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CHAETOTAXY OF THE CERCARIA OF PLAGIORCHIS MACULOSUS (RUDOLPHI, 1802) (TREMATODA, PLAGIORCHIIDAE)

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Abstract. The distribution of tegumentary papillae in the cercaria of *Plagiorchis maculosus* (Rudolphi 1802) from experimentally and spontaneously infected molluscs, *Lymnaea stagnalis* L. is described. The distribution of papillae is similar to that in the cercaria of other Plagiorchiidae species. Argentophilic corpuscle situated immediately behind the papillae in the positions $P_{I}D$ and $P_{III}D$ were found on the dorsal side. The chaetotaxy of cercaria may be used for the differentiation of *P. maculosus* from other five species of genus *Plagiorchis* in which the papillae distribution was studied previously.

Many authors dealing with the morphology, phylogeny, and systematics of trematodes study also the sensory apparatus of their developmental stages — redia and particularly cercaria. The significance of the distribution of tegumentary papillae in cercaria for the solution of systematic and taxonomic problems of trematodes is discussed in the papers by Ginetsinskaya and Dobrovolskiy (1963), Richard (1971), Shigin (1973, 1974), Bayssade-Dufour (1979) and others.

Since the determination of adults and cercaria of Plagiorchiidae species is sometimes problematic, the study of papillae distribution is very useful. The chaetotaxy of these cercaria has been intensively studied by several authors (Richard 1971, Vaucher 1972, Théron 1976, Grabda-Kazubska and Moczoń 1981, Samnaliev et al. 1982, 1983, Bock 1983, 1984) and their results confirm the practical applicability of chaetotaxy in the diagnostics of cercaria and adults of this family. However, the study of papillae distribution should be regarded as an auxiliary method supplementing the morphological and metrical studies of live and fixed cercaria in the light microscope.

P. maculosus is a common parasite of insectivorous birds of the order Passeriformes and it has been sometimes recorded also in birds of other orders, mammals, and rarely also reptiles (Krasnolobova 1977). According to some authors, the first intermediate hosts are water molluscs of the genera *Lymnaea*, *Paludina*, *Valvata*, and *Viviparus*, the second intermediate hosts are larvae of water insects of the orders *Diptera*, *Plecoptera*, *Trichoptera* and others.

MATERIALS AND METHODS

The cercaria were recovered from spontaneously infected molluscs *Lymnaea stagnalis* L. collected in the ponds and connecting canals in the vicinity of České Budějovice (150 km south of Prague, Czechoslovakia), and from experimentally infected molluscs of the same species coming from laboratory breeding.

The experimental infection was performed using miracidia in eggs which had been incubated in water in a thermostat at the temperature of 26 °C for 6 days. The eggs of *P. maculosus* were obtained from spontaneously infected *Apus apus*. After 51 days, first released cercaria were collected and coated with silver after Combes et al. (1976). Richard's (1971) nomenclature was used for the evaluation of papillae distribution.

For a more exact determination and for the study of the morphology of adult stages, larvae of the mosquitoes *Culex pipiens molestus* were infected with cercaria. The metacercaria from mosquito larvae were used for the infection of birds of the species *Serinus canaria* and *Taeniopygia guttata*. The trematodes obtained from *A. apus, S. canaria* and *T. guttata*, and cercaria from experimentally and spontaneously infected *L. stagnalis* fully conformed in their morphology to the species *P. maculosus* described by Angel (1959).

RESULTS

The total number of papillae on the cercarial tegument is about 225; their arrangement after Richard's (1971) nomenclature is as follows:

1. Head part (Fig. 1A, B)
   a) papillae around the oral sucker
      $C_I = 1C_IV, 4C_IL, 1C_Id_1, 1C_Id_2$
      $C_{II} = 1C_{II}0, 1C_{II}1, 2C_{II}2, 1C_{II}3, 2C_{II}4$
      $C_{III} = 2C_{III}1, 6C_{III}2, 5C_{III}3$
   b) papillae around the stylet
      13—17 St_1, 7—11 St_2, the papillae StV and StD are not separated from the other papillae

