Evaluation of lamb colostrum supplements

Cherry Bond

Abstract

Introduction Half of UK lamb mortality occurs within the first 24 hours of life, with newborn lambs requiring adequate intake of colostrum as soon as possible after birth to combat disease and optimise health. Approximately 22 percent of ewes produce colostrum of inadequate quality; consequently, colostrum replacers and supplements can be offered. Colostrum replacers should fully replace maternal colostrum, whereas colostrum supplements have been developed to provide exogenous immunoglobulins to neonates when natural concentrations are low and should contain a minimum of 3 g IgG/feed.

Methods Fifteen different colostrum supplements were evaluated. For each product, two different batches were analysed for IgG content.

Results Levels of IgG/feed ranged from 0.4 to 3.5 g. Products with the highest IgG levels were Lamaid (VetPlus), Colostro+ Lamb (Greencoat), Ovicol (Farmsense) and Shepherdess Lamb Colostrum (Provimi) averaging ≥3.0 g/ feed. The remaining 11 products had IgG levels below 3 g IgG/feed, hence could be providing inadequate levels of IgG and potentially impacting on neonatal health.

Conclusion This study has shown great variability between the quality of commercially available colostrum supplements, so care must be taken when selecting products.

Introduction

UK lamb mortality is reported at 15 per cent, half of which occurs within the first 24 hours of life. Colostrum uptake initiates growth, morphological changes and functional maturation of the gastrointestinal tracts of neonates. Consequently, adequate intake of colostrum reduces the likelihood of lambs succumbing to infectious bacterial causes of mortality, for example, Escherichia coli and Salmonella, and reduces the need for prophylactic antibiotic treatment to manage watery mouth.

Reportedly, 22 per cent of ewes produce colostrum of inadequate quality. Although milk composition and immunoglobulin concentrations vary between sheep breeds, high-quality colostrum contains >50 mg/ml IgG. While there is no universally accepted critical value of serum IgG concentrations to characterise failure of passive transfer (FPT) in lambs, a value of below 15 mg/ml IgG has been suggested. Using this parameter, FPT was observed in 39.5 per cent of lambs; therefore, it is vital that 3 g of IgG is absorbed shortly after birth, to account for non-selective absorption of immunoglobulins.

Colostrum IgG concentration decreases at a rate of 3.3 mg/kg/hour from parturition to 23 hours, where the level becomes zero. Therefore, neonates must maintain adequate uptake within their first 36 hours. The volume of colostrum administered is vital to allowing lambs to thrive; generally, lambs require 200 ml/kg of colostrum in the first 24 hours post partum, 100 ml/kg of that being within the first 6 hours to prevent starvation and 50 ml/kg at their first feed.

Maternal colostrum may not always be adequate or readily available. Therefore, there are two main alternatives to natural colostrum: replacers and supplements. These products may be used for disease control strategies, to manage variable quality and quantity of available colostrum, and address lack of labour to collect and administer flock colostrum.

Colostrum replacers substitute maternal colostrum, defined as a product that raises serum IgG levels above 10 mg/ml. The efficiency of colostrum replacers was evaluated in lambs, concluding that those fed colostrum replacers showed decreased morbidity, decreased pre-weaning mortality and subsequently increased the number of lambs marketed.
Alternatively, colostrum supplements (table 1) provide exogenous immunoglobulins to newborns, when natural concentrations are low. Colostrum supplements vary in price but are consistent in dose, with all manufacturers recommending a 25 g feed, or dose, per lamb. Supplements should be used as an addition to maternal colostrum and not as a liquid replacement, as their IgG concentrations are not formulated to achieve required levels for complete passive transfer of immunity.

IgG levels were previously analysed in colostrum products, showing significant variability from under 0.5 g to over 3 g per feed. This study aimed to update this research and evaluate various commercially available lamb colostrum supplements for IgG content.

Materials and methods
Fifteen different colostrum supplements (table 1) were evaluated. For each product, two different batches were sent for testing. Samples were analysed for IgG content by Microtech Services (Wessex), Dorset, UK, using a validated radial immunodiffusion assay. A 5 µL sample was deposited into a cylindrical well and incubated at 20°C–24°C for 72 hours. In summary, antigen–antibody complexes form a precipitin ring around each well and the diameter of each ring is measured. A calibration curve is generated using calibrators of known concentrations and is used to calculate IgG content in each sample.

Results
IgG levels averaged 1.9 g/feed (range 0.4–3.5 g/feed) (table 2; figure 1). Products with the highest levels of IgG were Lamaid (VetPlus), Colostro+ Lamb (Greencoat), Ovicol (Farmsense) and Shepherdess Lamb Colostrum (Provimi), whereas Lamb Colostrum (Nettex), Lam Col Gold (Wynnstay), Colostrum Concentrate Lamb (Provima), and Easymix Lamb (Roxan) had the lowest levels respectively.

