

Randomised clinical trial comparing doses of colostral IgG to maximise transfer of passive immunity in calves.

D. Hapukotuwa^{AC}, J. House^A, K. Denholm^B, and S. Rowe^A

^A*Sydney School of Veterinary Science, The University of Sydney, Camden, New South Wales 2570, Australia*

^B*School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Glasgow, Scotland*

^C*Corresponding author. Email: dini.hapukotuwa@sydney.edu.au*

Feeding calves higher doses of colostral IgG improves their immunity. However, the optimal dose when supply is limited remains unclear. We hypothesised that the biologically optimal dose (i.e., dose that maximises serum IgG concentration without excessive wastage due to diminished apparent efficiency of absorption; AEA) and the maximum practically feasible (MPF) dose (the maximum IgG dose that can be reliably delivered on farm) were between 200 and 350g IgG. A randomised clinical trial was conducted in a herd where cows were milked within 2hrs of calving, colostrum was pooled and pasteurised. Calves were block-randomised to receive an oral colostrum IgG dose of 200 (n=45), 250 (n=125), 300 (n=123), or 350g (n=107) in a single feeding of ≤ 4 L within 2hrs of birth. Calf serum was collected at 48hrs and tested for IgG concentration using RID. IgG concentrations and volumes of harvested colostrum were used to estimate the MPF dose per calf. Linear models compared mean serum IgG and AEA between colostrum dose groups. Average serum IgG increased for each 50g increment in oral IgG dose. However, AEA dropped by 4.3% for every 100g increment in IgG dose (95% CI: 2.9 to 5.8% drop), suggesting a curvilinear relationship between oral IgG and serum IgG. Model predictions found that the dose of diminishing returns was approximately 450g IgG, a dose beyond what is practically feasible on most farms.

The MPF dose in our study was 320g IgG, based on mean IgG available per calf (118kg IgG shared across 368 calves) and the finding that most colostrum batches (89%) supported this dose when limited by batch concentration (range: 282–482g) and volume (≤ 4 L). Therefore, we recommend that producers aim to maximise oral IgG intake based on practical feasibility rather than relying on a universal target dose. This MPF dose will likely vary between farms, according to their dynamics of IgG supply, demand, storage capacity, and delivery.

Keywords: colostrum, IgG, calves