Clinical Indicators Dictated by Subacute Rumen Acidosis (SARA) Condition in Cows for Milk Production

Agriculture & Veterinary Medicine

Kewords: SARA condition, rumen pH, urine pH, contractions, faecal structure.

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Abstract

The study was conducted to evaluate the incidence of subacute rumen acidosis in cattle and impact of this situation (SARA) in the pH of the urine, in rumen contractions and faecal physical qualities. In four cow farms were checked 87 samples from rumen content sample through the nasoesophagal probe and equally urine samples at the cows in start of lactation and in middle lactation. All animals were checked clinically for rumen contractions and faecal physical qualities. Esteemed affected by SARA condition, cows which had pH of rumen content 5.5 and less. From the total heads in the experiment were found 24 cows (27.58 %) with SARA condition. Of these, 15 heads (32.6 %) were at the beginning of lactation and 9 heads (21.95%) in mid-lactation. pH of the urine seems influenced by the pH value of the rumen contentst. Among these indicators related to positive character dependency (r = 0403). pH of the rumen contents affects the number of its contractions. The results showed poor korelative and negative character (r = -0329). Physical qualities and faecal structure were also affected by the pH values of rumen contents. pH of the urine, the number and strength of ruminal movements and with them the changes in the physical structure of faecal can be used for early diagnosis of SARA condition in cows.

Introduction

Subacute rumen acidosis (below SARA condition) is the most important economic problems on farms and cows for milk production and is characterized by daily episodes of pH reduction in the rumen content between values of 5.5 - 5.0, *Krause KM; Oetzel G.R, (2006).* Poverty or lack of clinical signs do not easily identifiable pathology. Clinical signs may appear to reduce the amount of dry food consumption, laminitis, rumenitis, liver abscesses, pulmonary bacterial embolism, loss of body weight and % reduction of fat in milk, require weeks and months to follow the negative impact of SARA condition, Garret EF, et al. (1999); Kleen J.L. et al. (2003). Protocol recommendations for early diagnosis of the SARA condition in cows, represent sampling of fluid and control ruminal content by not less than 12 representative randomly selected flock, through nasoesofagal probe or ruminocentezis, Enemark J. Et al. (2002). If, after the control result more than 30 % of the heads with the pH of rumen contents 5.5 or less, the group is considered affected by SARA condition, Nordlund KV et al. (1995); Garret E.F. et al. (1999). The decline in pH of ruminal content and rumen movement disorders in cows with SARA condition, caused by the local accumulation of volatile fatty acids only as a result of feeding the animals with food ration easily fermentable and not by accumulation of lactic acid, *Krause KM Oetzel G.R, (2006).* In cattle farms in our country have begun to emerge consequences of the presence of SARA condition. The study aims to research clinical findings dictated by the reduced values of pH in rumen content, and to avoid severe interference in sampling of its contents and to contribute to the early diagnosis and indirect assistance of SARA condition in cows.

Material and Methods

In addition to efforts to find ways and indirect methods for the early identification of SARA condition in cows for milk production was studied experimentally the impact of this condition on several clinical indications. From January to December 2012, four cows for milk production farms were selected at random from two groups of 12 cows, breed "Holstein", a group in early lactation (days 3 – 30^{-th} lactation) and the other in the mid-lactation (days 91 - 120). In groups of cows in the experiment were included in the first lactation and individuals with more than one lactation cows. The experiment was conducted in groups of cows with the same diet. From selected animals were sampled content from rumen and urine, and were assessed clinically functional indicators of rumen and faecal physical qualities. Sampling the contents from rumen were performed 3 - 5 hours after food and clinical control, through naso-esophagale probe. Urine sampling was carried out by the method of provocation, 7 - 9 hours later. pH of rumen content and urine was analyzed immediately, with portable pH meter. For all animals in the experiment was estimated the number and strength of rumen movements, according to *Enemark J. et al. (2002).* To assess the impact of SARA condition and qualities of faecal consistency were used *Kleen J.L. et al. (2003)* and *Hughes J. (2001)* data, who recommend and reference values. The same tests were used to control all the animals in the experiment. Depending on the pH values of rumen contents animals were grouped into three groups, according to the recommendations of *Krause K.M.* and *Oetzel G.R. (2006).* Healthy animals were considered to be those that have pH values of ruminal contents over 5.8. Animals with pH value of rumen content in the limits 5.6 - 5.8 were considered at risk and animals with pH value of rumen content in 5.5 - 5.2 were considered affected by SARA condition. The data obtained were processed statistically for average values by groups, to clarify the attachments between the indicators and to compare differences between groups of animals in early lactation and among his. Differences were considered statistical validity for $P < 0.05$.

