

A PROBE FOR COLLECTION OF RUMINAL FLUID IN JUVENILE CATTLE AND COWS

Thomas Geishauser, Dr. med. vet.

Medical and Forensic Veterinary Clinic II
(Internal Diseases of Ruminants)
Justus-Liebig-University, 63 Gießen, FRG

Introduction

In order to avoid saliva contamination, forestomach fluid used for diagnostic purposes should be collected from the ventral sac of the rumen. In adult cattle instruments therefore are commercially available (17,3) (I-III). In juvenile cattle there are no instruments available that are tested for these purposes. Tölgyesi and Goóts used Kaltenböck's probe for collecting ruminal fluid in adult cattle (7). This instrument was developed for the treatment of foamy bloat (5). It is obtainable in two different sizes for the use in adult and in juvenile cattle (IV). We modified the model for juvenile cattle and tested it in juvenile cattle and cows for the collection of ruminal fluid (4) (V).

Material and Methods

The probe was modified by arranging lots of perforations at the rumen-sided end of the probe (instead of the few perforations over a long distance in the original probe). On the other end of the probe we attached a quick coupling connection. It serves for connection to a suction pump for the acquisition of ruminal fluid (4) (VI) or for the connection to a water tap for cleaning purposes (Fig.1). In the probe's head we installed a magnet (cobalt-samarium). The position of the probe's head in the reticulorumen should then be fixed by a compass from outside.

Experimental Design:

A. First we investigated the magnet field of the probes' head outside the reticulorumen. We determined the maximum detectable distance between the probe's head and the compass.

B. The probe was then inserted into 4 ruminotomied cows. We tried to fix the position of the probe's head in the reticulorumen by the compass from outside. The location of the probe's head was also determined manually via the ruminotomy. At least we determined the maximum detectable distance between the probe's head in the reticulorumen and the compass outside of the reticulorumen. Therefore we removed the probe's head step by step from the rumen wall while fixing its position by the compass from outside.

C. We tested the probe in 26 cows and 34 juvenile cattle. 30 of them were patients of our clinic (race: *Deutsche Rotbunte*, *Deutsche Schwarzbunte* or *Deutsches Fleckvieh*, sex: female or male, age: between 9 months and 8 years). 30 of them were healthy cattle (race: *Deutsches Fleckvieh*, sex: female or male, age: between 9 and 23 months). In these animals we determined age, height, the time required for fixation of the protection tube and the introduction of the probe (the probe was introduced until an obstacle was perceptible), the time required for pumping off half a liter of forestomach fluid, the number of corrections of the probe's location (withdrawal at a length of 0.5 - 1 m and subsequent reintroduction), the position of the probe's head in the reticulorumen and the length, the probe was introduced. For determining the position of the probe's head, we applied a coordinate system upon the skin (Fig.2). Its x-, y- and z-axes limited 9 fields (4) (Fig.3). The positions of the probe's head were registered as numbers of these fields and recorded in a diagram. As soon as the position of the magnet was fixed within the

fields No. 4 to No. 9 we assumed the probe's head to be located in the ventral sac of the rumen.

Results

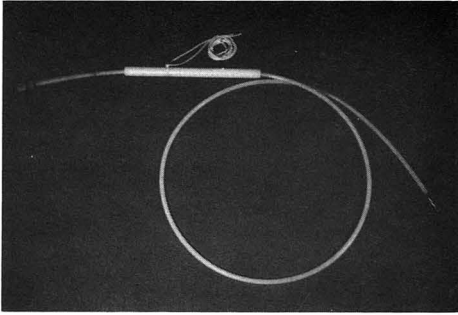


Fig. 1: KALTENBÖCK's probe, modified for the collection of ruminal fluid.

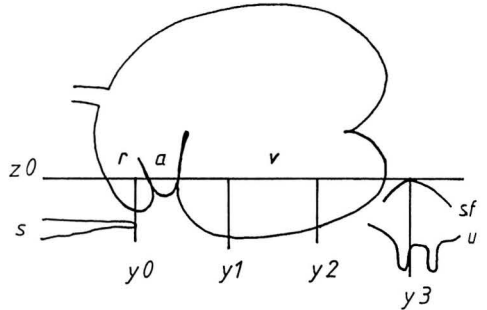


Fig. 2: Coordinate system applied upon the skin and transferred to the reticulorumen (coordinates: y_0, y_1, y_2, y_3, z_0) (reticulorumen presented according to NICKEL & WIL-1955). a antrium, r reticulum, s sternum, sf stifle fold, u udder, v ventral ruminal sac.

