Relationship Between Long Bone Distortion and Tibial Dyschondroplasia in Male Turkeys

PATRICIA Y. HESTER*2 and PETER R. FERKET†

*Department of Animal Sciences, Purdue University, West Lafayette, Indiana 47907 and †Department of Poultry Science, North Carolina State University, Raleigh, North Carolina 27695

ABSTRACT To determine whether a relationship exists between long bone distortion and tibial dyschondroplasia (TD), the hock joints of Large White commercial male turkeys were examined using low intensity x-ray imaging (hand-held lixiscope). All lame birds with long bone distortion and 96 control birds without lameness were examined at 8.3 and 12.3 wk of age for TD lesions using a lixiscope. Results indicated that the incidence of TD was less than 2% at 8.3 wk of age. The incidence increased to 21% by 12.3 wk of age. The TD lesions at 12 wk of age were considered mild covering only one-fourth of the growth plate. Chi-square analysis indicated that control turkeys without long bone distortion were just as likely to have TD lesions as were lame turkeys with long bone distortion. Under the conditions of the present experiment, TD did not appear to be a significant skeletal problem in Large White commercial male turkeys prior to 12.3 wk of age. Only 5 out of 37 (14%) toms with long bone distortion at 12.3 wk of age had TD lesions, suggesting that the valgus-varus deformity may be independent of TD.

(Key words: tibial dyschondroplasia, long bone distortion, valgus-varus deformity, turkey)

INTRODUCTION

Of all the major types of leg abnormalities affecting poultry, the largest economic loss is due to long bone distortion (Riddell, 1981; Riddell and Springer, 1985). Other names for long bone distortion include bowed legs or varus deformity, knock knees or valgus deformity, and twisted legs. Although growth plates and bone mineralization are normal, birds with long bone distortion show a bending or twisting of the tibia and tarsometatarsus. Slipped gastrocnemius tendons are also sometimes found. In chickens and turkeys, males have a higher incidence of long bone distortion than females (Glass, 1971; Buffington et al., 1975; Haye and Simons, 1978).

Another type of skeletal deformity affecting meat-type fowl is tibial dyschondroplasia (TD), which is characterized as a mass of avascular cartilage projecting from the growth plate of long bones (Leach and Nesheim, 1965; Leach and Lilburn, 1992). Sauveur and Mongin (1978) reported that TD could be eliminated in broilers through the use of radiography (Riddell, 1976) or low intensity x-ray imaging with a hand-held lixiscope (Bartels et al., 1989), live birds with TD can be identified. After four generations of selecting broiler breeders for a low occurrence of TD using a lixiscope, Wong-Valle et al. (1993) reported an incidence of 3.5% at 7 wk of age. In comparison, high TD line birds have incidences approaching 61.9%. It is unknown whether eliminating birds with severe TD lesions will lead to a reduction in the incidence of long bone distortion (Riddell, 1976) or other types of skeletal deformities (Riddell, 1975). The objective of the current study was therefore to evaluate the relationship between long bone distortion and TD in live male turkeys. Specifically, we wanted to determine whether the presence of TD lesions caused a concomitant impairment of walking ability resulting in angular deformities of the leg bones.

MATERIALS AND METHODS

A total of 1,104 commercial male turkeys were housed in 48 pens at a density of 32 m² per bird. Details on the management and nutritional regimens of the birds are described by Clarke et al. (1993). Average live body weights for the flock at 8 and 12 wk of age were 3.2 and 8.0 kg, respectively, with cumulative mortality of 6% up to 17.7 wk of age.
The incidence of leg abnormalities was determined at 8.1 and 12.1 wk of age by examining the walking ability of each turkey in the study. The backs of all lame birds and two control birds per pen were spray-painted black for easy identification and retrieval from the pens. Both hock joints of lame birds and the right hock joint of two control birds per pen with normal walking ability and no obvious leg deformities were examined at 8.3 and 12.3 wk of age through the use of a hand-held lixiscope. This low intensity gamma-radiation (125I) imaging of the hock joint allowed for viewing the distal end of the tibiotarsus and the proximal end of the tarsometatarsus. The same person (PRF) performed the lixiscope readings on all birds in a darkened room to enhance visibility of the image. An opaque lesion that occupied at least one-quarter the area of the distal end of the tibiotarsus was considered a positive reading of a TD lesion. This technique was confirmed in a previous study by correlating radiographic lesions with gross necropsy (Ferket, unpublished data). The same birds that were examined at 8.3 wk of age were also examined at 12.3 wk of age, with the exception of the additional 31 lame birds that developed long bone distortion after 8.3 wk of age. Toms were not evaluated after 13 wk of age because the size of the birds exceeded the capacity of the lixiscope. The incidences of TD in both control and lame turkeys were analyzed by chi-square (Steel and Torrie, 1980; SAS Institute, 1986).