Discussion
Ingestion of colostrum is the single most important event in a lamb’s life. Neonates must be supplied with adequate levels of IgG to develop an active immunity, reducing the likelihood of production-limiting conditions. If the lamb has received good-quality colostrum soon after birth, supplementation may not improve passive transfer of immunity. Therefore, colostrum replacers and supplements are intended for colostrum-deprived lambs.

IgG levels obtained in this study were analogous with those of a previous study, both studies reporting IgG ranged from under 0.5 g to over 3 g per feed. Eight products were tested in both studies. Products that demonstrated high IgG levels here (VetPlus Lamaid and Farmsense Ovicol) matched the previous study with products demonstrating low levels remaining low (Wynnstay Lam Col Gold, Nettex Lamb Colostrum and Provita Colostrum Concentrate Lamb).

Lambs must consume at least 30 g of IgG within 24 hours for successful passive transfer. As the products tested are supplements, IgG levels should be at least 3 g/feeding to account for extremely poor adequacy of maternal colostrum supply. However, only 4 out of 15 products (Lamaid (VetPlus), Colostro+ Lamb (Greencoat), Ovicol (Farmsense) and Shepherdess Lamb Colostrum (Provimi)) showed an average of over 3 g IgG/feed (table 2). Consequently, while marketed as colostrum supplements, the remaining products may provide lambs with inadequate IgG levels, even after supplementation. Inadequate ingestion can result in detrimental effects on neonates, including and not limited to, starvation, hypothermia and infectious disease, such as watery mouth.

There is no legal requirement for companies to test or disclose IgG levels within their products. Therefore, it is the company’s responsibility to ensure product quality and provide correct information to customers.

| Table 1 | Lamb colostrum supplement products |
| Product name | Manufacturer |
| Bacto-col Plus | Carrs Billington, Carlisle, Cumbria |
| Ultra Concentrate | Nettex Industries, Rochester, Kent |
| Colostrum Concentrate Lamb | Provita Eurotech, Olmagh, Co. Tyrone, Northern Ireland |
| Easymix Lamb | Roxan, Selkirk, Scotland |
| Colostro+ Lamb | Greencoat Farm, Moremounth, Wales |
| Immucol Lamb Colostrum | Vetsoric, Malton, Yorkshire |
| Lamaid | VetPlus, Lytham, Lancashire |
| Lamb Colostrum | Nettex Industries, Rochester, Kent |
| Lamb Force Premium Colostrum | Downland Marketing, Warwick Bridge, Carlisle |
| Lamb Volostrum | Volac International, Rosslyn, Herfordshire |
| Lam Col Gold | Wynnstay Group, Llansanffraid, Powys, Wales |
| Molecare Lamb Colostrum | Mole Valley Farmers, South Molton, Devon |
| Ovicol | Farmsense, Lytham, Lancashire |
| Premium Brand Lamb Colostrum | Osmonds, Whitchurch, Shropshire |
| Shepherdess Lamb Colostrum | Provimi, North Yorkshire |

| Table 2 | IgG levels for each colostrum supplement (data shown to 1 decimal place) |
| Product Name | IgG g/Feed |
| Batch 1 | Batch 2 | Average |
| Bacto-col Plus | 2.5 | 2.1 | 2.3 |
| Ultra Concentrate | 1.2 | 1.4 | 1.3 |
| Colostrum Concentrate Lamb | 0.8 | 0.5 | 0.7 |
| Easymix Lamb | 0.8 | 0.8 | 0.8 |
| Lam Col Gold | 3.1 | 3.1 | 3.1 |
| Immucol Lamb Colostrum | 2.0 | 2.6 | 2.3 |
| Lamaid | 3.3 | 3.1 | 3.2 |
| Lamb Colostrum | 0.6 | 0.4 | 0.5 |
| Lamb Force Premium Colostrum | 2.7 | 2.7 | 2.7 |
| Lamb Volostrum | 1.3 | 1.3 | 1.3 |
| Lam Col Gold (Wynnstay) | 0.6 | 0.5 | 0.6 |
| Molecare Lamb Colostrum (Mole Valley) | 3.1 | 2.2 | 2.7 |
| Ovicol (Farmsense) | 2.7 | 3.5 | 3.1 |
| Premium Brand Lamb Colostrum (Osmonds) | 1.1 | 1.7 | 1.4 |
| Shepherdess Lamb Colostrum (Provimi) | 3.1 | 3.0 | 3.1 |
regarding actual IgG content. Studies such as these enable farmers to make more informed choices during product purchasing regarding minimum IgG content and batch–batch variability, allowing better colostrum supplementation to their stock.

