SCANNING ELECTRON MICROSCOPE EXAMINATION OF SCALE-LIKE SPINES ON THE ROSTELLUM OF FIVE DAVINEINAE (CESTODA, CYCLOPHYLLIDEA)

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Summary :

The study by scanning electron microscope of the scolex of *Cotugnia polyacantha*, *Raillietina* (R.) *echinobothrida*, *R.* (R.) *tetragona*, *R.* (R.) *tunetensis* and *R.* (Skrjabinia) *cesticillus* allowed us to demonstrate the presence, on the rostellum of each individual, of scale-like spines. We believe that these scale-like spines represent a new character of diagnosis for the whole of the Davaineidae.

KEY WORDS *Cotugnia polyacantha*. *Raillietina* (R.) *echinobothrida*. *R.* (R.) *tetragona*. *R.* (R.) *tunetensis*. *R.* (Skrjabinia) *cesticillus*. Davaineidae. Davaineinae. ultrastructure. scanning electron microscopy. scale-like spines.

Résumé : OBSERVATIONS AU MICROSCOPE ÉLECTRONIQUE À BALAYAGE, D'ÉPINES EN FORME D'ÉCAILLES SUR LE ROSTRE DE CINQ DAVINEINAE (CESTODA, CYCLOPHYLLIDEA) PARASITES D'OISEAUX.

L'étude au microscope électronique à balayage du scolex de *Cotugnia polyacantha*, *Raillietina* (R.) *echinobothrida*, *R.* (R.) *tetragona*, *R.* (R.) *tunetensis* et *R.* (Skrjabinia) *cesticillus* nous a permis de mettre en évidence, sur le rostre de chaque individu, la présence d'épines en forme d'écaillles. Nous pensons que ces épines représentent un nouveau critère de diagnose pour l'ensemble des Davaineidae.

MOTS CLÉS : *Cotugnia polyacantha*. *Raillietina* (R.) *echinobothrida*. *R.* (R.) *tetragona*. *R.* (R.) *tunetensis*. *R.* (Skrjabinia) *cesticillus*. Davaineidae. Davaineinae. ultrastructure. microscopie électronique à balayage. épines en forme d'écaillles.

INTRODUCTION

The Davaineidae are parasites, at the adult stage, of the intestine of Birds and Mammals. They have a scolex equipped with four spiny or unarmed suckers and a retractile rostellum bearing one or many rows of hammer-shaped hooks (Yamaguti, 1959; Schmidt, 1986). According to the evolution of the uterus in their gravid segments, they have been subdivided into three sub-families : the Ophryocotylinae with a persistent, sacciform uterus, the Idiogeninae whose uterus is connected with a single paruterine organ and the Davaineinae whose uterus becomes fragmented into egg capsules containing one or several eggs.

Few authors so far have taken an interest in the ultrastructural aspect of these helminths. To our knowledge only few species of Davaineidae have been the subject of transmission electron microscope studies (Blitz & Schmidt, 1973; Polyakova-Krusteva & Vassilev, 1976a, 1976b; Mackinnon & Burt, 1983; Swiderski, 1984; Bâ & Marchand, 1994, 1995). We therefore undertook the study by scanning electron microscope of the scolex of *Cotugnia polyacantha* (Führmann, 1909), *Raillietina* (*Raillietina*) *echinobothrida* (Megnin, 1880), *Raillietina* (*Raillietina*) *tetragona*

(Molin, 1858), *Raillietina* (*Raillietina*) *tunetensis* (Joyeux & Houdemer, 1928) and *Raillietina* (*Skrjabinia*) *cesticillus* (Molin, 1858).

MATERIALS AND METHODS

20 *Cotugnia polyacantha* and 17 *R.* (R.) *tunetensis* were gathered live from the intestine of *Streptopelia senegalensis* (Laughing Dove) and *S. vinacea* (Vinaceous Dove). 8 *R.* (R.) *echinobothrida*, 16 *R.* (R.) *tetragona* and 13 *R.* (S.) *cesticillus* were collected in the same way from the digestive tract of *Gallus domesticus*. The whole worms were cleaned with a brush in physiological saline (9 ‰ NaCl solution) then fixed for 24 hours at 4 °C in 2.5 % glutaraldehyde in 0.1 M sodium cacodylate buffer at pH 7.2. The scolices were removed, dehydrated with ethanol and critical point dried. They were mounted on metal stubs and coated with a gold film by sputtering, before being examined with a Jeol, JSM 35 CF scanning electron microscope.

RESULTS

COTUGNIA POLYACANTHA (Figs. 1-3)

The scolex, in apical view, is rectangular and measures 350 to 450 µm long by 200 to 300 µm wide (Fig. 1). It bears four unarmed circu-

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Figs. 1-3. - *Cotugnia polyacantha*. Fig. 1. - Apical view of the scolex. The rostellum is here invaginated. Bar = 100 μ m. Fig. 2. - Portion of the rostellum. Three hooks and numerous scale-like spines became detached when the worm came away from the mucous membrane of the host's intestine. Bar = 5 μ m. Fig. 3. - Another portion of the rostellum. The hooks form two alternate rows and are orientated, like the scale-like spines, towards the base of the rostellum. Bar = 4 μ m.
E, lateral extension; H, hook; I, indentation; R, rostellum; Sc, scale-like spines; Su, sucker.

