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Effects of Mercury on Production and Reproduction
of Laying Hens--Second Egg Laying Cycle

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Hens fed diets containing various levels of two mercury sources from the time of hatching were studied during a second laying cycle. Early growth data and data pertaining to the first laying cycle were reported in the 1973 Poultry Day reports (A.S. Series 73-18). It was concluded from these earlier phases of the study that inorganic mercury at levels up to 20 ppm in the diet does not influence growth or egg production, quality and hatchability. Methylmercury at levels of 2.5 ppm or less also appeared to be well tolerated with no visible harmful effects. However, detrimental effects of higher levels became increasingly apparent with progression of that phase of the experiment.

After completion of an initial 26-week laying period followed by a forced molt, Shaver Starcross 288 hens were continued on the original experimental regime through a second laying cycle. Ten treatments incorporated into the diet consisted of mercuric chloride providing 1.25, 2.5, 5.0, 10.0 and 20.0 ppm inorganic mercury and methylmercuric chloride providing 1.25, 2.5, 5.0 and 10.0 ppm organic mercury. Each treatment was replicated four times and, except for death losses during the first laying cycle, consisted of four cages each containing six birds per treatment.

Egg production was measured daily and egg quality measurements were made monthly on one day's collection of eggs. Approximately midway through the second 36-week laying period, the hens were artificially inseminated and a maximum of 30 eggs per group (120 eggs per treatment) were incubated. Chicks hatching were inspected for abnormalities and were grown in batteries for 4 weeks on diets free of mercury.

Production, egg quality and hen mortality data are shown in Table 1. None of the criteria pertaining to production or egg quality were influenced by inorganic mercury at levels up to 20 ppm in the diet. Methylmercury at 10 ppm greatly increased mortality, reduced egg production by about one-half and lowered egg quality as measured by average egg weight and Haugh units. While methylmercury at 5 ppm lowered egg quality significantly ($P < .01$ for egg weight and Haugh units), percent production was not changed.

Mercury concentrations in the eggs were almost directly proportionate to those in the diets, but the proportions differed for the two mercury sources. For the inorganic mercury treatments, mercury concentrations in the eggs were only one-tenth of the concentration in the diets. For methylmercury treatments, mercury concentrations in the eggs were slightly greater than those in the diets.

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Hatchability of eggs produced during this second laying cycle (Table 2) was practically eliminated by the 10 ppm of methylmercury, but no teratogenic effects were observed in any of the embryos or chicks. The very obvious effect of 10 ppm methylmercury on hatchability, as well as the lesser effect of the other mercury treatments, was more pronounced than the results reported previously for the first laying cycle where 10 ppm of methylmercury reduced hatchability to about one-half that observed in the controls.

It is concluded that sublethal effects of mercury under conditions of continuous mercury feeding were more pronounced during a second laying cycle than were observed in the same birds during the first cycle. A progressive reduction in reproduction appeared to result from continuous feeding of 2.5 ppm or more of methylmercury, even though mercury concentrations deposited in eggs remained relatively constant over the full term of the experiment.

Table 1. Production Data of Second Laying Cycle

Treatment	Hen-day production %	Feed consumed gm/day	Avg. egg weight gm	Feed per dozen eggs kg	Egg shell thickness mm x 10 ²	Haugh units	Mercury content of eggs ppm	Mortality ¹ %
Control	67.1	110.0	66.2	2.01	40.6	84	0.10	21.3
Inorganic mercury, ppm								
1.25	64.3	115.2	66.4	2.13	41.7	81	0.13	9.7
2.5	70.0	121.8	67.6	2.42	41.5	81	0.25	17.1
5.0	63.5	116.0	67.7	2.21	43.7	80	0.56	0
10.0	68.2	119.0	65.9	2.09	41.8	82	0.91	3.2
20.0	68.8	125.6	64.5	2.19	39.8	82	1.94	16.2
Methylmercury, ppm								
1.25	72.8	115.9	66.0	1.89	40.5	82	1.86	5.1
2.5	66.3	118.1	65.4	2.13	41.4	78	3.66	6.9
5.0	67.5	117.1	56.1	2.10	43.1	68	7.17	15.7
10.0	31.8	98.2	47.7	7.48	39.4	66	11.69	43.5

¹Percent mortality is the accumulative mortality during two egg-laying cycles.

Table 2. Hatchability of Eggs from Mercury-fed Hens
During a Second Laying Cycle

Treatment	Hatch of all eggs %	Avg. wt. progeny	
		Initial gm	28 days gm
Control	64.0	47.2	292
Inorganic mercury, ppm			
1.25	62.5	47.7	322
2.5	59.8	48.6	297
5.0	50.0	47.9	315
10.0	38.3	46.1	302
20.0	45.2	47.0	302
Methylmercury, ppm			
1.25	62.9	46.9	294
2.5	55.9	46.8	321
5.0	51.4	41.2	276
10.0	2.6 ¹	32.0	227

¹One bird hatched.