EARLY NUTRITION: EFFECT OF FEED AND WATER ON LIVABILITY AND PERFORMANCE

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Introduction

Poultry, both chickens and turkeys, tend to get a slow start and often do not immediately begin to eat and drink on their own. Hatchlings are very susceptible to early stress and mortality from a variety of causes. Lightweight hatchlings are especially vulnerable. The consequences of a delay in the intake of feed and water include poor response to vaccination, slow gastrointestinal and immune development, poor disease resistance, and also poor long-term performance. Composition of the feed also affects development of digestive and immune systems. These tissues use glucose and glutamine as preferred energy substrates (Watford et al, 1979). It is important to note that what the bird uses for glucose is gluconeogenic amino acids such as glutamine, arginine and even limiting amino acids such as methionine. The consequences of this preference are long reaching. Since the residual yolk has no remaining glycogen, if feed is not provided the bird must degrade protein for the amino acids used as substrate for gluconeogenesis. Thus, the nutrient profile of feed for the immediate post hatch period should be rich in highly available carbohydrates. The availability of substrate will affect development of the gut, which in turn will determine future nutrient availability and influence resistance to disease.

The bird is particularly vulnerable in the early post hatch period, in part due immaturity of its immune system (Lillehoj and Chung, 1992). In the hatchling, all humoral immunity must be provided by maternal immunoglobulin from the residual yolk. Perhaps the most important source of pathogens in the hatchling is the gut, which is virtually unprotected in the neonate (Dibner, et al, 1998). Optimally, establishment of a stable gut microflora should take place at this time, and the nutrient composition of the early feed can influence the species available and selected for colonization. Thus, inclusion of antimicrobial substances such as organic acids can promote the establishment of a microflora high in acid tolerant microorganisms (Cherrington et al, 1991). Such a microflora will tend to reduce the numbers of opportunistic pathogens such as Clostridium and Salmonella (Hinton and Linton, 1988).

Source of Early Nutrition

Oasis® hatchling supplement has been designed to be a complete source of feed and water to the hatchling. The dry matter is about half carbohydrate, in a particularly available form, and half protein. The moisture content of the Oasis formulation as sold is 30%, but this can be doubled easily by the addition of water. A moisture content of 30%

is adequate for the first day of life, when the balance of water that might be needed can be absorbed from the residual yolk, which usually contains about 3 g of water at hatch. It is important to add water when Oasis is used as the sole source of nutrition and water for more than 24 hr, as in bird shipment. Addition of water also allows the producer to include other soluble compounds that may benefit the hatchling.