Results

From 96 selected cows was possible to obtain content from ruminal fluid with nasoesophagal probe into 87 heads, of which 46 in early lactation and 41 in mid-lactation. Minimum and maximum values of pH of ruminal content that is found in all animals was within the limits 5.3 and 6.2. Table 1 provides data on minimum values, maximum and average pH of rumen content, by groups of cows after classifying them into healthy, vulnerable and affected by SARA condition. Total controlled cows, 24 head (27.58 %) were with SARA, or had pH of rumen content less than 5.5 units, at the time of sampling. From animals with SARA, 15 heads (32.6 %) were in early lactation and 9 heads (21.95 %) in mid-lactation, table 2.

Table 1: *Average maximum and minimum values of the pH on the content of rumenit by groups and lactation period.*

Lactation period	Healthy animals		Risk animals		Animal SARA	
	Min - Max	Average	Min – Max	Average	Min - Max	Average
Early-L	5.9 - 6.2	5.97 ± 0.07	5.6 – 5.8	5.7 ± 0.08	5.3 – 5.5	5.4 ± 0.09
Mid-L	5.9 – 6.2	5.98 ± 0.06	5.6 – 5.8	5.7 ± 0.05	5.3 – 5.5	5.4 ± 0.06

In the limit values of pH of rumen contents between 5.8 and 5.6, or at risk to be affected by the SARA condition, found 13 cows (14.94 %) of which 5 heads (10.86%) in early lactation and 8 heads (19.51 %) in mid-lactation.

Table 2: *Healthy animals, risk animals and affected by SARA condition in different cow farms, based on average values of Rumen pH content.*

Farm – Heads	Cow status	The number of cows sampled	Results after control of the content of Rumen pH					
			Healthy		Risk		SARA	
			Heads	%	Heads	%	Heads	%
A- 139	Early lactation	11	6	54.54	1	9.09	4	36.36
	Mid-lactation	9	4	44.44	2	22.22	3	33.33
B- 118	Early lactation	12	7	57.33	-	-	5	41.66
	Mid-lactation	12	8	66.66	2	16.16	2	16.66
C- 102	Early lactation	12	7	57.33	2	16.66	3	25.0
	Mid-lactation	10	6	60.0	3	30.0	1	10.0
D- 176	Early lactation	11	6	54.54	2	18.18	3	27.27
	Mid-lactation.	10	6	60.0	1	10.0	3	30.0
TOTAL	Early lactation	46	26	56.52	5	10.86	15	32.6
	Mid-lactation	41	24	58.53	8	19.51	9	21.95
Amount	**In total**	**87**	**50**	**57.47**	**13**	**14.94**	**24**	**27.58**

At the time of sampling content from rumen, in cows in early lactation in three farms and in mid-lactation cows on two farms were found on 30 % of heads with SARA condition, or pH < 5.5. Such holdings, according to *Nordlund K.V. et al. (1995)* and *Garret E.F. et al. (1999)*, considered to have animals affected by the SARA condition require rapid corrective intervention.
Minimum, maximum and average values of urine pH by groups of healthy animals, risk and with SARA condition are given in table 3.

