

# MEASUREMENT OF CORTISOL METABOLITES IN FAECES OF TRANSPORTED COWS WITH ABOMASAL DISPLACEMENT

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## Abstract

The aim of the study was to investigate the stress hormone production caused by right (RDA) and left (LDA) displacement of the abomasum in cows by measuring faecal glucocorticoid metabolites. Seven cows were suffering from LDA, 6 dairy cows and 1 pregnant heifer had RDA. The animals with additionally periparturient diseases were of different breeds. Five healthy dairy cows served as control group. Faeces samples were collected 6 times: after the first examination, before and immediately after surgery, then 24-, 48- and 72 h later. For the measuring of cortisol metabolites an enzyme immunoassay for 11-oxoetiocholanolone was used. There was a significant difference in the median value of cortisol levels in faeces between all cows with abomasal displacement to the control group and also a significant difference 24 h after surgery between cows with LDA and RDA. The highest concentrations in cows with LDA were noted before and immediately after surgery. As opposed to these findings the highest cortisol metabolite levels were reached in cows with RDA after surgery and 24 h later. This is the first report of cortisol measurement in faeces of cattle suffering from LDA and RDA. This method can be used for pain observation in the future.

**Key words:** cows, abomasal displacement, faeces, glucocorticoid metabolites.

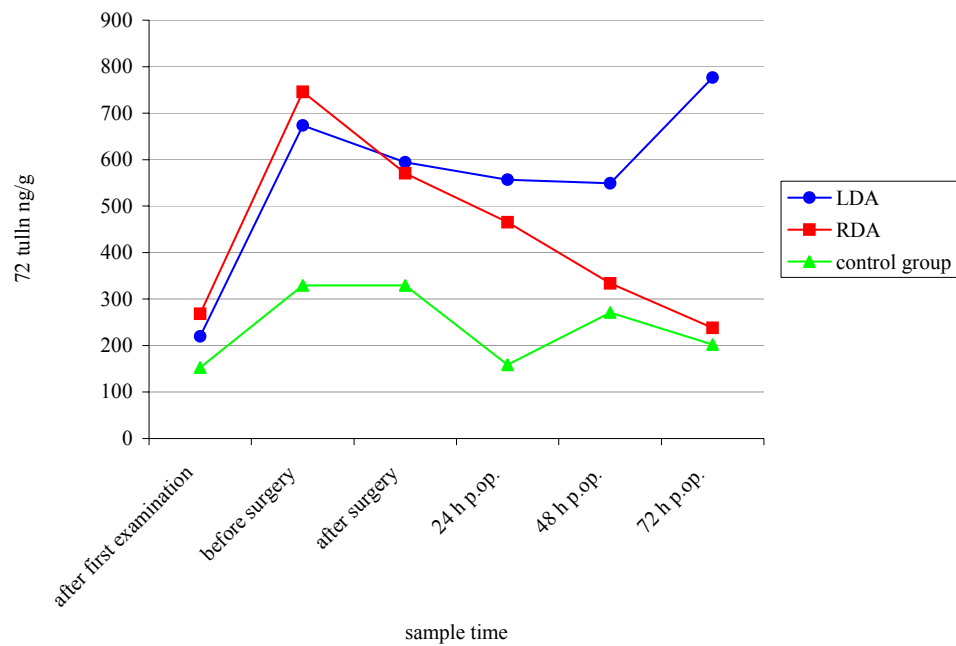
Since the 1950s the incidence of abomasal displacement has increased world-wide and is commonly regarded as a multifactorial disease. Displacement of the abomasum is a particular problem of dairy cows in early lactation and is associated with periparturient diseases such as retained foetal membranes and metritis as well as ketosis, hypocalcaemia and ruminal acidosis. The aim of our study was to investigate the adrenocortical activity caused by right and left displacement of the abomasum.

