

Eating and rumination behaviour in cows with traumatic reticuloperitonitis

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Summary

Eating and rumination behaviour in 22 cows with traumatic reticuloperitonitis was recorded after the start of treatment. Based on the results of clinical, ultrasonographic and radiographic examinations, the cows were divided into two groups: Group A consisted of 12 cows without an intramural or perforating foreign body and group B had 10 cows with an intramural or perforating foreign body. Cows of group A received amoxicillin, flunixin meglumine and a NaCl-glucose infusion, and cows of group B received the same treatment accompanied by foreign body removal via ruminotomy. All cows were fitted with a horse halter equipped with a pressure sensor integrated into the noseband, and eating and rumination activities were recorded continuously for 7 days. Additional 24-hour-recording periods occurred on days 14 and 30. Results obtained previously from 300 healthy cows were used for comparison. Median daily eating time in group A was 168 minutes (reference interval 211 to 319 min) on day 1 and increased to within the reference interval by day 3. Eating time on day 14 was 290 minutes and significantly longer than on day 1. Eating time was 294 minutes on day 30. Eating time in group B was comparable, and the patterns of normalisation for the number of chewing cycles related to eating, rumination time, the number of regurgitated cuds per day and the number of chewing cycles per cud were similar to that of group A: all variables were significantly reduced on day 1 and normalised within 3 to 5 days. The findings showed that eating and rumination are reduced in cows with traumatic reticuloperitonitis and that successful treatment results in rapid normalisation. Monitoring eating and rumination behaviour using a pressure sensor integrated into a halter allows objective clinical assessment of cows recovering from traumatic reticuloperitonitis.

Keywords: cattle, eating, rumination, traumatic reticuloperitonitis, treatment

Fressen und Wiederkauen bei Kühen mit traumatischer Reticuloperitonitis

In der vorliegenden Untersuchung wurden die Fress- und Wiederkauparameter von Kühen mit traumatischer Reticuloperitonitis (TRP) im Anschluss an die Therapie untersucht. Die Studie umfasste 22 Kühe mit Reticuloperitonitis traumatica, die aufgrund der klinischen, ultrasonographischen und radiologischen Untersuchung zwei Gruppen zugeordnet wurden. In die Gruppe A wurden Kühe ohne steckenden Haubenfremdkörper, in die Gruppe B Kühe mit steckendem oder perforierendem Fremdkörper eingeteilt. Die Kühe der Gruppe A wurden rein medikamentös (Amoxicillin, Flunixin meglumine, NaCl-Glukose-Infusion) behandelt. Bei den Kühen der Gruppe B wurde zusätzlich eine Ruminotomie durchgeführt, um den Fremdkörper zu entfernen. Im Weiteren wurden die Kühe mit einem Pferdehalter versehen, das einen druckempfindlichen Sensor im Nasenband enthielt und mit welchem das Fressen und Wiederkauen erfasst werden konnten. Die Untersuchungen wurden vorerst über 7 Tage durchgeführt. Weitere, jeweils 24-stündige Untersuchungen erfolgten an den Tagen 14 und 30. Die Ergebnisse wurden mit den Befunden von 300 gesunden Kühen verglichen. Bei den Kühen der Gruppe A lag die Fressdauer (Medianwert) am Tag 1 mit 168 Minuten unter dem bei 300 gesunden Kühen ermittelten Referenzbereich von 211 bis 319 Minuten. Bis zum Tag 3 stieg sie in den Normalbereich an. Am Tag 14 war die Fressdauer mit 290 Minuten erstmals signifikant länger als am Tag 1. Bis zum Tag 30 erfolgte ein weiterer Anstieg auf 294 Minuten pro Tag. Ähnliche Befunde wurden bei den Kühen der Gruppe B ermittelt. Auch die Anzahl Kauschläge beim Fressen, die tägliche Wiederkaudauer, die Anzahl Wiederkauboli pro Tag und die Anzahl Kauschläge pro Wiederkaubolus zeigten ein ähnliches Bild: Die Parameter waren am Tag 1 im Vergleich zu den Normalwerten deutlich erniedrigt und normalisierten sich innerhalb von 3 bis 5 Tagen. Die Untersuchungen zeigen, dass die Fress- und Wiederkauparameter bei Kühen mit TRP erniedrigt sind und dass es nach erfolgreicher Therapie innerhalb weniger Tage

