

Michael Klindtworth, Osnabrück, as well as Michael Nelle and Markus Käck, Engen

# Automatically Recording Individual Water Intake in Calf Rearing

*Automatic milk dispensing is a commonly used method in calf rearing and a basic application for automatic data recording in cattle husbandry. To extend the available database, a new commercial system for automatic water intake registration was investigated. The study was carried out to examine the water intake as a parameter for animal development and animal health. The results showed a strong correlation between intake of water and concentrate, which can be used as an indicator for ruminal development. Furthermore, febrile diseases influenced animal-specific water intake.*

Dr. agr. Michael Klindtworth is representative of the chair of agricultural engineering and building technology at the Fachhochschule Osnabrück (University of Applied Sciences), Faculty of Agriculture and Landscape Architecture, Am Krümpel 31, 49090 Osnabrück; e-mail: m.klindtworth@th-osnabrueck.de

Michael Nelle was student at the Faculty and is now employed at Foerster-Technik GmbH. Dr. agr. s.c. Markus Käck is head of the development department at Fa. Förster-Technik GmbH, Gerwigstrasse 25, 78234 Engen.

## Keywords

Calf rearing, animal health, water intake

## Literature

Literature references can be called up under LT 05513 via internet <http://www.landwirtschaftsverlag.com/landtech/local/literatur.htm>.

For the nutrition of calves the intake of milk and water is an essential aspect. Calf's daily water demand is approx. 10% of its weight. If the animals do not drink enough water, they will not be able to consume the corresponding amount of dry feed [1]. This applies particularly to the additional concentrate feeding [4]. Consequently an interaction between feed and water intake is the result of early weaning. Until now the technical process of measuring water intake has only been adopted for some scientific studies. The examined technical device is a new development and will be described hereinafter, before going into the practical investigations and the obtained results [2].

## Material and methods

The investigations are based on the automatic water measuring system (ATS) from the company Förster-Technik GmbH, Engen, Germany. Main component of this system is a stainless steel pipe (5) with a capacity of 500 ml (Fig. 1). This steel pipe contains a float switch (6) signalling the status of the water bowl (filled or empty) to the control unit (4). For water supply the stainless steel pipe is connected to the existing water line (2) via the pressure reducer (1) located on top of it. Between the pressure reducer and the measuring cylinder a water solenoid valve (3) is located. The water measuring

system ("ATS") ends in a water bowl (8), which is secured to the front by a mounting plate (7) and connected on the bottom of the water bowl to the measuring cylinder.

For the individual registration of water intake RFID-transponders are used, which are identified at the antenna (9) in the station (10).

When a calf, wearing a transponder, enters the "ATS", it is automatically identified by the antenna. In the case that the float switch is free (the water bowl is empty), the calf is provided with a water portion. The amount of provided portions is registered and stored electronically.

Pre-investigation, including functional tests, were carried out in the experimental farm of Foerster-Technik with 12 animals. The accommodation consists of two pens with an automatic milk dispenser each (containing sensor-technology for temperature measurement in the mouth of the animal), an automatic concentrate dispenser and an "ATS".

The main investigations were carried out in the agricultural centre "Haus Riswick". Two groups with 16 animals each were housed at an average age of 7 days (min. 3 days; max. 18 days). The average birth weight was 46 kg (min. 32 kg; max. 59 kg) and the average housing weight was 50 kg (min. 39 kg; max. 62 kg). The housing system can be described as an open-front hous-

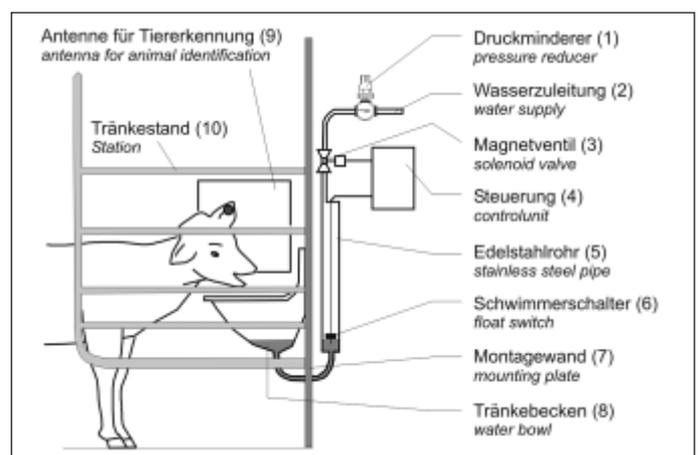


Fig. 1: Side view drawing of the automatic water measuring system for automatic recording of individual intake (System „ATS“; Förster-Technik GmbH, Engen)

