INTRODUCTION

Hyperketonemia is frequently detected in high-yielding postparturient dairy cows resulting in elevated acetone concentrations in blood, urine and milk.

At the Clinic for Ruminants in Ljubljana the simple semiquantitative O'Moore's method has been used for several years to detect acetone in milk of individual cows. Milk proved as a useful biological material for the detection of acetonemic dairy cows. With the MLP-test (2) we have begun to determine weekly variations in the bulk tank milk samples' composition. Analyses included also acetone content. A regular weekly control of the milk yield composition of the whole herd can be thus accomplished. A possible positive response to the acetone content gives warning to the breeder or the veterinarian of one or more hyperketonemic dairy cows within herd.

MATERIAL AND METHODS

The research has been based on a 12-months lasting monitoring of acetone content in the bulk tank milk samples on 10 farms with 305 animals. The samples were analyzed on a weekly basis with the O'Moore's method. Thus 624 weekly examinations of bulk milk have been carried out. The farms have been divided into 3 groups regarding breeding and feeding management (Table 1).

Table 1: Distribution of farms regarding feeding and breeding management

<table>
<thead>
<tr>
<th>1. group</th>
<th>2. group</th>
<th>3. group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers of farms</td>
<td>Numbers of farms</td>
<td>Numbers of farms</td>
</tr>
<tr>
<td>1 in 10</td>
<td>2,4,5,7,9</td>
<td>3, 6 in 8</td>
</tr>
<tr>
<td>summer</td>
<td>winter</td>
<td>summer</td>
</tr>
<tr>
<td>pasture</td>
<td>stall rearing</td>
<td>pasture*</td>
</tr>
<tr>
<td>Black Pied 100%</td>
<td>Black Pied 95% Simmental 5%</td>
<td>milking parlour</td>
</tr>
<tr>
<td>K1&gt;50%,T2,S3,KO4</td>
<td>K1,T2&gt;50%,S3,KO4</td>
<td>K1&gt;50%,T2,S3,KO4</td>
</tr>
</tbody>
</table>

1= maize silage
2= grass silage
3= hay
4= concentrates
*= fresh grass

By the milk analyses on acetone content and with Chi² test we have investigated the frequency of acetone incidence with regard to farms and season. All data are statistically processed with the Statistical Package for the Social Sciences.

RESULTS AND DISCUSSION

Bulk tank milk samples, the results of the examinations respectively, have been divided according to the acetone content into 3 groups:

1. negative response (neg.) = 0,0 mmol/l
2. slightly positive response (+) = up to 0,15 mmol/l
3. positive response (+) = 0,17 - 0,41 mmol/l
With the statistical method using Chi² no significant differences (P=0.1865) have been established among farms and the frequency of acetone content in bulk tank milk samples. The results are presented in Graph 1. It is of interest that the results have been statistically insignificant, though farms differentiate regarding feeding and breeding management practices. When tackling the problem of ketosis in herds it should be taken into consideration that numerous factors are responsible for the incidence of the disease what has been confirmed by other authors as well (3,4).

Graph 2: Frequency of acetone incidence in bulk tank milk samples with regard to season

With the method of Chi² test we have established a statistically (P<0.001) more frequent acetone incidence in bulk milk samples during the winter season than in the summer. We believe that the frequency of hyperketonemia occurring during winter is caused by a number of factors, e.g. energy and protein intake before and after partruition, breeding management, feeding qualitative silage with low butyric acid content as well as frequency of partrutions during a season. The importance of seasonal effects on acetone incidence in milk has been described by several authors (5,6), however, there have been no reports from ANDERSSON and LUNDSTRÖM (7).

Weekly analyses of bulk milk samples have shown a rather frequent weak positive response (q). A quick detection of such cows was achieved by means of regular monthly individual milk controls. Acetone
discharge has been mainly ascertained with postparturient cows calving between two monthly milk controls.
For the detection of such dairy cows the evaluation of acetone content in bulk milk on a weekly basis is especially recommended because the control of the herd is thus carried out more often. Monthly milk analysis on acetone content is not frequent enough what has been stated also by EMANUELSON et al. (2). ANDERSSON and LUNDSTROM (8) have established a high recurrence and insignificant diurnal variations of acetone in milk which is favorable for routine practices.

