

The Development of Grooming Behavior in the Domestic Chicken, (*Gallus gallus domesticus*)

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ABSTRACT The sequential development of grooming in male and female domestic chickens was preening the body with the beak and scratching the head with the foot followed by dustbathing and later by oiling. The relative frequency of preening movements to different parts of the plumage seems to vary with the age of the chicken and be related to the development of the wing feathers. No difference was found in grooming frequency between males and females during the first six weeks.

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INTRODUCTION

While numerous studies have focused on the social and individual behavior patterns of the domestic chicken, (*Gallus gallus domesticus*), as reviewed by Guhl (1962) and Wood-Gush (1971), only a few have looked at the development of grooming. We will use grooming as did Rowell (1961), realizing however, that Goodwin (1956) and Denny and Ratner (1970) called it care of the body surface and Simmons (1964) called it feather maintenance. Grooming is defined here as those actions directly related to body surface maintenance including preening with the beak (Simmons, 1964), scratching with the foot, dustbathing (Borchelt *et al.*, 1973), and oiling (Elder, 1954).

Kruijt's masterful study (1964) of the ontogeny of behavior in the Burmese red junglefowl (*Gallus gallus spadiceus*) briefly considered the different types of grooming and offered guidelines on their order of appearance. While Dawson and Siegel's (1967) paper looked at the development of preening with the beak in domestic chickens. Borchelt and Overmann (1974 and 1975) discussed the effects of age, experience, strain and social facilitation on the development of dustbathing in bobwhite quail.

The purpose of the present study is to provide analysis of the development of grooming in domestic chickens during the first six weeks posthatching.

MATERIALS AND METHODS

Two separate experiments were performed using early feathering stocks of White Rock chickens from a commercial hatchery. In the

first experiment, two groups of seven males and two of seven females were observed from one to 35 days of age. In addition, the behavior of two of these populations, one male and one female, was observed during the sixth week. In the second experiment, two groups of eight males and two of eight females were observed from one to 42 days of age. All of the animals were assigned randomly to groups and were checked to make sure they were free of ectoparasites at the beginning and end of the experiment.

In both experiments, seven or eight birds of the same sex were housed in wire cages affording 949 cm² and 830 cm² per bird, respectively. Chicks were initially supplied with chick mash and water, and thereafter chicken pellets and water *ad libitum*. They were exposed to the continuous illumination of white fluorescent lights at an intensity of 1038.72 lumens/m² in the first experiment and 14 hr light:10 hr dark cycle in the second. Room temperature and relative humidity were measured daily; their median values for the two experiments were 27.5 C (23.0 to 33.0) and 24.0 C (20.0 to 26.2), and 29% (25.0 to 57.8) and 39.5% (25.0 to 63.5), respectively. In Experiment 2, a plastic tray (30.5 x 16.5 x 1.5 cm) containing fine dust was placed in each cage beginning with day seven in order to observe dustbathing. Fine dust consisted of dry earth sifted through a 1.5 mm wire mesh.

The head plumage of all the chickens was marked with a small amount of paint to facilitate identification. Ten-minute observation periods of each group were made five days per

week with the observer starting with a different group each time. Because Wood-Gush (1959), under conditions of natural lighting on winter and summer days, reported a diurnal rhythm of preening in the domestic fowl with peaks in the late morning and early evening, we made our observations daily during the first experiment between 1000 hr and 1230 hr and during the second between 1600 hr and 1730 hr.

Because a study by Hogan and Abel (1971) showed that handling causes an increase in preening, there may be an inflation in all of the scores because the chickens were handled when measuring parts of the body, marking for identification, and infrequently while cleaning the cages.

Prior to data collection, a 5 min period was allowed to enable the birds to become adjusted to the white-coated observer. The authors observed together twice during the initial experiment to check if the same behaviors were being recorded similarly.

An individual grooming act was defined as the action of preening with the beak, scratching with the foot, dustbathing or oiling followed by inactivity or another activity regardless of the amount of time involved in the act. For the purposes of this study, preening to the uropygial gland, or oiling, refers to the movement of the beak from the uropygial gland to the feathers using a sequence of behavior first described by Matthews (1861).

The Mann-Whitney U Test was used to test if two independent groups were drawn from the same population and the Kruskal-Wallis one-way analysis of variance to decide if independent samples were from different populations.

RESULTS AND DISCUSSION

The data in the present studies indicate no overall difference in grooming frequency between males and females. When male and female weekly totals for preening to the body and the wings, and scratching with the foot were compared, only six of 36 were significantly different at the .05 level for a two-tailed Mann-Whitney test, and of these six, half showed the females' preening to be greater and half the males'.

The median and range of first occurrence in days for the various grooming actions are presented in Table 1. Data for groups and

TABLE 1. Median and range of first occurrence (days)

	Experi- ment 1	Experi- ment 2
Wing preening	1 (1-6)	2 (1-8)
Body preening	1.5 (1-3)	2 (1-9)
Scratching	1 (1-17)	3 (1-8)
Dustbathing ^a	14 (6-39)	17 (9-35)
	Others n.o.	Others n.o.
Oiling ^b	32 (28-36)	...
	Others n.o.	

^aNumbers indicate first occurrence in 12 chickens showing the behavior; n.o. = not observed.

^bIn 8 chickens; no oiling observed in Experiment 2.

sexes are pooled since there were no group or sex differences. Preening to the body and wings, and scratching with the foot were observed in both males and females during the first two days in agreement with Kruijt (1964) and in contrast to the study of Ratner (1965) which showed the first occurrence of preening on day 12. The data in Table 1 on the median age of first occurrence also indicate that most chickens preen their wings and bodies, followed by scratching the head with the foot, dusting, and preening to the uropygial gland.

