

## STUDIES ON THE PROTOZOAN ETIOLOGY OF SWIM BLADDER INFLAMMATION IN COMMON CARP FRY

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Swim bladder inflammation (SBI) of the common carp (*Cyprinus carpio*) is a well-known disease, which has economical significance in several countries. Though the disease was originally described by Hofer (1904), in Hungary it was first detected by Szakolczai (1967) among two summer old common carp populations.

The etiology of the disease is still problematical. Some specialists isolated virus, others bacteria from cases of SBI. Only very few specialists raised the possibility of a parasitic etiology.

In the course of veterinary surveys of the last years the occurrence of unknown protozoon stages in the swim bladder wall was recorded regularly in common carp fry. Neither viruses nor bacteria could be isolated from these fish. Reference to these parasites has been made by Molnár (1980).

During the years of 1979–1981 we performed detailed examinations in order to elucidate the role of the swim bladder protozoa in causing SBI and to examine their supposed identity with C-blood protozoon described by Csaba (1976) and with *Sphaerospora angulata*, a parasite of the kidney.

Several thousand common carp fry (from 3-week- to 5-month-old) were examined. Detailed pathological and histological examinations were done, involving bacteriological, virological and electron microscopic examinations. Impression smears and squash preparations from the swim bladders, kidneys and blood were also prepared.

The results of our survey showed that

although SBI was a frequent disease in many pond farms, its incidence varied between farms and depended on the season of the year. SBI appeared first in 4- to 6-week-old carp fry in the first half of July, and this was also the period when C-blood protozoa in the capillaries and *S. angulata* stages in the renal tubules were first detectable. There was a significant correlation between the appearance of *Sphaerospora* infection and swim bladder inflammation. The incidence of the three parasitic infections increased until the end of July, afterwards, however, it declined and by autumn was sporadic.

Both in gross pathology and histologically, changes of the swim bladder were prominent among other lesions. Swelling of the kidneys and peritonitis were also often recorded. In the acute stage of the disease no clinical signs were found. Cloudy opacity accompanied by branch-like pattern of dilated vessels and minor haemorrhages in the tunica interna of the anterior sac of the swim bladder were apparent as the first gross signs. In histological sections dilated capillaries and minor haemorrhages were found in the loose connective tissue of the tunica interna. At the same time in the adventitia and the blood vessels, and later, also in the inner layers, large numbers of parasite-like aggregations with a diameter of 15–30  $\mu\text{m}$  were observed (Fig. 1). In impression smears of SB made from acute cases of SBI and stained by Giemsa, the protozoan nature of these formations was evident. The fine structure

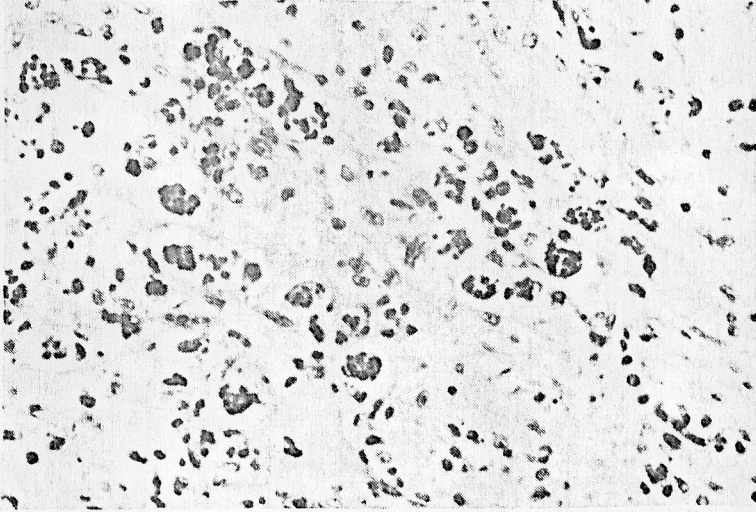


Fig. 1. Section of the wall of the swimbladder with parasites. *Sphaerospora* sp.



Fig. 2. Electron microscopic demonstration of the parasite *Sphaerospora*.

of the parasite was studied electron microscopically (Fig. 2). Histological sections and impression smears were also prepared from the kidneys of SBI-affected fish. The early stages of *S. angulata* showing morphological features resembling SB parasites were found in these preparations.

On the basis of our results it has been postulated that acute SB changes of common carp fry are caused by protozoa described in this paper. Protozoa of SB are regarded as precursor stages of some Myxozoa. Morphological similarities and the frequent simultaneous incidence of protozoa at the three different locations have led us to postulate that SB and blood stages

could represent the hitherto unknown pre-sporogenic stages of *S. angulata*.

Our studies do not concern the subacute and chronic stages of SBI where bacteria as possible secondary invaders were also detected.

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