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## The Effect of Louse Infestation, Wet Feathers, and Relative Humidity on the Grooming Behavior of the Domestic Chicken<sup>1</sup>

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**ABSTRACT** The amount of grooming of chickens (*Gallus domesticus*) infested with *Menacanthus stramineus* was significantly different from that of non-infested chickens as demonstrated by the Mann-Whitney U test. Use of the Spearman rank correlation coefficient showed a significant correlation ( $P < 0.05$ ) between the number of lice and the total amount of grooming per chicken. Wet chickens preened significantly more to the uropygial gland ( $P < 0.002$ ) and had higher total grooming scores ( $P < 0.002$ ) than the dry chickens. A positive correlation ( $P < 0.01$ ) was found between the average weekly relative humidity and the total grooming per week.

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WHILE Clay (1957) suggested that host grooming is an important factor controlling the size of mallophagan populations and the data of Kartman (1949) and Brown (1972) indicate that debeaking leads to high ectoparasite levels in chickens, no one has quantified the effect of louse infestation on grooming. This study was performed to do this as well as determine the effect of wet feathers and relative humidity on grooming.

### MATERIALS AND METHODS

Two groups of White Rock chickens, *Gallus domesticus*, each with two males and six

females were housed in barn pens affording .388 and .508 m.<sup>2</sup>/bird from 166 to 306 days of age. Birds were supplied with food and water *ad libitum* and subject to natural lighting (Massachusetts, March-July). Chickens were observed for 5 min. periods, between 9 a.m. and 1 p.m., five days per week starting with a different group each observational period. A "grooming act" (Rowell, 1961) is defined as a particular action i.e., preening with the bill, scratching with the foot, etc.

Approximately twenty-five Mallophaga (*Menacanthus stramineus*) were applied on day 241. At the end of the experiment, chickens were chloroformed. They were then placed in a 56.8 l. can with 10 g. of detergent, covered with water, agitated for 2 min., and

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held over the can and hosed to collect the lice. When large numbers of lice were collected, they were placed in 50 ml. of mineral oil, shaken, and 2 ml. of this mixture were poured on a glass counting slide and viewed under a dissecting microscope. The procedure was repeated once, and the average taken as the final count.

During the above observations, I noticed that chickens which had wet their neck feathers while drinking groomed more than their coopmates. Two experiments were conducted to see if the amount of grooming was affected by water on the feathers. In the first, the neck feathers of eight chickens were wet with 50 ml. of water using a sponge while eight other chickens remained dry. The behavior of each group was observed for 10 min. In the second, eight chickens were observed for 10 min., wet, and observed again.

Temperature and relative humidity measurements were taken daily.

Nonparametric statistical tests were used in the analysis of data. While nonparametric tests assume that the observations are independent and the variable studied has underlying continuity, they do not depend on a Gaussian distribution of the population. Since there have been no studies to determine the frequency distribution of lice on chickens for large samples, it was not possible to determine the form of the distribution of this character, and parametric statistics could not be used. Nonparametric statistics are also considered to be the tests of choice in treating samples as small as 6 (Siegel, 1956).

## RESULTS

The range of numbers of lice on infested chickens was 264-11,575 (Table 1). Some chickens not originally infested showed low numbers which were probably introduced from the clothing of the caretaker.

While no significant difference (Mann-Whitney U test,  $U = 23$ ,  $P = .382$ , two-tailed) in the grooming of the two groups of males and females was seen during the 60 days prior to infestation, there was a significant difference ( $U = 0$ ) in the amount of grooming of infested and non-infested chickens in the 30 days before they were sacrificed. No significant difference was found between sexes. The Spearman rank correlation coefficient showed a significant correlation ( $r_s = .598$ ,  $P < 0.05$ , one-tailed) between the number of lice removed from the 16 chickens and the total amount of grooming per chicken during the final 30 day period. These data indicate that the number of lice may be a factor leading to increased levels of grooming. The data also suggest that females groom more efficiently than males. Most of the preening observed in heavily-infested, male chickens involved smoothing the neck feathers with the beak rather than pulling the feathers through the beak or jabbing at the skin where most *M. stramineus* are found.

The wet chickens preened significantly more to the uropygial gland ( $P < 0.05$ ) and their total amount of grooming was significantly more frequent ( $P < 0.002$ ) than that of dry chickens (Table 2). In a second experiment, eight chickens were observed for 10

TABLE 1.—Comparison of total grooming of infested and uninfested chickens

Number and sex	Infestation	Body wt. (kg.) mean (range)	No. of lice median (range)	Total grooming per chicken day 277-306 median (range)
2♂	+	3.02 (2.91-3.14)	11,437.5 (11,300-11,575)	247 (201-293)
6♀	+	3.55 (2.45-4.27)	619.5 (264-1,901)	200 (163-226)
2♂	-	4.39 (4.05-4.73)	292.5 (55-530)	22 (10-34)
6♀	-	2.51 (1.77-3.14)	.5 (0-3)	43 (21-69)

TABLE 2.—Comparison of grooming in dry and wet chickens

	No. of chickens	Condition	Preening to uropygial gland. median (range)	U <sup>1</sup>	P	Total grooming median (range)	U	P
Exp. 1	8	Dry	0(0-4)	13	<0.05	2(0-8)	5	<0.002
	8	Wet	2(0-6)			12(1-19)		
Exp. 2	16	Dry	0	21	<0.002	.5(0-6)	30	<0.002
	16	Wet	2(0-3)			8(0-22)		

<sup>1</sup>Statistic of the Mann-Whitney U test.

min., wet, and then observed. This was repeated for a second group. The wet chickens preened significantly more to the uropygial gland ( $P < 0.002$ ) and had higher total grooming scores ( $P < 0.002$ ) than the dry chickens. These data are very similar to those reported by van Iersel and Bol (1958), and Rowell (1961) for two tern species and the chaffinch, respectively.

A positive correlation ( $r_s = .797$ ,  $P < 0.01$ , one-tailed) was found when the average weekly relative humidity was compared to the total grooming per week. The median and range of the weekly relative humidity and temperature readings were 73.8° C. (63.8-90.8) and 13.6° C. (2.2-27.4), respectively. When the relative humidity was compared to preening the uropygial gland, no significant correlation was found nor was any detected when the average temperature for the same weeks was compared to the total grooming per week.

I have observed that wild birds often groom more right before rain storms than at other times. The correlation between grooming and relative humidity demonstrated in the present study may indicate that Domestic Chickens have retained this behavior even though they

no longer need to safeguard their ability to fly.

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