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The influence of certain nutrients on the prevention of dermatitis in turkey poults

Leighton H. Panter

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To the Graduate Council:

I am submitting herewith a thesis written by Leighton H. Panter entitled "The influence of certain nutrients on the prevention of dermatitis in turkey poults." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Husbandry.

Homer Patrick, Charles, S. Hobbs, Major Professor

We have read this thesis and recommend its acceptance:

Marshall C. Hervey

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

June 7, 1948

To the Committee on Graduate Study:

I am submitting to you a thesis written by Leighton H. Panter entitled "The Influence of Certain Nutrients on the Prevention of Dermatitis in Turkey Poults." I recommend that it be accepted for nine quarter hours credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Husbandry.

Tomer Patrick
Co-Major Professor

Charles Hobbs
Co-Major Professor

We have read this thesis
and recommend its acceptance:

M. C. Hervey

Sam L. Hansard

Accepted for the Committee

E. A. Waters
Dean of the Graduate School

THE INFLUENCE OF CERTAIN NUTRIENTS ON THE
PREVENTION OF DERMATITIS IN
TURKEY POULTS

A THESIS

Submitted to
the Committee on Graduate Study
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by
Leighton H. Panter
June 1948

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Leighton H. Carter

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INTRODUCTION

During the past ten years, an extensive study has been made in connection with the occurrence of dermatitis in turkey poults. The specific anti-dermatitis factor or factors have not been definitely established and the reports of the various research workers are in rather wide disagreement.

Laboratory experiments have demonstrated that riboflavin, niacin, pantothenic acid and biotin are the anti-dermatitis factors reported in turkey poult nutrition. However, the appearance of dermatitis has also been reported in turkey poults receiving a ration considered to be nutritionally adequate.

The rations used by the various experimental workers have varied considerably in their compositions. The disagreements in the reports may be due, at least to some extent, to the different feed constituents used in the rations. The variations in the management received by the different lots of poults also may have contributed to the present controversy among the research workers.

This study was planned in an effort to determine the factor or factors influencing the occurrence of dermatitis in turkey poults.

OBJECTIVES

Due to the wide disagreement which exists among the present research workers concerning the factor or factors influencing the occurrence of dermatitis in turkey poults, it seemed advisable that further work be done in an effort to clarify this controversy.

Two definite objectives were set up at the beginning of this experiment:

1. The first objective was to use a practical ration which was reported to have produced a high incidence of dermatitis in turkey poults.
2. The second objective was to supplement this ration with crystalline vitamins and to determine their value in preventing this dermatitis.

REVIEW OF LITERATURE

The various reports in literature are in rather wide disagreement as to the anti-dermatitis factor or factors in turkey poult nutrition. Most of the research work conducted has been centered around riboflavin. While there is fairly good agreement on the amount of riboflavin needed by turkey poults for maximum growth, there is disagreement concerning the deficiency symptoms in poults resulting from a lack of this vitamin.

Using a riboflavin deficient diet, composed largely of practical ingredients, Hauser (1935) showed that a lack of riboflavin resulted principally in reduced growth. Hauser did not report any evidence of dermatitis among the turkey poults used in his experiment.

Lepkovsky and Jukes (1936) reported that dermatitis started to appear in poults after eight days on either a diet consisting of natural feedstuffs, low in riboflavin, or on a more purified diet deficient in riboflavin. An acute dermatitis developed in the poults, even though the ration was amply fortified with a "filtrate factor" which prevented dermatitis in baby chicks. The external symptoms of poult dermatitis, reported by these workers, were similar to those reported for chick dermatitis, except that the vent also became encrusted, inflamed, and excoriated. The poults grew very slowly and stopped growth by the seventeenth day. This dermatitis was prevented by supplementing the diets with 2 mg. of vitamin G per 100 grams of feed.