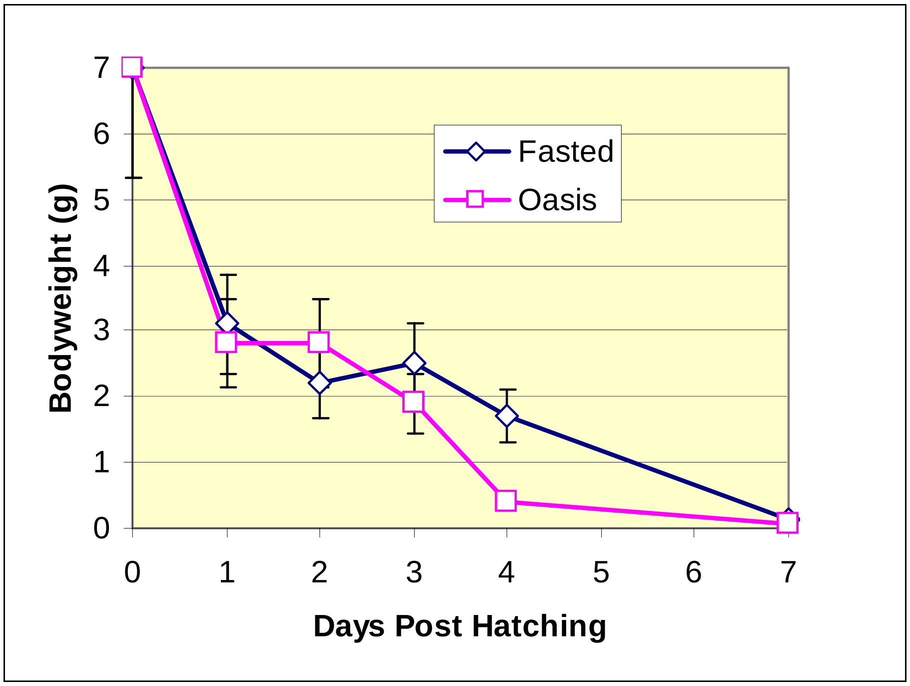

Figure 1 Effect of Fasting or Feeding Oasis on use of residual yolk by hatchling turkey poults.

Figure 1 shows the effect of early nutrition on yolk sac weight as a percent of body weight when hatchling turkey poults are not fed immediately. These birds were fed Oasis® Feed Supplement or were fasted in the early post hatch period. In terms of body weight, fasted poults lost 1.12 g and fed birds gained 1.0 g over the treatment period. Interestingly, fasting did not change the rate of yolk utilization. Absolute weight of yolk sacs confirmed that fasted birds do not show accelerated use of their residual yolk as a way to compensate for a lack of feed.

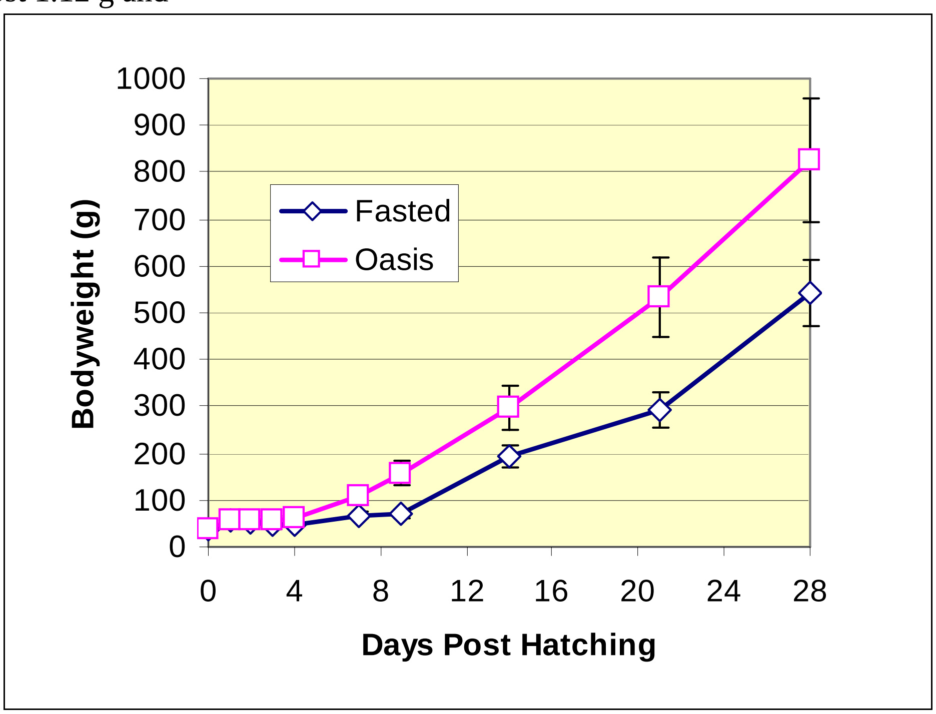

Figure 2 Feeding Oasis was associated with a long term body weight advantage.

Figure 2 shows that body

weights in the fasted poults were significantly lower than those fed Oasis. The consequences of an early fast are long-lasting and can still be seen at market weight, particularly in turkeys. Differences in breast meat yield also persist to market weight (Noy and Sklan, 1998).

