

LOUISIANA AGRICULTURE

Assuring Our Future Through Scientific Research and Education



Fall 2004 Vol.
47, No. 4



Nonruminant Farm Animals Issue



A'maze'ing Growth

Fast chicks gain more weight

Photo by John Wozniak

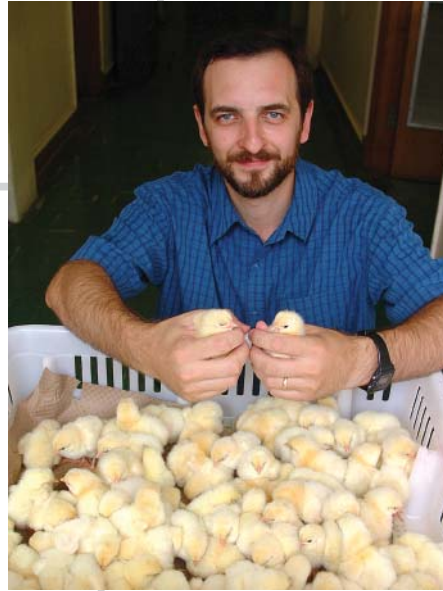
Raul H. Marin and Daniel G. Satterlee

Genetic selection of broiler chickens for production performance has been associated with changes in their behavior. Traits such as aggressiveness, mating behavior, fearfulness (propensity to be easily frightened), feather pecking and sociality vary considerably within genetic strains. Many of these traits can exert profound effects on the welfare and productivity of farmed poultry because they influence the birds' ability to adapt to their social and physical environment.

In small-scale laboratory and field studies conducted in Argentina, success with a chick behavior test was linked to greater sociality, a reduction in stress responsiveness and improved production performance. The test involved rapid negotiation of a T-maze to regain visual contact with other chicks placed in a nearby brood area. The T-maze uses a mirror at the end of a corridor in the maze that stimulates the test chick to leave a start box and move towards its reflection. Upon reaching the mirror, it can see other birds and thereby be stimulated to exit the maze (a successful outcome). The speed at which a chick traverses the maze is considered indicative of its subsequent production performance (fast chicks gain more weight).

The Argentine studies were recently extended and clarified by LSU AgCenter scientists who, in a large-scale trial, re-examined the relationship between T-maze behavior and growth in broilers

Raul H. Marin, Postdoctoral Researcher, and Daniel G. Satterlee, Professor, Department of Animal Sciences, LSU AgCenter, Baton Rouge, La.



Raul Marin, an Argentinian, conducted this research as part of his post-doctoral work at the LSU AgCenter.

reared under intensive and environmentally controlled conditions such as would be typically found in commercial rearing facilities in Louisiana and throughout the Southeastern United States.

At the LSU AgCenter, the T-maze performance of 3-day-old broiler chicks, each tested for 5 minutes in a maze, was assessed using three different criteria: 1) chick latency to exit the start box, 2) chick latency to reach the T-maze mirror, and 3) total time required to solve the maze (the only study variable used in the Argentine T-maze experiments).

The first two measures were added because of previous observations that as many as 30 percent of broiler chicks de-

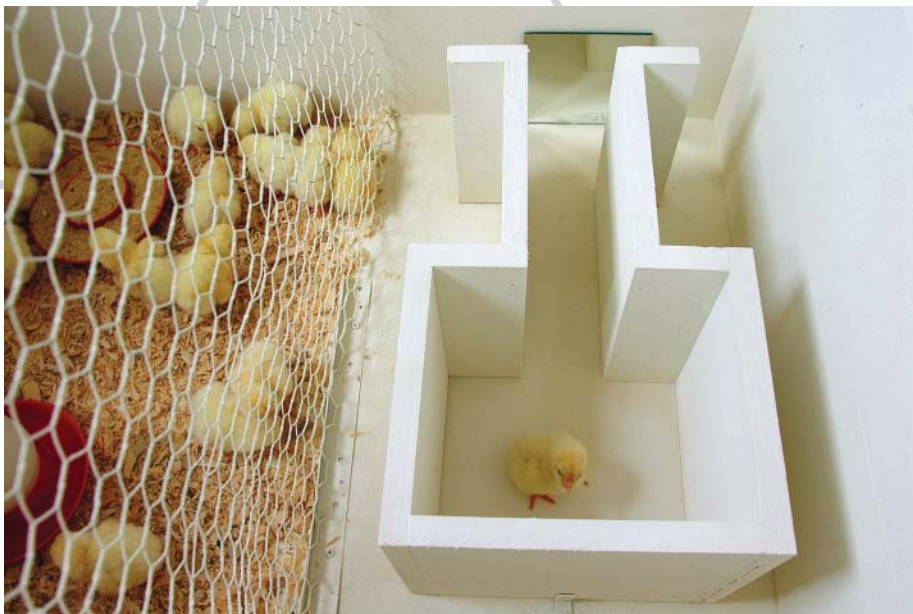
lay or stop traversing the maze in front of the mirror. And although these laggards reach this section quickly (in less than 25 seconds), the prolonged time spent in front of the mirror typically prevents such birds from being categorized as HPs (high performers). A few birds have also been found to sit in front of their reflection for the rest of the T-maze test time (until expiration of the 5-minute test ceiling) and such behavior appears to be increased when ambient temperatures are elevated.