**RESULTS**

The incidence of leg abnormalities was determined at 8.3 wk of age was extremely low (Table 1). From 1,104 turkey toms examined for their walking ability at 8.3 wk of age, only 0.5% (6 birds) were categorized with long bone distortion. Lixiscope examination of the hock joint of these 6 birds revealed no TD lesions. Likewise, control birds with normal walking ability and no long bone distortion exhibited a very low incidence of TD lesions at 8.3 wk of age, with only 2 toms out of 96 revealing mild TD lesions in the hock joint. By 12.3 wk of age, the incidence of long bone distortion had increased to 3.3% so that 37 toms were examined for TD lesions. Of these 37 toms, only 5 birds or 14% had TD lesions. The 96 control toms showed an increase in the incidence of TD from 2% at 8.3 wk of age to 24% at 12.3 wk of age. The TD lesions were mild, covering approximately one-fourth of the growth plate. Chi-square analysis indicated that control turkeys without long bone distortion were just as likely to have TD lesions as were lame turkeys with long bone distortion.

**DISCUSSION**

The results of this study support the contention that meat-type fowl can have TD lesions without valgus-varus deformity, or vice versa. From 8 to 39 wk of age, Walser *et al.* (1982) examined, through necropsy and radiography, a random selection of tibiotarsi from five developmental lines of turkey breeders. For the male breeders, the incidence of TD peaked at 80% at 12 wk of age. Of the 20 tibiotarsi examined at 12 wk of age, none had gross tibial deformities such as bowing. The incidence of TD was not as high in our study (24% in control toms at 12.3 wk of age), perhaps because we were working with commercial birds rather than breeders and the fact that the study was conducted about 10 yr later.

Although TD lesions can be prevalent in long bones without any angular or other gross deformities at the time of examination, it has been suggested that TD lesions may predispose birds to leg deformities later in life. However, in a study by Walser *et al.* (1982), in which the incidence of TD peaked at 80% at 12 wk in tom breeders and then subsequently declined between Weeks 14 and 38, only 21 out of 274 (7.7%) tibiotarsi examined post-peak had gross deformities. With the exception of one bone, all of the deformed tibiotarsi from males had TD (Walser *et al.*, 1982). Female turkey breeders showed no increased susceptibility to angular deformities as a result of TD lesions. Specifically, the incidence of TD in breeder hens peaked at approximately 68% at 13 wk of age and none of the tibiotarsi of hens ever showed gross deformities at any time during the 31-wk study (Walser *et al.*, 1982).
The prevalence of TD lesions in long bones without any angular or other gross deformities at the time of examination was confirmed under the conditions of the present experiment. In addition, TD did not appear to be a significant skeletal problem in Large White commercial male turkeys with angular deformities prior to 12.3 wk of age. Only 5 out of 35 (14%) toms with long bone distortion at 12.3 wk of age had TD lesions suggesting that the valgus-varus deformity may be independent of TD.

ACKNOWLEDGMENTS

This study was supported by the Value Added Center of the state of Indiana Office of the Commissioner of Agriculture, the Indiana Turkey Market Development Council, and Purdue University Agricultural Experiment Station Crossroads Funds. The authors are indebted to Cuddy Farms, Inc., for providing the poult.

REFERENCES


