Effects of glutamine protected on body condition score changes and plasma metabolites of Holstein fresh cows

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Abstract

This study was conducted to evaluate the effects of protected glutamine (Gln) supplementation in the diet of Holstein fresh cows after parturition on dry matter intake (DMI), plasma metabolites, body condition score (BCS) and reproductive performance. Forty Holstein dairy cows (796±58 kg of pre-parturition live weight; 3.25±0.35 BCS) at zero d of parturition were divided to four groups (n=10), including: basal diet (control group: a total mixed ration (TMR) consisting of 49% forage and 51% concentrate mixture on dry matter (DM) basis), basal diet supplemented with 150, 250 or 350 g of Gln protected with formaldehyde/cow per day. Dry matter intake of experimental treatments on 21 d after calving were 12.09, 14.39, 15.40 and 97.15 kg/d respectively. Plasma glucose concentrations of 1 to 4 treatments on 21 d after calving were 48.8, 55.0, 59.2 and 60.5 mg/dl respectively. total protein concentrations of 1 to 4 treatments on 21 d after calving were 5.02, 5.98, 7.10 and 7.20 g/dl respectively. AST concentrations of 1 to 4 treatments on 21 d after calving were 132.5, 82.1, 73.3 and 71.3 U/l respectively. Dietary supplementation with protected Gln had no effect on blood urinary nitrogen. The cows that received Gln changed the BCS less than the control treatment. Dietary supplementation of Gln had no effect on reproductive performance and the number of artificial insemination leading to pregnancy and also the interval between calving to pregnancy were not significant between treatments.

Keywords: Transition period, blood metabolites, Glutamine, Cow

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Refrencses

Ardawi, M.S.M. and Newsholme, E.A. (2001). Glutamine metabolism in lymphocytes of the rat. Biochemistry Journal, 212(3): 835-842.

Beam, S.W. and Butler, W.R. (1999). Effects of energy balance on follicular development and first ovulation in postpartum dairy cows. Journal of Reproduction and Fertility. (Suppllement): 54: 411-424.

Bondurant, R.H. (1999). Inflammation in the bovine reproductive tract. J. Dairy Science. 82(2): 101-110.

Boza, J.J.; Marco, T. and Denis, M. (2001). Effect of glutamine supplementation of the diet on tissue protein synthesis rate of glucocorticoid-treated rats. Nutrition, 17(1): 35-40.

Bromfield, J.J.; Santos, J.E.P.; Block, J.; Williams, R.S. and Sheldon I.M. (2015). Uterine infection: Linking infection and innate immunity with infertility in the high-producing dairy cow. Journal of Animal Science, 93(5): 2021-2033.

Correa, M.T.; Erb H. and Scarlett, J. (1993). Path analysis for seven postpartum disorders in Holstein cows. Journal of Dairy Science, 76(5): 1305-1312.

Curthoys, N.P. and Watford, M. (1995). Regulation of glutaminase activity and glutamine metabolism. Annual Review of Nutrition, 15: 133-159.

Doepel, L.; Lobley, G.E.; Bernier, J.F.; Dubreuil, P. and Lapierre, H. (2007). Effect of glutamine supplementation on splanchnic metabolism in lactation dairy cows. Journal of Dairy Science, 90: 4325-4333.

Hassan, S.A.; AL-Ani, A.N.; AL-Jassim, R.A.M. and Abdullah, N.S. (1990). Effects of roughage to concentrate rations and rumen undegradable protein supplementation on growth of lambs. Small Ruminant Research, 3: 317-324.

Jensen, R.G. (1995). Handbook of Milk Composition. R. G. Jensen, ed. Academic Press, Toronto, Ontario, Canada. Pp: 25-63.

Johnson, A.T.; Kaufmann, Y.C.; Luo, S.; Todorova, V. and Klimberg, V.S. (2003). Effect of glutamine on glutathione, IGF-I, and TGF-beta 1. Journal of Surgical Research, 111(2): 222-228.