Jukes (1938) confirmed the findings of Lepkovsky and Jukes (1936)

by adding a whey absorbate rich in riboflavin to a basal diet of ground yellow corn, wheat middlings, washed casein, and rice bran filtrate, supplemented with minerals, cod liver oil, and vitamin K concentrate. The poults on the basal diet grew very slowly, and began to develop dermatitis by the end of two weeks. By supplementing the diet with a fullers' earth absorbate of whey the rate of growth was much increased, dermatitis was prevented, and mortality was greatly reduced. A basal diet similar to that used by Hauser (1935) but supplemented with a rice bran filtrate was fed to poults in another experiment. The poults grew very slowly, acute dermatitis developed, and the death rate was high. These symptoms were prevented by supplementing the diet with eight per cent of dried skimmed milk as a source of riboflavin. Supplements of the filtrate factor (pantothenic acid) were not effective in preventing these symptoms.

In attempts to determine the riboflavin requirement of turkey poults, Patrick, Boucher, Dutcher and Knandel (1941) found that dermatitis occurred in the poults fed either a simplified or a commercial type of ration and that the addition of riboflavin to either ration did not prevent the occurrence of dermatitis. The deficiency symptoms observed by Patrick, et al., were very similar to those described by Lepkovsky and Jukes (1936) and by Jukes (1938). The poults began to develop dermatitis at two to three weeks of age. Definite lesions were reported between the toes, on the bottoms of the feet, and at the proximal-dorsal portion of the upper beak. As the manifestation of the deficiency symptoms progressed, the feet became completely encrusted and

hemorrhagic cracks appeared. Addition of riboflavin up to 500 micrograms per 100 grams of feed was ineffective in preventing dermatitis. Ca-pantothenate, nicotinic acid, cane molasses, the water-soluble fraction of dried beef liver were also ineffective in preventing the symptoms. However, the residues from yeast and liver protected the poults completely. Complete protection from dermatitis also resulted from the use of a biotin concentrate.

A further report on the prevention of dermatitis in turkey poults was made by Patrick, Boucher, Dutcher, and Knandel (1943). By the end of the third week of the experiment, severe dermatitis and perosis occurred in the poults of all groups receiving various amounts of riboflavin, while the poults receiving a supplement of ten per cent dried brewers' yeast were free of dermatitis and perosis. The feet, vent, mouth, eyes, and most of the proximal portion of the upper beak of the infected poults, showed severe dermatitis. The amount of riboflavin added to the diet did not appear to influence the time of onset or severity of dermatitis or perosis. The poults which received rations adequate in biotin, but inadequate in any fraction of the aqueous extract of yeast or in riboflavin, were completely protected from dermatitis but not from perosis. The occurrence of perosis did not always parallel the occurrence of dermatitis.

A report on the role of riboflavin in turkey poult nutrition was made by Patrick, Darrow, and Morgan (1943). A simplified ration, inadequate in riboflavin and biotin, was used in these experiments. The poults which received the basal ration, plus adequate amounts of ribo-

flavin and biotin, developed normally. Those which received suboptimum levels of riboflavin and adequate amounts of biotin grew slowly, but did not develop dermatitis. The poultts receiving no supplementary riboflavin and adequate amounts of biotin, died by the fourth week of life, but did not develop dermatitis. Those receiving 500 mg. of riboflavin per 100 grams of diet, and no biotin, developed dermatitis and perosis by the end of the third week of life. This report indicated that riboflavin deficiency is characterized largely by retarded growth and increased mortality.

Jukes, Stokstad and Belt (1946) gave a report of certain vitamin deficiencies as studied with turkey poultts on a simplified diet. Jukes, et al., confirmed the early work of Lepkovsky and Jukes (1936) and Jukes (1938) by reporting that a riboflavin deficiency resulted in slow growth and dermatitis. The description of the riboflavin-deficiency dermatitis was very similar to the original description of Lepkovsky and Jukes (1936) and Jukes (1938).

McGinnis and Carver (1946) found that severe dermatitis and perosis developed in turkey poultts when fed a practical turkey starting ration which was low in riboflavin. The addition of riboflavin to the basal ration was very effective in preventing dermatitis and reducing the occurrence of perosis. Pantothenic acid was found ineffective in preventing either dermatitis or perosis. The dehydrated alfalfa and fermentation riboflavin supplement prevented dermatitis, perosis, mortality, and promoted growth. While less effective than riboflavin, crystalline biotin reduced the occurrence of both dermatitis and perosis.

