

PRODUCTION AND MANAGEMENT: *Letter to the Editor*

LETTER TO THE EDITOR: Regarding the article “Comparison of milk replacer composition and effects on growth and health of preruminant lambs, and health-associated costs of artificial rearing,” by McCoard et al. (2021)

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ABSTRACT

Purpose: The April 2021 issue included an article by McCoard et al. (2021). This letter brings to the attention of readers several fundamental issues relating to the study design and the conclusions reported.

Sources: The cost and scarcity of skim milk powders has driven research into alternative protein sources for young ruminants (Terosky et al., 1997; Lammers et al., 1998). Careful trial design, ensuring diets have a very comparable nutrient profile (Toullec et al., 1994) have improved our understanding of the suitability of different raw material sources for milk replacers (MR) for young animals. Research also has shown that the osmolality of MR, determined by the lactose and mineral contents of the MR (Amado et al., 2019; Wilms et al., 2020), will affect both rate of gastric emptying and DM content of feces produced by lambs.

Synthesis: The authors conclusions that MR containing vegetable ingredients are not suitable for feeding to neonatal lambs in the first 5 to 6 wk of life and that increased systemic antibiotic use is a consequence of MR composition are not supported by the results presented. The conclusion that greater fecal moisture observed in lambs fed a milk replacer containing hydrolyzed wheat protein was a consequence of, or caused by, disease is not supported by the results presented and is more likely a consequence of the osmolality of the reconstituted MR, which is influenced by both the nutrient composition of the MR and the rate at which MR is mixed with water.

Conclusions and Applications: A comparative assessment of the suitability of different ingredients for use in MR requires that the comparison be made using MR with an equivalent nutrient composition. Thus, it is not possible to conclude that MR containing vegetable (wheat in the case of this study) protein and fat sources is inferior and should be avoided.

Key words: sheep, mortality, antibiotics, welfare, hydrolyzed wheat

DISCUSSION

McCoard et al. (2021) stated the objective of their research as follows:

“... to evaluate the effects of 2 commercially available lamb milk replacers (MR) that differed in protein and fat ingredient sources on lamb growth, health, antibiotic use, and survival and health costs associated with lamb rearing on a commercial scale.”

The authors concluded the following:

“... feeding a MR containing vegetable versus 100% milk protein ingredients resulted in lower ADG and was associated with an increased incidence of animal health issues (notably, scouring, pneumonia, pink eye, and external infections) and increased therapeutic antibiotic use. These results indicate feeding neonatal lambs in the first 5 to 6 wk of life with MR containing vegetable proteins and fats should be avoided.”

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However, the study design is inappropriate to allow for the valid assessment of the stated objective. Similarly, the stated hypothesis cannot be tested based on the information presented. Thus, the conclusion of the authors that

MR containing vegetable ingredients are not suitable for feeding to neonatal lambs in the first 5 to 6 wk of life is unsubstantiated.

The first MR (**MR1**) contained more CP (25.9 vs. 23.7%), more fat (27.6 vs. 24.0%), and less lactose (39.3 vs. 44.2%) than the second MR (**MR2**). These diets therefore can be considered neither isonitrogenous nor isoenergetic, as would be required for a study designed to comparatively assess the effects of ingredient source on animal performance and health. Consequently, it is impossible to determine whether the reduction in growth rates of lambs reported in the study is due to the difference in the source of the ingredients used in the MR or the difference in the concentrations of nutrients in the MR. A simple comparison of the growth performance reported in Table 2 showed an 8% difference in ADG of animals not treated with antibiotics; it would be reasonable to attribute this to a 9 or 10% difference in nutrient supply rather than to a difference in nutrient source.

When researchers are seeking to compare the suitability of different protein or fat sources for young lambs, the appropriate study design would be one in which the nutrient concentrations of the diet are equal or very similar and only the source of the nutrients is altered (Toullec et al., 1994).

In their discussion the authors stated the following:

“... the most striking difference in disease incidence between the groups was for scours, where lambs reared on MR2 experienced 8 times more cases of scours compared with lambs on MR1.”

There are no results presented in the article that support the conclusion that greater fecal moisture observed in lambs fed MR2 was a consequence of, or caused by, disease. Indeed, despite the greater incidence of “scours,” which was reported for lambs fed MR2, there is no evidence presented to suggest that the so-called scours required any form of treatment, either antibiotics or electrolytes.

