larvae has been published up to the present time.[1] Neumann (1896), Ransom (1907) and some other investigators have been struck by the morphological similarity of the scolex of Dithyridium and that of the genus Mesocestoides parasitic in the intestine of various mammals and birds. Neumann appears to have been the first investigator who suggested a connection between Dithyridium and Mesocestoides. Unfortunately, that investigator postulated what appears to be an unsound biological hypothesis to account for this relationship and his experimental work designed to test his hypothesis is decidedly inconclusive, a fact which he himself recognized. Neumann was inclined to regard Dithyridium as an erratic, immature cestode (Mesocestoides) which succeeded in reaching the body cavity apparently as a result of perforating the stomach or intestinal wall or in some other manner and which was destined to perish in this location without completing its further development. He also postulated a direct life cycle for Mesocestoides and expressed the opinion that the ingestion of hexacanth embryos of this tapeworm by a suitable host probably results in the development of a mature strobilate tapeworm in the intestine.

Recent investigations by the present writer have shown Neumann's interpretation of Dithyridium to be erroneous. Not only have these parasites a typical larval organization, consisting of a simple unsegmented ribbon-shaped body and an invaginated head provided with four suckers, but in common with other infective larval tapeworms they are capable of reaching maturity in the small intestine of a suitable definitive host. When ingested by a susceptible host Dithyridium develops into a strobilate tapeworm belonging to the genus Mesocestoides. Dithyridium thus bears the same morphological and biological relationships to Mesocestoides as Sparganum bears to Diphyllobothrium and as Cysticercus bears to Tænia.

Briefly stated, the writer succeeded in rearing Mesocestoides in dogs and cats as a result of feeding them Dithyridium obtained from the peritoneal cavity and lungs of a mongoose. As early as forty-six days after ingestion of Dithyridium, gravid segments of Mesocestoides were found in the feces of dogs which prior to experimental infection were ascertained to be free from cestodes. Fifty-one days after experimental ingestion of five live specimens of Dithyridium, five mature specimens of Mesocestoides were recovered from a cat at necropsy. Before ingesting the larvæ the cat was free from tapeworms so far as fecal examinations showed anything. As Mesocestoides has never been found in native dogs and cats in the Eastern United States, it seems safe to assume that that no such worms were present.

On the basis of these experiments, which it is hoped will be supplemented by the results of additional feeding tests which are now in progress, it may be safely concluded that the definitive host becomes infected with Mesocestoides as a result of devouring a carcass or a portion of a carcass of an animal harboring Dithyridium and that the latter is not a tapeworm which has accidentally strayed from its course but is a true larva in a normal location in an intermediate host.

It still remains to be determined whether the hexacanth embryos contained in the egg capsule of each gravid proglottid of Mesocestoides are capable of infecting the intermediate host directly, as is known to be the case in cyclophyllid cestodes whose life histories have been determined, or whether the embryos undergo their earlier larval development in an invertebrate, intermediate host before they can metamorphose into infective larvæ in a vertebrate, intermediate host. The answer to this question must await the results of experiments which are now in progress.

While this investigation was in progress an abstract[2] of a paper in Russian by Skrjabin came to the writer's attention. Among other references to Professor Skrjabin's recent work in helminthology was the statement that he had found that mice are the intermediate hosts of *Mesocestoides lineatus*.

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[1] This manuscript was submitted for publication on April 8 and while it was in the hands of the editor Professor Henry published a paper (Rec. de méd. vét., v. ciii, no. 8, April 30, 1927) reporting experimental results essentially similar to those covered in this paper.

ACCLIMATIZATION OF BUFO TADPOLES TO ETHYL AND METHYL ALCOHOLS[1]

THAT animals may become immune to toxic substances that ordinarily will destroy them is too well known to call for comment. Since the work of such pioneers as Sewall and Erlich a mass of information has been collected on this subject. Yet in one phase, at least, the experimental data are not consistent. Studies of the resistance that organisms exhibit towards alcohol after they have been immersed in a weak solution of it for some time have failed to produce uniform results. Daniel ('09) has made rather an extensive study of the effects of ethyl alcohol upon Stentor and Spirostomum, subjecting them for various periods of time to a weak solution of the alcohol, and then killing them along with controls in a stronger solution. In general he holds that the ani-

[2] Berl. tierarztl. Wchnschr., v. 42 (52), Dec. 24, 1926.