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Introduction

Eating and rumination activities are of paramount importance in dairy cows and are reliable indicators of a cow's well-being. Eating and rumination variables of cattle have been studied by nutritionists and veterinarians for several decades (Gürtler, 1974; Hill, 1976; Dulphy et al., 1980; Welch and Hooper, 1988; Beauchemin, 1991) and recently were investigated in relation to various clinical conditions (Braun et al., 2013, 2014, 2015a, b, c). There are different methods for automated recording of eating and rumination (Schirmann et al., 2009; Nydegger et al., 2011); a technique that we have used extensively at our clinic involves a pressure sensor that is integrated into the noseband of a halter and records changes in pressure caused by movement of the jaw (Nydegger et al., 2011). Our first study on eating and rumination in cows evaluated the pressure sensor technique itself (Trösch, 2013; Braun et al., 2013). Subsequent studies included examination of rumination and eating behaviour in cows in the peripartum period (Tschoner, 2013; Braun et al., 2014), establishment of reference intervals for eating and rumination variables in Brown Swiss, Swiss Fleckvieh and Holstein Friesian cows (Zürcher, 2014; Braun et al., 2015a) and determination of the reliability of pressure sensor measurements by calculating variation coefficients of different variables in ten cows over a ten-day period (Zürcher, 2014; Braun et al., 2015b). The results of those studies provide a baseline for the assessment of eating and rumination in cows with various diseases. The adverse effects of illness on eating and rumination as well as the ameliorating effects of treatment are of primary clinical interest. It was shown that experimental intramammary challenge with *Escherichia coli* caused a decrease in rumination activity within 24 hours (Fogsgaard et al., 2012), and collection of a liver biopsy sample also led to reduced rumination, most likely because of pain (Mølgaard et al., 2012). Cows with left displacement of the abomasum (LDA) had significantly lower rumination activity, particularly fewer chewing cycles per regurgitated bolus, for five days after successful surgical correction, whereas eating variables did not differ between operated and healthy cows (Trösch, 2013; Braun et al., 2015c). Another important digestive disorder of dairy cows is traumatic reticuloperitonitis, which has a profound adverse effect on eating and rumination (Dirk-

sen, 2002; Radostits et al., 2007). The goal of this study was to examine the eating and rumination activities in cows after successful treatment of traumatic reticuloperitonitis. The cows were divided into two groups: Group A consisted of cows treated medically and group B comprised cows that underwent medical treatment as well as surgical removal of an intramural or perforating foreign body.

Schlüsselwörter: Rind, Fressen, Wiederkauen, Reticuloperitonitis traumatica, Therapie

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Animals, Material and Methods

Twenty-two cows with traumatic reticuloperitonitis were divided into two groups based on clinical, ultrasonographic and radiographic findings. Group A included 12 cows with no intramural or perforating foreign body and group B consisted of 10 cows with an intramural or perforating foreign body.

Clinical examination

All cows underwent clinical examination (Rosenberger, 1990), which included assessment of the general health status, rectal temperature, the heart and circulatory system, the respiratory system and digestive tract, and transrectal examination. Foreign body tests to assess cranial abdominal pain were carried out and included the withers pinch technique, percussion of the reticular region and upward pressure on the xyphoid region using a pole. Blood samples were collected for a complete blood cell count, biochemical analysis and a glutaraldehyde test (Glutaltest[®], Graeub AG, Bern). Urine samples were obtained for dipstick testing (Combur-9-Test[®], Roche, Basel) and rumen juice for chloride measurement.