After testing 600 chicks, the fastest (upper 25 percent) and slowest (lower 25 percent) birds within a sex and within each T-maze criterion were classified as HPs and LPs (low performers). Within each of the three T-maze measures and for each sex, the relationships between performance category (HP or LP) and body weight were examined at 4 days of age and at two slaughter ages commonly used in the U.S. poultry industry, 42 and 56 days of age.

HP and LP chicks had similar body weights at 4 days of age – an indication that T-maze performance classification the day before is not associated with early body weight. However, chicks classified as HP by either their latency in exiting the start box or reaching the T-maze mirror were significantly heavier than LP ones at both harvest ages of 7 and 8 weeks. These differences were apparent in both sexes. While the chicks that solved the maze sooner (HP ones) were also heavier than their slower counterparts (LP chicks) at 42 and 56 days, this performance category difference, unlike in the previous Argentina trials, was not statistically relevant.

It was questionable whether divergence in the growth rates of HP and LP broilers might only be evident when the birds were reared in poultry houses with limited environmental control and where they were exposed to hot climates, such as in the previous lab and farm trials conducted in Argentina. However, the present results clearly demonstrate that the usefulness of T-maze behavior to predict harvest-age body weight can be generalized to include well-insulated houses with environments controlled by fan ventilation and evaporative cooling.

We also confirmed the belief that individual variation in sociality is an important variable underlying T-maze performance. Directed reinstatement responses are likely to be evoked by two main visual features of the T-maze: 1) the chick's image in the mirror and 2) the direct visual contact with stimulus chicks in the brood area that occurs when they



The chicks were put singly into the maze to see how fast they would go through.



The maze is designed with a mirror to help give the chick visual contact with other chicks.

are approaching the mirror section.

Because chickens are social animals often housed in large groups, individual variation in underlying sociality is likely to influence their welfare and productivity, particularly since this trait has been linked to fearfulness in certain behavioral tests. Similarly, shyness and social withdrawal have been positively linked with circulating stress hormone levels and general fearfulness. Inappropriate levels of sociality could exert undesirable effects on all aspects of social interaction in birds, including affiliation, aggression, dispersal and mating, as well as on their ability to cope with social disruption, such as isolation, exposure to strangers or crowding.

Furthermore, a perceived mismatch between a bird's underlying sociality and its social environment could elicit either a series of acute stress responses or chronic social distress with associated negative effects on performance. Thus, because in previous studies HP chicks were found to be more sociable than LP ones in the T-maze, as well as in other behavioral tests of sociality, HP-type birds may be better suited to rearing in large, crowded situations. Indeed, this might at least partly account for the superior body weights of HP broilers found at 42 days and 56 days of age.

In conclusion, broiler chicks that quickly exited the T-maze start box and reached the T-maze mirror gained more weight than their slower counterparts. Therefore, the T-maze test may be a valuable selection criterion for future

breeding programs. Its use would likely lead to improvements in the productivity and well-being of broiler chickens. In addition, the T-maze technique is non-invasive, inexpensive, and simple and easy to apply. ■

ACKNOWLEDGMENTS

Raul H. Marin is a career member of CONICET in Argentina. R. Bryan Jones, Roslin Institute, Scotland, contributed to this research. Shane Castille, Gary Cadd, Lonnie Parker, Antonio Gonzalez, Fuad Odeh, Billy Dudley, Jessica O'Neil and Todd Pittman, Department of Animal Sciences, LSU AgCenter, provided assistance. The

authors also thank Anthony DeLee, hatchery manager of Sanderson Farms, McComb, Miss., for donation of the chicks used in this study.

Photos by John Wozniak



The faster the chick joins the others, the more social it is and the more likely it is to be a better breeder.