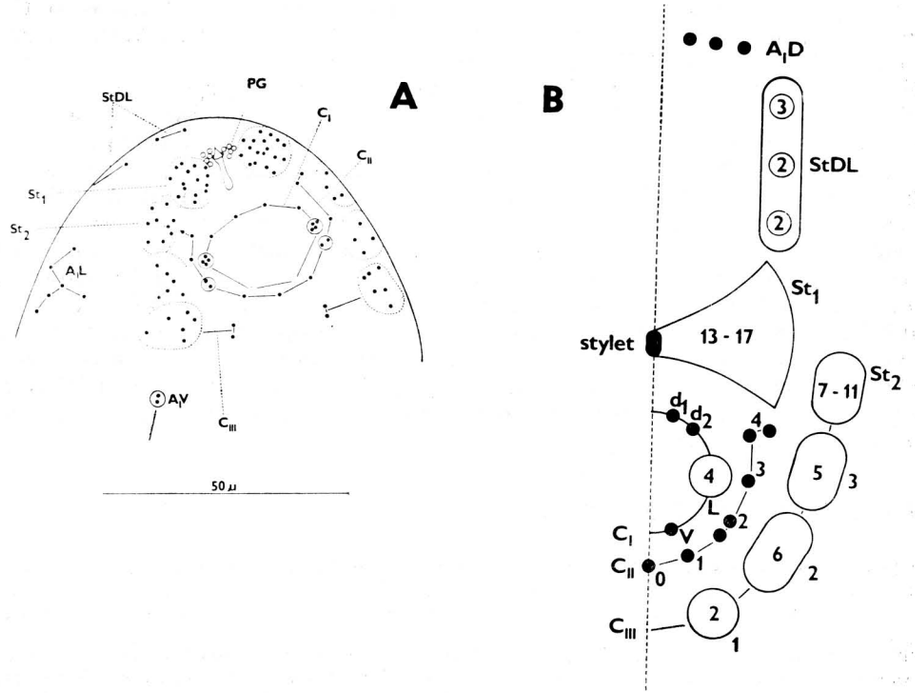

Fig. 1. A—B. Chaetotaxy of the cercaria of *Plagiorchis maculosus*. A — Distribution of the tegumentary papillae around the mouth opening; B — scheme of the distribution pattern.

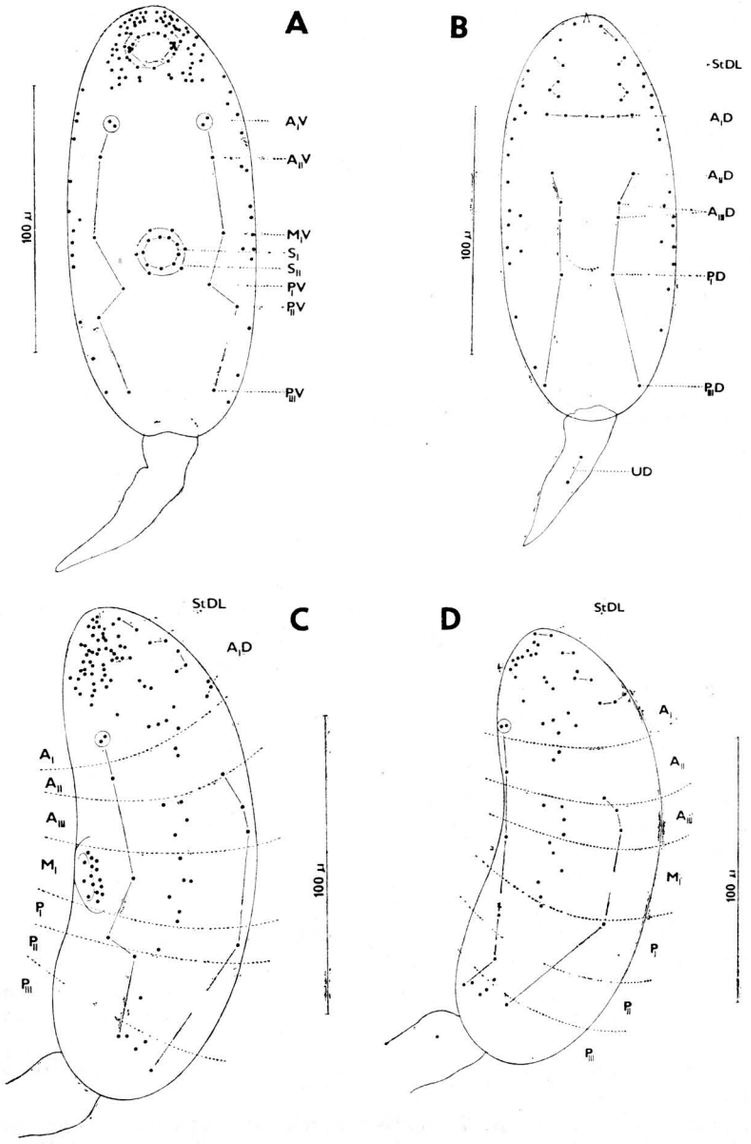

Fig. 2. A—D. Chaetotaxy of the cercaria of *Plagiorchis moculosus*. Distribution of the tegumentary papillae of the body A — ventral view, B — dorsal view, C — ventrolateral view, D — lateroventral view.