PROCEDURE

Experimental Animals

The experimental animals used in this study were day old Broad-breasted Beltsville white turkey poults which were obtained from the Poultry Department of Clemson A & M College, Clemson, South Carolina. The poults were allotted to the different groups with equal weight distribution.

Management of Experimental Animals

The poults used in Experiment I were kept in electrically heated brooders equipped with hardware cloth floors throughout the entire experimental period. The brooders were operated according to recommendations given by the manufacturer.

The poults used in Experiment II were kept in the electrically heated brooders until the end of the fourth week of life, at which time they were transferred to growing batteries where they remained until the end of the experiment.

The poults were fed feed and water ad lib from containers attached to the side of the brooders.

Rations

The composition of the basal rations used in these experiments is shown in Table 1. The supplements added to these rations are shown in Tables II and III. The folic acid used in these experiments was obtained from Lederle Laboratories, and the other vitamin products were supplied by Merck and Company.

TABLE 1 -- PERCENTAGE COMPOSITION OF TURKEY POULT BASAL RATIONS

Constituents	Ration A	Ration B
	%	%
Yellow Corn Meal	36.2	51.2
Wheat Middlings	10	-
Wheat Bran	10	-
Fish Meal	8	-
Soybean Oil Meal	32	45.0
Bone Meal	1	2
Limestone - powdered	2	1
Salt	0.5	0.5
Vitamin A. Oil (6000A)	0.2	0.2
Vitamin D-Concentrate (2000D)	0.1	0.1
Manganese Sulfate - 4 oz. per 1000 lbs. of ration		

RESULTS AND DISCUSSION

Experiment I.

The poults in this experiment were fed Basal Ration A supplemented as shown in Table II. Basal Ration A is a practical ration which is reported to have produced a high incidence of dermatitis in turkey poults at other stations. However, in this experiment no dermatitis was observed in any of the poults. (Table 2, Lot 1).

TABLE 2 — DERMATITIS PREVENTATIVE ACTION OF SUPPLEMENTS USED IN EXP. I.

Lot	Number of poults started	Supplement added to Basal Ration A	Results at four weeks				
			Weight	Perox- sis %	Mor- tality %	Dermatitis	
						Vent %	Feet %
1	15	None	349	27	27	0	0
2	15	Folic acid (3 ppm.)	349	23	13	8	0
3	30	Riboflavin (3 ppm.)	401	0	3	0	0
4	30	Riboflavin (3 ppm.) plus Folic acid (3 ppm.)	379	0	0	0	0
5	30	Riboflavin (3 ppm.) plus Alfalfa (10%)	399	0	3	0	0
6	30	Riboflavin (3 ppm.) plus Folic acid (3 ppm.) plus Pantothenic Acid (4 ppm.)	407	0	3	0	0

Experiment II.

The practical Basal Ration A, as well as the more simplified Basal Ration B, were used in this experiment. These rations were supplemented with crystalline vitamins as shown in Table III.

In marked contrast to the results obtained in Experiment I, dermatitis appeared in all of the lots of poult used in Experiment II. Careful observation made of the poult on Experiment II indicated a moist condition of the hardware cloth floor of the brooders accompanied by an increased accumulation of wet droppings. At the end of the second week of this experiment, the heating of the brooders was discontinued. Since the negative control groups in both Experiment I and Experiment II received the same ration and those in Experiment I did not develop dermatitis while dermatitis did occur in the poult on the moist floor in Experiment II, there is some indication that dermatitis of the feet of poult and pasting around the vent may be associated with temperature and moisture control.

The failure of the vitamin supplements to prevent dermatitis indicates that they do not prevent dermatitis under all conditions.

The poult receiving Basal Ration B appeared normal; however, a close examination of the bodies of the poult revealed rather poor fleshing. Basal Ration A and Basal Ration B contained approximately the same amount of total protein, but Ration A contains both vegetable and animal proteins while Ration B contains only vegetable protein. This indicates that poult may be similar to chicks in that they must have some animal protein for normal development.

TABLE 3 — THE INFLUENCE OF FOLIC ACID, CHOLINE, NIACIN, AND RIBOFLAVIN DEFICIENCIES IN TURKEY POULT NUTRITION.

