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Mercury Toxicity in Chick Embryos

R. J. Emerick¹, C. W. Carlson², Alice M. Holm³ and C. E. Holmquist⁴

Mercury accumulating to high levels in animal tissue is generally in the form of methylmercury which is readily absorbed but only slowly eliminated. While methylmercury can be formed by microorganisms in lake bottom sediments and concentrated up the biological food chain, inorganic mercury or its metabolic equivalent is sometimes available to animals.

Egg shell thinning and poor hatchability have reportedly accompanied measurable amounts of mercury occurring in eggs of either seed- or fish-eating birds. Studies completed and others currently in progress at the South Dakota Agricultural Experiment Station involve two forms of mercury, inorganic mercuric chloride (HgCl_2) and organic methylmercuric chloride (CH_3HgCl). These have been injected into fertile eggs prior to incubation or fed to hens used to produce eggs for hatching.

Egg Injection and Incubation

Hatchability of chicken eggs injected with mercuric chloride and methylmercuric chloride was studied using levels of the compounds providing 0 to 16 ppm mercury in the egg contents. Table 1 provides a brief summary of the results. These data show a 50% embryonic death rate to be associated with a calculated dose of 8.06 ppm mercury (LD_{50} dose) from mercuric chloride. No conclusive evidence of toxicity from injected methylmercuric chloride was seen at the highest level (16 ppm mercury).

Eggs from Mercury-Fed Hens

Hens fed mercury continuously since hatching have been used to provide eggs for further hatchability studies. Mercuric chloride has been fed at levels providing up to 20 ppm mercury in the diet, and methylmercuric chloride provided levels up to 10 ppm. Data, incomplete at this time, show eggs from hens fed 20 ppm mercury from mercuric chloride to contain approximately 2 ppm mercury. This is much lower than the approximate 18 ppm mercury in eggs of hens fed 10 ppm mercury from the methylmercury source.

A lowering of egg production with a high percentage of abnormally shaped, thin-shelled eggs was associated with the feeding of high levels of methylmercury. A lower hatching rate for eggs from these hens has appeared to be related more to the thin shells and subsequent dehydration of the embryo rather than mercury-induced toxicosis.

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Table 1. Hatchability of Eggs Injected with Inorganic Mercuric Chloride (HgCl₂) or Organic Methylmercuric Chloride (CH₃HgCl)

Mercury dosage ppm Hg	Hatching Rate, % ^a	
	HgCl ₂ treatments ^b	CH ₃ HgCl treatments
0	88	96
0.25	90	93
0.5	83	97
1	74	93
2	81	100
4	62	87
8	54	89
16	0	88

^a Data were obtained from two trials using one mercury source in each; each value is based on 25 to 30 fertile eggs.

^b LD₅₀ for HgCl₂ = 8.06 ppm Hg in egg contents.