

Crooked Toes

poultry defect may be hereditary
nutritional or managerial in type

A. F. Hicks, Jr.

In past years crooked toes in chickens have been considered to be of two types, one due to a nutritional deficiency and another caused by faulty management. A third type which has not been described until recently is hereditary in nature and as such, is of considerable interest to breeders and hatcherymen.

The nutritional type is caused by a riboflavin deficiency in the diet of the chicks themselves or of the breeding stock producing them. It is characterized by an inward curling of the toes and a partial paralysis of the legs which forces the bird to assume a squatting position whereby it walks and rests on the hock joints.

The second type is produced by improper managerial practices. An insufficient source of heat which results in considerable competition among chicks for warm spots, crowding under hovers, and smooth, slick floors seem to be the chief causal factors. In other words, an excessive and strained use of the toes, due to competition and lack of traction during early stages of bone formation produces the deformity. In most cases of managerial crooked toes, the toes curve inward, but occasionally outward curling has been observed. One or both feet may be involved. Only the toes are affected in this form of the defect and the curvature may range from slight to very severe. The birds walk in a normal upright fashion and have no apparent difficulty in locomotion except for a slight impairment of balance when the expression of the defect is severe.

The defect has been observed in a flock



Six-week-old bird with moderately crooked toes exhibiting outward curving of fourth toe on both feet.

which was on feed containing nearly twice the quantity of riboflavin established as the requirement by the National Research Council. Furthermore, in an experiment conducted at Cornell, it was found that massive doses of riboflavin are ineffective in curing early cases of the deformity. There is, therefore, no doubt that nutritional and managerial crooked toes are distinct and different types.

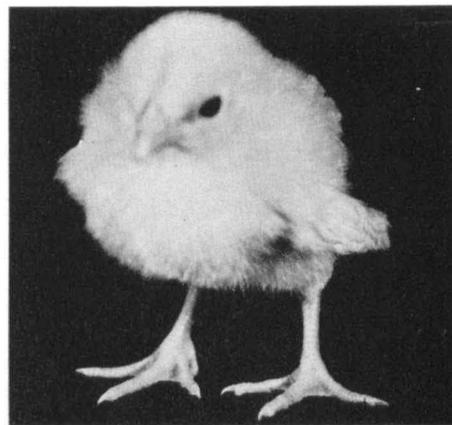
The third type of crooked toes has been noted for many generations in a small number of birds in the University of California flock of Single Comb White Leghorns. The expression of the defect appears to be identical with that found in the managerial type, but may be observed in embryos in the third week of incubation. At hatching time the toes of both crooked toes and normal chicks are tightly flexed, but are drawn straight down. When the normal chicks stand, the toes are extended to their normal position, but in chicks with crooked toes they do not extend as far as they do normally. This results in the chicks walking on their knuckles. However, because of the weight exerted upon the toes, the chicks may walk on the sides of the toes. Due to the rapid bone formation during the next few weeks the toes assume the type of curling illustrated in the accompanying photograph of a six-week-old bird shown in the lower left corner of this page.

The toes are almost invariably curved inward at hatching but when the birds are older a rare individual is found with outward curving of one or more toes. One or both feet may be involved and only the second, third, and fourth toes are affected.

When the toes are only slightly crooked it frequently happens that they straighten out as the bird gets older. However, when the early expression is severe, the toes rarely become entirely straight. There is some loss of balance in birds with extreme expression of the defect, but it is largely regained as the birds grow older. The impaired balance and loss of traction result in a characteristic spraddling in day-old chicks.

In 1943 a selection experiment was initiated to increase the incidence of the defect. The results of six years of selection are given in the accompanying table.

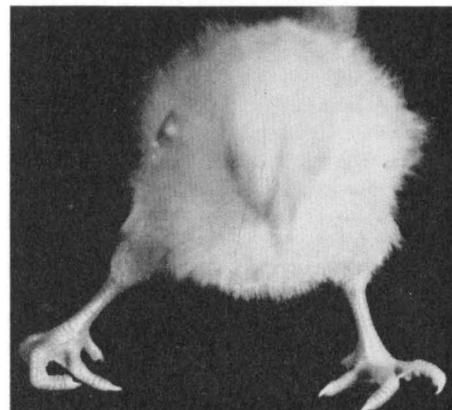
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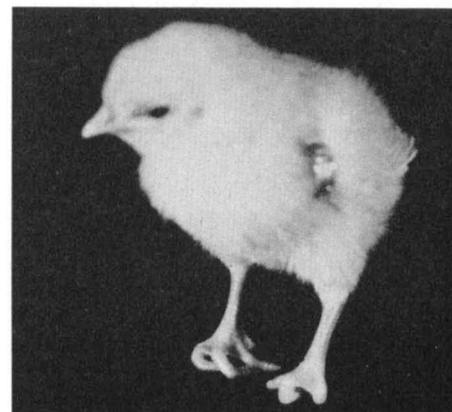
Day-old chick with normal toes.



Day-old chick with only one foot affected.



Day-old chick exhibiting characteristic spraddled position. Toes are slightly crooked.



Day-old chick with severely crooked toes.