Lot No.	Number of Poults Started	Supplement to Basal Ration	Results at four weeks				
			Weight	Pero- sis %	Mor- tality %	<u>Dermatitis</u> Vent Feet %	
1	15	<u>Basal Ration A.</u>	404	8	13	31	54
2	15	" plus Folic acid (3 ppm.)	363	0	7	0	50
3	15	" plus Folic acid (3 ppm.) plus Choline (0.2%)	306	0	0	40	87
4	15	" plus Folic acid (3 ppm.) plus Choline (0.2%) plus Niacin (50 ppm.)	337	7	0	67	80
5	15	" plus Folic acid (3 ppm.) plus Choline (0.2%) plus Niacin (50 ppm.) plus Riboflavin (3 ppm.)	374	0	0	13	80
6	15	" plus Niacin (50 ppm.) plus Folic acid (3 ppm.)	380	0	13	69	76
7	20	" plus Folic acid (3 ppm.) plus Niacin (50 ppm.) plus Riboflavin (3 ppm.)	405	0	15	35	93
8	15	<u>Basal Ration B.</u>	369	0	33	60	60
9	15	" plus Niacin (50 ppm.)	335	0	7	36	78
10	15	" plus Niacin (50 ppm.) plus Riboflavin (3 ppm.)	403	0	7	43	100

CONCLUSIONS

1. The practical ration A which is reported to have resulted in a high incidence of dermatitis in poults at other stations failed to produce any dermatitis among the poults of Experiment I at this laboratory.

2. From the results of these experiments, there is some indication that dermatitis of the feet of poults and pasting around the vent is ^{maybe} associated with temperature and moisture control.

3. These experiments demonstrated that riboflavin, pantothenic acid and niacin do not prevent dermatitis under all conditions.

4. There is some indication that poults may be similar to chicks in that they must have some animal protein for normal growth.

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APPENDIX



TABLE 4 -- RESPONSE OF TURKEY POULTS TO SUPPLEMENTS USED IN EXPERIMENT 1.

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
<u>Group 1.</u>	None				
1		430	none	none	none
2		370	"	"	"
3		450	"	"	"
4		335	yes	"	"
5		310	none	"	"
6		365	"	"	"
7		265	"	"	"
8		385	yes	"	"
9		390	none	"	"
10		270	yes	"	"
11		250	none	"	"

Group 1 - Average 349 27% 0% 0%

*Four poults in this lot were dead before the 28th day of life.

<u>Group 2.</u>	Folic acid (3 ppm.)				
1		420	none	none	none
2		360	"	"	"
3		390	"	"	"
4		300	yes	"	"
5		405	none	"	"
6		390	"	"	"
7		245	"	yes	"
8		380	"	none	"
9		220	yes	"	"
10		280	none	"	"
11		330	yes	"	"
12		335	none	"	"
13		380	"	"	"

Group 2 - Average 349 23% 8% 0%

*Two poults in this lot were dead before the 28th day of life.

(TABLE 4 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
<u>Group 3.</u>	Riboflavin (3 ppm.)				
1		385	none	none	none
2		450	"	"	"
3		370	"	"	"
4		395	"	"	"
5		410	"	"	"
6		410	"	"	"
7		460	"	"	"
8		425	"	"	"
9		415	"	"	"
10		380	"	"	"
11		435	"	"	"
12		360	"	"	"
13		410	"	"	"
14		390	"	"	"
15		380	"	"	"
16		350	"	"	"
17		380	"	"	"
18		350	"	"	"
19		385	"	"	"
20		410	"	"	"
21		470	"	"	"
22		330	"	"	"
23		400	"	"	"
24		365	"	"	"
25		470	"	"	"
26		550	"	"	"
27		430	"	"	"
28		390	"	"	"
29		280	"	"	"
Group 3 - Average		401	0%	0%	0%

*One poult in this lot was dead before the 28th day of life.