The experimental methodology itself is likely to have contributed to this difference in fecal moisture. Specifically,

- a) The incidence of scours was questionably assessed using the scoring system described by Bentounsi et al. (2012). Although there are few scoring systems available for assessing scours in lambs, this tool is particularly blunt [with the scale ranging from 1 (at 40% DM) to 3 (at 15% DM)]. The scoring system described by Bentounsi et al. (2012) was developed to improve the accuracy of fecal egg counts when determining worm burdens in sheep and not to assess the incidence or severity of scours in prurient lambs. Indeed, when applied in isolation, this scoring system provides no effective measure of illness. It also is worth noting that Walker and

Faichney (1964) only considered lambs with a fecal DM content of less than 15% as diarrheal.

- b) In the current study, both MR were fed at the same mixing rate (230 g/L), despite the fact that MR2 had a greater (12.5%) relative lactose content compared with MR1 (44.2 vs. 39.3%) and the same ash content (7.2%), which reflects the mineral content of the MR.

Research (Amado et al., 2019; Wilms et al., 2020) has shown that the lactose and mineral content of a MR is an important determinant of MR osmolality, with increasing concentrations of both lactose and minerals increasing the osmolality of the MR. Research also has shown that the osmolality of MR solution entering the abomasum affects the rate of gastric emptying and also will affect the DM content of any feces produced by lambs.

The authors stated that the MR used in the study were commercially available. However, they do not state whether the MR were mixed according to the manufacturer's recommendations, which would be essential for a valid comparison of 2 commercially available products. The dramatically different lactose content of the 2 MR indicates that mixing rates are likely to be different, and yet, the products were fed at the same mixing rates, resulting in dramatically greater osmolality for MR2 compared with MR1.

The authors stated the following:

“Total antibiotic use in MR2 lambs was almost 2.5 times more likely than in MR1 lambs.”

The results presented show no difference in the use of topical antibiotics but do show a significant difference in the use of systemic antibiotics. However, there is no information presented that reports the use of systemic antibiotic treatments for any conditions other than lameness or pneumonia (Animal Measurements, page 178). Also, there are no results presented that support the conclusion that increased systemic antibiotic use is a consequence of MR treatment.

There was no significant difference in the incidence of pneumonia, suggesting that the reason for the significant difference in the use of systemic antibiotics was due to lameness.

It is not possible, based on the results presented, to determine why there should be an increased incidence of lameness in any of the lambs. The authors provide no comment on this, other than to comment that the incidence was low and the “results should be treated with caution.” It is possible to hypothesize about the causes of this lameness (e.g., damp bedding, navel ill, and so on), yet without more specific information, which is unavailable to readers, it is not possible to draw a reasonable conclusion. If the cause is damp bedding, as occurs with scald (McCoard et al., 2020a), then this is likely a consequence of

the study design as discussed previously. Navel ill, which can result in lameness, is unlikely to be a consequence of the choice of MR fed to lambs (Eales et al., 2004a,b; McCoard et al., 2020b).

The authors note that a reduction in the therapeutic use of antibiotics contributes to meeting consumer demands and reducing the risk of antimicrobial resistance. Reducing therapeutic antibiotic use is therefore an important objective of animal production systems, and understanding why antibiotics are required in a specific production system is a valid step in reducing their long-term use. However, the results presented in this article do not support the conclusion that feeding a MR containing vegetable protein increased therapeutic antibiotic use. Although the authors reported an increased incidence of therapeutic use of antibiotics, the results show that this was predominantly in response to an increase in lameness.

APPLICATIONS

A comparative assessment of the suitability of different ingredients used in milk replacers requires that the comparison be made using milk replacers with an equivalent nutrient composition. It is therefore not surprising that in the study by McCoard et al. (2021), those animals fed MR1 containing a greater proportion of bovine milk protein and fat and a greater nutrient profile achieved greater ADG. Furthermore, it emphasizes that commercially available MR should be mixed and fed according to manufacturer's recommendations. Thus, it is not possible to conclude that MR containing vegetable (wheat in the case of this study) protein and fat sources is inferior and should be avoided.

RESPONSE

A response (McCoard and Hea, 2022) to this Letter to the Editor can be found in the April 2022 issue of *Applied Animal Science*.

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