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Not only has the incidence been increased by selection from one to two to over 90%, but the severity of expression has also greatly intensified in the crooked toe line. There is no doubt concerning the hereditary nature of the deformity in view of these results and of data from other experiments conducted.

Although there is no evidence at present that crooked toes, even when the expression is severe, have an adverse effect on productive qualities—including fer-

Year	Production line	Selected crooked toe line
1943	2.19	
1944	0.28	14.7
1945	1.86	42.3
1946	0.75	63.3
1947	1.42	88.2
1948	5.00*	97.1
1949	1.72	94.0

* This increased incidence may be explained in part by a more exacting classification.

tility and hatchability—hatcherymen and breeders will probably wish to prevent the spread of the hereditary form of the defect in their breeding flocks. While no detailed recommendations regarding a breeding program can be made at this time, it seems probable that elimination of birds exhibiting this type of crooked toes from the breeding flock will maintain the incidence of the abnormality at a low level.

A. F. Hicks, Jr., is Research Assistant, Poultry Husbandry, Berkeley.

PASTURE

Continued from page 6

five or six inches lest there be insufficient leaf area for rapid regrowth. Also internal parasites are largely concentrated near the ground. If grazing stock keep the pasture closely cropped they tend to pick up more parasites.

A good way to utilize irrigated pasture on dairy farms is to have seven or more fields and rotate the grazing stock from field to field. Cattle are thereby concentrated in a field in sufficient numbers to crop the pasture evenly to the proper level in a day or two and then are removed to a different one so irrigation and regrowth may take place.

Dairymen, who put the milking herd in a fresh pasture each day or two, suffer less decline in milk production than where the herd is left in four to seven days with declining available feed. The milking herd is followed in each field by the dry and young stock.

As soon as a field is eaten down to five or six inches, stock should be removed until regrowth makes the field ready for use again. Where the basic legume is alfalfa it must be allowed to grow practically to the stage where it would be cut for hay or the life of the alfalfa stand will be very short.

Where sufficient fields are not available for such a rotation, it is important to limit the numbers of stock or the hours of use so there is always plenty of vegetation for quick regrowth. Selective grazing, tuft grass, overgrazing, and manure spots are more of a problem under constant grazing than rotational grazing.

Irrigation

Proper irrigation is essential to maximum pasture production and maintenance of the desired mixture.

Ladino clover is shallow rooted and will suffer or be eliminated with too long a period between irrigations. Grasses feed below the clover and will be harmed by too shallow irrigations, hence frequent irrigation of moderate amounts is generally a better practice than very frequent light waterings or infrequent heavy ones.

The irrigation schedule must fit the particular soil type, the weather and the pasture mixture.

Fertilization

Field trials in many areas show considerable response to pasture fertilization.

The use of commercial fertilizers to supplement the available manure and barn washings is increasing. In San Bernardino County both nitrogen and phosphorus have been shown to be beneficial.

Improper grazing, poor irrigation practice, and low fertility promote the replacement of desirable forage plants by weeds. Attention to the above three factors will help control weeds, but periodic mowing as needed is an essential operation in reducing weed competition.

Most productive pastures are usually mowed at least twice a year. It has recently been shown that 2,4-D will, if properly timed and applied, control many of the troublesome weeds in the Ladino grass pastures. At present, it should not

PASTURE USE, FEED COSTS, AND PROFIT San Joaquin Valley dairies 1947-48

	Market Milk Dairies		Manufacturing Milk Dairies	
	†High use of pasture	‡Low use of pasture	†High use of pasture	‡Low use of pasture
Number of Dairies	19	29	12	19
Pounds of milkfat sold per cow	339	371	307	322
Feeds used per cow per year*				
Hay, tons	4.0	5.0	3.5	4.9
Concentrates, tons	1.0	1.2	.7	.9
Silage and green feed, tons	1.2	3.3	.0	2.6
Pasture, animal-unit-months	10.8	5.7	11.1	5.5
Feed cost per cow	\$254.32	\$291.31	\$211.85	\$236.47
Difference		36.99		24.62
Management income per cow (profit)	\$102.33	\$74.02	\$64.05	\$21.81
Difference	28.31		42.24	
Feed cost per pound of milkfat	.75	.78	.69	.73
Management income per pound of fat	.30	.20	.21	.07

* Includes feed for young stock and bulls.

† Dairies having 9 or more animal-unit-months per cow.

‡ Dairies having 8 or less animal-unit-months per cow.

Standard practice now is to apply 300 pounds per acre of 16-20 ammonium phosphate in February or March to stimulate early feed production and another 300 pounds about mid-July to overcome the midsummer sag and to stimulate fall growth. Application of commercial fertilizers should be based on local trials on a particular soil.

Weeds use moisture and plant food that should go to the desirable forage species in a pasture.

be used in pastures where alfalfa or trefoil are the basic legumes.

Arthur Shultis is Agriculturist, Farm Management, in Agricultural Extension, and Associate on the Giannini Foundation, Berkeley.

Milton D. Miller is Associate Agriculturist, Agronomy, in Agricultural Extension, Davis.

Agricultural Extension Service Circular 125 "Irrigated Pastures in California" has just been revised and may be obtained from the College of Agriculture or from the local office of the Farm Advisor.