Ultrasonographic and radiographic examinations

All cows underwent ultrasonographic examination of the abdomen with detailed evaluation of the reticulum (Braun, 2009). Traumatic reticuloperitonitis was diagnosed in cows when pronounced inflammatory changes consisting of fibrinous deposits, occasionally extending to the flank fold, with or without the inclusion of inflammatory fluid were seen in the cranial, ventral and caudal aspects of the reticular wall. Latero-lateral radiographic views of the reticulum were obtained as described (Braun et al., 1994, 2003) and evaluated for ra-

diodense foreign bodies, magnets and pieces of metal attached to magnets. Foreign bodies were counted and their location assessed as loose within the reticular lumen, lodged in the reticular wall or perforating the reticular wall.

Cows of group A (no intramural or perforating foreign body) were 3.1 to 8.9 years of age (median = 4.1 years) and had been ill for 2 to 33 days (median = 5 days). Ultrasonography showed reticular lesions consistent with traumatic reticuloperitonitis and radiographs showed no lesions or a magnet with or without attached pieces of metal but no intramural or perforating foreign body. The diagnosis in these cows was localised fibrinopurulent to apostematous traumatic reticuloperitonitis. Treatment consisted of amoxicillin (7 mg/kg; Clamoxyl, Zoetis) given intramuscularly once daily for eight to ten days, flunixin meglumine (600 mg; Flunixin, Biokema, Lausanne) administered intravenously once daily for three days and 10 L of a solution containing 50 g glucose and 9 g NaCl per L administered daily via an indwelling catheter for three days.

Cows of group B (intramural or perforating foreign body) were 3.7 to 5.8 years of age (median = 3.7 years) and had been ill for 2 to 11 days (median = 4 days). Ultrasonography showed reticular lesions consistent with traumatic reticuloperitonitis and an intramural or perforating foreign body was seen on radiographs. The cows were treated with a magnet, and radiographs taken 24 h later showed that the position of the foreign bodies had not changed. Therefore, rumenotomy was carried out and the foreign bodies removed via left-flank laparotomy in nine cows and ventral midline laparotomy in one cow; the latter was positioned in dorsal recumbency under general anaesthesia to allow drainage of an abscess at the ventral aspect of the reticulum. The cows were fasted for 48 h after surgery to reduce strain on the ruminal sutures and promote healing. Medical treatment was analogous to that done in group A.

Housing and feeding

The cows were kept in tie stalls and bedded with straw. They were fed hay ad libitum, 1 kg corn pellets (Landi, Schneisingen) and 2 kg of a 17% protein mix (UFA 142 F) twice daily and had free access to water.

Monitoring technique of eating and rumination activities

The recordings were obtained as described (Nydegger et al., 2011; Braun et al., 2013, 2014, 2015a, 2015b) using a pressure sensor integrated into the noseband of a horse halter (MSR Electronics, Seuzach, Switzerland). The sensor recorded pressure changes in an oil-filled tube; opening of the mouth caused bending of the tube and an increase in pressure within it. The sensor was con-

nected to a data logger (MSR 145W, MSR Electronics) placed in a leather pouch on the side of the halter and contained a secure digital (SD) card to store the data. At the end of a measuring period, the data were uploaded from the logger to a personal computer using the SD card.

Recording of eating and rumination activities

Cows were fitted with a recording halter immediately after the start of treatment (day 1; group A, 1st antibiotic injection; group B, rumenotomy) and data were recorded continuously for 7 days, after which time the halter was removed. The owners were given two pre-programmed halters and detailed instructions on how and when to use them when the cows were discharged from the clinic. At 14 days and 30 days after the start of treatment, the halter was reapplied by the owner for a 24-hour period to record eating and rumination activities. A special software program (R V2.12.1, MSR Electronics) was used to evaluate the data. The analysis was done as described (Braun et al., 2014). The measured variables included duration of eating and rumination, number of chewing cycles related to eating, number of regurgitated cuds and number of chewing cycles per cud.

Reference data

The results obtained from 300 healthy cows of 3 different breeds were used for comparison (Braun et al., 2015a). The reference ranges were 211 to 319 minutes for duration of eating per day, 13,431 to 20,722 chewing cycles per day related to eating, 370 to 511 minutes for duration of rumination per day, 484 to 672 regurgitated cuds per day and 45 to 65 chewing cycles per cud.