## Material and Methods

Thirteen dairy cows of different breeds (Simmental, Red Friesian, Holstein-Friesian and crossbreds) and 1 heifer were used. Seven cows were suffering from LDA, 6 dairy cows and 1 pregnant heifer had RDA. Only 3 dairy cows and the pregnant heifer showed no additional diseases as ketosis, metritis, mastitis and claw disorders. All animals with displaced abomasum were patients of the clinic and the dairy cows were all in early lactation (6 d to 8 weeks after parturition). Five healthy dairy cows served as control group and were transported only. Faeces samples were collected 6 times: after the first clinical examination, before starting surgery, immediately after surgery, then 24-, 48- and 72 h later. After defecation the faeces were frozen at  $-20^{\circ}\text{C}$ . For the measurement of cortisol metabolites in faeces an enzyme immunoassay for 11-oxoetiocholanolone was used. Statistical analyses were conducted using Sigma Stat 3.0.

## Results

There was a significant difference ( $P = 0.047$ ) 24 h after surgery between the groups with RDA and LDA and the control group. Cortisol metabolite values in the groups with abomasal displacement ranged from 115.35 ng/g to 2439.00 ng/g (median value = 511.18 ng/g) (Fig. 1). Cows in the control group showed cortisol metabolite concentrations between 91.05 ng/g and 302.05 ng/g (median value = 158.90 ng/g) (Fig. 1). There was a significant difference ( $P < 0.001$ ) in the median value of cortisol levels in faeces between all cows with abomasal displacement (median value = 455.45 ng/g) to the control group (median value = 239.50 ng/g) in all samples. The highest concentrations in faeces of cows with LDA were noted before and immediately after surgery. In contrast to these findings the highest cortisol metabolite levels were reached in cows with RDA immediately after surgery and 24 h later.



**Fig. 1.** Median values from cortisol metabolites in faeces from cows with LDA and RDA and the control group.

## Discussion

For the first time the method described for horses (2), based on the theory that increased concentrations of cortisol are present in faecal samples following pain and stress, was tested in cows. Faeces of cows suffering from LDA and RDA showed extremely high values of cortisol metabolites. There were no significant differences in cortisol metabolite values in faeces between cows with left- respectively right abomasal displacement before surgical treatment. Contrary to the literature (1) RDA seems to be more pain- and stressful than LDA. There was an increase of the glucocorticoid values in cows with LDA 72 h after surgery, as opposed to cows with RDA.

The highest concentrations of cortisol metabolites in cows with LDA were seen before- and immediately after surgery, about 12 to 15 h after transport. Similarly to the literature, the concentration of the metabolites in faecal samples of ruminants reflect the cortisol production of about 12 h before. So the high cortisol metabolite content in comparison to the control group could have also been caused by other secondary diseases, the examination or manipulation during surgery and treatment afterward. Stress arising from

transport causes an increase in the concentration of faecal metabolites of cortisol (3, 4). In our study the cows were transported to the clinic 3 to 8 h depending on the distance to the farm. The conclusion of this study is that this method also can be used in cows. It is a simple non-invasive method for the monitoring of pain and stress. The cortisol metabolite values from faeces of cows with displacement of the abomasum were much higher in comparison with the control animals.

## References

1. Dirksen G.: In: Dirksen, G., Gründer, H.-D., Stöber, M.: *Innere Medizin und Chirurgie des Rindes*. 4. Aufl., Parey, Berlin, 2002, pp. 473-493.
2. Merl S., Scherzer S., Palme R., Möstl E.: Pain causes increased concentrations of glucocorticoid metabolites in horse feces. *J Equine Vet Sci* 2000, 20, 586-590.
3. Möstl E., Maggs J.L., Schrötter G., Besenfelder U., Palme R.: Measurement of cortisol metabolites in faeces of ruminants. *Vet Res Com* 2002, 26, 127-139.
4. Palme R., Robia C., Baumgartner W., Möstl E.: Transport stress in cattle as reflected by an increase in faecal cortisol metabolites. *Vet Rec* 2000, 146, 108-109