A. Within the distance of 10 cm the magnet in the probe's head was detectable by the compass.

B. In 3 of 4 ruminotomied cows the probe's head was detected by the compass from outside the reticulorumen. In these cases it lay close to the rumen mucosa opposite that point it was detected before by the compass. The probe ran forming a large curvature from the cardia to the ventral sac of the rumen (Fig.4). The probe's head was detectable with the compass up to 6 cm removed from the rumen wall. In that case the position of the probe's head was not fixed by the compass he met with the medial longitudinal pillar, forming a ventral concavity.

C. In all trials half a liter of forestomach fluid was taken. The fixation of the protection tube and the introduction of the probe took an average time of 43 s (minimum: 25 s, maximum: 75 s). Pumping off half a liter of forestomach fluid took an average time of 13 s (minimum: 5 s, maximum: 60 s). The probe's location had to be corrected in 15 of 60 cases. It was not corrected more than 3 times per trial. For the collection of forestomach fluid the probe was introduced in juvenile cattle (age: 9-23 months, height: 103-125cm) at a length between 1.65 and 2.35 m. In cows (age: 2-8 years, height: 126-143cm) it was introduced at a length of 1.7 m to 3.2 m. The position of the probe's head was then fixed in the ventral sac of the rumen in 43 of 60 cases (71,6%). This was more frequent in cows (77%) than in juvenile cattle (67%). In 5 of 60 cases we found the probe's head located in the area of the reticulum and the antrium (cranial area of the fields No. 1-3 and the fixed positions in the area of the 6th, 8th and 9th intercostal space). In 12 of 60 cases the position of the probe's head was not fixed (Fig.5,6,7).

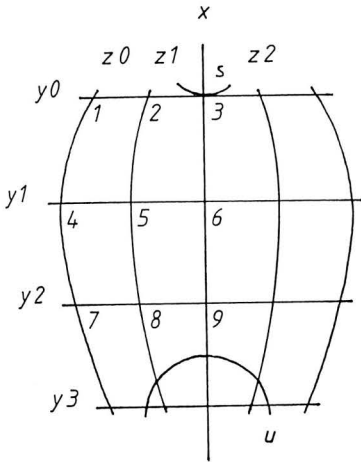


Fig. 3: Coordinate system applied upon the skin seen from above (coordinates: x , $y_0, y_1, y_2, y_3, z_0, z_1, z_2$). s sternum, u udder, x Linea alba. 1-9 fields No. 1-9 limited by the coordinates.

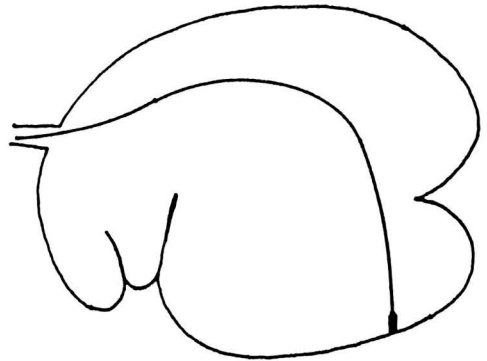


Fig. 4: Extend of the probe in 3 ruminotomied cows

If the probe was introduced in cows at a length below 1.9 m, it entered the reticulum, the atrium or the ventral ruminal sac. If it was introduced at a length between 2.15 and 3.2 m it entered predominantly the ventral sac of the rumen. But in one case it entered the reticulum after having introduced a length of 2.85 m. If the probe was introduced in juvenile cattle at a length between 1.65 and 2.35 m the probe's head entered mainly the ventral ruminal sac. In the cases it was introduced more than 2 m it was introduced too far, because the ventral ruminal sac was entered in smaller cattle by introducing the probe at a shorter length. Following introduction between 2.65 and 2 m the probe's head entered also the reticulum and atrium (2 cases) (Fig.7)

