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Ascites (also known as Pulmonary Hypertension Syndrome) is a metabolic disease in broilers that increases in incidence when broiler flocks grow rapidly and decreases in incidence when flock growth rates are restricted. Ascites has become a major cause of economic loss

Joint studies between Dr. Bob Wideman at the University of Arkansas and Dr. Bill Roush at Penn State University are being conducted to examine methods of detection of birds that have a tendency to develop ascites.

The objective of these studies is to give producers a tool for identification of birds prone to ascites so those birds can be removed from the genetic population A previous study using artificial neural networks and several physiological measurements has been already reported (Lancaster Farming, November 23, 1998, 42(3)·D2). The current study involves the monitoring of the daily growth of broilers for evidence of a tendency of the birds to develop ascites

Growth is usually described as a cumulative weight over time resulting in an S-shaped growth curve. Growth can also be described in physics terminology as velocity (growth rate) and acceleration (the rate of growth rate).

Previous work at Penn State on nonlinear dynamics of growth has shown that day-to-day growth velocity and acceleration can be divided into three distinct growth phases The phases can be identified as (1) 0-15 days, (2) 16-35 days and (3) 35 to 50 days

These growth phases exhibit increased oscillating behavior. Growth responses in the last two phases can be very erratic or chaotic (Lancaster Farming April 22, 1995).

A hypothesis was formed, based on previous nonlinear research on heart rate, that normal birds would exhibit oscillating behavior while ascitic birds would be more steady in growth behavior. Because of success in diagnosis and prediction of complex data using artificial neural networks, a second hypothesis was proposed.

That is, that an artificial neural network would be able to differentiate between normal birds and birds with ascites based on individual daily growth velocities and accelerations. Artificial neural networks are computer programs that have been developed to mimic the biological network of neurons present in the biological brain. Artificial neural networks have been shown to be very successful in prediction and classification problems.

An experiment was conducted involving 46 male broiler chicks from a breeder pullet line. Growth data form each bird was obtained by manually weighing the birds for each of 50 days on an electron balance.

The birds were raised in a pen, provided water, ad libitum, and feed as mash for the first three days and pellets thereafter. Birds surviving to 50 days and prior mortality were examined for the presence or absence of ascites. Of the 46 birds, 13 were identified as having ascites and the remaining 33 were considered normal.

Average growth velocity and acceleration and standard deviation values were statistically evaluated as response variables for each growing phase Average values for velocity and acceleration during the third phase were different between normal birds and those with ascites.

The third phase standard deviations of velocity and acceleration (reflecting oscillation for velocity and acceleration), were greater for normal birds as compared to birds with ascites. The results suggest that while strains of birds with high growth rates are more prone to ascites, individual birds not getting ascites (within the high growth strain) have higher growth rates and more oscillation than birds within the strain that are prone to ascites.

An artificial neural network (General Regression Neural Network) was trained to predict ascites based on the day-to-day growth velocity and acceleration Data represented the first, first two, and all three growth phases The responses of birds in all three data sets were successfully classified (100%) as having or not having ascites.

These results are quite promising. In the future, artificial neural networks may have the potential for computerized diagnostic weighing of birds to determine which birds have a tendency to develop ascites.

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