Development of Individual Bird Cages for Use in Nutrition Research

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Battery brooders have been used extensively in nutrition studies with growing turkeys and broilers and have aided considerably in the control of environmental effects. The batteries used to date have been designed to accommodate 20 to 30 birds within each compartment. This means that data collected from these studies are mere reflections of the average response of the group of birds to the treatment, and thus cannot be partioned to determine the causes of individual variations in response. It has become necessary in nutrition studies to obtain more precise data which would be impractical to obtain when 20 to 30 birds are included in any one group. In order to measure small differences in treatment effect using current techniques, tremendous laboratory facilities would be needed to replicate the treatments sufficiently and at the same time include a large number of treatments. Individual cages are being used with good results in laying hen research allowing 15 to 20 replicates on each of several treatments. It appears that the same type of individual feeding could be used with growing birds.

The primary objective of this experiment was to design and develop a battery brooder in which 16 poults could be raised individually from day-old to four weeks of age. After the battery had been designed and built, five preliminary nutrition studies were conducted to identify insofar as possible the problems which might be encountered in the use of this equipment, and to determine what modifications would be necessary for maximum performance. After this test model has been thoroughly tested, it will be used as a pattern for the construction of 10 identical units. These 10 units, with a capacity of 16 poults each, will make possible nutrition studies involving a total of 160 individually fed poults. Through the use of this equipment, it will be possible to collect a greater volume of data more precisely with fewer experimental poults.

Materials and Methods

Individual Battery Description

The battery which was developed in this study consisted of four decks with each deck divided into four individual compartments. These compartments were separated by ½" mesh hardware cloth, which allowed the poult in each compartment to be within sight of the other three poults on the same deck. This arrangement was intended to prevent "starveouts" and related problems of isolation which are always encountered when individual units of this type are used in research.

Each compartment was provided with an individual feeder and waterer. A 9-inch fluorescent light was placed above each feeding area to eliminate any possible variation resulting from differences in light intensity. A thermostatically-controlled electrical heating unit was placed within each deck so as to give equal temperature control among the four individual compartments.

Experimental Design

Studies 1, 2, & 3

The first three preliminary studies were conducted in order to make observations as to the mechanical difficulties which might be encountered in the use of the individual batteries. Actually, three experimental diets were involved in each of the three trials. However, the information obtained from a nutritional standpoint will not be included in this paper, since the primary objective is to report the results obtained and problems encountered with the individually treated poults.

A commercial strain of Broad White toms was used in Study 1. Broad Breasted Bronze toms obtained from a commercial source were used in Studies 2 and 3. The sixteen male poults in each of the studies were wing-banded, weighed, vaccinated for the prevention of Newcastle disease and randomized into the 16 compartments in the individual battery. The poults were fed *ad libitum*. Body weight and feed consumption data were obtained at precise weekly intervals throughout a 28-day feeding period.

Results and Discussion

Studies 1, 2, & 3

The results obtained in these three initial studies indicate that variation in response is affected by the design of the individual battery. The problems which were noted and should constitute reason for a change in the present design are:

1. The heating element in the bottom compartment does not produce sufficient heat to maintain the necessary temperature of 95°F during the first four to five days of the growing period. This was a problem even though an additional heating element was placed below the floor of the bottom compartment to assist in maintaining the desired temperature. This is a seasonal problem which would occur only during the months when the temperature is below freezing.

2. Another problem was to motivate the poults to begin eating. In these first studies one-third of the poults did not start eating properly, and consequently the death rate was high during the first week of the growing period.

3. There was a question as to the necessity of the fluorescent lights as incorporated in the original design. Elimination of these lights

would reduce the construction and operational costs of the equipment.

4. Two sets of waterers may be required in order to provide water for the birds at all times and at the same time maintain a hygienic environment for the poults. One set will be used on the battery while the other set is being cleaned and disinfected.

5. It was found that the vented doors should be replaced by solid doors, and that the reflectors covering the heating elements should be insulated with asbestos in order to maintain the proper temperature within the brooding area of the battery.