LeBlanc, S.J.; Duffield, T.F.; Leslie, K.E.; Bateman, K.G.; Keefe, G.P.; Walton, J.S. and Johnson, W.H. (2002). Defining and diagnosing postpartum clinical endometritis and its impact on reproductive performance in dairy cows. Journal of Dairy Science, 85(9): 2223-2236

Meijer, G.A.L.; Van Der Meulen, J.; Bakker, J.G.M.; Van Der Koelen, C.J. and Van Vuuren, A.M. (1995). Free Amino Acids in Plasma and Muscle of High Yielding Dairy Cows in Early Lactation. Journal of Dairy Science, 78(5): 1131-1141.

Milis, C.h.; Liamadis, D.; Roubies, N.; Christodoulou, V. and Giouseljiannis, A. (2005). Comparison of corn gluten products and a soybean-bran mixture as sources of protein for lactating Chios ewes. Small Ruminant Research, 58(3): 237-244.

Nathali, Le Floc'h, N.; Melchior, D. and Obled, C. (2004). Modifications of Protein and Amino Acid Metabolism During Inflammation and Immune System Activation. Livestock Production Science, 87(1): 37-45.

Newsholme, P. (2001). Why is L-glutamine metabolism important to cells of the immune system in health, post-injury, surgery or infection? Journal of Nutrition, 131: 2515-2522.

Newsholme, P.; Curi, R.; Gordon, S. and Newsholme, E.A. (1986). Metabolism of glucose, glutamine, long-chain fatty acids and ketone bodies by murine macrophages. Biochemistry Journal, 239(1): 121-125.

Plaizier, J.C.; Walton, J.P. and Mcbride, B.W. (2001). Effect of post-ruminal infusion of glutamine on plasma aminoacids, milk yield and composition in lactating dairy cows. Canadian Journal of Animal Science, 81: 229-235.

Preston, T.R. and Leng, R.A. (1985). Assayfor bypass protein in a supplement. In:Matching livestock systems to available feed resources. ILCA. Addis Ababa. Pp: 196-197.

Rabelo, E.; Rezende, R.L.; Bertics, S.J. and Grummer, R.R. (2005). Effects of pre- and postfresh transition diets varying in dietary energy density on metabolic status of periparturient dairy cows. Journal of Dairy Science, 88(12): 4375-4383.

Reeds, P.J.; Burrin, D.G.; Stoll, B. and Jahoor, F. (2000). Intestinal glutamate metabolism. Journal of Nutrition, 130: 978-982.

Sheldon, I.M.; James Cronin, J.; Goetze, L.; Gaetano Donofrio, G. and Schuberth, H.J. (2009). Defining Postpartum Uterine Disease and the Mechanisms of Infection and Immunity in the Female Reproductive Tract in Cattle 1. Biology of Reproduction, 81(6): 1025-1032.

Sordillo, L.M.; Contreras, G.A. and Aitken, S.L. (2009). Metabolic factors affecting the inflammatory response of periparturient dairy cows. Animal Health Research Review, 10(1): 53-63.

Turner, M.L.; Cronin, J.G.; Healey, G.D. and Sheldon, I.M. (2014). Epithelial and stromal cells of bovine endometrium have roles in innate immunity and initiate inflammatory responses to bacterial lipopeptides in vitro via Toll-like receptors TLR2, TLR1, and TLR6. Endocrinology, 155(4): 1453-1465.

Van der Schoor, S.R.D.; Van Goudoever, J.B.; Stoll, B.; Henry, J.F.; Rosenberger, J.R.; Burrin, D.G. and Reeds, P.J. (2001). The pattern of intestinal substrate oxidation is altered by protein restriction in pigs. Gastroenterology, 121(5): 1167-1175.

Van Knegsel, A.T.M.; Van den Brand, H.; Dijksstra, J.; Van Straalen, W.M.; Heetkamp, M.J.W.; Tamminga, S. and Kemp, B. (2007). Dietary energy source in dairy cows in early lactation: Energy partitioning and milk composition. Journal of Dairy Science, 90(3): 1467-1476.

Van Soest, P.J. (1994). Nitrogen metabolism. Pages 290–311 in Nutritional ecology of the ruminant. Cornell University Press, Ithaca, NY. Pp: 119-170.

Wildman, E.E.; Jones, G.M.; Wagner, P.E.; Boman, R.L.; Troutt, H.F. and Lesch, T.N. (1982). A dairy cow body condition scoring system and its relationship to standard production characteristics. Journal of Dairy Science, 65(3): 495-501.