[1] Contribution from the Department of Zoology, University of Michigan.

TABLE I

Showing acclimatization to alcohols. The animals designated "treated" were either kept in a weak solution of methyl or of ethyl alcohol for a number of days, or were exposed to an 8 per cent solution of ethyl alcohol for 5 minutes each day for several days. The results shown in the table were obtained by exposing for 20 minutes equal numbers of treated and control tadpoles to 11 1/9 per cent. methyl or 8 per cent. ethyl, depending on the alcohol to which the treated animals had been exposed, after which all were transferred to water and the number that recovered noted.

Alcohol used for acclimatization	Concentration of alcohol used to test for acclimatization	Number of tadpoles used in the experiment		Number of tadpoles that recovered		Percentage of tadpoles that recovered	
		Control	Treated	Control	Treated	Control	Treated
Methyl	11 1/9 per cent. methyl	107	107	11	43	10.3	40.2
Ethyl	8 per cent. ethyl	207	207	44	102	21.3	49.3

mals did become acclimated. The treated protozoa generally lived considerably longer than the controls. Yet of the two strains of *Stentor* employed, one, while given exactly the same treatment as the other, showed little or no indication of acclimatization and led the author to remark (p. 611), "the fact that in these experiments some strains show little or no capacity for becoming acclimatized to alcohol although tried for long periods of time and with refined methods makes is questionable whether acclimatization takes place so readily and to so high a degree as is commonly supposed." Bills,[2] using Paramoecium and adopting a method similar to that of Daniel,[3] maintains that he not only obtained no indication of acclimatization, but that the treated animals were even less resistant to alcohol than those that were untreated.

An attempt to find out whether Bufo tadpoles will become acclimated to ethyl and methyl alcohols led to the experiments presented below. The tadpoles were put in solutions of one per cent. and three fourths per cent. ethyl alcohol, and one per cent., one half per cent. and one fourth per cent. methyl alcohol for periods varying from three days to about three weeks. In addition a number were treated for five minutes each day for several days with an eight per cent. solution of ethyl alcohol, which brought about complete narcotization, and were then returned to water and allowed to recover. Finally all were tested for acclimatization by placing them along with controls into 11 1/9 per cent. methyl or 8 per cent. ethyl alcohol for 20 minutes, after which they were transferred to water and the number that recovered ascertained. The results, greatly abbreviated, are given in the accompanying table.

Examination of the table will show that 107 animals were subjected to weak methyl alcohol and later placed for 20 minutes in a 11 1/9 per cent. solution of the same alcohol along with an equal number of controls, and that 43 of the treated animals recovered when they were transferred to water, while only 11 of the controls recovered. The table also shows that out of 207 tadpoles treated with ethyl alcohol, 102 recovered after having been subjected to an 8 per cent. solution of the alcohol for 20 minutes, and that only 44 out of a like number of controls recovered. These results seem to point unmistakably to an acclimatization.

Owing to the small number of animals used one can scarcely draw any conclusions as to the relative effects of the various solutions, and for this reason a detailed account of the experiments has not been given. The exact time required for acclimatization and the effect of one alcohol upon the ability of the tadpole to withstand another are also problems deserving of solution, but which the data at hand are too meager to solve. A more comprehensive set of experiments is contemplated, designed to throw light on these questions.

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[2] Bills, C. E., "Some Effects of the Lower Alcohols on Paramoecium." *Biol. Bull.*, vol. 47, pp. 253–264. 1924.

[3] Daniel, J. F., "Adaptation and Immunity of the Lower Organisms to Ethyl Alcohol." *Jour. Exp. Zool.*, vol. 6, pp. 571–611. 1909.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE SECOND NASHVILLE MEETING OF THE ASSOCIATION AND ASSOCIATED SOCIETIES

PREPARATIONS for the second Nashville meeting of the American Association for the Advancement of Science and associated societies, which will occur from December 26 to 31, are very well begun. Adequate lodging accommodations will be available, partly in hotels and partly in the Ward-Belmont and Peabody dormitories. The general headquarters will be the Andrew Jackson Hotel, in which will be the registration and news offices and the science exhibition. Headquarters for the societies that are to meet with the association will be announced later. Scientific sessions will be held mainly in the buildings of Van-