the chick. We are at present studying the physiological requirements of mouse embryos *in vitro* and the possibility of grafting tissues from one embryo to another.

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Thyroid Gland and Temperature Tolerance Relationships in Cold-blooded Vertebrates

Although the thyroid gland is of extreme importance in the metamorphosis of amphibians, its function in cold-blooded vertebrates in general is still obscure[1]. Several workers have suggested that thyroid hormones enable poikilotherms to withstand changes in environmental temperature. For example, Evropeitzeva[2] reported that larvæ of *Coregonus lavaretus ludoga* withstood exposure to 29° C for 5 min after treatment with 0·033 per cent thiourea, whereas untreated animals died. Suhrmann[3] found that immersion in a solution of thiourea increases the upper lethal temperature in the goldfish, *Carassius auratus*. Dent and Lynn[4] also indicated that the thyroid may play a part in tolerance to changes in temperature. But the most striking report in this field comes from the work of Fortune[5,6], who has reported that in the minnow, *Phoxinus phoxinus* L., the thermal death point is raised some 10° C by treatment with thiourea. She states: "*Phoxinus* already treated with thiourea for 3 days, were subjected to a rise in temperature of 10° C (that is, to 33° C) over 2 days. They survived indefinitely at this temperature and appeared normal, the controls dying under such conditions between 23° C and 24° C". On the other hand, La Roche and Leblond[7] state that the ability of salmon parr to withstand rising temperatures is impaired by radiological thyroidectomy and is restored by the administration of thyroid powder.

As a preliminary to further work on these aspects of thyroid physiology, and in an attempt to confirm and extend the work of Fortune, one of us (J. M. D.) set out to repeat the work on minnows already described. Fish were obtained from Lake Windermere in September and October and a series of experiments was started. A repetition of Fortune's protocol gave thermal death points of 29°–31° C in both thiourea-treated and control fish. The preliminary treatment with thiourea was then extended, first to 10 days at 23° C and afterwards to 27 days at 15° C without effect on the thermal death point. In the latter experiment all fish died at about 30° C whether the rise was sudden (15°–30° C a day) or more gradual (5° C a day). In conjunction with these studies, tests of the temperature tolerance of a fish with an extensive, naturally occurring goitre and a group of fish that had been treated with sodium thyroxine at a concentration of 1 in 10^7 at 23° C for 3 days were carried out. All died at about 30° C, indicating that neither depression nor elevation of thyroid function affects temperature tolerance in this type of experiment. This work was extended to include tadpoles of *Xenopus laevis*, and it was found that neither thiouracil treatment nor surgical thyroidectomy enabled the tadpoles to withstand temperatures higher than 34°–36° C, at which control specimens also died.

We have more recently repeated part of this work and have once again found no elevation of the thermal death-point. Minnows, received from Lake Windermere in mid-September, were kept at 15° ± 1° C for about a month and were fed on 'Bemax' fish food. On October 17, 20 fish, each about 5 cm in length, were selected and divided into two groups of 10. Each group was put in 4 l. tap water in a 5-l. beaker and the beakers were submerged to the level of their contents in a constant-temperature bath at 15° C. The temperature of the bath was gradually raised from 15° C to 19° C on the first day and from 19° C to 22° C on the second. By the end of the second day one fish in each beaker was dead. On the third day the water in one beaker was replaced with fresh tap water and the other with tap water containing 0·05 per cent thiourea, both at 22° C, and the temperature was raised to 23° C, at which level it was maintained for 3 days. This concluded the conditioning period. The gradual elevation of the temperature was then continued. After 22·5 h the temperature reached 27·6° C and the first fish died. Between 22·5 and 31 h the temperature was raised to 29·7° C and the progressive mortality of the treated and control groups was virtually identical. At 31 h and a temperature of 29·7° C one control and one experimental fish remained alive. By 45 h and without raising the temperature further all the fish were dead.

These findings are not sufficiently extensive to serve as a firm basis for sweeping conclusions, particularly in the face of some contradictory evidence; but clearly they give support to the view that hypofunction of the thyroid gland of the minnow does not enhance the ability of the fish to withstand exposure to lethal and sub-lethal temperatures under the conditions described here. However, they do not necessarily run counter to Evropeitzeva's findings since her fish were exposed to near-lethal temperatures for only 5 min.

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Rapid Detection of the Pathogenicity of Phytopathogenic Pseudomonads

Most bacterial plant diseases are caused by bacteria belonging to the genus *Pseudomonas*. A number of saprophytic pseudomonads occur in large amounts on the surface of the plant (*Pseudomonas fluorescens*, *Ps. denitrificans*, etc.). Therefore, isolation of phytopathogenic pseudomonads from the diseased plant is difficult. Generally the morphology of the colonies, the biochemical properties[1], the antigenic structure[1] and the phage sensitivity[2] of the pathogenic and saprophytic pseudomonads are so similar that they can scarcely be distinguished on the basis of the foregoing characteristics. In practice the pathogenicity test is the sole reliable method which can be used for identification. To carry out pathogenicity tests one must have suitable hosts, but in this case the entire procedure of artificial infection in the greenhouse is tedious. Testing of woody plants is particularly difficult.

An 'injection-infiltration' method has been developed as a rapid test of pathogenicity. Potted tobacco plants instead of the normal hosts of the pathogens are used