Figs. 4-15. — Scoleces of the four species of the genus *Raillietina*. Figs. 4-7. — *R. (R.) echinobotrida*. Fig. 4. — View of the scolex in profile. The rostellum is invaginated. Bar = 50 μ m. Fig. 5. — Apical view of the scolex. The arrows show the position of the hooks which became detached when the worm was removed from the mucous membrane of the host's intestine. Bar = 10 μ m. Fig. 6. — Spines on the suckers of the scolex. Bar = 2 μ m. Fig. 7. — Rostellar scale-like spines. Bar = 1 μ m. Figs. 8, 9. — *R. (R.) tetragona*. Fig. 8. — Scolex. The rostellum is invaginated. Bar = 50 μ m. Fig. 9. — Rostellar scale-like spines. Bar = 1 μ m. Figs. 10-13. — *R. (R.) tunetensis*. Fig. 10. — Apical view of the scolex. The rostellum is completely invaginated. Bar = 20 μ m. Fig. 11. — Another apical view of the scolex. The rostellum is partially evaginated. Bar = 20 μ m. Fig. 12. — Hook of the rostellum. Bar = 1 μ m. Fig. 13. — Scale-like spines of the rostellum. Bar = 1 μ m. Figs. 14, 15. — *R. (Skrjabinia) cesticillus*. Fig. 14. — Apical view of the scolex. Bar = 50 μ m. Fig. 15. — Portion of the scolex. Bar = 2 μ m.

H, hook; R, rostellum; S, spines of the suckers; Sc, scale-like spines; Su, sucker.

lar suckers 90 to 100 μm wide and a retractile rostellum. This is 150 to 250 μm wide, bears two crowns of about 400 hammer-shaped hooks 9 to 11 μm long (Fig. 2) arranged in quincunx (Fig. 3). Behind these hooks, on a 4 to 5 μm wide, circular band, numerous very flat spines are found, of an exceptional type that we designate, owing their shape, by the term scale-like spines (Fig. 2). Each scale-like spine is 3.5 to 4 μm wide by 1 to 2 μm high. They exhibit bilateral symmetry, a slightly convex appearance and comprise : an apical point roughly 0.5 μm long, one or two indentations at the base and two lateral extensions (Fig. 2). Moreover, the point is directed towards the base of the rostellum. The scale-like spines are arranged in quincunx and form successive rows which partially cover each other (Fig. 3).

RAILLIETINA (R.) ECHINOBOTHRIDA (Figs. 4-7)

The scolex is globular and measures 200 to 300 μm in diameter. It bears four circular suckers 50 to 100 μm in diameter lined with 8 to 12 rows of scale-like spines (Figs. 4, 6). The rostellum is retractile and armed with about 200 to 250 hooks arranged in two crowns measuring 8 to 14 μm long. Numerous scale-like spines, arranged as above, form a "collar" under the rostellar hooks (Figs. 5, 7). The apical point of the scale-like spines varies from 0.4 to 0.8 μm long.

RAILLIETINA (R.) TETRAGONA (Figs. 8, 9)

The scolex is between 150 to 250 μm in diameter. It bears four circular suckers roughly 80 μm in diameter, each bordered by numerous spines, and a retractile rostellum (Fig. 8). This is armed with hooks 4 to 8 μm long. Scale-like spines, under the rostellar hooks, form several rows which partially cover each other (Fig. 9). The apical point of the scale-like spines is 0.4 to 0.8 μm long.

RAILLIETINA (R.) TUNETENSIS (Figs. 10-13)

The scolex, in apical view, is roughly rounded and measures 80 to 100 μm in diameter. It bears four spiny, circular suckers, about 35 μm in diameter and a retractile rostellum about 50 μm in diameter (Figs. 10, 11). This is equipped with hammer-shaped hooks (Fig. 12) roughly 7 μm long and numerous rows of scale-like spines (Figs. 11, 13). The apical point of the scale-like spines varies in length between 0.5 and 0.7 μm .

RAILLIETINA (SKRJABINIA) CESTICILLUS (Figs. 14, 15)

The scolex is globular and measures about 250 μm in diameter. It bears a rostellum and four small, oval, unarmed suckers with a linear opening. The rostel-

lum, roughly 130 to 160 μm wide (Fig. 14), is armed with two crowns of hooks 7 to 12 μm long and several successive rows of scale-like spines whose apical point is roughly 0.3 to 0.7 μm long (Fig. 15).

DISCUSSION

The family Davaineidae "is large and boasts the largest genus of Cestodes : *Raillietina*, with about 295 species" (Schmidt, 1986). To date, about 54 species of the genus *Cotugnia* (Diamare, 1893) and 300 species of the genus *Raillietina* (Fürhmann, 1920) have been described in Birds and Mammals throughout the world (Yamaguti, 1959; Artyukh, 1966; Schmidt, 1986). As far as we know, rostellar spines have only been reported by light microscopy on the rostellum of three Ophryocotylineae, five Idiogeninae and nine species of the Davaineinae (Movsesyan, 1977; Beveridge, 1981; Schmidt, 1986; Kornyshev, 1989). By scanning electron microscopy, Gijon-Botella *et al.*, 1989 described for the first time scale-like spines termed "placas puntiagudas cuticulares" on the rostellum of *R. (R.) micracantha* (Fürhman, 1908).

In the present work, we have examined by scanning electron microscopy the scale-like spines covering the base of the rostellum of some Davaineinae. The specimens we were able to study belong to two genera and five species. By their position and arrangement, we consider them as similar to the rostellar spines for the other species previously described by light microscopy (see above). We also believe that the scale-like spines represent a character which exist in the whole of the Davaineidae. Nevertheless, further scanning electron microscopic studies of a larger number of species and genera belonging to the different subfamilies of Davaineidae are necessary in order to support this statement.

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