

Twenty-two calf studies reported in 20 journal articles (2 reported multiple studies) examining plasma proteins added to milk or milk replacer have been published, 20 reported ADG and of these, 4 showed significant ($P \leq 0.05$) improvement (Grice 2020, Kehoe 2015, Quigley 2000, Morrill 1995), 12 no difference (Henrichs 2021, Wood 2019, Wood 2021, Raeth 2016, Pineda 2016, Quigley 2006, Quigley 2003, Quigley 2002, Arthington 2002, Quigley 1996, Jones 2004), and 3 showed a reduction (Chebel 2021, Vasquez 2017, Morrison 2017), and in one of these three studies, plasma only reduced ADG when replacing 66% and 100% of the whey-based protein in the formula, when replacing 33% of whey-based protein, performance was comparable (Vasquez 2017), and in another of the three, reduced ADG occurred post-feeding Gammulin. Seventeen reported starter grain intake and 5 showed an increase ($P \leq 0.05$) when plasma was in the milk replacer (Grice 2020, Pineda 2016, Quigley 2003, Arthington 2002, Morrill 1995) while 12 showed no difference (1 of 12 noted \downarrow starter intake post-Gammulin feeding; Gammulin contains spray dried serum). Twenty reported incidence of diarrhea and 11 reported reductions ($P \leq 0.05$) in incidence or severity (Chebel 2021, Wood 2019, Vasquez 2017, Morrison, Pineda, Raeth, Kehoe, Quigley 2003, Quigley 2002, Hunt 2002, Nollet 1999), the balance reported no difference. Four (Pineda, Quigley 2003, Quigley 2002, Nollet) reported reduction ($P \leq 0.05$) in mortality and 3 a reduction ($P \leq 0.05$) in use of medications (Pineda, Morrison, Quigley 2002). Comparable (NSD) or improved ($P \leq 0.05$) health or growth was achieved when plasma was incorporated at 3.3% (Quigley 2000), 5% (Wood 2021, Heinrichs 2021, Wood 2019, Morrison, Quigley 2003, Quigley 2002), 6.33% (Quigley 1996, Grice), 6.66% (Vasquez), 7% (Raeth), 7.5% (Heinrichs), 7.7% (Morrill 1995, Raeth), and 10% (with added

amino acids in all three studies - Wood 2021, Heinrichs 2021, Morrison 2017). SDBP is typically priced similarly to WPC per unit of protein.

Citations for published papers on feeding plasma in CMR's:

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Henrichs BS, Brost KN, Hayes CA, Campbell JM, Drackley JK, et al. Effects of spray-dried bovine plasma protein in milk replacers fed at a high plane of nutrition on performance, intestinal permeability, and morbidity of Holstein calves. *J Dairy Sci* 2021. 104:7856-7870. <https://doi.org/10.3168/jds.2020-20104>

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Pineda A, Ballou MA, Campbell JM, Cardoso FC, Drackley JK, et al. Evaluation of serum protein-based arrival formula and serum protein supplement (Gammulin) on growth, morbidity, and mortality of stressed (transport and cold) male dairy calves. *J Dairy Sci* 2016; 99:9027-9039. <http://dx.doi.org/10.3168/jds.2016-11237>.

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Wood DR, Blome RM, Ribeiro LC, Keunen AJ, Keunen BW, Crenshaw JD, Campbell JM, Renaud DL, et al. Effect of porcine plasma on growth and health of Holstein Calves. *JDS Communications* 2021; 2. <https://doi.org/10.3168/jdsc.2021-0112>

Citations for non-published abstracts presented at ADSA regarding feeding plasma proteins in CMR's

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Catherman DR. Evaluation of spray dried animal plasma addition to milk replacer fed to calves at 2 feeding rates. *J Dairy Sci* 2001; 84, Suppl. 1, 269. Abstract 1111.

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