Overall, the results from this study demonstrate great variability in IgG levels between commercially available colostrum supplements. Therefore, care must too be taken when selecting supplements, with Lamaid (VetPlus), Colostro+ Lamb (Greencoat), Ovicol (Farmsense) and Shepherdess Lamb Colostrum (Provimi) providing the highest IgG levels.

**Funding** This study was sponsored and supported by VetPlus Ltd, Lancashire, England.

**Competing interests** Work was undertaken by the International Centre for Nutritional Excellence Limited who are part of the holding company, Tangerine Holdings. Some of the supplements tested within this study are within the Tangerine Holdings portfolio. All analytical testing was carried out by a UKAS-accredited third-party laboratory. The International Centre for Nutritional Excellence Ltd, Farmsense Ltd and VetPlus Ltd are subsidiaries of the Tangerine Holdings Group.

**Data availability statement** All data relevant to the study are included in the article or uploaded as online supplemental information. All data are held by the International Centre for Nutritional Excellence and are summarised within the manuscript (email: info@icne.co.uk).

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, an indication of whether changes were made, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

© British Veterinary Association 2020. Re-use permitted under CC BY-NC. No commercial re-use. Published by BMJ.

**ORCID iD** Cherry Bond http://orcid.org/0000-0002-9658-3153

---

**References**

1. Warner R. Improving lamb survival. [Online]. Farming Connect, 2017. Available: https://businesswales.gov.wales/farmingconnect/posts/improving-lamb-survival [Accessed 25 Sep 2019].
2. Blum JW. Nutritional physiology of neonatal calves*. J Anim Physiol Anim Nutr 2006;90:1–11.
3. Gascoigne E, Davies P. An approach to neonatal lamb post-mortem examinations. Livestock. 2019;24:193–8.
4. Responsible Use of Medicines in Agricultural Alliance (RUMA). 2018. #ColostrumIsGold Science and Facts. Available: https://farmantibiotics.org/wp-content/uploads/2019/01/RUMA-ColostrumIsGold-factsheet-updated-2019.pdf [Accessed 28 Aug 2019].
5. Nowak R, Poirntron P. From birth to colostrum: early steps leading to lamb survival. Reprod Nutr Dev 2006;46:431–46.
6. Dwyer CM, Conington J, Corbierre E et al. Invited review: Improving neonatal survival in small ruminants: science into practice. Animal. 2016;10:449–59.
7. Beam AL, Lombard JE, Kopral CA et al. Prevalence of failure of passive transfer of immunity in newborn heifer calves and associated management practices on us dairy operations. J Dairy Sci 2000;92:3706–16.
8. Alves AC, Alves NG, Ascani LJ et al. Colostrum composition of Santa Inês sheep and passive transfer of immunity to lambs. J Dairy Sci 2015;98:3706–16.
9. Downland. Improving newborn lamb survival, 2018. Available: https://www.downland.co.uk/improving-newborn-lamb-survival/ [Accessed 28 Aug 2019].
10. Hinde D, Woodhouse M. Ewe nutrition and colostrum. Livestock. 2019;24:9–14.
11. SCCL. Colostrum for calves, lambs and kids, 2019. Available: https://sccl.com/english/colostrum-kids-calves-lambs/ [Accessed 29 Aug 2019].
12. PennState Extension. Colostrum supplements and replacer, 2016. Available: https://extension.psu.edu/colostrum-supplements-and-replacer [Accessed 28 Aug 2019].
13. Lago A, Socha M, Geiger A et al. Efficacy of colostrum replacer versus maternal colostrum on immunological status, health, and growth of preweaned dairy calves. J Dairy Sci 2018;101:1344–54.
14. Berge AC, Hassid G, Leibovich H et al. A field trial evaluating the health and performance of lambs fed a bovine colostrum replacement. J Anim Physiol Anim Nutr 2018;92:1–6.
15. Quigley JD, Strothbom RE, Kost CJ et al. Formulation of colostrum supplements, colostrum replacers and acquisition of passive immunity in neonatal calves. J Dairy Sci 2001;84:2059–65.
16. Corke MJ, Doster IR, Gurunatne RM. The use of colostrum supplements in lambs. Sheep Veterinary Society Spring (May) Meeting Proceedings, Skipton, UK. Sheep Veterinary Society 2016:40.
17. Scott P. South West Farmer, 2012. Available: https://www.southwestfarmer.co.uk/news/9560617.marage-flocks-well-to-reduce-lamb-deaths/ [Accessed 1 Oct 2019].
18. Brian K, Generey K. Reducing lamb losses for better returns, 2015. Available: https://farmantibiotics.org/wp-content/uploads/2018/01/BRP-Reducing-lamb-losses-for-better-returns-manual-14-231115.pdf [Accessed 5 Sep 2019].