A note on the effect of dose of fumigation on hatchability of hen eggs

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INFECTIONS in poultry caused by members of the Salmonella genus, other than *S. Pullorum* and *S. Gallinarum* have been increasingly reported in this country during the past few years (Kulasegaram, 1963).

Fumigation of hatching eggs has been recommended as an effective means of controlling Salmonella infections in the newly hatched chick (Wilson, 1951). Wilson recommended a dose of 75 cc formalin and 50 grs. $KMnO_4$ per 100 cubic feet of space for routine fumigation of eggs. Clarenburg and Romijn (1954) however reported that they could recover *S. barielly* from artificially contaminated eggs fumigated at the above concentration indicating that this dose was not completely lethal to the organisms. Wilson also used double the above concentration, viz. 150 cc formalin and 100 grs. of $KMnO_4$ for fumigation of hatching eggs 73 hours after incubation, but observed a significent reduction in hatchability.

Since shell penetration of organisms can occur during the period of storage before incubation (Biester & Schwarte 1952), fumigation of eggs at the end of the storage period or during incubation cannot prevent some of the embryos being infected before fumigation. To avoid this, a practice of daily fumigation of eggs on the day of collection has been adopted at this station (as opposed to fumigation 3 days after incubation as reported by Wilson). The experiment reported here was performed to investigate whether a depression in hatchability occurs when the double concentration mentioned above is used for *pre-incubation* fumigation of eggs.

MATERIALS AND METHODS

Two experiments were performed, one with eggs known to have good hatching quality and the other with eggs consistently giving poor hatchability.

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Experiment 1.

Eggs were obtained from a flock of 800 Australorp pullets, 8 months old, housed in 5 deep little pens. Hatching eggs were selected at the end of each day's collection and eggs from each of the five pens were divided into two approximately equal groups. The two groups were fumigated separately using either (i) 75 cc formalin and 50 grs. of $KMnO_4$ (single dose) or (ii) 150 cc formalin and 100 grs. $KMnO_4$ (double dose) per 100 c.ft. The other conditions of fumigation such as the position of the tray during fumigation and the length of time of fumigation were kept identical for the two groups. Eggs collected for 7 days were treated in the same manner and incubated on the 8th day in a 6,000 capacity Zenkei incubator.

Experiment 2.

Eggs were obtained from 1000 White Leghorn hens, 14 months old mated to Rhode Island Red males. The other conditions of the experiment were identical to experiment 1.

Eggs were candled on the 7th and 14th day of incubation and all infertile and dead embryos removed. All eggs removed and those failing to hatch on the 22nd day were broken out and the age at which the embryo died determined using the criteria given by Buvanendran (1967). Based on the time of death, embryonic mortality was classified into two stages, early or late depending on whether death occurred before or after the 13th day of incubation. Five weekly hatches were obtained for study.

Statistical Analysis :

Since hatchability varied between hatches, each week's hatchability data for the two treatments were paired and a *t* test performed according to Snedecor (1961). Percentages were transformed to angles before analysis.

RESULTS AND DISCUSSION

The fertility and hatchability of both treatment groups in the two experiments are shown in Table 1. The hatchability of eggs in experiment 2 was considerably lower than those of experiment 1 as expected.

Table 1.—Effect of single and double dose fumigation on fertility, embryonic mortality and hatchability

Experiment	*Concentration*	*No. of Eggs*	*Fertility* %	*Embryonic Mortality* %		*Hatchability* %
				Early	*Late*	(*Among fertile eggs*)
1	Single	981	97·5	5·12	9·09	85·8
	Double	978	96·2	5·32	11·79	82·9
2	Single	1,204	94·7	10·02	27·78	61·3
	Double	1,160	93·2	9·14	25·36	65·3

Small differences in hatchability between fumigation treatments were seen in both experiments. In experiment 1, the group in which good quality hatching eggs were used, there was a reduction of about 3 per cent in hatchability of fertile eggs in the double dose fumigated eggs when compared to the other. In the second experiment however, the effect of fumigation was the reverse of that seen in experiment 1, eggs treated with double dose of fumigant being superior in hatchability by 4 per cent. Both differences however were small and not significant ($P > 0.05$).

Wilson (951) and Clarenburg and Romijn (1954) observed that eggs which were normally of poor hatching quality showed a reduction in hatchability after fumigation at high doses during incubation. This effect was not noted in good quality eggs. In the present experiment however, an increase in hatchability of poor quality hatching eggs was obtained after fumigation at the higher dose. This may be due to the fact that in the experiment reported here, eggs were fumigated before incubation on the day of collection whereas the workers cited earlier fumigated the eggs during the first 72 hours of incubation.

On the basis of these experiments, it could be concluded that pre-incubation fumigation of hatching eggs at a dose of 150 cc formalin and 100 grs. of $KMnO_4$ per 100 c. ft. is not deterimental to hatchability. Since fumigation at this higher concentration has also been reported to be more lethal to Salmonella organisms, this dosage is to be recommended for routine fumigation of hatching eggs in the control of Salmonellosis.

SUMMARY

The effect of pre-incubation fumigation of hatching eggs at a dose of 75 cc formalin and 50 grs. $KMnO_4$ or double this quantity per 100 c.ft. of space on hatchability was studied. Significant differences in hatchability were not observed between the two fumigation treatments.

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