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Calf Note #75 – Egg proteins in milk replacer

Introduction. Researchers in industry and academia have been looking for economical alternatives to milk proteins in calf milk replacers (**CMR**) for many years. Milk proteins such as casein, dried skim milk and whey protein concentrate (**WPC**) are becoming more expensive and less available as new uses are developed for these proteins in human foods. Therefore, animal scientists have a need to find protein by-products that do not compete with the human food chain as ingredients in CMR. Ingredients that have been evaluated in CMR formulations include soy proteins (soy flour, soy protein concentrate, soy isolate), wheat isolate, potato protein, fish meal, spray-dried animal plasma, spray-red blood cells, meat meal, pea protein and others. All have been compared with WPC (the primary protein ingredient in CMR formulas in the U.S.) in research trials – some with more success than others.

A by-product that has received new interest as a protein ingredient for CMR formulas is egg protein. There are many possible sources of egg and it's very important to understand where these by-products come from. Spray-dried whole egg (**SDWE**) is the by-product produced from eggs that are rejected for human consumption. These eggs are collected, processed, pasteurized and spray-dried to produce a product that is high in both fat and protein. Egg white proteins may also be obtained, which are high in protein (usually >80%) and low in fat. Other by-products may be available (e.g., egg yolks) may be available, depending on the product being manufactured.

Because the amino acid quality and digestibility of egg is considered to be excellent for most animals, egg by-products should be excellent ingredients for CMR formulas. Several research studies have been conducted to determine if egg by-products could be viable ingredients for CMR formulas.

APC researchers conducted a trial using 0, 10 or 20% SDWE in CMR, replacing WPC (Quigley et al., 2001). The spray-dried by-product contributed 0, 22 or 44% of the total protein that was included in the CMR. We fed 120 calves CMR for 42 days and followed growth for 56 days. The calves were fed CMR in a "phase feeding" program – we began by feeding 454 g (1 lb.) of CMR powder daily, increasing the amount offered to maximum of 733 grams per day during week four. From day 29 to 42, the amount of CMR offered was reduced to promote dry feed intake. Calves were weaned at 42 days. The calves had access to calf starter from day 29 and water at all times.

Including 10 or 20% SDWE in CMR resulted in a dramatic reduction in growth and efficiency of calves. Body weights (Figure 1) were different within the first week of the study. During the first 28 days of the trial, calves fed 0, 10 and 20% SDWE gained 231, 70 and 0 grams per day, respectively. By 56 days, calves that were fed the highest level of SDWE were 11 kg (24 lbs.) lighter than calves fed the CMR containing 0% SDWE. It is important to remember that calves were fed ONLY milk replacer during the first month of the trial, so differences in animal performance were not associated with differences in starter intake. Furthermore, all CMR contained similar amounts of crude protein (24%) and fat (22%). Concentration of ash declined as the amount of SDWE increased, and all

minerals were formulated to meet or exceed NRC requirements. We also balanced formulas for the major essential amino acids. Animals that consumed SDWE were less efficient, ate less calf starter, and had more scours than calves fed control diets. We concluded that the SDWE that we used was inappropriate for use in CMR.

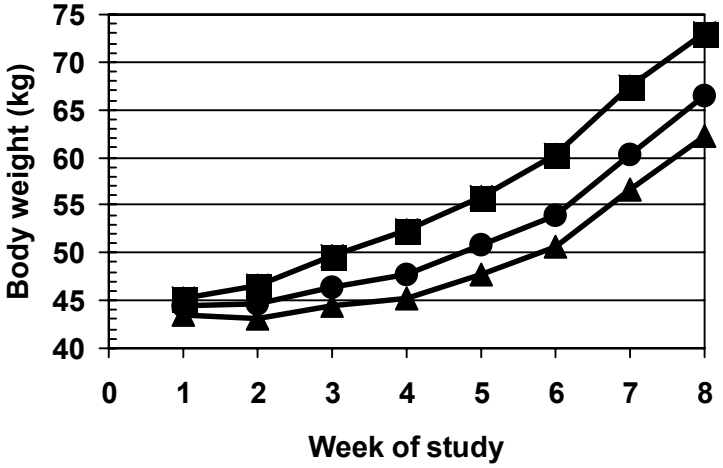

Figure 1. Body weights in calves fed 0% (■), 10% (●), or 20% (▲) SDWE in CMR. From Quigley et al., 2001.

Other researchers have reported varying performance in calves fed egg by-products. Scott et al. (1999) fed 173 calves CMR containing 0, 25, or 50% of protein as SDWE for a 56-d trial. Calves gained 0.13, 0.01, or –0.06 kg of BW/day, respectively for the first 14 days of the study, and 0.32, 0.22, and 0.19 kg/day, respectively, during the entire 56-day trial. In addition, efficiency of feed utilization was reduced by 29% and 38% when CMR contained 25% and 50% of protein as SDWE, respectively. These data are consistent with the dramatic reduction in performance observed in our. On the other hand, researchers at the University of Arkansas (Kellogg et al., 2000) reported acceptable intake and BW gain when calves were fed 0 or 30% egg protein in CMR. Hill et al. (2001) fed calves diets containing 0 to 30% of CP in CMR from egg protein obtained from two sources. These researchers reported reduced growth and intake when calves were fed 30% of CP from egg protein. However, 15% of CP from egg protein did not affect animal performance compared to calves fed CMR containing WPC (Hill et al., 2001).

Clearly, there is a distinct discrepancy between these trials. In some studies, there were few differences among treatments. Others showed very dramatic reductions in performance. It is likely that the variable performance of calves fed CMR containing egg by-products is due to the variability in the source of the egg, and, potentially, methods of processing. As with many other types of by-products, consistency of the by-products may be difficult to maintain.

Given the markedly different performance in these studies, it is clear that much more work needs to be done before egg by-products can be incorporated into CMR formulas. Researchers need to determine the cause for reduced animal growth and efficiency in some studies. If methods of processing are variable, then that variability needs to be reduced or controlled. However, from the standpoint of the calf grower, egg by-products are not recommended for use in CMR formulas until studies show consistent acceptable performance.

References:

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