Statistics

The program IBM SPSS Statistics 20 (IBM Corporation, New York, USA) was used for calculation of means, standard deviations and medians, and the program STATA 12 (StataCorp LP, College Station, Texas, USA) was used for statistical analysis. Data were tested for normality using the Wilk-Shapiro test and non-normal data were transformed. Analysis of variance (ANOVA) for repeated measures with between-subjects error term or general linear model (GLM) for normal data was used as appropriate. Models with significant repeated variables were analysed by one-way ANOVA and Bonferroni post hoc test. Differences were considered significant at $P \leq 0.05$.

Approval of the study

The study was approved by an ethical committee of the canton of Zurich, Switzerland.

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Results

Clinical findings and response to treatment

The clinical findings were described elsewhere in detail (Tschoner, 2013). All of the cows responded favourably to treatment, and with the exception of one cow, were discharged 7 to 12 days (9.2 ± 2.4 days) after the start of treatment. The cow that was operated under general anaesthesia was a valuable breeding cow and remained in the clinic for 27 days to minimise the risk of complications.

Duration of eating

On day 1, cows of group A had a median duration of eating of 168 minutes, which was below the reference interval of 211 to 319 minutes (Braun et al., 2015a) (Fig. 1). Eating time increased to 220 minutes and was

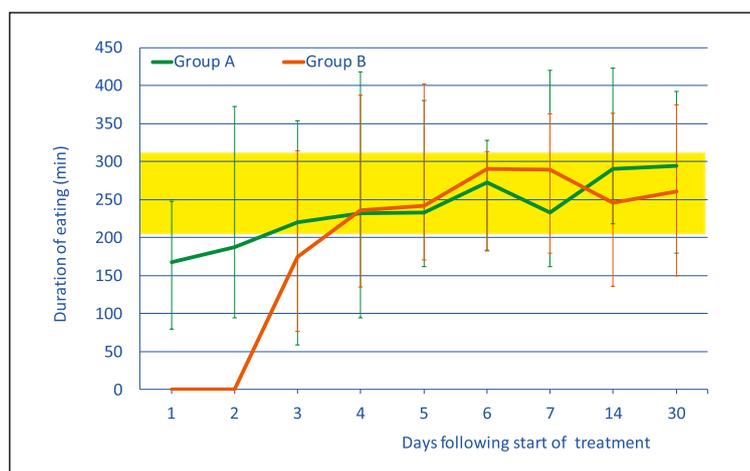


Figure 1: Daily eating time in cows with traumatic reticuloperitonitis after the start of medical (group A, $n = 12$) and medical and surgical treatment (group B, $n = 10$; median \pm range). The yellow bar represents the reference interval from 211 to 319 minutes established in 300 healthy cows (Braun et al. 2015a).

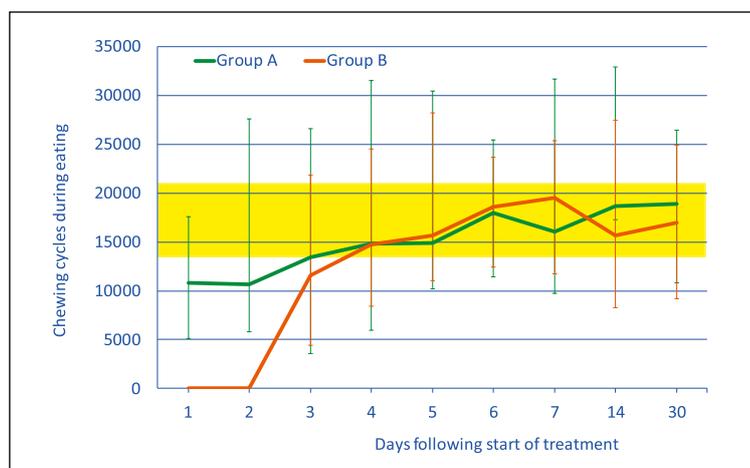


Figure 2: Number of chewing cycles related to eating per day in cows with traumatic reticuloperitonitis after the start of medical (group A, $n = 12$) and medical and surgical treatment (group B, $n = 10$; median \pm range). The yellow bar represents the reference interval from 13,431 to 20,722 cycles established in 300 healthy cows (Braun et al. 2015a).

