase contrast microscopes, and drawn with the help of a camera lucida. Measurements were taken from cercariae fixed in hot 4 % formalin. Mean values of data were reported as means $\pm$ standard error. Twenty cercariae, previously fixed with hot (70° C) 4 % formalin, dehydrated with an alcohol series, transferred into acetone, mounted on stubs, dried using the critical-point method (CO₂) and coated with gold-palladium, were examined with scanning electron microscope (SEM).

RESULTS

A total of three *A. hypnorum* among 46 collected were infected (prevalence = 6.52 %), all with brevifurcate ocellate cercariae. One infected *A. hypnorum* (8.4 mm) was found in September 2000 with well-developed furcocercariae, and the two others (9.5 and 11.4 mm) in March 2001 with immature furcocercariae. It is the first mention in France of *A. hypnorum* naturally infected by larval Trematodes. Members of Physidae are generally scarcely infected by Trematodes, except in America where several species act as intermediate hosts for Schistosomatidae (Combes *et al.*, 1980).

Brevifurcate ocellate cercariae found in *A. hypnorum* (Figs 1, 2) are developing in sporocysts and have a tail with furcal finfolds and a tail stem shorter than the body. Measurements from cercariae fixed are $275 \pm 9 \mu\text{m}$ long and $116 \pm 5 \mu\text{m}$ large for the body, $214 \pm 7 \mu\text{m}$ long and $42 \pm 6 \mu\text{m}$ large for the tail stem and $101 \pm 8 \mu\text{m}$ long and $20 \pm 1 \mu\text{m}$ large for the tail furca. The body and the tail (stem and furca) are covered by spines. The body is characterized by a head organ of penetration with six gland-duct openings, two

Fig. 1. – Dorsal (A) and ventral (B) views of cercarial Schistosomatidae in *Aplexa hypnorum*.

dorsal pigmented eyespots and a ventral prominent acetabulum. Excretory pores are opened at the posterior end of the furca. According to Combes *et al.* (1980), these brevifurcate ocellate cercariae belong to the family of Schistosomatidae Poche, 1907, in which 13 genera are recognized (Snyder *et al.*, 2000). Unfortunately, because of the absence of corresponding adult worms, it is impossible to determine the genus for the moment.

DISCUSSION

Except *A. hypnorum*, the other gastropod species (Lymnaeidae, Planorbidae, Physidae) in the study-site were not infected by Schistosomatidae. The morphology of *A. hypnorum* furcocercariae is characterized by a tail stem shorter than the body and the presence of furcal finfolds. These features are occurring in *Heterobilharzia americana* (Combes *et al.*, 1980), but not in the other Schistosomatidae that have a tail stem longer than the body. Cercariae of *H. americana* have been described in America, and constitute an agent of cercarial dermatitis in man. Its life-cycle includes Carnivora as definitive host and the pulmonates *Lymnaea cubensis* and *Pseudosuccinea columella* as intermediate host, but no Physidae (Yamaguti, 1975; Combes *et al.*, 1980; Schell, 1985). According to Combes *et al.* (1980), several species of *Physa* are infected in America by three genera of Schistosoma-

Fig. 2. – SEM-photographs of cercarial Schistosomatidae in *Aplexa hypnorum*.

A) acetabulum; B) ventral view of the anterior part of the body; C) ventral view of the head organ with six gland-duct openings; D) dorsal view of the anterior part of the body.

tidae cercariae: *Schistosomatium douthitti*, a rodent schistosome, *Gigantobilharzia oregonensis* and *Trichobilharzia* sp., avian schistosomes. European physids are not known harboring Trematodes, and in the study-site, *Physa heterostropha*, *P. acuta* and *Physa fontinalis* were uninfected (versus 6.52 % of infected *A. hypnorum*). On a morphological point of view, the species of american physid schistosomes are clearly different from the *A. hypnorum* furcocercariae: tail stem of the cercariae longer than the body, furca finfolds absent (except for *Trichobilharzia cameroni*, *T. adamsi* and *T. physellae*).

Based on the morphological differences and the narrow specificity of schistosomes towards the snail host (Horak *et al.*, 1998; Kock, 2000), the schistosome species of *A. hypnorum* can be considered like a new species in Europe belonging to a indeterminated genus. Moreover, one can suspect the existence of a life-cycle, maybe not with bird, but with wild mammal definitive hosts. Because of being a possible agent of cercarial dermatitis in France, extensive investigations are necessary to complete the life-cycle and characterize adults

and other developmental stages; investigations must take into account the rarity of *A. hypnorum* in the field and its unusual habits (Den Hartog & De Wolf, 1962).

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