Table 3: *Minimum, maximum and average values of urine pH in animals in the study, by groups and lactation period.*

Lactation period	Healthy animals		Risk animals		SARA animals	
	Min - Max	Average	Min – Max	Average	Min - Max	Average
Early lactat	8.33 – 8.39	**8.36 ± 0.03**	8.20 – 8.24	**8.22 ± 0.02**	8.17 – 8.25	**8.21 ± 0.04**
Mid-lactat	8.31 – 8.40	8.36 ± 0.04	8.20 – 8.24	8.22 ± 0.02	8.18 – 8.24	8.21 ± 0.03

The data obtained were processed statistically and compared with data of rumen pH content to detect the presence of association. Limits the maximum and minimum values of pH of urine in three groups of cows are narrow and not exceed ± 3 σ. The average values of urine pH tend to decrease and associated with reduction of pH values of rumen content. In figure 1, the linear regression evidenced attachment and dependence of these two factors. The data obtained for urine pH indicator are confirmed statistically (P> 0.005). Among the pH of urine and pH of rumen content seems to have strength correlative relation (r = 0.403) and positive character.

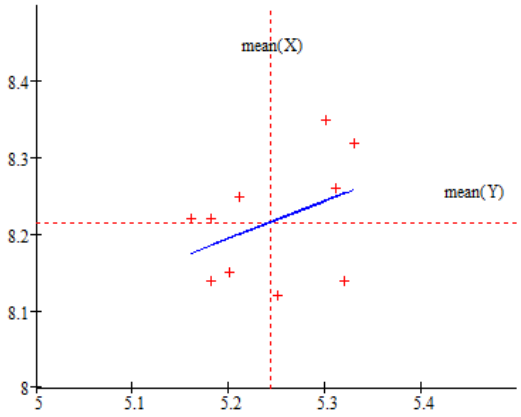


Figure 1: *The relation of dependency between urine pH and pH of rumen content in cows.*

r = 0.403

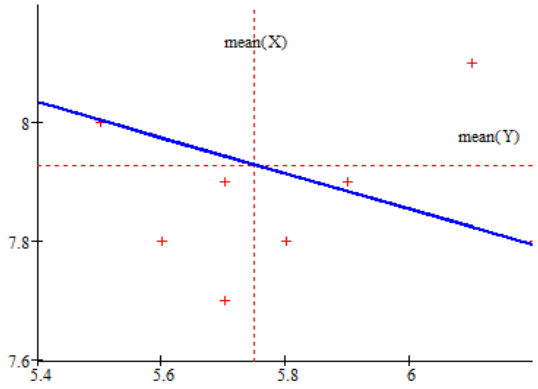
pH $_{(urine)}$ = 5.662 + (0.487 x pH $_{(rumen)}$).

The trend of declining pH of urine in animals with low pH of rumen contents are reported by other researchers, *Gianesella M. (2012)* and *Kleen J.L. et al. (2003).*

The data obtained from clinical evaluation of changes in the structure and physical qualities of faecal are given in tables 4 and 5. Changes in the number of rumen contractions in cows for 5 minutes by groups are determined statistically (P> 0:05). The data obtained showed that the average value of rumen contractions in animals show a tendency to grow with decrease the value of the rumen pH contents, but not below the value of 5.2.

Table 4: *Minimum, maximum and average values of animal rumen contractions in the study, by groups and lactation period.*

Lactation period	Healthy animals		Risk animals		SARA animals	
	Min - Max	Average	Min – Max	Average	Min - Max	Average
Early lact	6.56 – 8.82	**7.69 ± 1.13**	7.11 – 9.53	**8.32 ± 1.21**	7.37 – 9.75	**8.51 ± 1.24**
Mid-lact	6.62 – 7.82	7.71 ± 1.1	7.18 - . 9.50	8.34 ± 1.16	7..40 - 9.84	8.62 ± 1.22



Our data are comparable with data of other authors, *M. Gianesella (2012).* The trend of dependency by rumen contractions from pH values of rumen content provided are shown in figure 2 of the linear regression.