Discussion

The presented probe is suitable for the collection of ruminal fluid. The protection tube can easily be fixed and the probe can easily be introduced if the animal is fixed by a nose twitch. The probe should be introduced forming a ventrally open curvature, because it then will be deflected towards the ventral sac of the rumen. The diameter of the probe's head is fitted for juvenile cattle and cows. Esophageal injury and probing the trachea were not observed. Probes without a protection tube can be inserted more rapid (1,3,8), but they are more costly. Naso-gastric tubes do not enter the ventral sac of the rumen (2). Half a liter of forestomach fluid was always easily to be taken. Occasionally the location of the probe had to be corrected. The tube did never get plugged. Occasionally several perforations got plugged, but this did not hamper the acquisition of forestomach fluid. Concerning these parameters the present-

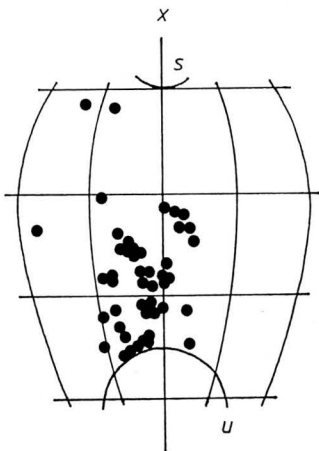


Fig. 5: Positions of the probe's head in the reticulo-rumen according to the coordinate system. Fixation by the means of a magnet in the probes's head and a compass from outside. s sternum, u udder, x Linea alba

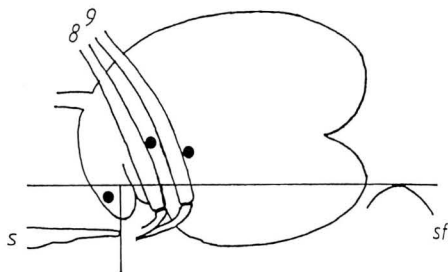
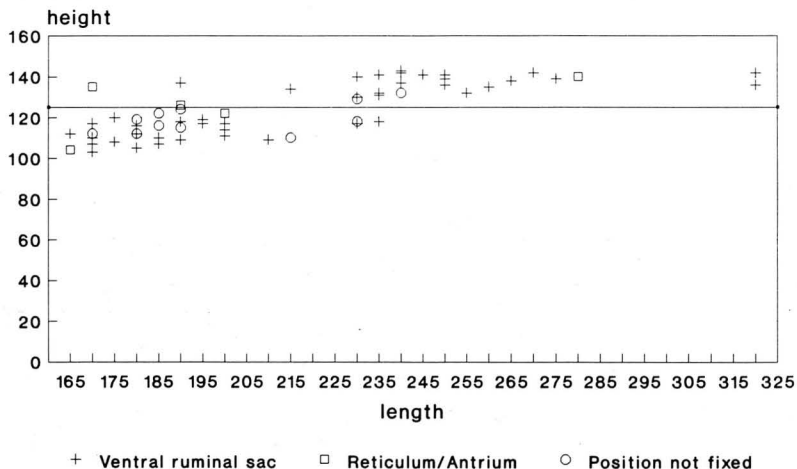


Fig. 6: Positions of the probe's head outside the coordinate system. s sternum, sf stifle fold, 8 8th rib, 9 9th rib.



+ Ventral ruminal sac □ Reticulum/Antrium ○ Position not fixed

Fig. 7: Height (cm) of the cattle, length (cm) of the probe introduced and position of the probe's head

ted probe was equal or superior to probes available commercially, for rumen fluid sampling in adult cattle (1,3,8).

The height of the cattle does not serve as a parameter for estimation of the length the probe should be introduced, because there is no tight correlation between these parameters. According to the results of earlier investigations a probe should be introduced at a length of 2 m to enter the ventral ruminal sac (3). In the ruminotomied cows the probe was introduced 2.70 - 2.80 m. Taking these results into account we recommend to introduce this probe at a length of 2.15 - 2.80 m in normal cows and up to 3.2 m in large cows. In juvenile cattle (age: > 9 months), this probe should be introduced at a length of 1.65 - 2 m, depending on race, sex and age of the animals. It depends on ration composition and the time since last feed intake whether or not the probe enters the ventral sac of the rumen (1). The most appropriate time for collection of rumen fluid is prior to morning feeding or 3-4 hours after morning feeding (3). The cows in this investigations were patients of our clinic, with poor appetite. The majority of the juvenile cattle were healthy with unaffected appetite. Poor feed intake may result in a large proportion of fluid in the reticulorumen. This facilitates the probe to enter the ventral ruminal sac. This might be the reason why the position of the probe's head was fixed more frequently in the ventral sac of the rumen in cows than in juvenile cattle.