Another important aspect of the Oasis formulation is that it includes organic acids. The Oasis formulation contains three organic acids: citric, sorbic and propionic at a final total of about 3%. All of these have shown antimicrobial activity that can contribute to the establishment of an acid tolerant microflora (Izat et al, 1990; Roth and Kirchgeshner, 1997). Feeding organic acids has been associated with benefits beyond those associated with microbial control, such as enhanced nutrient digestibility through increased pancreatic secretion (Harada and Kato, 1983). The presence of organic acids may play a role in the trophic effect of Oasis on the pancreas (Figure 3).

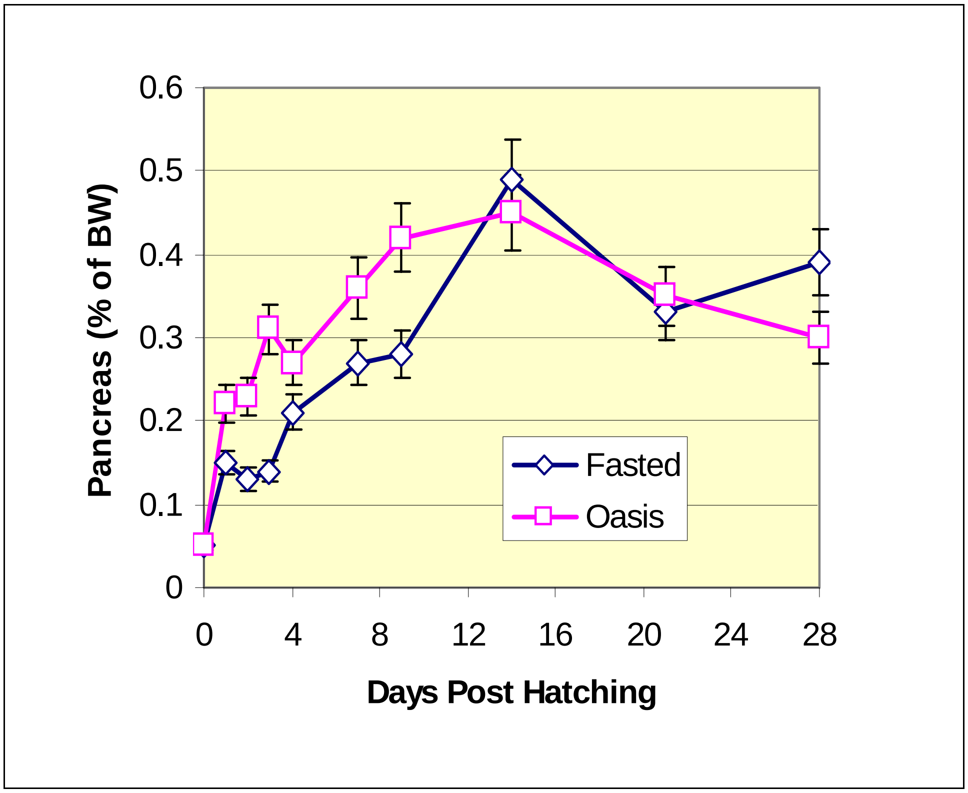

Figure 3 The trophic effect of Oasis on the pancreas may be due to the presence of organic acids in the formulation.

Early Nutrition & Gastrointestinal Function

Early nutrition and initiation of feeding seem to be essential to optimum performance. There are numerous reports in the literature that demonstrate the impact of delays in feeding on growth and livability (Fanguy et al, 1980; Moran, 1990; Pinchasov and Noy, 1994). Delayed feeding has been shown to retard maturation of systems that begin developing in the hatchling only after the availability of feed. This is particularly marked in the gastrointestinal system, including effects on liver and pancreas (Sell et al, 1991).

Gut development - not only villus growth but also enterocyte differentiation - depends in part on oral intake (Baranyiova, 1972; Baranyiova and Holman, 1976). Intestinal motility, nutrient transport systems, pancreatic enzyme secretion and bile salt synthesis are all examples of systems which are partly developed at hatch but whose development to adult levels requires oral intake (Nir et al, 1988; Noy and Sklan, 1995; Palo et al, 1995; Uni et al, 1998).

