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EARLY CHICK AND POULTRY MORTALITY

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Recently reference has been made to the possible role of low levels of blood glucose in triggering some of the non specific early mortality problems noted with chicks and poults .

A recent article by Dr. W.E. Donaldson provides further interesting information on the importance of maintaining blood glucose levels as a defense against stress.

Birds that are hatched early, or from small eggs, may have reduced blood glucose levels when taken from the hatcher. Chicks and poults are subjected to various procedures in the hatchery, each adding to the stress load on the animal. As the stress load increases the demand for blood glucose increases, with the result that adrenalin is secreted and glycogen reserves are mobilized from the body. Thus in a situation where the chick or poult is without feed for 24 to 48 hours, low blood glucose levels can result.

Diet is a very important factor in maintaining blood glucose levels through carbohydrate intake as glucose is an end product of carbohydrate breakdown in the digestive tract and is readily transported across the intestinal wall into the portal blood.

When an egg is laid, it contains very little carbohydrate and what is there is in the form of glycogen, a polymer of glucose. Nervous tissue must have glucose to function properly. Thus the embryo, during incubation, synthesizes significant quantities of carbohydrate, primarily from amino acids. This process is called gluconeogenesis as the carbohydrate is stored in the form of glycogen often referred to as animal starch. The poult or chick, at hatching, thus has a good supply of glucose available which allows it to go through the stress of hatching.

Glycogen is continually being broken down to supply the body with glucose and in turn is continually being synthesized. However, when a good size chick or poult hatches from a small egg, glucose reserves can be quickly depleted. This is especially true for males as they have a higher metabolic rate as compared to females. Birds that hatch early use up their glucose reserves while in the hatcher as compared to those that hatch later. When glucose reserves are depleted, the chick or poult is in a precarious state with respect to their ability to handle stress.

Ventilation also affects carbohydrate metabolism. Thus hypoxia (low oxygen levels reaching body tissues) can negatively affect glucose production.

To a certain extent, diet composition can influence carbohydrate metabolism in the body. High protein diets, especially those fed to turkey poults, have reduced levels of cereal grains and thus carbohydrate levels. Hence, the amount of potential glucose available to a glycogen-depleted animal is not as great with its first few mouthfuls of feed.

Glycogen concentration in the liver of a poult has been shown to fall by almost one half during hatchery procedures. The fall and recovery of glycogen to close to normal levels in an animal may suggest that blood glucose is at normal levels and thus all should be well. However, an animal that is fasting will attempt to replete its glycogen reserves through non carbohydrate sources, primarily amino acids. This synthesis is referred to as gluconeogenesis and is important as it provides a continuous source of glucose to the brain which is necessary if the animal is to maintain normal body functions. However, during a prolonged fast, a significant proportion of body muscle tissue may be lost, due to the bird attempting to maintain glycogen reserves, and thus sufficient circulating glucose. Thus, while normal blood glucose levels may be maintained this could be at the expense of muscle tissue which will further reduce the resistance of the bird to environmental stresses.

To demonstrate the importance of diet in reducing early poult mortality, North Carolina State researchers compared a 28% protein, corn soya starter diet to an 18.7% protein diet, of similar composition. These were fed to two lots of poults for the first 2 days of age, after which time all birds received the 28% protein diet.

Body weights at 7 days were similar while mortality was lower for the low protein fed birds. Although this difference in mortality was small it was constant with repeated experiments and with field tests.

The North Carolina workers also studied CO₂ and O₂ levels in a holding room at a hatchery. Carbon dioxide levels as high as 0.4% were found (normal level is 0.033%) along with O₂ levels as low as 18% (normal level is 21%). Experiments conducted in an attempt to duplicate the above levels of O₂ and CO₂ showed that such levels resulted in glycogen reserves in poults being significantly reduced. They also demonstrated that body protein was broken down to form glucose under hypoxic conditions.

It is of interest to look at the report of Kotula and Wang (1994), in which the relationship of feed withdrawal for broilers was studied to investigate the effect on biochemical and sensory qualities of meat. It was demonstrated that liver glycogen, on a wet weight basis, dropped from 5.09 to 4.35 mg/g after a 3 hour fast and a further drop to 3.15 mg/g after a 24 hour fast. Similar drops were noted in breast and thigh tissue. These workers also demonstrated a significant drop in pH of breast, thigh and liver after a 24 hour fast.

The above paper provides additional proof that significant biochemical changes take place, within the body of the chick and poult, during periods of fasting. It should be remembered that in the young, newly hatched chick and poult those periods of fasting do not follow the normal eating and fasting periods of normal fed animals but rather the fast takes place at a time when the animal is at a critical period in its life re depletion and repletion of body reserves.

Low blood glucose has been shown to be present with several of the non-specific early mortality problems reported with poults and chicks. Reduced pH values will obviously result in changes in acid-base balance, a condition which is receiving increased attention when investigating factors leading to SDS and ascites.

There is no question but that some poults and chicks are in a very depleted state when delivered to a growing facility. Perhaps it is time for the industry to re-think some of the early handling, feeding and management programs of the young chick and poult.

REFERENCES

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