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Seasonal Variation of Aortic Ruptures of Turkeys Induced by Diethylstilbestrol* (33606)

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In 1963, it was reported from this laboratory that injections of high levels of diethylstilbestrol (DES) resulted in a high incidence of aortic rupture in turkeys (1). The administration of DES by either the parenteral or oral routes caused mortality from aortic ruptures (2). The mortality resulting from the DES treatments is apparently due to the estrogenic effect since the feeding of dienestrol diacetate also resulted in a high level of mortality (3). In several experiments, various factors have been found to influence the rate of mortality resulting from the injections of DES. It was determined that a higher incidence of mortality occurred on a corn–soybean type diet containing 23% protein and a relatively high level of energy than occurred when the diet contained 20% protein and a high level of oats (4). Increasing the level of dietary sodium chloride from 0.5 to 3.0% resulted in significantly increasing rate of aortic rupture, and reducing the level from 0.05 to 0% resulted in a significantly decreased incidence of aortic rupture (5). Supplementing the diet with thiouracil has been found to increase incidence of aortic rupture (6) as compared to a significant decrease in mortality by the addition of iodinated casein (7).

During the past 7 years, 23 experiments were conducted to study factors which influence aortic ruptures in turkeys induced by diethylstilbestrol. In this series of studies it was observed that the turkeys are more susceptible to aortic rupture in certain periods of the year than in others. The data from these 23 experiments were combined to demonstrate this seasonal effect.

Materials and Methods. Mortality data from 23 experiments involving the use of DES to produce aortic ruptures in turkeys have been summarized. Only the data from those groups receiving DES without addition-

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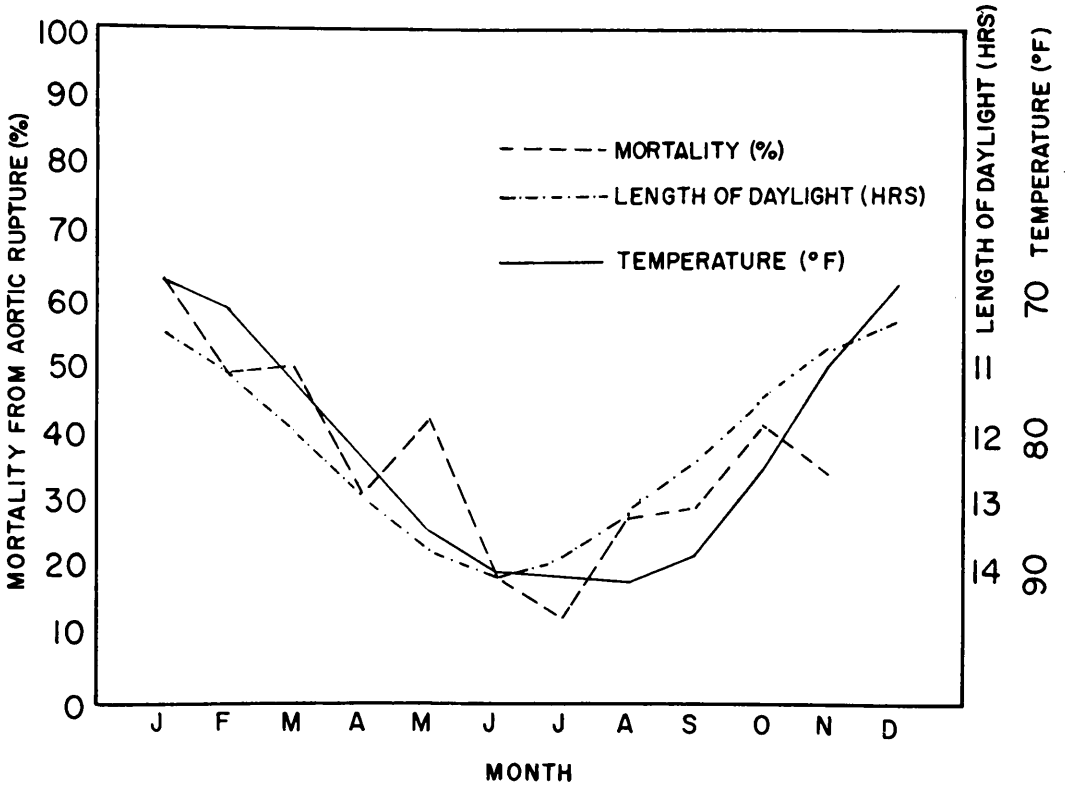

FIG. 1. Length of day, temperature, and incidence of DES-induced aortic ruptures.

al treatments were used in order to standardize all experiments. All experiments conducted during a given month were averaged, resulting in one mortality mean for each month. In some instances this amounted to as many as four experiments during a month and in other cases only one experiment was conducted. These data were plotted against time (Fig. 1). Also, the average length of daylight and mean temperature (60 year av) for each month were plotted on this graph.

Results and Discussion. A high rate of aortic ruptures occurred in experiments conducted during January (Fig. 1). During succeeding months the rate of mortality from aortic rupture decreased until July when it reached a low of 13%. During succeeding months there was a steady increase in mortality with the exception of November and this value is represented by only one experiment. Unfortunately, no experiments were started during the month of December, and, as a result, no mortality data are available for that month.

It is of interest to note that rate of mortality from aortic rupture induced by diethylstilbestrol was inversely related to length of day and environmental temperature. It has not been possible to determine whether either of the factors is the direct cause or whether the relationship is due to other factors which are associated with these. However, Ringer (8) reported that field cases occur only, or predominantly, in those flocks hatched in January and February. In a later report (9) it was noted that blood pressure of turkeys apparently had a seasonal low in the summer and fall and it was thought that this lower summer blood pressure may account for a lower incidence of aortic rupture in the warmer climates and a greater incidence in the cooler climates. It is doubtful that the lowered mortality in the summer season is entirely due to changes in blood pressure since little seasonal change in blood pressure was observed in our studies. The blood pressure

of DES-treated turkeys was extremely depressed yet mortality was high.

It is speculated that thyroid activity may be involved in the seasonal variation in mortality. Thyroid secretion rate of chickens has been reported to decrease in the summer (10) and with high temperatures (11–13). The seasonal curve of thyroid activity varies inversely with environmental temperature in the same manner demonstrated for mortality in Fig. 1. The increased incidence of aortic rupture observed after feeding thiouracil (6) and the decreased incidence after feeding iodinated casein (7) would also implicate a thyroid relationship. Data presently available, however, do not permit an elucidation of this relationship.

The fact that a low mortality rate occurs during the latter part of May, June, July, and August would indicate that it is very difficult to study factors affecting the mortality during these months. In the 23 experiments involved it was found that a difference of 13–18% in mortality between treatments was necessary to be significant at the 5% level of probability. If it is possible to produce only a mortality rate of approximately 15–20% during the periods May through August, it would not be possible to detect significant differences due to treatment. Therefore, it would appear that if diethylstilbestrol is used to produce aortic rupture in turkeys it is desirable to study these factors during the periods of shortest day length or lowest temperature.

Summary. Data were summarized from 23 experiments in which diethylstilbestrol (DES) was used to produce aortic rupture in turkeys. The mortality rate from DES injections decreased from January to July and increased from July to November. It was not possible to determine whether length of day or temperature change was directly related to mortality rate of DES-induced aortic ruptures of turkeys. However, it is speculated that thyroid activity as influenced by these changes may be involved.

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