within the reference interval by day 3, and on day 14, it was 290 minutes, which was significantly longer than on day 1 ($P < 0.01$). Eating time was 294 minutes on day 30. Cows of group B were not fed on days 1 and 2 and on day 3 had a median duration of eating of 176 minutes. From day 4 to the end of the study period, the duration was in the reference interval. In group B, the duration of eating did not differ among days, and duration of eating did not differ between groups.

Number of chewing cycles related to eating

In cows of group A, the median number of chewing cycles on day 1 was 10,836, which was below the reference interval of 13,431 to 20,722 (Braun et al., 2015a) (Fig. 2). The count increased to within the reference interval (14,788 chewing cycles) on day 4, and on days 14 and 30, it was significantly greater than on day 1 ($P < 0.05$). The maximum number of chewing cycles was 18,885, recorded on day 30. On day 3, cows of group B had 11,594 chewing cycles and on day 4, the count increased to within the reference interval (14,717 cycles). The number of chewing cycles fluctuated within the reference interval from day 5 to day 30 and was 16,994 at the end of the study period. Number of chewing cycles related to eating did not differ between groups.

Duration of rumination

The median duration of rumination on days 1 (233 minutes) and 2 (260 minutes) was considerably below the reference interval of 370 to 511 minutes (Braun et al., 2015a) (Fig. 3) in cows of group A. Thereafter, it increased to within the reference interval on day 4 (396 minutes). The increase continued after a temporary decline, and the duration of rumination was 413 minutes on day 14, which was significantly longer than on day 1 ($P < 0.01$). A maximum of 459 minutes was recorded on day 30. Although diminished, rumination occurred in cows of group B on days 1 (53 minutes) and 2 (68 minutes) despite food deprivation. Resumption of eating was accompanied by a sharp increase in rumination and on day 4, the duration was significantly longer than on day 1, and on day 5 it was in the reference interval (387 minutes). It increased further by day 7, after which time it changed little and was 479 minutes on day 30 (difference to day 1, $P < 0.01$). The duration of rumination did not differ between groups.

Number of regurgitated cuds per day

On day 1, cows of group A had 427 cuds, which was below the reference interval of 484 to 672 cuds (Braun et al., 2015a) (Fig. 4). The count increased after day 2 to 488 cuds on day 5 and to 582 cuds on day 30. Small numbers of cuds were regurgitated by cows of group B on days 1 (102 cuds) and 2 (97 cuds) despite food deprivation. Resumption of eating was accompanied by a

sharp increase in the number of cuds, which was in the low range of the reference interval on day 6 and was 584 on day 30. The differences between day 1 and day 4 ($P < 0.05$) and between day 1 and days 14 and 30 ($P < 0.01$) were significant. The number of cuds differed significantly between groups ($P < 0.05$); on the first three days of treatment, cows of group A had more cuds than cows of group B (days 1 and 2, $P < 0.01$; day 3, $P < 0.05$).

Number of chewing cycles per cud

On day 1, cows of group A had a median of 40 chewing cycles per cud, which was below the reference interval of 45 to 65 cycles (Braun et al., 2015a) (Fig. 5). The count increased to within the reference interval on day 3 (47 cycles), where it remained until day 7. It increased further and reached 61 cycles on day 30 (difference between days 1 and 30, $P < 0.05$). During food deprivation on days 1 and 2, the cows of group B had low numbers (26 and 28) of chewing cycles per cud. The median count increased to within the reference interval on day 4 (46 cycles) and reached 57 at the end of the study period. The differences between days 1 and 14 and between days 1 and 30 were significant ($P < 0.01$). The numbers of chewing cycles per cud differed significantly between groups ($P < 0.05$); on days 1 ($P < 0.01$) and 2 ($P < 0.05$), cows of group A had significantly higher counts than cows of group B.

