

Poultry Nutrition

Lipid Metabolism in Laying Hens

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The laying hen is unique with respect to lipid biosynthesis. The yolk in a two ounce egg contains approximately seven grams of lipid, all of which is synthesized in a 20 gram liver, transported to the ovary, and deposited in the yolk. With the introduction of management procedures involving individually caged layers and the development through poultry breeding of hybrid strains of laying hens, difficulties have been encountered which may be related to lipid biosynthesis and/or transport. The result is an excessive accumulation of lipid in the liver, abdominal cavity, and intestinal mesentery. In addition, the liver may have hematomas and hemorrhages. Under commercial production conditions substantial economic losses are suffered by egg producers when high producing hens develop this condition.

Experimental data are not yet available to describe the series of events which do take place in lipid biosynthesis and transport in the laying hens during the complete laying cycle. Neither is it known at what point this overall situation moves from "normal" to "pathological", and what factors including nutrient intake and confinement may be responsible for the change. Studies designed to provide new data in this area with the laying hen may provide data relevant to circulatory problems in humans which are thought to be associated with lipid metabolism and degree of physical activity.

Caged layers at the Oklahoma Agricultural Experiment Station which were fed a specific layer ration accumulated an excessive amount of lipid in the liver. The condition was further characterized by measuring the changes in the quantity and composition of total lipid, triglyceride, cholesterol, phospholipid, and triglyceride fatty acids present in the liver during an egg production period of 36 weeks. Although the percentage of phospholipid, cholesterol and cholesterol ester remained constant, the total lipid concentration increased at a greater rate than dry liver weight. The increase lipid was due to increased triglyceride concentration. With the onset of egg production, the relative concentration of fatty acids in the triglyceride fraction changed, and by 4 weeks resembled within 1 or 2 percent the relative distribution of fatty acids in egg yolk. Research studies now underway are designed to identify possible changes in fatty acid metabolism and transport within the liver which may develop as the total liver lipid concentration increases.

Nutrient Intake Requirements of Caged Turkey Breeder Hens

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Market turkey producers in Europe are using a management system with turkey breeder hens in which the hens are maintained in laying cages. These breeder hens are relatively small in size with an average body weight of from 8 to 10 pounds. They are prolific layers and produce a large number of eggs with a minimum of feed intake. The breeder toms which are mated to these hens are extremely large, averaging in body weight from 30 to 50 pounds. Fertile hatching eggs are produced through the use of artificial insemination. The market turkeys produced through this mating are intermediate in size and have desirable characteristics from the standpoint of growth, efficiency of feed conversion, and market finish.

This system makes it possible to produce poults at a much lower cost than can be done under floor management conditions. Reduction in poult cost through this means in the United States would bring about a significant decrease in the overall cost of producing market turkeys. For this reason, market turkey producers in the United States are considering this management technique.

Research at Oklahoma State University has been designed to determine the nutrient intake requirements of turkey breeder hens maintained under this management system. Current emphasis is being placed upon protein and energy intake requirements. Data collected to date indicate that these small turkey hens (minihens) require a daily intake of 335 kilocalories of metabolizable energy, and approximately 30 grams of protein. Studies are being conducted to pinpoint more exactly, energy and protein intake requirements and additional studies will be undertaken to determine vitamin and mineral intake requirements.

It is anticipated that data from this project will be of interest to market turkey producers in the United States as they give consideration to the adoption of management procedures in which turkey breeder hens are maintained in cages. The trend in the Poultry Industry in the United States is toward confinement in cages. In-so-far as turkeys are concerned, it required considerable research in all phases of management and nutrition in order to develop procedures to successfully produce market turkeys on a second economic basis under domestic conditions as contrasted to the natural habitat. Difficulties of a similar

nature in both management and nutrition are being encountered as poultrymen work toward the development of systems to produce hatching eggs and market turkeys under strict confinement conditions in cages. A great deal of research effort will need to be directed toward the solving of these problems.