Experimental Design

Studies 4 and 5

In addition to the three initial studies, two other trials were conducted in the battery brooder. Study 4 was designed to obtain data upon which to base an improved starting procedure. In this study all sixteen birds were fed the same starter diet and the trial was conducted for a one-week period only. A commercial strain of chicks was used in these trials, since it was felt that a starting procedure could be attained with individual chicks and then applied directly to poult feeding. The broilers were started in duplicate groups of four, two, and one bird(s), respectively. At the end of 48 hours the birds were all separated and randomized into the 16 individual compartments.

Study 5 was conducted using commercial broiler chicks, to obtain more data on a starting procedure and at the same time to obtain some indication as to the need for the fluorescent lights which were included in the original battery brooder design. As in Study 4, the birds were started in groups of four, two, and one chick(s), respectively, and then separated into individual compartments at the end of 48 hours. In order to obtain data relative to the necessity of the lights, a randomized block design was used. The blocks were composed of a replicate from each of the starting procedures, and one block was provided lights while the lights were removed from the battery for the other block.

Results and Discussion

Studies 4 and 5

The results of Study 4 indicate that it will be necessary to start the poults in groups of at least four. The feed consumption data, as shown in Table 1, indicate that the competition afforded by a group of birds lends incentive to the birds to begin eating properly. It can be seen from these data, as in earlier trials, that the individually fed birds did not consume enough feed in comparison to those birds in groups of four.

It is felt that the effect of starting poults in groups of four will be of minor consequence in any given experiment, since only a small amount of feed is consumed during the 48 hours immediately following hatching. This means that all birds could be started on a standard diet and at the end of 48 hours changed to their respective experimental diets. Research indicates that, once poults begin to eat, little trouble will be encountered in feed consumption, barring pathological disorders.

Due to the inconsistency of the data obtained in Study 5 and the failure of the results to follow any specific trends, no valid conclusions can be drawn concerning (1) the effects of the fluorescent lights or (2) the number of birds to be placed in each compartment. The amount of feed consumed by the group of 4 birds in the lighted block shows why an individual battery needs to be developed. It can be seen from the results

given in Table 2 that this group of birds consumed much less feed than those on any of the other treatments in the study. In interpreting these results, the researcher has no means of determining whether this deviation is due to one individual poult or to the treatment effect on all poults in the group.

The question still remains as to the need for lights, both during the starting period and the remaining three weeks of the feeding experiment. It will be necessary to investigate further in order to arrive at a solution to this problem.

Plans have been made to conduct additional studies in search of a favorable starting procedure. In the selection of this procedure, it is felt that data should be obtained from birds that are kept in groups for a period of 60 to 72 hours. The adverse effects encountered during the first few hours in the individual battery must be eliminated before research studies can be conducted.

TABLE 1 — FEED CONSUMPTION* PER CHICK, STUDY 4

Chicks/group	1		2		4	
	48hr.	1wk.	48hr.	1wk.	48hr.	1wk.
Replicate 1	2.0	58.0	2.0	51.5	16.0	68.5
Replicate 2	0	Dead	0.5	85.5	7.3	66.8

*Expressed in grams

TABLE 2 — FEED CONSUMPTION* PER CHICK, STUDY 5

Chicks/group	1		2		4	
	48hr.	1wk.	48hr.	1wk.	48hr.	1wk.
Lighted block	2.0	Dead	5.0	39.5	0.8	14.8
Unlighted block	2.0	30.0	1.5	56.0	5.5	46.8

*Expressed in grams

Conclusions

These preliminary studies indicate that before the battery brooder can be used as a model to build additional units the following conditions must be met:

1. A larger heating element will have to be used beneath the bottom deck of the battery.

2. Asbestos insulation should cover the heating elements in order to hold the heat within the battery.

3. A second set of waterers will need to be constructed for each battery.

4. Solid doors should replace the vented doors.

5. Additional research will be required to develop improved starting procedures.

6. Further investigation will be required to determine the necessity of the fluorescent lights.