Discussion

To our knowledge, eating and rumination behaviour has not been studied in cows with traumatic reticuloperitonitis, although this disease, together with left displacement of the abomasum, is one of the most common digestive disorders in dairy cows. Standard veterinary texts state that eating and rumination are reduced in chronic traumatic reticuloperitonitis or completely absent in acute cases (Dirksen, 2002; Radostits et al., 2007). This was supported by our results, which showed that eating and rumination activities on day 1 were below the reference intervals. Of interest, traumatic reticuloperitonitis had more of an adverse effect on rumination than on eating behaviour. Eating and rumination variables did not differ between cows with and without intramural and perforating reticular foreign bodies except on the first two days when cows of group B were not fed. In cows that underwent laparotomy, it took four days for the duration of eating and number of chewing cycles related to eating to normalise, which was one day longer than cows that received medical treatment only. On day 7, these variables were comparable to measurements on days 14 and 30. Normalisation of rumination time and number of chewing cycles per regurgitated cud was analogous and also re-

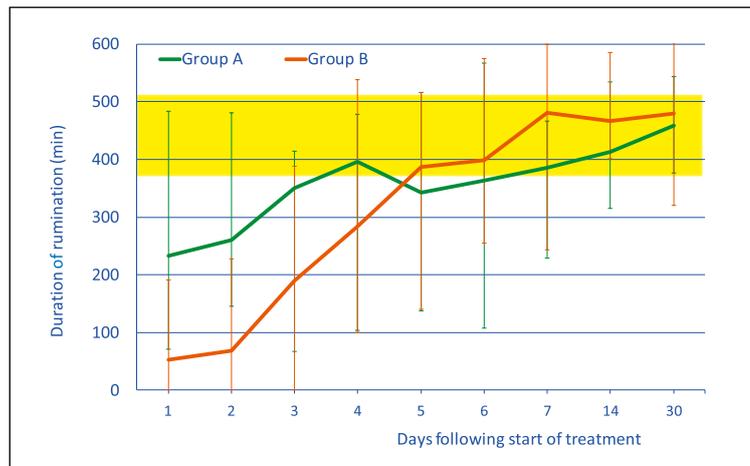


Figure 3: Daily rumination time in cows with traumatic reticuloperitonitis after the start of medical (group A, $n = 12$) and medical and surgical treatment (group B, $n = 10$; median \pm range). The yellow bar represents the reference interval from 370 to 511 minutes established in 300 healthy cows (Braun et al. 2015a).

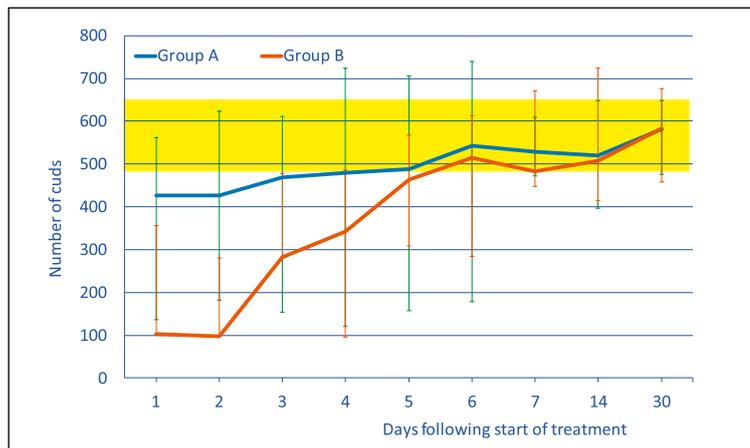


Figure 4: Number of regurgitated cuds per day in cows with traumatic reticuloperitonitis after the start of medical (group A, $n = 12$) and medical and surgical treatment (group B, $n = 10$; median \pm range). The yellow bar represents the reference interval from 484 to 672 cuds per day established in 300 healthy cows (Braun et al. 2015a).