(TABLE 4 CONTINUED)

Foult No.	Supplement	Results at 4 weeks of age			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
<u>Group 4.</u>	Riboflavin (3 ppm.) plus Folic acid (3 ppm.)				
1		355	none	none	none
2		335	"	"	"
3		410	"	"	"
4		370	"	"	"
5		455	"	"	"
6		350	"	"	"
7		410	"	"	"
8		335	"	"	"
9		310	"	"	"
10		380	"	"	"
11		355	"	"	"
12		350	"	"	"
13		295	"	"	"
14		380	"	"	"
15		420	"	"	"
16		385	"	"	"
17		310	"	"	"
18		380	"	"	"
19		415	"	"	"
20		360	"	"	"
21		350	"	"	"
22		410	"	"	"
23		450	"	"	"
24		420	"	"	"
25		385	"	"	"
26		490	"	"	"
27		380	"	"	"
28		405	"	"	"
29		335	"	"	"
30		375	"	"	"
Group 4 - Average		379	0%	0%	0%

(TABLE 4 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 5.	Riboflavin (2 ppm.) plus Alfalfa (10 per cent)				
1		570	none	none	none
2		470	"	"	"
3		415	"	"	"
4		400	"	"	"
5		405	"	"	"
6		455	"	"	"
7		435	"	"	"
8		360	"	"	"
9		390	"	"	"
10		395	"	"	"
11		400	"	"	"
12		265	"	"	"
13		410	"	"	"
14		240	"	"	"
15		380	"	"	"
16		480	"	"	"
17		360	"	"	"
18		360	"	"	"
19		350	"	"	"
20		405	"	"	"
21		535	"	"	"
22		460	"	"	"
23		400	"	"	"
24		440	"	"	"
25		405	"	"	"
26		350	"	"	"
27		300	"	"	"
28		360	"	"	"
29		380	"	"	"
Group 5 - Average		399	0%	0%	0%

*One poult in this lot was dead before the 28th day of life.

(TABLE 4 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
<u>Group 6.</u>	Riboflavin (3 ppm.) plus Folic acid (3 ppm.) plus Pantothenic acid (4 ppm.)				
1		410	none	none	none
2		495	"	"	"
3		470	"	"	"
4		440	"	"	"
5		280	"	"	"
6		460	"	"	"
7		380	"	"	"
8		390	"	"	"
9		510	"	"	"
10		375	"	"	"
11		300	"	"	"
12		390	"	"	"
13		365	"	"	"
14		380	"	"	"
15		425	"	"	"
16		465	"	"	"
17		465	"	"	"
18		385	"	"	"
19		180	"	"	"
20		380	"	"	"
21		430	"	"	"
22		380	"	"	"
23		440	"	"	"
24		440	"	"	"
25		490	"	"	"
26		430	"	"	"
27		470	"	"	"
28		435	"	"	"
29		330	"	"	"
Group 6 - Average		407	0%	0%	0%

*One poult in this lot was dead before the 28th day of life.

TABLE 5 -- RESPONSE OF TURKEY POULTS TO SUPPLEMENTS USED IN EXPERIMENT 2.

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 1. Ration A with no supplement					
1		370	none	none	yes
2		330	"	yes	"
3		480	"	none	none
4		500	"	"	yes
5		500	"	"	"
6		445	"	yes	none
7		490	"	none	yes
8		370	"	yes	none
9		350	"	"	yes
10		400	"	none	none
11		345	"	"	"
12		360	"	"	yes
13		320	yes	"	none

Group 1 - Average..... 404 8% 31% 54%

*Two poult in this lot were dead before the 28th day of life.

Group 2. Ration A plus Folic acid (3 ppm.)					
1		230	none	none	none
2		320	"	"	"
3		395	"	"	"
4		420	"	"	"
5		405	"	"	yes
6		400	"	"	"
7		385	"	"	none
8		250	"	"	"
9		425	"	"	"
10		390	"	"	yes
11		500	"	"	"
12		350	"	"	"
13		315	"	"	"
14		295	"	"	"

Group 2 - Average 363 0% 0% 50%

*One poult in this lot was dead before the 28th day of life.

