

# Rumen protected choline supplementation in beef cattle: effect on growth performance

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**ABSTRACT** - The aim of this study was to investigate the effect of rumen-protected choline administration on growth performance in beef cattle. Thirty-two newly received Charolais steers (420 kg  $\pm$  8 kg initial BW), were assigned randomly to one of the two experimental groups: control (CTR), no choline supplementation; choline (RPC), supplemented with 5 g/day choline chloride in rumen-protected form. Experimental period was 122 d long. DMI at different times did not differ between treatments. Supplementation of 5 g of choline increased body weight, and average daily gain on day 89 of the experiment, but not later on. Feed conversion rate and killing out percentage were not affected by the treatment. Therefore ruminally protected choline can improve growth performance of newly received beef cattle, and its inclusion in receiving diet can be useful.

*Key words:* Beef cattle, Choline, Growth performance.

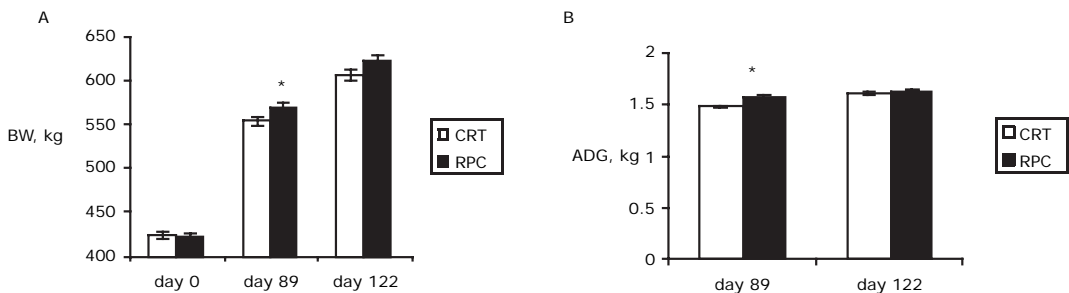
**Introduction** - The effects of rumen-protected choline (RPC) supplementation to transition cows have been investigated in several studies. Findings in transition and early lactating dairy cows suggest that greater choline availability can improve not only milk production, but also lipid and methyl group metabolism (Baldi and Pinotti, 2006). More recently Pinotti *et al.* (2008) investigated the effects of rumen-protected choline supplementation in dairy goats, finding that RPC supplementation can increase milk yield and milk fat concentration also in this species. By contrast, data on choline supplementation and its effects in beef cattle are limited; in fact, only a few studies (Bindel *et al.*, 2005) investigated the effect of RPC supplementation in beef cattle indicating that choline supplementation can improve growth performance of finishing cattle without negative effects on carcass characteristics. In light of this we investigated the effect of rumen-protected choline administration on growth performance in Charolais beef cattle reared in north of Italy.

**Material and methods** - Thirty-two newly received Charolais steers (420 kg  $\pm$  8 kg initial BW) were used in this study. At the beginning of the experiment the steers were moved to four contiguous pen of 8 steers each and assigned randomly to one of the two experimental groups. The experimental groups were: control (CTR), no choline supplementation; choline (RPC), supplemented with 5 g/day choline chloride in rumen-protected form (Sta-Chol 50%, Ascort Chimici, Forlì, Italy). Rumen protected choline was 85% rumen stable (measured using in situ protocol) as already reported (Baldi and Pinotti, 2006). The quantity of choline given was based on experiments in beef cattle (Bindel *et al.* 2005). The formulation containing rumen-protected choline was microencapsulated with fats, so the CTR group was fed with empty microcapsules to ensure equal fat intake in all two groups. Treatments were given as a top dressing to the feed to ensure complete consumption. The total mixed ration was sampled 6 times during the experiment and analyzed for dry matter (DM), crude protein