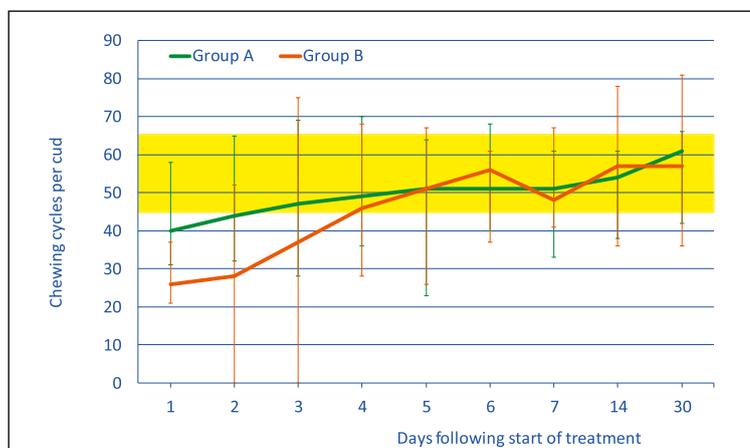


Figure 5: Number of chewing cycles per regurgitated cud in cows with traumatic reticuloperitonitis after the start of medical (group A, $n = 12$) and medical and surgical treatment (group B, $n = 10$; median \pm range). The yellow bar represents the reference interval from 45 to 65 cycles established in 300 healthy cows (Braun et al. 2015a).

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quired an extra day in the operated cows. Likewise, it took five days for the number of cuds per day to return to normal in cows that received medical treatment only and six days in operated cows. These findings show that normalisation of eating and rumination is rapid in cows with traumatic reticuloperitonitis provided that the perforating foreign body is removed or neutralised by a magnet or fibrinopurulent peritonitis is treated successfully using appropriate antibiotics. Our experience with hundreds of ultrasonographically confirmed cases of traumatic reticuloperitonitis shows that amoxicillin is very suitable for the treatment of reticuloperitonitis. Monitoring of eating and rumination behaviour allows the clinician to assess the efficacy of treatment. Conversely, when eating and rumination do not improve noticeably within five days of treatment, misdiagnosis or treatment failure must be considered. Treatment failure usually means that an intramural or perforating foreign body was not removed from the reticular wall by the magnet. This is evidenced radiographically by a foreign body not attached to the magnet or by a foreign body attached to the magnet at one end and lodged in the reticular wall at the other.

Compared with traumatic reticuloperitonitis, differences in eating and rumination variables before and after treatment were much less pronounced in cows with LDA (Braun et al., 2015c) mainly because eating was less severely affected. Nevertheless, the number of chewing cycles per cud and the daily number of chewing cycles related to rumination increased significantly from 43 to 54 and from 19,891 to 29,879, respectively, during the 5-day postsurgical observation period. This was interpreted as improvement in general health and normalisation of the passage of ingesta through the gastrointestinal system as a result of surgical correction of LDA.

Conclusion

The findings of the present study show that eating and rumination behaviour is decreased in cows with traumatic reticuloperitonitis and that successful treatment results in rapid normalisation. Monitoring eating and rumination by means of a pressure sensor integrated into a halter allows objective clinical assessment of cows recovering from traumatic reticuloperitonitis.

Alimentation et rumination chez les vaches souffrant de réticulo-péritonite traumatique

Dans le présent travail, on a étudié les paramètres d'alimentation et de rumination de vaches souffrant de réticulo-péritonite traumatique après traitement. Vingt-deux vaches souffrant de réticulo-péritonite traumatique ont été, sur la base des examens cliniques, échographiques et radiologiques, réparties en deux groupes. Le groupe A comprenant les vaches sans corps étranger implanté dans le bonnet, le groupe B les vaches ayant un corps étranger implanté ou perforant le bonnet. Les vaches du groupe A ont reçu uniquement un traitement médicamenteux (amoxicilline, flunixin meglumine, perfusions de NaCl-glucose). Chez les vaches du groupe B, une ruminotomie a en outre été réalisée pour retirer le corps étranger. Par la suite, les vaches ont été équipées d'un licol comprenant un capteur de pression dans la muserolle qui permettait d'enregistrer la prise d'aliments et la rumination. Les mesures ont tout d'abord été faites durant 7 jours puis des enregistrements sur 24 heures ont été réalisés aux jours 14 et 30. Les résultats ont été comparés à ceux de 300 vaches en bonne santé. Chez les vaches du groupe A, la durée d'alimentation (valeur moyenne) était, au jour 1, avec 168 minutes, inférieure aux valeurs de référence situées entre 211 et 319 minutes enregistrées chez les vaches en bonne santé. Elle augmentait jusqu'au jour 3 pour atteindre la norme. Le 14^{ème} jour, la durée d'alimentation, avec