Beside the use for rumen sampling for diagnostic purposes the presented instrument may serve for: acquisition and transfer of rumen fluid (volume > 2l), administration of liquids (funnel necessary) and removing a free dorsal gas cap from the rumen (introduce the probe forming a dorsal open curvature).

Summary

The KALTENBÖCK probe (modell for juvenile cattle) was modified and tested in juvenile cattle and in cows for collection of rumen fluid for diagnostic purposes. In all cases forestomach fluid was taken easily. In 71.6% of the cases rumen fluid was collected from the ventral sac of the rumen.

Zusammenfassung

Die Ausführung für Jungrinder der KALTENBÖCK'schen Kreissonde wurde etwas abgeändert und zusammen mit einer Saugpumpe zur Pansensaftentnahme bei Jungrindern (Alter: 9 - 23 Monate) und Kühen geprüft. Bei allen Probanden konnte einfach und rasch Vormageninhalt gewonnen werden, wobei die Entnahme überwiegend (71,6%) aus dem unteren Pansensack erfolgte.

Resumen

La sonda de KALTENBÖCK (modelo para bovinos juveniles) fue modificado y probado para la extracción de liquido ruminal en bovinos juveniles y vacas. En todos los casos liquido estomacal fue extraído facilmente. Por 71,6 % de los casos el liquido ruminal fue extraído del saco ventral del rumen.

References

1. Dirksen, G., Smith M.C., Acquisition and analysis of bovine rumen fluid. *Bov. Practitioner* 22:108-116. 1987.
2. Brockmann, C., Der Weg der Schlundsonden in die Vormägen des Rindes. *Hannover, Tierärztl. Hochsch., Diss.* 1935.
3. Geishauser, Th., Development and testing of an instrument for collection and transfer of ruminal fluid and for administration of liquids in adult cattle. *Proc. 1st Sci. Congr. Egypt. Soc. Cattle Dis.*, 1.-3.12., Assiut/Egypt, 217-223. 1991.
4. Geishauser, Th., Eine Sonde

zur Pansensaftentnahme bei Jungrindern und Kühen. *VET*, 7(5). 1992 (in press). 5. Kaltenböck, K., Über die Behandlung der Schaumgärung im Pansen der Rinder mit Hilfe einer kreisförmigen Sonde. *Wien. Tierärztl. Mschr.* 51:767-774. 1964. 6. Nickel, R., Wilkens, H., Zur Topographie der Rindermagens. *Berl. Münch. tierärztl. Wschr.* 66:264-270. 1955. 7. Tölgyesi, G., Goóts, L., Die Verwendung der Kaltenböckschen Kreissonde in der tierärztlichen Praxis. *Ung. Agr. Rdsch.* (1):21. 1969. 8. Wagner, D, Vergleichende Prüfung von vier Sonden zur Pansensaftentnahme beim erwachsenen Rind unter Berücksichtigung des Speichelzuflusses in der abgesaugten Probe. *München, LMU-Universität, Diss.* 1984.

Instruments

I. Rumen sampling device Sørensen & Schambye's pattern, modified by Dirksen, *Eickemeyer, Eltastr.* 8, 72 Tuttlingen, Germany. II. Rumen sampling device Dirksen's pattern, *Eisenhut, Sandweg 52, 4123 Allschwil, Switzerland.* III. Rumen sampling device Geishauser's pattern, *Heiland, Albert-Schweitzer-Ring 5, 2 Hamburg 70, Germany.* IV. Kaltenböck's probe, *Kruuse, Byvej 35, 529 Marslev, Denmark.* V. Kaltenböck's probe, modified by Geishauser, *Kruuse, Byvej 35, 529 Marslev, Denmark.* VI. Suction pump, Geishauser's pattern, *Heiland, Albert-Schweitzer-Ring 5, 2 Hamburg 70, Germany.*