"33rd Annual Meeting EAAP 2012"
Bratislava, SLOVAKIA, August 27th-31st, 2012

Effect of ACTH injection on acute phase and immune response in heifers

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Aim

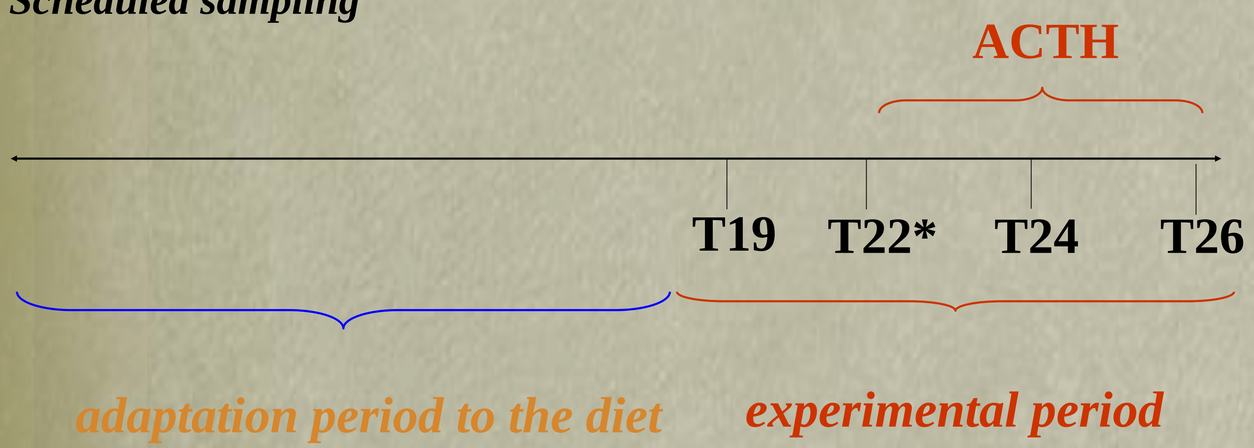
Investigate the effect of ACTH challenge (AC) on acute phase and immune response in dairy heifers.

Materials & methods

Animals and diet: 15 Friesian dairy heifers fed twice a day the same basal diet (concentrate and forage).

Experimental protocol: Induction of cortisol secretion with i.m. injection of 0.5 mg ACTH agonist (Synacthen, Novartis, Varese, Italy - Tetracosactrin acetate) twice a day for 5 days.

Scheduled sampling



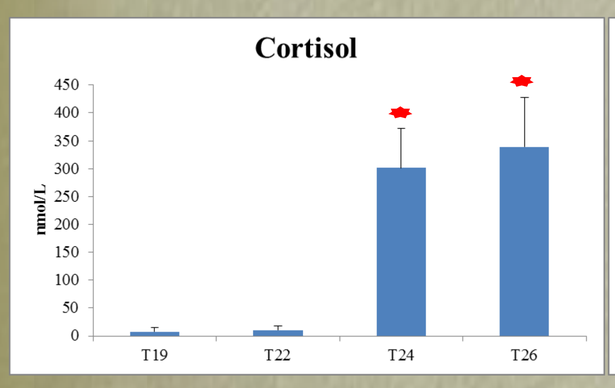
**Sampled before the beginning of ACTH treatment*

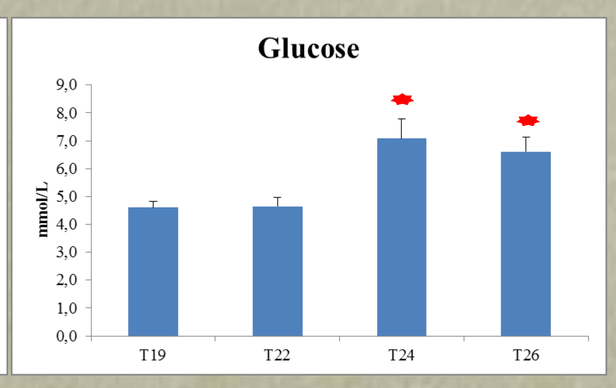
Biochemical analyses: cortisol, glucose, ceruloplasmin (CuCp), haptoglobin (Hp), Zn and paraoxonase (PON).