Ingestione e ruminazione nelle mucche affette da reticolo peritonite traumatica

Nel presente studio sono stati esaminati i parametri dell'ingestione e della ruminazione delle mucche con reticolo peritonite traumatica (TRP) in relazione alla terapia. Lo studio ha coinvolto 22 mucche affette da reticolo peritonite traumatica che sono state suddivise in due gruppi sulla base di un esame clinico, ecografico e radiologico. Nel gruppo A vi erano mucche senza corpi estranei infilzati nel reticolo, nel gruppo B vi erano mucche con corpi estranei infilzati o con perforazioni. Le mucche nel gruppo A sono state medicalmente trattate (amoxicillina, Flunixin meglumine, infusione di NaCl e glucosio). Nelle mucche del gruppo B è stata inoltre eseguita una ruminotomia per rimuovere il corpo estraneo. Inoltre, le mucche sono state munite di un capestro contenente, nella banda sul naso, un sensore sensibile alla pressione per poter rilevare l'ingestione di cibo e il ruminare. Le indagini sono state inizialmente svolte su 7 giorni. Più tardi, nei giorni 14 e 30 si sono condotti esami su 24 ore. I risultati sono stati confrontati con i reperti di 300 mucche sane. Nelle mucche del gruppo A, al giorno 1, il periodo di alimentazione (valore medio) è stato di 168 minuti, minore che nelle 300 mucche sane dove oscillava tra i 211 e i 319 minuti. Fino al giorno 3 vi è un aumento fino a valori normali. Al giorno 14, il periodo di alimentazione era di 290 minuti, per la prima volta significativamente superiore al

290 minutes, était pour la première fois significativement plus longue qu'au jour 1. Une nouvelle augmentation à 294 minutes se produisait jusqu'au jour 30. On a relevé des données semblables chez les vaches du groupe B. Le nombre de mastications lors de la prise de nourriture, la durée journalière de rumination, le nombre de boli de rumination par jour et le nombre de mastication par bolus montraient une image semblable: ces paramètres étaient nettement abaissés au jour 1 par rapport aux valeurs normales et se normalisaient dans les 3 à 5 jours. Ces études montrent que les paramètres d'alimentation et de rumination chez les vaches souffrant de réticulo-péritonite traumatique sont abaissés et qu'ils se normalisent en peu de jours lors d'un traitement couronné de succès. Le contrôle de l'alimentation et de la rumination avec licol muni d'un capteur de pression permet donc d'objectiver l'évolution chez les vaches atteintes de réticulo-péritonite traumatique.

giorno 1. Fino al giorno 30 vi è stato un ulteriore aumento fino a 294 minuti al giorno. Simili risultati si sono ottenuti tra le mucche del gruppo B. Similitudini si sono registrate anche per il numero di masticazioni durante l'ingestione, la quotidiana ruminazione, il numero di boli nella ruminazione al giorno e il numero di masticazioni per bolo nella ruminazione. I parametri sono risultati significativamente diminuiti il giorno 1 rispetto ai valori normali e normali dai giorni 3 a 5. Le indagini mostrano che i parametri relativi all'ingerire e al ruminare sono inferiori nelle mucche affette da TRP e che solo dopo trattamenti di successo dopo alcuni giorni si ritorna a una normalizzazione dei parametri. Il controllo dell'ingestione e della ruminazione con l'aiuto di un sensore per la pressione nel capestro permette di oggettivare il corso della malattia nelle mucche affette da TRP.

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