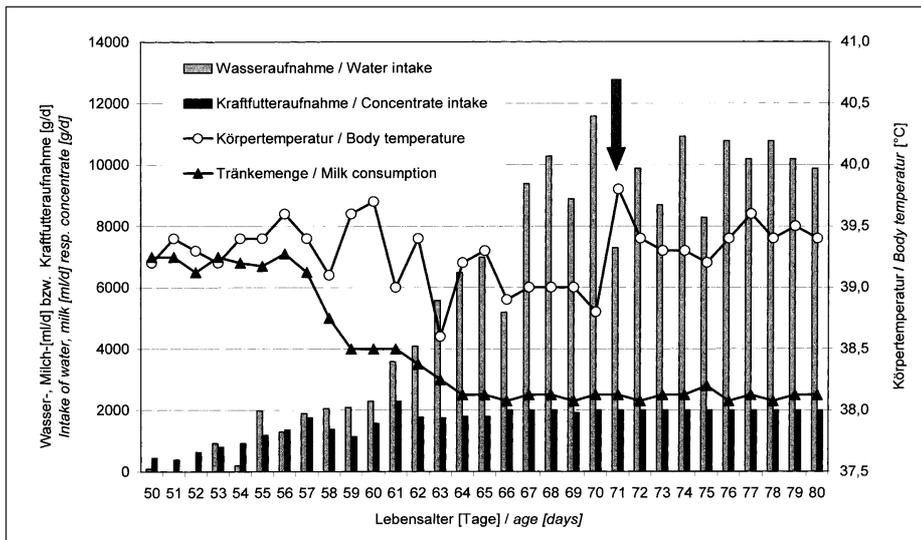


Fig. 2: Daily intake of water, milk and concentrates as well as automatically recorded body temperature in dependence on age (calf no. 19)

ing with automatic milk dispenser. Water was provided with one ATS in group I and with two ATS's in group II. Both groups got concentrates by an automatic concentrate dispenser.

## Results

The pre-investigations showed a high accuracy of the water dosing and registration at a constant level of water pressure. Following the assumption, that water intake correlates with concentrate intake, those days were examined, at which the calves took in a quantity of more than 1000 g of concentrates and/or more than 2 l of water. A further condition was, that these values were maintained afterwards. At an average age of 57 days all animals took in at least 2 litres of water per day. Just a few days later, at an age of 60 days, the calves consumed at least 1000 g of concentrates.

Figure 2 shows an almost simultaneous increase of water and concentrate consumption from 50th to 60th day of life (calf no. 19). Furthermore the automatically registered temperature is represented. A peak of body-temperature is obvious at day 71 (39,8°C). At this day the animal took the pretended amounts of milk (2500 ml) and of concentrates (2000 g). In opposite to this the consumed water was considerably higher the day before and was reduced about 4000 ml at the day with the registered fever.

In order to find out how milk, concentrate and water intake varies in those cases of fever, where temperature rises more than 0.5°C, occurring on consecutive days and leading to fever of more than 39.5°C, data was examined more closely. In cases of fever, milk and concentrate intake remains un-

changed in nearly three-quarter of the cases. Water intake, though, decreases considerably in 70% of the cases. Following these results the calves show more frequently a reduced water consumption than a reduced intake of milk or concentrates.

The main trial was divided into three phases. Phase I: period of highest milk consumption (6 litre); Phase II: period of reducing the pretended amount of milk (18th to 70th day) from 6 to 0 litres; Phase III: without any milk dispensing (71st to 180th day). As expected the consumption of water increases during the rearing period, when the amount of milk is reduced. In detail there are considerable differences of water intake between individuals and between the investigated groups (Fig. 3). The animals of group I consumed in total more water than the animals of group II during the whole observation period. Group II did not even reach the value of 10% of body weight during period III, which is a general estimate of water intake in the literature. One of the reasons for

this low consumption might be, that there was only one ATS for the animals available, which was positioned not just beside the automatic concentrate dispenser (group I) but at the opposite side of the pen.

## Conclusions

According to the presented investigations the amount of water intake is correlated to consumption of concentrates. Under the condition, that sufficient water and concentrates are offered to the animal at a close distance from each other, it is expected, that the values of the water registration system (ATS) are able to be used as an indicator for the ruminal development and for weaning in calf rearing systems. Several cases of fever were attended by an increase of water intake the day before, followed by a striking decrease the next day. In this context the individual registration of water intake is a prosperous technology in a sensor based system for health management.

## Acknowledgements

Sincere thanks are given to the agricultural centre "Haus Riswick", Kleve, Germany and to Foerster-Technik, Engen, Germany for their contribution to our work.

## Literature

- Books are identified • gezeichnet
- [1] • Kirchgelsner, M.: Tierernährung. 11. Auflage. DLG Verlags-GmbH, Frankfurt, 2004
  - [2] Klindtworth, M.: Elektronikeinsatz in der Rinderhaltung - Von der elektronischen Tierkennzeichnung zum Gesundheitsmanagement. In: VDI-Berichte 1865, ISSN 0083-5560, (2004), S. 123 - 139
  - [3] Nelle, M.: Untersuchungen zur tierindividuellen Wasseraufnahme von Aufzuchtälbern. Diplomarbeit FH Osnabrück, Fakultät Agrarwissenschaften und Landschaftsarchitektur, 2005
  - [4] • Schrag, L., und H. Singer. Das Buch vom Kalb. Schober Verlags-GmbH, 1987

Fig. 3: Mean values of water intake per animal and day of group I and II during the rearing periods I to III

