TREATMENT OF RAINBOW TROUT (*ONCORHYNCHUS MYKISS* WALB.) FRY INFECTED WITH ICHTHYOPHTHRIRIUS (*ICHTHYOPHTHIRIUS MULTIFILIIS*) BY ORAL ADMINISTRATION OF DIMETRIDAZOLES

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Introduction
The damage to fish by infection with ichthyophthirius (*Ichthyophthirius multifiliis*) and the life cycle of the parasite are known to a large extent (Schäperclaus, 1979; Körting, 1992). One control measure, repeated transfers of the fish, is based on the parasite's biology, but is only of practical value in aquarium fish. In the Federal Republic of Germany, chemotherapy was possible until the use of malachite green was banned explicitly (Deufel, 1960; Bauer et al., 1988; Tögel, 1993). Since then various substances have been investigated. Most of them are applied by bath, others via the feed. They include formalin (Rydlo, 1990), potassium permanganate (Kühlmann, 1989), toltrazuril (Mehlhorn et al., 1988; Schmahl et al., 1989a,b; Karas and Vordermeier, 1992; Tojo et al., 1994), amprolium, sulphaquinoxaline, quinacrine, N-methylglucamine, chloroquine, ketoconazole, acarpirin, diminazene aceturate, paramomycin (Tojo et al., 1994), metronidazole, amprolium, and trichlorfon (Herwig et al., 1979).

With the exception of 30 ppm potassium permanganate as a short bath of 10 minutes, none of those substances gave satisfactory results under practice conditions.

Materials and Methods
Coincidence helped. During therapy of rainbow trout fingerlings (20-30 g body weight) infected with *Ichthyophthirius* and Hexamita in ponds supplied by stream water (15°C) we applied potassium permanganate successfully (2 ppm every second day, 3 times) by the flow method and simultaneously dimetridazole orally in feed at the usual dosage of 7 mg/kg fish for 7 days. Using the same water but with reduced water flow and higher water temperatures (16-17°C) at a different site, the application of potassium permanganate alone at the same dosage to rainbow trout fingerlings with 100 g body weight had a catastrophic effect.

A year later we had the opportunity to test the effect of those substances in sick rainbow trout fry. The water temperature ranged between 10 and 13°C and the water hardness was 5.6 mVal. The fry weighed 20 g each. Each of two tanks with a capacity of 1400 litres held 500 rainbow trout fry which had a severe and clearly visible ichthyophthirius infection.

**Trial A**
Therapy with 3ppm potassium permanganate, every 2nd day, 5 times, in a flow bath and simultaneously dimetridazole, 28 mg/kg fish, mixed with lactate (Emtryl®) given via the feed for 10 days.

**Trial B**
Therapy only with dimetridazole, 28 mg/kg fish, mixed with lactate (Emtryl®), given via the feed for 10 days.

Results
The treatment was successful in both tanks but the fry in trial B was clearly more vital. The fry from both tanks did not show any visible signs of infection 7 days after the beginning of treatment. The fry of trial B in particular did not show any signs of behavioural or developmental abnormalities and there were no recognisable toxic symptoms or late effects.

Discussion
The disadvantage of all treatments by bathing is that a) too much of the applied com-
pounds enters the water system and b) short time bathing is only possible under conditions where a quick water change can be achieved or - as a time and labour intensive alternative- the fish are caught, bathed and placed in a different pond.

Dimetridazole belongs to the nitroimidazoles. Its effect on protozoa is due to the formation of metabolic compounds by nitroreductases of the gut flora or by reducing enzymes from the fish organism (Löscher et al., 1991). The suspicion that this metabolic compound could be mutagenic or carcinogenic for man is of little relevance in this context because only small amounts of this drug are required for the oral treatment and the degree of environmental pollution is negligible. Furthermore, the fish as food is not at risk because usually only juvenile fish have to be treated and compliance with the withholding period is not a problem. Due to acquired immunity older fish are rarely affected.

The work of Meier et al. (1994) showed that, at temperatures of 6-8°C, dimetridazole can be detected quickly in the musculature and skin and is also eliminated soon. At higher water temperatures, e.g. 18°C, a lot more dimetridazole is stored in the tissue (factor 100) and the elimination rate is slower. This is presumably due to an increased absorption rate. The therapeutic success with dimetridazole per os described above suggests that most developmental stages of *Ichthyophthirius multifilis* are damaged or killed in the epidermal and subepidermal tissue and that the drug affects particularly the theronts during the settling phase. The dosage and residue characteristics at different temperatures should be investigated more closely.

**Abstract**

With the exception of potassium permanganate as a short-time bath, which is very labour intensive under practice conditions, many other tested compounds fail to give satisfactory results in the treatment of *Ichthyophthirius multifilis* infections. Dimetridazole applied daily per os for 10 days at a dosage of 28 mg/kg fish in warm water leads to an uncomplicated and complete recovery of rainbow trout fry and fingerlings from infection with *Ichthyophthirius multifilis* as long as they still feed.

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**References**


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