

Unimpressive egg incorporation differs strikingly from the quantity of phosphorus-32 eliminated via oviposition⁸ and also from the notable third-day peak characteristic of zinc-65 experiments⁹.

Hatchability was low only on the first day (76 per cent). On the second day 98 per cent of the eggs hatched. This and subsequent values were not significantly different from control values.

In mammals, cobalt has been demonstrated to be one of the 'liver-seeking' elements^{10,11}, and on the basis of a rough analogy, localization in the insect fat body might be expected. In addition, the insect tissue has a propensity for storing excess amounts of metabolic products, not only as nutritional reserve but also as storage excretion. Thus histological conditioning towards a persistent radioisotope burden exists. Such an aspect of insect physiology helps to explain an effective half-life several times that in vertebrates where up to 67 per cent of a comparable radiocobalt dose is excreted by the end of the first day¹⁰; but there is also a prolonged association of cobalt with the wasp gut not entirely explained by the Malpighian-tube association. Most of the isotope can be precipitated along with the protein from homogenates of ground wasps. Such preparations on resuspension yield little dialysable cobalt-58, which suggests a firm association of cobalt-58 with tissue components. Furthermore, autoradiographs of ingested nickel-63 demonstrate that transition elements are retained by the cytoplasm of the cells of the mid-gut wall¹². Recently, Wisner and Nelson⁶ have reported a considerably longer time for the elimination of cobalt-60 from crayfish. Here integument adsorption plays an important part in addition to absorption by the gut and hepatopancreas.

Investigations of the bioaccumulation of isotopes of the transition elements appear to be essential for an understanding of potential environmental hazards in an 'atomic age', even though reproductive capacity is not specifically threatened.

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BIOLOGY

Experimental Infections of Cattle with *Fasciola hepatica*: a Comparison of Low and High Infection Rates

It has previously been demonstrated, in single infections of cattle with 200-1,300 metacercariae, that an increase in the infection level does not alter the percentage of the infection which becomes patent and that a few of the flukes are inhibited in the damaged parenchyma, particularly in the ventral lobe where a preferential migration of the parasite occurs¹. In subsequent investigations, parasite-free calves were given single infections of

Table 1

Infection level	Percentage take	Mature to immature ratio	Infection length
2,500 m	3	6 to 1	24 and 30 weeks
5,000 m	3-5	1 to 13	30 weeks
15,000 m	0-2	3 to 4	56 weeks
1,300 m	29	20 to 1	23 weeks

2,500, 5,000 and 15,000 metacercariae and killed 24-56 weeks post-infection.

The percentage takes, relative proportions of immature to mature fluke from calves which received 2,500, 5,000 and 15,000 metacercariae, and were killed 24, 30 and 56 weeks post-infection, are shown in Table 1 and compared with previous infections of calves with 1,300 metacercariae, killed at the 23rd week. When the level of infection is increased to 2,500 or more, the numbers of fluke reaching the bile duct is drastically reduced and at the higher levels of infection (5,000 and 15,000), many immature flukes are trapped in the liver parenchyma. That a large percentage of the infections proceeded to the parenchymal migrating stage is confirmed by the greater extent and severity of the cirrhosis present in the 2,500-15,000 infection livers compared with that present in the 1,300 group. The severity and extent of the fibrosis in the bile ducts in the high-level infections are considerably less than that present in infections of 1,300 metacercariae, and this observation, in conjunction with the absence of anaemia in the high-level infections compared with a severe anaemia which developed in the 1,300 infection group in association with the bile duct state infection, confirms that very few of the parasites in the high-level infections reached the bile ducts.

As was previously observed in lower level infections, the distribution of the cirrhosis produced by the migrating fluke was mainly confined to the ventral lobe of the liver. This preferential migration in the ventral lobe of the liver must, in high-level infections, enhance the local reaction and produce inhibition in the later migrating parasites. Many of these inhibited parasites were observed to be trapped within granulomatous tissue and many were dead and in varying stages of disintegration. Within these fibrous lesions considerable bile-ductule proliferation was observed and in some instances fluke eggs were present, indicating that a few parasites achieve patency within the granulomatous mass.

The inhibition phenomenon observed in these high-level infections may explain the rare occurrence of acute fascioliasis in cattle as compared with its high incidence in sheep. With massive infection levels in cattle there is quite considerable destruction of liver tissue, and it may perhaps be important to assess minimum liver tissue requirements in cattle if pathogenesis is to be fully understood.

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Haemoglobin in *Ceriodaphnia quadrangula* (O. F. Müller)

In the reports on the presence of haemoglobin in some of the representatives of the Daphniidae¹⁻⁴, I have found no data concerning haemoglobin in *Ceriodaphnia quadrangula* (O. F. Müller), quite frequently found in ponds and lakes.

In the marginal areas of ponds, large concentrations of this crustacean are quite often observed just below the surface of the water, giving it a red hue. I observed such a phenomenon in the middle of July in the ponds located on the park surrounding Białystok Medical Academy. Hydrochemical data of these ponds are given in Table I. It is significant that the surface layer of the water con-