(CP), neutral detergent fiber (NDF), ether extract (EE) content (Association of Official Analytical Chemists, 2005). Nutrient composition on DM basis, of the basal diet fed was: **13.2% CP, 36.3% NDF, 2.87% EE**. Experimental period was 122 d long. On d 0, 89, and 122, each steer was weighed before feeding, and average daily gain calculated. Through the experiment dry matter intake (DMI) was assessed for each pen of different treatments groups (2 replication per group) as the difference between feed DM offered and feed DM refused. On d 89, and 122 of the experiment, based on group DMI and group weight gain (kg of feed intake/kg of gain), feed conversion rate (FCR) was estimated. On d 122, each steer was weighed, and shipped to a commercial slaughter facility where carcass weight and killing out percentage were obtained. Dry matter intake, individual body weight, average daily gain, and killing out percentage were analyzed using the MIXED procedure of SAS (1999). Pen data (DMI and FCR) were analysed by ANOVA (GLM procedure of SAS statistic software). Differences with P values <0.05 were considered significant.

**Results and conclusions** – DMI at different times did not differ between treatments. Mean ( $\pm$ SEM) group DMI were  $81.48\pm 6.5$  and  $88.76\pm 7.0$ , on day 89, and 122 of the study, respectively. By contrast in term of growth performance, results obtained in the present study indicated that choline supplementation increased ( $P>.05$ ) body weight (BW) and average daily gain (ADG) on day 89 of the experiment but not later on. Feed conversion rate (FCR) and killing out percentage did not differ between treatments through the experiment. Mean feed conversion rate were 6.5 and 6.8 on day 89, and 122, respectively. Killing out percentage was 59% vs 60% in CRT and RPC group, respectively.

Figure 1. [A] Body weight (BW) and [B] average daily gain (ADG) on day 0, 89, 122 and 89 and 122 respectively. The asterisk (\*) indicates an RPC treatment effect ( $P<0.05$ ).



Therefore based on data herein presented it seems to be that choline was effective just during the first period of the experiment. These findings suggest that choline supplement may enhance growth performance of finishing cattle, even though the mechanism by which choline induces this effect is unknown. A possible explanation can be the fact that the animal used in the experiment were in a adaptation/receiving period. Several studies conducted in beef cattle during this phase, have reported a positive effect of vitamin and nutrients blends supplementation on growth performance (Sgoifo Rossi *et al.*, 2005). The lack of response to choline in the last part of the experiment, can be attributed to the dose. In fact, comparison between day 0 and day 122 the animal were receiving about 30% less of choline per kg of body weight. In conclusion ruminally protected choline can improve growth performance of newly received beef cattle, and its inclusion in receiving diet can be useful.

**REFERENCES** – **Baldi, A.**, Pinotti, L., 2006. Choline metabolism in high-producing dairy cows; metabolic and nutritional basis. *Canadian J. An. Sci.* 86: 207-212. **Bindel D. J.**, Titgemeyer, E. C., Drouillard, J. S., Ives, S. E., 2005. **Effects of choline on blood metabolites associated with lipid metabolism and digestion by steers fed corn-based diets** *J. Anim. Sci.* 83:1625–1632. **Galyean, M. L.**, Perino, L. J., Duff, G. C., 1999. **Interaction of cattle health/immunity and nutrition.** *J Anim. Sci.* 77: 1120-1134. **SAS**, 1999. User's Guide: Statistics, Version 8. SAS Institute Inc., Cary, NC, USA. 1999. **Pinotti, L.**, Campagnoli, A., D'Ambrosio, F., Susca, F., Innocenti, M., Rebucci, R., Fusi, E., Cheli, F., Savoini, G., Dell'Orto, V., and Baldi A., 2008. **Rumen-Protected Choline and Vitamin E Supplementation in Periparturient Dairy Goats: Effects on Milk Production and Folate, Vitamin B12 and Vitamin E Status.** *Animal* 2: 1019-1027. **Sgoifo Rossi, C.A.**, Ripamonti, G., Rizzi, F., Malfettani, D., Dell'Orto, V., 2005. Con una dieta ricca il ristallo parte meglio. *Informatore zootecnico* 52 (13): 27-33.