(TABLE 5 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 3. Ration A plus Folic acid (3 ppm.) plus Choline (0.2%)					
1		415	none	yes	yes
2		350	"	none	"
3		425	"	yes	"
4		390	"	none	"
5		350	"	yes	"
6		340	"	none	"
7		280	"	"	none
8		330	"	"	yes
9		380	"	"	"
10		340	"	"	"
11		330	"	yes	"
12		385	"	none	"
13		385	"	yes	none
14		370	"	"	yes
15		330	"	none	"
Group 3 - Average		306	0%	40%	87%
Group 4. Ration A plus Folic acid (3 ppm.) plus Choline (0.2%) plus Niacin (50 ppm.)					
1		410	none	yes	yes
2		305	"	none	none
3		285	"	"	yes
4		415	"	yes	"
5		345	"	none	"
6		415	"	"	"
7		365	"	yes	none
8		430	"	"	yes
9		340	"	none	"
10		380	"	yes	"
11		260	"	"	"
12		410	yes	"	"
13		340	none	"	none
14		440	"	"	yes
15		315	"	"	"
Group - Average		337	7%	67%	80%

(TABLE 5 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 5. Ration A plus Folic acid (3 ppm.) plus Choline (0.2%) plus Niacin (50 ppm.) plus Riboflavin (3 ppm.)					
1		400	none	none	yes
2		410	"	"	"
3		465	"	yes	"
4		590	"	none	none
5		375	"	"	yes
6		360	"	yes	yes
7		325	"	none	"
8		390	"	"	"
9		440	"	"	"
10		450	"	"	"
11		370	"	"	"
12		425	"	"	none
13		405	"	"	yes
14		370	"	"	"
15		335	"	"	none
Group 5 - Average		374	0%	13%	80%
Group 6. Ration A plus Niacin (50 ppm.) plus Folic acid (3 ppm.)					
1		410	none	yes	yes
2		380	"	"	"
3		460	"	"	"
4		480	"	none	"
5		370	"	yes	none
6		460	"	"	yes
7		360	"	none	none
8		370	"	yes	"
9		420	"	none	yes
10		410	"	yes	"
11		310	"	"	"
12		360	"	none	"
13		190	"	yes	"
Group 6 - Average		380	0%	69%	76%

*Two poultts in this lot were dead
before the 28th day of life.

(TABLE 5 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 7. Ration A plus Folic acid (3 ppm.) plus Niacin (50 ppm.) plus Riboflavin (3 ppm.)					
1		375	none	none	yes
2		440	"	"	"
3		455	"	"	"
4		400	"	"	"
5		370	"	yes	"
6		500	"	none	"
7		350	"	"	"
8		430	"	yes	"
9		400	"	"	"
10		400	"	none	none
11		380	"	none	yes
12		380	"	yes	"
13		470	"	none	"
14		460	"	"	"
15		390	"	yes	"
16		400	"	"	"
17		290	"	none	none
Group 7 - Average		405	0%	35%	93%
*Three poults in this lot were dead before the 28th day of life.					
Group 8. Ration B with no supplement					
1		305	none	yes	none
2		340	"	"	yes
3		390	"	none	"
4		525	"	yes	"
5		395	"	"	"
6		340	"	none	"
7		395	"	"	"
8		340	"	"	none
9		330	"	yes	"
10		330	"	"	"
Group 8 - Average		369	0%	60%	60%
*Five poults in this lot were dead before the 28th day of life.					

(TABLE 5 CONTINUED)

Poult No.	Supplement	Results at 4 weeks of age*			
		Weight (Grams)	Perosis	Vent Dermatitis	Feet Dermatitis
Group 9. Ration B plus Niacin (50 ppm.)					
1		340	none	yes	yes
2		310	"	none	none
3		360	"	yes	yes
4		395	"	none	"
5		360	"	"	none
6		390	"	"	yes
7		395	"	yes	"
8		340	"	none	"
9		260	"	"	none
10		295	"	yes	yes
11		380	"	none	"
12		270	"	yes	"
13		300	"	none	"
14		300	"	"	"

Group 9 - Average 335 0% 36% 78%

*One poult in this lot was dead
before the 28th day of life.

Group 10. Ration B plus Niacin (50 ppm.)
plus Riboflavin (3 ppm.)

1		510	none	none	yes
2		460	"	yes	"
3		410	"	none	"
4		430	"	"	"
5		330	"	"	"
6		360	"	"	"
7		365	"	yes	"
8		360	"	"	"
9		420	"	"	"
10		400	"	"	"
11		390	"	"	"
12		390	"	none	"
13		460	"	"	"
14		350	"	"	"

Group 10 - Average 403 0% 43% 100%

*One poult in this lot was dead
before the 28th day of life.