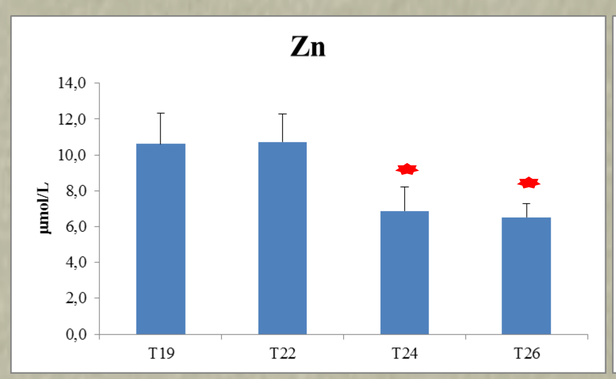
Biomolecular analyses: Real Time PCR (Sybr® Green chemistry) was performed on total RNA isolated from whole blood to analyse the transcriptional pattern of TNF-a, IFN-g, IL-2 and IL-6.

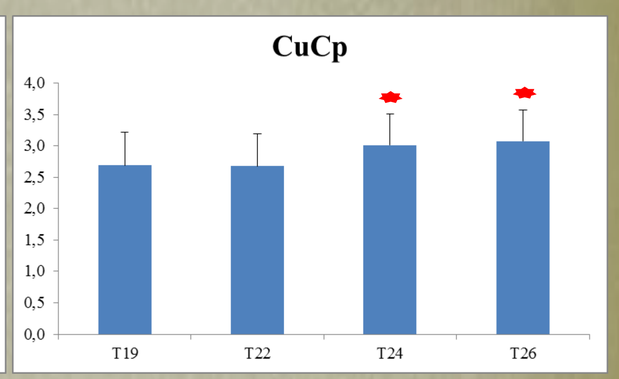
Statistical analysis: biochemical data were analysed with ANOVA model with fixed effects for time of sampling (SPSS, 1997). Biomolecular data were expressed as relative expression (*n*-fold), in comparison to the average values measured at days 19 and 22. The *n*-fold variations before and during AC were analysed with T-test.

