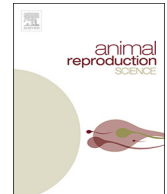




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## Serum neuropeptide concentrations in cows with intrapartum uterine torsion

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## ABSTRACT

Intrapartum uterine torsion is a common cause of dystocia in dairy cows. To clarify the pathophysiology of this disease, the aim of the present study was to examine serum neuropeptide and cytokine concentrations of cows with intrapartum uterine torsion. Blood samples of 20 cows with uterine torsion, 36 healthy controls, and 15 intrapartum cows without uterine torsion were obtained. Concentrations for substance P (SP), vasoactive intestinal polypeptide (VIP), and interleukin-1 $\beta$  (IL-1 $\beta$ ) were quantified by using commercially available ELISA kits. Significant differences between groups were observed for SP in cows with uterine torsion and cows calving normally ( $P < 0.01$ ). Markedly greater SP concentrations were observed in calving cows than in cows with uterine torsion. Compared with healthy controls, there were greater SP concentrations during parturition ( $P < 0.01$ ). No significant group differences were detected for VIP concentrations. Global differences were observed in IL-1 $\beta$  ( $P = 0.04$ ). Large amounts of SP are released into the blood during parturition. Because SP is mainly present within the cervix and functions as a biomarker and mediator of pain, cows with uterine torsion are presumed to not experience as much pain as cows that are calving normally. Consistent with this, in cows with uterine torsion, there is a disturbance in the opening of the cervix, along with only mild signs of colic. Furthermore, significantly elevated IL-1 $\beta$  concentrations correlate with the inflammation that occurs in cases of uterine torsion. Further research is needed to support these findings and clarify the clinical relevance.

### 1. Introduction

Uterine torsion is a common cause of dystocia in cattle and is mainly observed during parturition. Currently, the pathogenesis of uterine torsion remains unclear (Erteld et al., 2012). Several risk factors have been identified, such as reduced amniotic fluid, sudden movement of the cow or fetus, reduced uterine tone, breed, age, and concomitant diseases (Schönfelder and Sobiraj, 2005). Nevertheless, the etiological basis for predisposition to the development of uterine torsion has not yet been determined. In dairy cows with abomasal displacement, a change occurs in the tissue concentration of the stimulating neuropeptide substance P (SP) and the inhibiting neuropeptide vasoactive intestinal polypeptide (VIP) within the abomasal wall (Sickinger, 2007). Because uterine torsion resembles torsion or displacement of the abomasum in cattle, it was hypothesized in the present study that a difference exists in

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serum neuropeptide concentrations between cows with and without uterine torsion.

## 2. Material and methods

### 2.1. Blood samples

Blood samples were collected from 20 cows of different breeds with uterine torsion, 36 healthy controls (non-pregnant German Holsteins of varying lactation status), and 15 intrapartum cows without uterine torsion (German Holsteins). The samples were allowed to clot overnight at 4 °C. Centrifugation was then performed for 20 min at approximately 1000 × g. Samples were stored at –80 °C until evaluation. The serum concentrations of SP, VIP, and interleukin-1 $\beta$  (IL-1 $\beta$ ) were quantified using commercially available bovine-specific ELISA kits (USCN Cloud-Clone Corp., Houston, TX, USA).

All blood samples were harvested from cows according to standard operation procedures of the Clinic for Obstetrics, Gynecology and Andrology of Large and Small Animals, University of Giessen, Germany. Control blood samples were obtained from non-pregnant cows for which blood assessments occurred due to herd management and herd health diagnostics. Sample collection was performed with the approval of the local ethics authority and conformed to national ethics guidelines and legislation.

### 2.2. Statistical analysis

For the variables SP and VIP, a one-way analysis of variance was performed, with subsequent pairwise group comparison using the Tukey studentized range method, to evaluate differences among the groups. Due to the biased distribution of VIP data, VIP values were logarithmically transformed in the analysis. A considerable proportion of the IL-1 $\beta$  values was less than the detection limit; thus, the IL-1 $\beta$  group comparison was performed using the means of the non-parametric Kruskal-Wallis test (StatXact®, Cytel, Cambridge, MA, USA).

## 3. Results

There were differences between groups identified for SP concentrations in cows with uterine torsion and intrapartum cows without uterine torsion ( $P < 0.01$ ; Fig. 1). The SP serum concentrations were markedly greater in intrapartum cows than in cows with uterine torsion (Intrapartum: 49.6  $\pm$  14.5 pg/mL; Torsion: 32.8  $\pm$  14.1 pg/mL). There were greater SP concentrations in intrapartum cows than in healthy controls (Intrapartum: 49.6  $\pm$  14.5 pg/mL; Control: 37.9  $\pm$  10.5 pg/mL;  $P < 0.01$ ). There were no significant differences in VIP concentrations among the groups (Fig. 2). Global differences in IL-1 $\beta$  were detected using the Kruskal-Wallis test ( $P = 0.04$ ). Pairwise comparison revealed a significant difference between control cows and those with uterine torsion (Fig. 3).

## 4. Discussion

Intrapartum left uterine torsion is the most common form of uterine torsion in dairy cows (Schönfelder and Sobiraj, 2005; Erteld et al., 2012). The present study, therefore, included only cows which exhibited intrapartum left uterine torsion, with varying amounts of torsion. Torsion of the uterus at earlier stages of gestation is not frequently observed (Schwantag and Bleul, 2007), therefore,

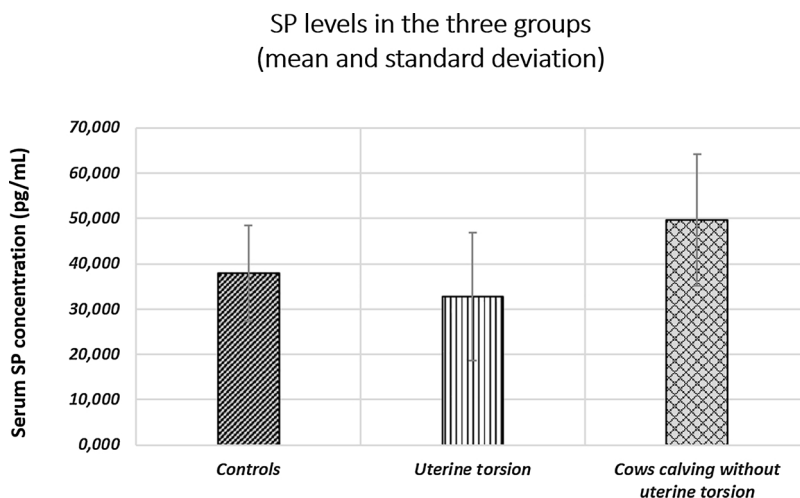


Fig. 1. Comparison of serum substance P (SP) concentrations among healthy controls, cows with uterine torsion, and cows calving without uterine torsion; \*\*indicates differences between groups ( $P < 0.01$ ).

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