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THE POSSIBILITY OF SECONDARY POISONING FROM THALLIUM USED
IN THE CONTROL OF RODENTS

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Introduction

The possibility of secondary poisoning of birds and mammals through eating carcasses of animals killed by thallium sulphate has been extensively studied at the Control Methods Research Laboratory maintained by the Bureau of Biological Survey at Denver, Colo. Thallium sulphate is used under certain conditions in the control of ground squirrels, prairie dogs, rats, and other rodents, and of moles. The birds and mammals studied as possible agents in secondary poisoning have been ducks, pigeons, quail, hawks, ravens, mice, white rats, brown rats, ground squirrels, prairie dogs, rabbits, porcupines, sheep, and cattle. The results of the laboratory studies and of investigations in the field have thrown sufficient light on the possibility of secondary poisoning to indicate that it would be remote.

Lethal Dose for Mammals

The weights of the mammals used have run from a few grams (in the case of mice) to 375 kilograms (847 pounds, in cattle), and the results demonstrate that for each one the lethal dose when administered orally is almost in direct proportion to the body weight, being about 25 milligrams (0.4 grain) per kilogram (2.2 pounds). This uniformity indicates that, per kilogram of body weight, in man the lethal dose of thallium sulphate is probably as great.

Deaths of mammals have been recorded from a dosage less than 25 milligrams per kilogram, and because of individual variations survivals have been reported from greater dosages. The cases in which the lethal doses have been less, however,

were mostly when the thallium was compounded as an acetate or a nitrate, both of which forms are more readily soluble than the sulphate. The present investigations have to do only with thallium as a sulphate, as it is in that form that it is used in rodent control. The indications, therefore, are that 25 milligrams per kilogram is generally a lethal dose for mammals, large or small.

Lethal Dose for Birds

In the case of ducks, ravens, pigeons, and doves, the minimum lethal dose administered orally is greater and more variable, ranging from 50 to 100 milligrams per kilogram. A duck weighing 750 grams (the average weight) requires 37.5 milligrams of thallium sulphate for a lethal dose (being 50 milligrams per kilogram).

Possibility of Secondary Poisoning in Man

In accordance with the assumption that in man 25 milligrams per kilogram is the lethal dose, a man weighing 68.2 kilograms (150 pounds) would require in secondary poisoning 1,705 milligrams of thallium sulphate for a fatal dose. To get such a dose from eating ducks that had died from thallium poisoning, he would have to eat at one meal at least 45 entire ducks weighing 750 grams each (including the viscera). The fact however, that the viscera retain about one-third of the poison, which thus would not be eaten, increases to 67.5 the number of eviscerated ducks that would have to be eaten. This calculation does not take into consideration the elimination of thallium during the period of sickness of the ducks or the excess of lethal dose taken.

It has been shown experimentally that in two days ducks may eliminate 50 percent of the thallium sulphate taken. The number of eviscerated ducks a man would have to eat to obtain a lethal dose, therefore, would be many more than 67.5, the exact number depending upon the degree of elimination (135 ducks in the case of a 50 percent elimination).

Observations on mammals given different dosages have indicated that one-sixth the fatal dose will produce symptoms of poisoning, whereas one-eighth will not. To exhibit any symptoms of poisoning, then, a man would have to eat at one meal 16 to 23 eviscerated ducks that had eliminated 50 percent of the poison. Assuming that man also would eliminate 50 percent or more of the poison ingested, and recognizing the cumulative effect of thallium, one sees that he would have to eat two or more ducks a day for 135 days (or considerably longer than the legal duck-shooting season) to take a lethal dose, and that would mean two or more ducks a day for 16 to 23 days before he would even show symptoms of poisoning.

It can thus be seen that if ducks, or any other birds mentioned, should eat grain poisoned with thallium sulphate exposed in rodent control, and then if these birds later should be eaten by man, the danger from secondary poisoning would be practically nil.