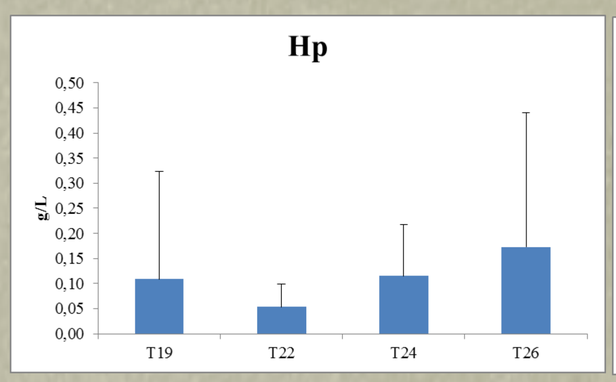
Results

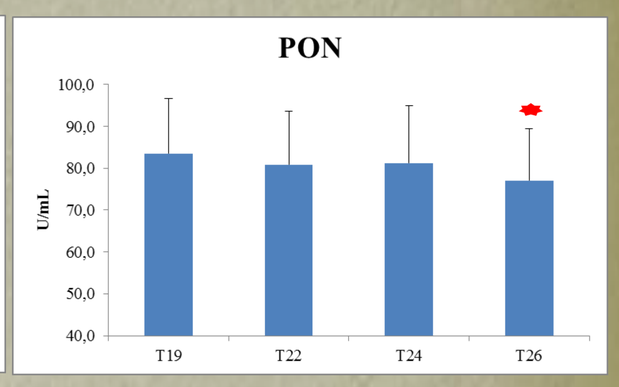


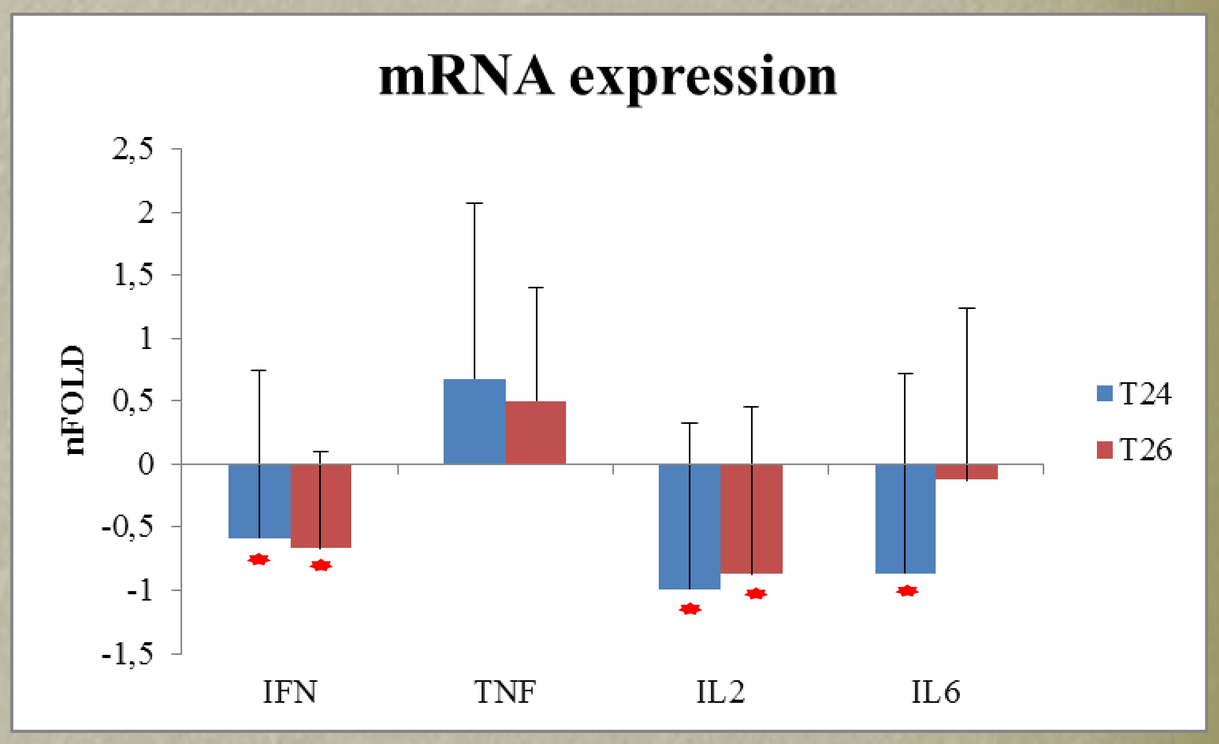












Discussion and conclusions

- ACTH-induced cortisol release has strong effects on acute phase response as observed in previous studies in sheep (Sgorlon et al., 2008; Stefanon et al., 2009).
- A linear relationship between mean cortisol concentrations and mean ceruloplasmin levels can be drawn.
- This relationship is also evident for Hp though not significant (Ting et al., 2004).
- The regulation of target genes confirms the effect of cortisol on the regulation of inflammatory response with a down regulation of the main proinflammatory cytokines.
- The anti-inflammatory response evoked by ACTH treatment mimicked the biological response mediated by glucocorticoids secretion (Elenkov and Chrousos, 1999).
- ACTH challenge can be efficiently used as experimental model to mimic stressful conditions in cattle.

REFERENCES: Elenkov, I.J., Chrousos GP. Stress hormones, Th1/Th2 patterns, pro/anti-inflammatory cytokines and susceptibility to disease. Trends Endocrinol. Metab. 1999;10:359–68. **Sgorlon, S.**, Ferrarini, A., Asquini, E., Dreos, R., Stefanon, B. 2008. Nutrigenomics studies in sheep using a custom microarray platform. Proceedings of the XXXI Conference of the International Society for Animal Genetics, Amsterdam 20-24th July 2008, abstract n° 2208. **Stefanon, B.**, Sgorlon, S., De Moro, G., Asquini, E. 2009. Action of larch bark in the regulation of cortisol induced stress in sheep. Atti del XVIII Congresso Nazionale A.S.P.A., Palermo, 9-12 giugno 2009. Italian Journal of Animal Science, 8 (Suppl. 2):162-164. **Ting**, S.T., Earley, B., Crowe M.A., 2004. Effect of cortisol infusion patterns and castration on metabolic and immunological indices of stress response in cattle. Domest. Anim. Endocrinol., 26:329-349.