Table 2: Share of acetonemic dairy cows with regard to total amount of milk in the tank

<table>
<thead>
<tr>
<th>Yield milk in bulk tank</th>
<th>No. of milking cows</th>
<th>Moore, reaction</th>
<th>Acetonemic cows</th>
<th>No. of cows</th>
<th>Yield milk (l)</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>210 l</td>
<td>14</td>
<td>±</td>
<td>21,0 l</td>
<td>19,2 l</td>
<td>30,8</td>
<td>++</td>
</tr>
<tr>
<td>26,0 l</td>
<td>19</td>
<td>±</td>
<td>29,0 l</td>
<td>23,0 l</td>
<td>15,0</td>
<td>+</td>
</tr>
<tr>
<td>29,7 l</td>
<td>27</td>
<td>±</td>
<td>16,7 l</td>
<td>30,7 l</td>
<td>8,4</td>
<td>±</td>
</tr>
<tr>
<td>430 l</td>
<td>23</td>
<td>±</td>
<td>1</td>
<td></td>
<td>7,0</td>
<td>±</td>
</tr>
</tbody>
</table>

Table 2 presents some cases when the response of milk to the acetone in the bulk was slightly positive, though the breeders have never reported on any health problems among dairy cows. Only upon our warning that in the bulk a weak positive response has been detected, have they mentioned inappetence and loss of weight among some animals within the herd.

Further, we have found out that the correlation between milk yield of all dairy cows and contribution of milk to the bulk by hyperketonemic cow/cows affects the positive response which is on the other hand affected also by the acetone level in bulk discharged by dairy cows via milk.

In the bulk of one of the farms very weak positive response was encountered last January through several weeks. The monthly milk control revealed in all dairy cows, with the exception of the two, a weak positive response. A low acetone concentration in milk, showing a weak positive response among the majority of dairy cows could result also from feeding on unsuitable silage with high butyric acid concentrations turning after resorption from rumen into beta-hydroxibutyrate and resulting in elevated ketone/acetone content in milk, urine and blood. The same findings have been reported by HUHTANEN et al. (9), ANDERSSON and LUNDSTRÖM (10).

REFERENCES

SUMMARY

The acetone content in bulk tank milk samples has been ascertained through 12 months on a weekly basis among 305 dairy cows from 10 farms. The samples were daily examined for acetone content with O'Moor's method. 624 examinations were done with the aim of early detection of acetonemic dairy cows. Frequency of acetone incidence with regard to farms and season has been researched. We have established that differences among farms did not significantly affect the acetone content in the bulk, while seasonal effects proved statistically significant. In the tank with over 7% milk of acetonemic cows the result of the bulk sample was slightly positive with regard to the acetone content. Thus the weekly control of bulk samples proved as a successful method for the detection of acetonemic dairy cows.

ZUSAMMENFASSUNG

DER AZETONGEHALT IN DER ANLIEFERUNGSMILCH


LA CONCENTRACIONE DI ACETONE NEI CAMPIONI DI LATTE DI STALLA DA CISTERNA

RIASSUNTO

La presenza di acetone nei campioni di latte di stalla da cisterna era controllata presso 305 lattifere su 10 poderi dodici mesi, una volta per settimana. Ogni settimana i campioni erano esaminati sull'acetone con il metodo di O'Moore. A questo modo sono state eseguite 624 indagini con 10 scopo di scoprire di buon ora le lattifere acetonemiche. Nella cisterna contenente più 7% di latte proveniente dalle lattifere acetonemiche il risultato del campione di stalla era delicatamente positivo sul contenuto di acetone. Il controllo settimanale degli esami del latte dalla cisterna così e stato trovato come un metodo efficace nel scoprire le vacche lattifere acetonemiche.