Impact Of Diet On Broiler Problems

RECENT DEVELOPMENTS with respect to the impact of diet changes on profitable broiler production have revealed an exciting new possibility for reducing body fat and increasing body protein. Also, a shift in vitamin emphasis for broilers subjected to Malabsorption Syndrome is indicated, while the incidence of tibial dyschondroplasia may be reduced by dietary alterations.

New research suggests too, that what broilers are fed during the first week of life could affect the quantity of abdominal fat at market age. Preventing Acute Death Syndrome by nutritional means, however, has received little scientific support. Here are observations based on some of the new research in specific areas:

Nutrients May Be Low

To ensure against possible deficiencies in the field, and depending upon the relative cost of each nutrient, poultry firms may use nutrient levels slightly higher or considerably higher than the recommendations of America's National Research Council.

Since most of the NRC nutrient requirements are estimated under laboratory conditions, where chicks may not be exposed to the stresses, diseases, dietary drug supplements and environmental factors that affect commercial production of broilers, it is important that nutritionists carefully evaluate the bird's needs for nutrients under commercial conditions.

Malabsorption Syndrome

This disease has severely affected the broiler industry in recent years. Optimum levels of vitamins for broilers exposed to this disease appear to be different than that for normal birds.

Malabsorption Syndrome has also been called runting disease, proventriculitis, and Pale Bird Syndrome. It results in reduced growth rate, impaired feed efficiency, decreased flock uniformity, and reduced pigmentation in the skin and shanks.

An orange mucus is observed in the intestine and the proventriculus is enlarged while the gizzard may be smaller than normal. Mortality is increased and may reach as high as 10% or more in some flocks.

Most of the extra mortality is due to encephalomalacia. Since encephalomalacia is known to be caused by a vitamin E and/or antioxidant deficiency in the diet, the obvious first conclusion regarding MS was that it was caused by inadequate diet formulation and vitamin fortification.

Determination of the vitamin E content in the diet and blood plasma of diseased chicks demonstrated that a simple deficiency of vitamin E was not the cause. Levels were adequate in the feed but little or no vitamin E was present in the blood plasma.

Research by veterinarians in Europe, the University of Georgia, and the University of Delaware have indicated that the disease is caused by a reovirus.

Table 1

Effect of Malabsorption Syndrome (MAS) on Nutrient Utilization in Broilers

Measurement	Birds		
	Control	MAS 'Normal'	MAS Diseased
Met. energy/kcal/kg	3264	3066	2662
Lipid absorption, %	91.3	76.2	50.2
Stearic acid absorption, %	81.6	55.5	23.3

Table 2

Effect of vitamin E and Se on response of chicks to Malabsorption Syndrome

Diet Supplement	Body weight, 4 wks (g)	
	House A	House C
None	823a	593a
Se (0.25 mg/kg)	837a	625ab
Vit. E (100 IU/kg)	827a	614ab
Se + Vit. E	831a	650b

The disease is characterised by poor absorption of nutrients. Chicks from an affected flock in Georgia were taken to our lab to compare their ability with nondiseased control chicks to utilise dietary energy and to absorb lipids.

Utilisation of metabolisable energy was reduced 20% in diseased birds and lipid absorption was markedly lowered (Table 1). Chicks from this same farm which appeared normal also had reduced energy utilisation and lipid absorption compared to the control birds.

We have also observed effects of this disease as a result of natural outbreaks in our University research farm. In an experiment devised to study the effect of vitamin E and/or selenium supplementation on development of immunity to coccidiosis, replicate groups of chicks had to be housed in 2 different locations because of space limitations.

At about 2 to 3 weeks of age, Malabsorption Syndrome was diagnosed in chicks in one location but no evidence of the disease was observed in the other location. At 4 weeks of age, growth rate in the diseased birds was depressed approximately 25%. Adding a combination of vitamin E and selenium to the diet significantly improved it (Table 2).

Vitamin E and selenium did not improve growth in birds not exposed to the disease. One-third of the chicks fed the basal diet unsupplemented with either vitamin E or selenium died when exposed to the disease while only 8% mortality was observed in those not exposed. Most of the extra mortality observed in the diseased pens was due to encephalomalacia.

When vitamin E was added to the diet, mortality was reduced to about 3% which was equivalent to the birds not having the disease. The results show that dietary vitamin E and selenium levels necessary for optimum performance of chicks differed under the two environmental conditions.

Excess Vitamin A

In a study to investigate the effect of the level of dietary vitamin A supplementation on performance of broilers, growth depression was observed with higher levels of vitamin A. A level of 48 000 I.U. vitamin A/kg of feed significantly depressed growth rate at 3, 6 and 7 weeks of age, while a level of 12 000 reduced growth rate at 3 and 7 weeks and significantly depressed growth at 6 weeks.