When the Kruskal-Wallis one-way analysis of variance was used, H values of 29.32 ($P < .001$) were obtained for Experiments 1 and 2, respectively. Because the associated probabilities were $< .05$, we conclude that the day of onset of preening varies significantly with the type of preening. No marked differences in median age of first occurrence are seen between males and females.

The percentage of total grooming represented by body preening, wing preening, and scratching during the first 28 days is given in Table 2. The relative frequency of preening movements to different parts of the plumage varies with the age of the chick. In Experiment 1, the frequency of wing preening increased to its highest level of 72% on day 5 and then leveled off to approximately 50% by two weeks and remained there for the next two. In Experiment 2, the frequencies of wing preening for days 1 and 2 were 73% and 66%, respectively. From day 3 through day 14, wing preening frequencies were between 35 and 58% with a gradual decline after day 14. Although he

TABLE 2. Percentage of total grooming by wing preening, body preening, and scratching during the first 28 days^a

	Day											
	1	2	3	5	6	7	8	9	10	13	14	
Wing preening	28	30	31	72	57		43	45	48	65	49	
	73	66	45		36	45	58	58	35	52	43	
Body preening	43	44	54	21	32		43	29	32	23	32	
	18	22	31		19	11	20	20	28	30	25	
Scratching	29	26	15	7	11		14	26	20	12	19	
	9	12	24		45	44	22	22	37	18	32	
	15	16	17	19	20	21	22	23	24	26	27	28
Wing preening	54	54	57	52	52	52	34	45	55	52		50
	43	47	39		35	32	44	38	31		39	41
Body preening	46	15	27	21	33	34	44	42	38	38		48
	27	39	32		48	51	45	46	40		41	49
Scratching	31	31	16	27	15	14	22	13	7	10		2
	30	14	29		17	17	11	16	29		20	10

^aUpper figures for Experiment 1, lower for Experiment 2.

did not include specific data on numbers of chickens observed and amounts of preening, Kruijt also reported that the percentage of wing preening is the highest during the first few days, occurring at the 50% level on days 4 and 5 and 75% on 6 and 7 and then declines slowly to 50% by the end of two weeks.

The high frequency of wing preening for the first two weeks probably corresponds to the rapid growth of wing contour feathers during this time. Lyon's (1962) study of plumage development in *Coturnix* and bobwhite indicates that the quills of many primaries and secondaries are apparent early in the first week, and unsheathing of these feathers begins to occur on the fifth to eighth day. In the present studies using rapid feathering stocks, we noted that contour feathers began to grow in and replace down in all of the chickens on or near day five. Wing primary feather growth, which was measured daily after observation in both experiments, showed an average rate for the first two weeks of .40 (.57) and .35 (.33) cm per day, respectively, and decreased to .17 (.21), .19 (.14), .19 (.18), and .22 cm per day in weeks three, four, five, and six, respectively. (Numbers in parentheses are values for the second experiment.) These data indicate that the percentage of wing preening increases markedly during a period of rapid feather growth, namely the first two weeks, and then levels off at the same time that a

similar leveling off is seen in the feather growth rate.

In Dawson and Siegel's 1967 study of behavior patterns of chickens to ten weeks of age, preening, expressed as an average per bird per week, increased in a linear manner with age. The data collected in the present study show no relationship between total amount of preening per week and age, although there was a linear increase in body preening.

Although dustbathing occurred at a low mean rate, there is an increase in weeks five and six which would tend to confirm the linear increase in this behavior observed by Nice (1962) in White Rock chicks (*Gallus domesticus*), Kruijt (1964) in Burmese Red Jungle fowl (*Gallus gallus spadiceus*), and Brett and Kruse (1967) in *Coturnix* chicks. Availability of dusting material in Experiment 2 did not significantly influence the day of first occurrence or the frequency of this behavior as seen in Table 1.

Kruijt (1964), who was first able to squeeze secretion from uropygial glands at 11 days, noticed oiling behavior the same day and suggested that accumulating secretion causes pressure on the gland releasing oiling responses. Elder (1954), however, observed that the oiling pattern is seen and persists into adulthood even in glandless birds. In Experiment 1, oiling first occurred on day 28 with the average gland length at the onset of oiling

being .7 cm, but no note was made of the day on which oil could first be squeezed from the gland. In Experiment 2, where gland sizes were measured from day 13, oil was first squeezed from them on days 36 and 38 when their average length was .5 cm but no oiling was observed. This may be a reflection of the behavior not occurring during the observation period rather than its not being present.

Borchelt *et al.* (1973) and Borchelt and Duncan (1974), in papers on dusting in bobwhite quail as a function of dust deprivation, suggest that the accumulation of lipids from the uropygial gland on the feathers elicits dustbathing. While their data strongly support this hypothesis, other factors may also play a role since, in a particular bird, we always noted the day of first occurrence for dustbathing to be before that of oiling. The median and range values for the first day of occurrence for dustbathing were 14 (6-29) and 17 (9-35) as compared to 32 (28-36) for oiling.

In summary, we have provided data on a large number of animals in some areas for which there previously existed only a few observations. We support the contention of Dawson and Siegel (1967) that grooming frequencies of male and female chickens appear to be similar in the first six weeks. We have also found that in both male and female chickens the usual order of appearance of grooming activities is preening the wing and the body, followed by scratching the head with the foot, dustbathing and preening to the uropygial gland. Further study is needed to determine the relationship between dusting and preening to the uropygial gland. Our final conclusion is that the relative frequency of wing preening appears to be related to the development of the wing feathers.

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