2. Body of cercarium
   a) ventral papillae (Fig. 2A)
      $2A_IV$, $1A_{II}V$
      $1M_IV$
      $1P_IV$, $1P_{II}V$, $1P_{III}V$
   b) acetabular papillae (Fig. 2A)
      $9S_I$, $6S_{II}$
   c) dorsal papillae (Fig. 2B)
      7StDL (in groups 2 + 2 + 3)
      $6A_ID$, $1A_{II}D$, $2A_{III}D$
      $1P_ID$, $1P_{III}D$
   d) lateral papillae (Fig. 2C, D)
      $9A_IL$, $2A_{II}L$, $4A_{III}L$
      $6M_IL$
      0—$1P_IL$, 1—$2P_{II}L$, $3P_{III}L$
3. Tail papillae (Fig. 2B)
   2UD, tandem, approximately in the middle of tail, dorsally

No differences in papillae distribution were observed between the cercaria from spontaneously and experimentally infected snails. The arrangement of papillae is symmetrical and small individual differences in their number and situation may be regarded as insignificant.

DISCUSSION

The basic type of papillae distribution in the cercaria of *Plagiorchis maculosus* is the same as in other species of Plagiorchiidae (Bayssade-Dufour 1979, Richard 1971 and others). The chaetotaxy in the species of this family is characterized by the presence of complete circles C_I and C_{II} around the oral sucker, one or two circles around the ventral sucker (of which S_I is usually 9), two papillae on the tail, and horizontal row of papillae in the position A_ID.

Like in *Plagiorchis momplei* (Richard 1971), *P. neomidis* (Theron 1976), *P. elegans* (Samnaliev et al. 1982), *P. laricola* (Samnaliev et al. 1983), and *P. spec.* (Bock 1983), also in *P. maculosus* we have found complete circles C_I and C_{II} with papillae in all positions. With a single exception (1-2 C_IV in *P. laricola*), the mentioned cercaria of *Plagiorchis* possess the same number of papillae in all positions of the circles C_I and C_{II} and in the first position of the circle C_{III}, which is typical of the genus *Plagiorchis* ($1C_IV$, $4C_IL$, $1C_Id_1$, $1C_Id_2$, IC_II0, $1C_II1$, $2C_II2$, $1C_II3$, $2C_II4$, and $2C_{III}1$). Six species of the genus *Plagiorchis* possess $2C_II2$ and $2C_{III}1$ and this number of papillae separates them from the cercaria of the genus *Opisthioglyphe*, in which $1C_II2$ and $1C_{III}1$ (with the exception of $2C_{III}1$ in *O. megastomus*) were found. The papillae C_IV, like in the majority of the above species, are invaginated; the papillae StD and StV are not separated from the other stylet papillae.

The openings of penetration glands were sporadically found in silver-coated preparations, but their number was only rarely full.

StDL in *P. maculosus* consists of 7 papillae which are arranged in groups of 2 + 2 + 3 papillae. Their number is constant, the papillae are well visible and distinctly separated from one another.

Of particular importance for the differential diagnosis of cercaria are the papillae of the first preacetabular circle on the dorsal surface of body. All *Plagiorchis* cercariae in which the chaetotaxy was studied differed in the number of arrangement of papillae in the position A_ID. In *P. maculosus*, there were 6 papillae in one row without side groups in the position A_ID, which is similar to Theron's (1976) observations in *P. neomidis* cercaria. The differences in the number and distribution of the complex of dorsal, ventral, and other groups of papillae (Table 1) enable an easy differentiation of the two species, as well as separation of the cercaria from other *Plagiorchis* species.

