

Aortic Rupture in Turkeys Induced by Diethylstilbestrol.* (28390)

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(Introduced by R. L. Shirley)

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Aortic rupture due to dissecting aneurysms occurs commonly in rapidly growing male turkeys in commercial flocks(1). The cause of the syndrome is not known. Fatal dissecting aneurysms in turkeys, however, can be readily induced by feeding *beta*-amino-propionitrile (BAPN), the *lathyrus* factor (2). Some time ago a high incidence of fatal dissecting aneurysms in male turkeys was observed in a commercial flock that had been pelleted with stilbestrol(3). This report describes an experimental procedure for producing significant numbers of fatal dissecting aneurysms in turkeys, using diethylstilbestrol (DES).

Materials and methods. Experiment 1. Thirty-six, one-day-old Broad-Breasted Bronze male turkey poults, obtained from a commercial source, were started in electric brooders with raised wire floors and fed *ad libitum* a commercial-type-starter diet containing 28% protein for the first 4 weeks of life. At 4 weeks of age the birds were transferred to unheated batteries and fed a 16% protein diet which contained 0.2% added DL-methionine. At 10 weeks of age birds were transferred to concrete-floored pens and separated at random into 4 groups of 9 birds each. One 24 mg pellet of DES was implanted subcutaneously in the upper neck region of each bird in 2 groups. Turkeys in the remaining 2 groups served as controls. Implantation was repeated weekly until the birds were 21 weeks old. At this time all living birds were weighed and slaughtered.

Experiment 2. The birds in Exp. 2 were obtained from the same hatchery as those in Exp. 1. The management of poults in Exp. 2 was also similar to those of Exp. 1 up to 4 weeks of age except that poults were started on a 20% protein commercial-chick-

starter mash. At 4 weeks of age, 96 birds were randomly assigned to 8 groups of 12 birds each. The birds in 4 groups were fed a 28% protein corn-soybean meal type diet with 4.5% added animal fat. The other 4 groups received a corn-soybean meal diet containing 16% protein with 0.2% added DL-methionine. These diets were formulated to satisfy requirements for turkeys as suggested by the National Research Council, with the exception of protein(4).

At 10 weeks of age, 2 groups of birds fed the 28% protein diet and 2 groups fed the 16% protein diet were implanted subcutaneously in the neck region with a 24 mg DES pellet per bird. The remaining 4 groups served as untreated controls. Weighing and collecting of heparinized blood was also instigated at 10 weeks of age. Implantation with DES, weighing, and bleeding were continued weekly until the experiment terminated at 21 weeks of age. Total plasma lipid levels were determined by the method of Bradstein *et al.*(5).

Results. Experiment 1. Five of 18 birds (27.7%) implanted with DES died of aortic ruptures (Table I). None of the control birds died of the disease. The first death due to aortic rupture occurred 17 days and the last death 51 days after the first implantation; however, most deaths developed between the 2nd and 5th weeks following the first injection. All ruptures occurred in the posterior aorta approximately 0.5 to 1 cm anterior to the sciatic arteries. All birds implanted with DES developed a partial prolapse of the cloaca. There was white barring

TABLE I. Occurrence of Aortic Ruptures in Birds Implanted with DES.

Diet % protein	Treatment	Aortic rupture/No.birds	
		Exp I	Exp II
16	DES	5/18	14/24
16	Control	0/18	1/24
28	DES	—	7/24
28	Control	—	0/24

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TABLE II. Total Plasma Lipids of DES-Treated and Control Birds on 2 Levels of Protein. (Exp II.)

Diet % protein	Treatment	Lipid levels (mg/100 ml serum)												
		10*	11	12	13	14	15	16	17	18	19	20	21	22
16	DES	325	350	598	755	675	1080	680	1200	800	1460	650	430	1030
16	Control	275	315	275	360	210	230	280	330	250	255	190	225	140
28	DES	175	240	530	690	515	805	1180	1455	1430	1225	1135	985	1055
28	Control	205	230	285	285	235	140	230	210	275	125	255	155	315

* Age in weeks.

of the wing feathers of all birds in the experiment.

Experiment 2. Fourteen of 24 birds (58.3%) implanted with DES pellets and fed the 16% protein diet died of aortic rupture (Table I). The first death occurred 7 days and the last death 73 days after initial implantation. Birds in both the control and implanted groups developed a white barring of the wing feathers. One of 24 control birds died of aortic rupture.

Seven of 24 birds (29.2%) fed the 28% protein diet and implanted with DES died of aortic ruptures. Deaths occurred between the 22nd and 74th day after treatment was initiated. None of the controls on the 28% protein diet died of aortic rupture.

All aortic ruptures occurred 0.5 to 1 cm anterior of the sciatic arteries except one which was located 0.5 cm posterior to the anterior mesenteric artery. With both diets, most ruptures developed during the 2nd and 5th weeks post-initial implantation.

DES-treated birds gained weight more rapidly than the controls from 11 through 15 weeks of age, but treated and non-treated groups weighed about the same at 17 weeks. The fatal dissecting aneurysms occurred during the period that the DES-treated turkeys were gaining weight more rapidly than the non-treated controls.

Total plasma lipid levels of DES-treated birds were 4 to 6 times higher than those of control birds (Table II).

Discussion. In these experiments weekly injections of 24 mg of DES appeared to be more effective in producing fatal dissecting aneurysms when poults were fed 16% protein diets than when birds were fed 28% protein diets containing animal fat. These experiments suggest that the high plasma lipid levels which were induced by DES-implantation may have been implicated in

the pathogenesis of the disease because of the striking difference between plasma lipid levels between the principals and the controls. It is significant, however, that most fatal cases of dissecting aneurysms occurred between the 2nd and 5th weeks following the beginning of treatment and not throughout the entire period. This is true even though the lipid levels were elevated to nearly the same degree throughout the entire treatment period. Dissecting aneurysms occurred during the period when body weight of the treated birds was increasing rapidly, *i.e.*, 1 to 6 weeks following the first implantation and not when the weight gains were minimal as they were during the latter stages of the treatment period.

No satisfactory explanation could be found for the higher incidence of fatal dissecting aneurysms in the turkeys fed 16% protein diets as compared to those fed the diet containing 28% protein. It may be that relative deficiencies of amino acids might have been present, particularly because feather color change indicated that the diet was deficient in lysine.

Summary. Weekly implantation of Broad-Breasted Bronze turkeys with 24 mg of DES increased the incidence of aortic ruptures. Poults fed a 16% protein diet developed more aortic ruptures (58%) than turkeys fed a 28% protein diet (29%).

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