Noy and Sklan (1998) reported that after an initial growth reduction, the weight of the small intestine increases more rapidly in relation to body weight than other organs of both chickens and turkeys. They stated that this enhanced growth is at its maximum in poults at 4-6 days after hatch and then decreases. Microscopic examination of the intestinal mucosa showed that the villi increased rapidly in size, and hence surface area. They believe these changes in the gastrointestinal tract are required in order to facilitate the change-over from yolk dependence to feed.

Relative Importance of Water in Promoting Livability and Performance

Figure 4 shows the results of an experiment in which Oasis was compared to simple hydration in terms of livability. In this study, birds were given water or Oasis plus water for 48 hr. Vaccination for coccidiosis was given by oral gavage on day 0. Clearly, the Oasis fed birds had superior livability over the entire study period. Note that a coccidiosis challenge was administered on day 21 and was followed by a decline in livability in all treatments. Oasis fed birds were still superior to birds given water only.

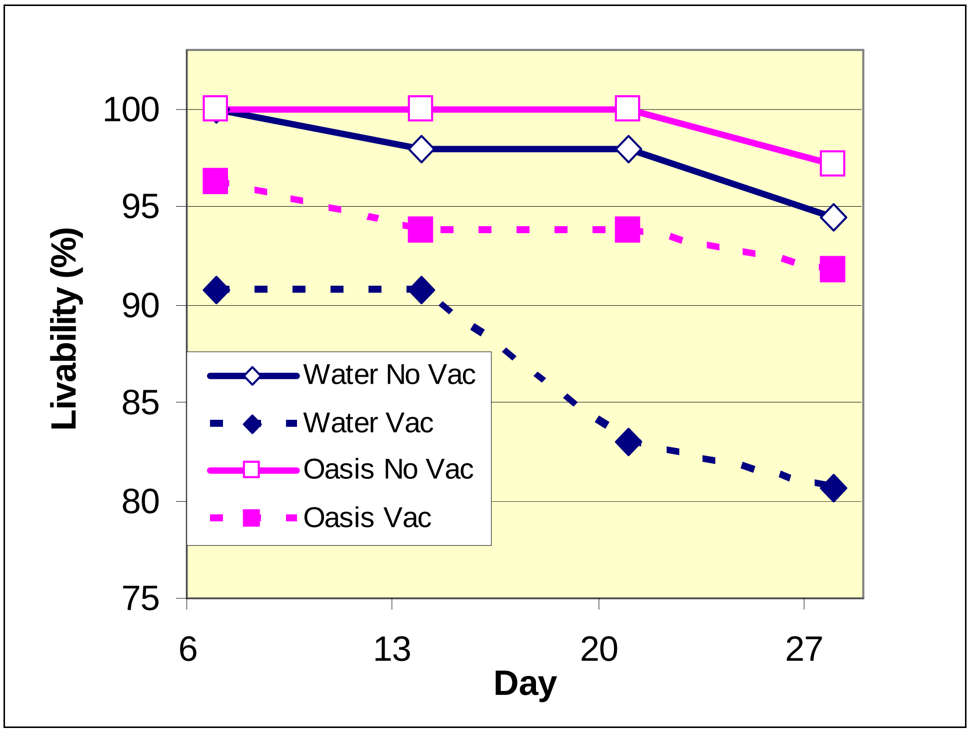

Figure 4 Feeding Oasis for 48 hr results in superior livability over birds given water only. This can be seen in the presence and absence of coccidiosis vaccination given on day of age.

Summary

The time from hatching to the onset of feeding is obviously a critical period in the development of hatchling poultry. It is clear that just keeping birds alive the first several days after hatching may squander an important opportunity for future health and production. It is important to provide both water and nutrients, particularly carbohydrates.

The impact of providing feed early is more than simply giving birds a head start over those where feeding is delayed a day or two. What is consumed in the first days following hatching can play a definitive role in achieving the genetic potential of the bird for body weight, muscle yield and immune competence.

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