Table 1. Distribution of papillae in the cercaria of the genus *Plagiorchis* (*P. maculosus* — our own results, other species after Richard 1971, Theron 1976, Samnaliev et al. 1982, 1983, and Bock 1984)

Groups of papillae	*P. maculosus*	*P. momplei*	*P. neomidis*	*P. elegans*	*P. laricola*	*P. spec.*
StDL	2+2+3	5+4+1+2	3+2+2	3+2+2	2+2+2+1 or 2+2+2+1+1	3+2+2
A_ID	6 (in row)	3+4+3	6 (in row)	3+8+3	3+6+3	4+6+4
$A_{II}D - P_{III}D$	1+2+0+1+0+1	3+0+1+0+0+0	3+0+1+0+0+0	1+1+1+1+0+1	1+1+1+1+0+1	2+1+0+1+0+1
$A_IV - P_{III}V$	2+1+0+1+1+1+1	1+2+1+3+0+1+1	1+1+1+1+1+1+1	2+0+1+1+1+1+1	2+0+1+1+1+1+1	2+1+0+1+1+1+1

An argentophilic corpuscle of approximately half the size of papillae was found in the majority of cercaria on the dorsal side immediately behind the position P_I, usually in the centre of body (less often outside the centre). A similar corpuscle was sometimes observed on the dorsal side behind the papillae in the position P_{III} or in both positions (P_I and P_{III}) simultaneously. Samnaliev et al. (1983) found an argentophilic corpuscle in the position A_ID in *P. laricola* cercaria.

Like the cercaria of other *Plagiorchis* species, also *P. maculosus* possesses 9 papillae in the first acetabular circle and 6 papillae in the second acetabular circle.

The tail bears two papillae on the dorsal side, arranged in tandem at about middlength of the tail.

The above data of the chaetotaxy of *Plagiorchis maculosus* cercaria indicate the close relation of this species with other species of the genus *Plagiorchis*. At the same time they show the practical applicability of this method for the differentiation of related species of cercaria.

ХЕТОТАКСИЯ ЦЕРКАРИЙ ТРЕМАТОДЫ *PLAGIORCHIS MACULOSUS* (RUDOLPHI, 1802) (TREMATODA, PLAGIORCHIIDAE)

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Резюме. Изучали распределение тегументальных сосочков церкарии трематоды *Plagiorchis maculosus* (Rudolphi 1802) от экспериментально и естественно зараженных моллюсков *Lymnaea stagnalis* L. Распределение сосочков этой церкарии похожего типа как у других церкарий семейства Plagiorchiidae. На дорзальной стороне были обнаружены аргентофильные тельца, помещенные непосредственно за сосочками в положениях P_ID и $P_{III}D$. На основе хетотаксии можно отличать церкарии вида *P. maculosus* от церкарий других видов рода *Plagiorchis*, у которых распределение сосочков было изучено уже раньше.

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International Microsymposium on Imported Human Tropical Parasitoses

The International Microsymposium on Imported Human Tropical Parasitoses was held at České Budějovice, Czechoslovakia on October 20—24, 1986. It was organized by the Institute of Parasitology, Czechoslovak Academy of Sciences, České Budějovice, under the auspices of the Commission for Comprehensive Research in the Developing Countries of the Presidium of the Czechoslovak Academy of Sciences and Czechoslovak Parasitological Society of the Czechoslovak Academy of Sciences.

Foreign participants from nine countries, mostly socialist ones, represented leading institutions dealing with the research of tropical parasitoses and practical measures against their importation and introduction. Czechoslovak specialists in human parasitology and tropical medicine represented research and scientific institutes, as well as medical service.

The Symposium was divided into five sections: Imported tropical protozoans, Imported tropical helminths, Clinical features and therapy of tropical parasitoses, Diagnostical methods, Antiepidemic measures and Miscellaneous. The reports read at the Symposium showed the high level of studies on these specific medical problems in socialist countries and presented results concerning the importation of parasitoses from tropical countries.

Abstracts of the reports were published in a separate volume.

The participants of the Microsymposium accepted a resolution on important problems to be solved in the near future, as the production of antigens for serological tests in the countries of CMEA, establishing of banks of antigens, strains, standard sera and reference diagnostic material for the unification of results. It is necessary to intensify the bilateral international cooperation of socialist countries on the basis of integration and international scientific teams.

The general improvement of activities in the studies on tropical parasitoses will result in a better work of medical workers delegated to tropical regions. It will improve our cooperation with developing countries of the tropical zone and at the same time it will increase the prestige of socialist countries in this so important field of their medical activities.

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