A second experiment also revealed a significant depression in growth rate with increasing levels of vitamin A. These observations were surprising in that previous results

Table 4

Effect of amino acid supplementation of low protein diet on fat in broilers

Diet from 4-7 wks		
Protein (%)	Added amino acids	Abdominal fat (%)
16		3.47a
16	L + M	3.20b
16	L + M + GA	2.90c
20	M	2.95c

Uzu, Poultry Sci. 61: 1557 (1982). L = lysine, M = methionine and GA = glutamic acid. Added amino acids brought levels to 1.06% lysine and 0.79 + SAA (3200 kcal ME/kg).

Table 5

Effect of β-agonist on broiler performance (4-7 wks)

	% change from control diet				
Parameter	.25	.5	1	2	4
Body weight	4.1	4.2	4.2	3.2	2.2
Feed efficiency	3.2	3.6	3.6	3.6	2.7
Body protein	3.9	5.0	4.2	4.6	4.0
Body fat	−8.8	−10.1	−11.9	−12.5	−10.0

Dalrymple *et al*, Fed. Proc. 42: 688 (1983)

reduction in abdominal fat at 7 weeks of age in broilers that had been fed a diet with 8% added fat during the first week compared to controls during that same week. The birds were fed the same diets from 7 days to 7 weeks of age.

We have not confirmed this in our laboratory but did observe in one experiment a reduction in abdominal fat at 7 weeks associated with higher protein levels fed during the first week.

The chicks were fed isocaloric diets with or without 8% added fat and protein levels of 18, 23 and 28% to 7 days of age. The birds were then placed together in the same pens and fed the same practical diets to 7 weeks.

Abdominal fat pad size in birds fed the 28% protein diet was significantly larger than that of those fed the 18% protein, even though there was no difference in rate of growth. No significant differences were observed between groups fed the diets with and without added fat at each protein level.

A subsequent experiment using corn-soybean meal diets higher in energy, and with a wider range of protein levels, failed to confirm the effect of protein level during the first week of life on subsequent fat pad size. Results of these studies at 2 institutions, however, do suggest that what the broiler is fed during the first week of life may have some influence on subsequent fat deposition.

Salt and Abdominal Fat

Some recent studies have also indicated that the level of salt in either the diet or water given to broiler chickens influences the amount of fat deposited. Work at Clemson indicated that including 50 to 100 meg of salt in the water supply significantly reduced abdominal fat at 7 weeks of age.

In studies by Marks and Washburn, adding high levels of salt to the diet (1.6 to 2.4%) resulted in significant reductions in abdominal fat without much effect on growth rate.

The practical significance of these observations are not clear since the addition of excess salt to the diet will result in excess water consumption and severe litter management problems in commercial broiler production.

Repartitioning Agents

A new approach to reducing body fat and increasing efficiency of broiler production was recently reported by researchers from the American Cyanamid Company. An orally-active repartitioning agent that results in reduced muscle protein degradation and fat deposition, therefore leading to greater muscle accretion, has been tested.

A β-agonist (clenbuterol) was added to practical broiler diets in floor pen studies from 4 to 7 weeks of age. As little as one part/million of this compound resulted in a significant improvement in body weight gain, feed efficiency, whole body protein and a significant reduction in whole body fat (Table 5). An increase of about 1% in carcase yield also was observed.

These results demonstrate that compounds of this type will probably play a role in broiler nutrition in the future. Unfortunately, this compound or similar ones have not been approved by America's Food and Drug Administration. More research work must be done to satisfy the FDA that these compounds are safe with respect to human health.

Acute Death Syndrome

Another problem that continues to result in losses in broiler production is Acute Death Syndrome. This has also been called 'flipover disease' or Sudden Death Syndrome. This syndrome results in mortality from about 0.5% to 2% in commercial broilers in various parts of the world. It is evident in the more rapidly growing birds and about 70% of the mortality is in males.

The etiology of the syndrome is unknown. One report from Canada indicated that including supplements of some of the B complex vitamins resulted in reduced mortality from this disease. Work in our laboratory failed to confirm this and we have not been able to show any significant differences in mortality from this syndrome associated with various dietary changes.

These changes included diets with high and low levels of fish meal or other animal protein concentrates, with and without a high level of copper sulphate, with and without molybdenum and chromium supplementation, as well as vitamin supplements with and without biotin, vitamin B6 and thiamin. Thus, recent research continues to show the interaction between nutrition and disease and new forms of diet manipulation.—Dr Leo S. Jensen, Georgia University, USA. □

Rear Cockerels Separately

Cockerels for mating with dwarf breeder females should be reared separately and mixed with the females as late as possible, preferably when they are laying their first eggs, according to a new male management guide issued by ISA.

The cockerels should be as light as possible. This will avoid compensatory growth as the cocks will mate immediately and therefore devote less time to eating.

A male bird of 5kg weight is the limit say the French breeders. Birds heavier than this will have fertility problems. And it is important therefore, to have feeding systems that are capable of giving adequate control over feed intake or to distribute feed by means of special hanging feeders. This is possible with short-legged pullets like the vedette dwarf as it permits special feeding of the cockerels with a low nutrient density ration such as that formulated for growing pullets.