Figure 2: *The relation of dependency between contractions and pH of rumen content in cows.*

r = - 0.329

Contration.(rumen) = 9.65 + [- 0.299 x pH(rumen)]

Among the indicators of rumen contractions and rumen pH content (up to values higher than 5.2) seems weak correlative relation (r = - 0.329) and negative character. The scoring faecal physical qualities, to form, consistency, presence of gas and insoluble fibers, influenced by SARA condition, was conducted according to the recommendations of *Berberi P. et al. (2005)* and studies of *Kleen J.L. et al. (2003)* and *Hughes J. (2001).* The data obtained are given in table 5. At the end of the physical assessment of faecal, SARA was found that had an impact on the final indicators, consistency, presence of gas bubbles and the presence of undigested food fibers. Faeces changed consistently, but shape half rolls (valued at 3 points) were common in the group of healthy animals. In animals with SARA condition, change shape and consistently without half circles (valued at 2 points).

Table 5. *Clinical indicators of faecal quality, influenced by SARA condition.*

Indicators assessed	Evaluation of faecal-point, according to animal groups		
	Healthy animals	SARA animals	
		Early lactation (days 3 – 30)	In mid lactation (days 91 – 120)
Faecal form and consistency	Half liquid with half circles (3 points)	Half liquid without half circles (2 points)	Half liquid without half circles (2 points)
Gas presence in faeces	Without gas	Rare bubbles (2 point)	Rare bubbles (3 pikë)
Presence of undigested fiber in faeces.	Without presence of undigested fiber in faeces.	Rare undigested particle (1 points)	Rare presence of undigested particle (2 points)

Gas bubbles were absent in healthy animal faecal and were present (rated 3 points) in faecal of cows with SARA condition. Fiber from undigested food particles were not found in the faecal of healthy cows and faecal in cows with SARA were in diameter 3 - 5 cm. In our opinion the change of properties and structure of the faecal in cows were affected by pH of rumen content. Such changes were present in faecal of cows with SARA condition at any stage of lactation. Impact of rumen pH content on the physical properties and structure of faecal is published by other authors, *Underwood (1992)* and *Enemark J.M. et al. (2002).*

Discussion

Frequency of SARA condition in our study, 87 cows from 27.58 % (32.6 % of cows in the early lactation and 21.95 % in mid-lactation), is close to reports of other authors. *Garrett E.F. et al. (1999)* found the presence of SARA condition in 32.1 % of cows in early lactation (3 - 30 days lactation) and in 26.3 % of cows in mid-lactation (90 - 120 days lactation). Indicator affected by SARA condition in cows was the pH of the urine. Such fact has found by *Oetzel G.R. (2005,*

2003). In our study, we found significant differences in the number of rumen contractions affected by SARA condition (8.51 ruminal movement in 5 minutes versus 7.69). Change in number of rumen movements as a clinical sign of SARA in cow is proven by *Underwood W.J. (1992)* and *Enemark J.M. et al. (2002)*. Findings disorders of form, consistency and faecal structure, perhaps not entirely dictated by the SARA condition. Considering the fact that SARA condition is episodic and often transitory condition, without significant clinical signs obvious, we think that dictated changes in the quality and structure of faecal be caused by more serious disorders of rumen than SARA condition, *Underwood W.J. (1992)*. Based on our survey data, we estimate that the pH of the urine, rumen contractions and with them faecal physical qualities, may be used for indirect identification of SARA condition in cows.

Conclusions

1. Subacute rumen acidosis (SARA) is a problem present in our cows farm. The degree of vulnerability varies from 21.9 % to 32.6 %, regardless of the nature of nutrition and lactation period.
2. In cows suffering from SARA condition, identified deviations in the values of pH of urine. By reducing pH of rumen contents the urine pH lows. Among the indicators has correlative related hardness, positive character (r = 0403).
3. SARA condition affects the strength and number of rumen movements. In cows with SARA condition increases the number of rumen contractions, but reduced the strength of their performance. Among indicators has correlative related, negative character (r = - 0.329).
4. Urine pH indicator and rumen contractions, together can be used for early diagnosis of SARA condition in cow.
5. Changes in form, consistency and structure of faecal affected by pH values of rumen content can and should be used as a clinical finding aids for ascertaining the presence of SARA condition in cow.

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