

8. Summary

Investigation for the practical use of anionic rations to prevent hypocalcemia in dairy herds.

The aim of this study was to find a solution how to value the effect of anionic rations with herd data and to make the use of anions safer. The first part of the study shows the examinations about the practical use of the measurement of urine pH to value the effects of anions on the acid-base status. For that purpose, samples of urine were taken for eight weeks from the two weeks prepartum cows of two different farms. The pH was measured with an electrical pH-meter in the cowshed and with pH-stripes directly after the milking. Apart from that, the urine was frozen and after defrosting measured with an electrical pH-meter in the lab. The measurement of the pH by pH-stripes showed nearly the same results than the measurement of the urine pH by electrical pH-meter directly after the milking. After defrosting the urine, the results of the urine pH were slightly increased.

Within the scope of herd management fifty farms were visited and some of them more than one time. Blood and urine samples were taken from close up dry cows and recently calved cows. The ration of the close up dry cows was analysed. Ten single samples of blood and urine were necessary to produce a pool sample. The values of the pool samples of urine pH, net acid-base excretion and urine calcium excretion were compared with the mean values of the single samples. There were high correlations between the pool and the mean values for each of the parameters. Because of that, the pool and the mean values have nearly the same content of information.

The analyses of the rations from 2002 to 2004 contain the DCP and the amount of potassium, sodium, chloride and sulphur. Herds with and without anionic rations were compared. The analysis of the feed of herds with anionic rations showed a lower DCP and a higher amount of sulphur in all of the three years. But the recommendations of the NRC were not achieved. That is an indication that not enough anionic salts were used refer to the rations content.

To examine the influence of more factors of the ration on the effect of the anions the urine pH, the net acid-base excretion and the urine calcium excretion were compared with the parameters of the rations. The effect of reducing the DCP and the amount of potassium as well as the effect of increasing the amount of calcium and sulphur in the ration is a mild acidosis and an increased urine calcium excretion. These are the effects of the anions. Within feeding anions there should be a shift of the major elements.

This leads to a decreased dcad and to the metabolic effects as described. The same effects on the acid-base status and the urine calcium excretion were observed by feeding an increased amount of starch and a decreased amount of crude fibre. This could simulate the effect of anionic rations. The parameters of the energy concentration in the rations have a slight correlation with the parameters of the acid-base status. At low amounts of energy there is an acidotic stress of the animals. This has to be avoided when farmers use anionic rations because it could raise the effect on the acid-base status and provoke a clinical acidosis with its negative results. The crude ash and the amount of salt showed the same effects as described for the dcad. The crude ash as a characteristic number for the major elements contains a certain degree of the amount of anions.

The comparison of farms with or without anionic rations includes the rations analysis, the acid-base status, the major elements and some metabolic parameters from close up dry cows and from recently calved cows. Farms with anionic rations had a lower dcad and a lower amount of potassium as well as higher amounts of sulphur and calcium in their rations. This result in a mild metabolic acidosis above all reflected in the urine parameters of the cows two weeks prepartum. Besides the urine calcium excretion of the close up dry cows were increased, so that a heighten calcium homeostasis can be assumed. The closer inspection showed that the recommended values for the rations and the metabolic parameters are not achieved. So the farms feeding anionic rations were divided into farms with or without an effect of the anions. This was attempted by the statement of the farmers about the incidence of milk fever. But there were no useable results. The assessment of the effect of the anions seemed to be difficult for the most farmers because the most farmers don't list the diseases in their herd. However the incidence of diseases is useful for the assessment of the state of health of the herd and the effect of the anionic ration. Moreover the farms were divided on the basis of the urine ph and the urine calcium excretion. The farms with an effect of the anions showed a lower dcad. There should be a dcad between 0 – 50 meq/kg DM in the ration of close up dry cows. Because of the classification by the urine ph was a reduction of the parameters of the acid-base status in the group with an effect of the anions expected. The net acid-base excretion was in the recommended area. The recently calved cows in farms with an effect of anions showed lower values of the parameters of the acid-base status.

A high dcad and a high amount of potassium as well as a low amount of calcium and sulphur in the rations were considered as sources of errors. The nutrient recommendations of the NRC were unsuitable for the classification of the farms sufficient or insufficient nutrient amount because the recommended values were not achieved.

So the values of the dcad, the amount of potassium and the amount of calcium were taken from the group of farms with an effect of anions. After this classification the ration analysis as well as the urine ph, the net acid-base excretion and the urine calcium excretion were studied. With sufficient amounts of the rations contents the urine parameter were optimized. To optimize the ration you have to give special attention to the amount of potassium and sulphur. The main target by using anionic rations is to optimize the dcad.

Finally there were three farms described. Two farms sprinkled the anions over the ration and mixed it with a pitchfork. The urine ph, the net acid-base excretion and the urine calcium excretion were measured over eight weeks. In both farms is a great variation of the values conspicuous. For this could be a varying feed intake or an individual reaction of each cow responsible. This also explained the farmers report about a failure or sudden death by using anionic rations. The third farm started using anionic rations. After optimizing the ration the farm uses the anions with success. The close up dry cow ration had an amount of sulphur over the recommended 0,4% without any negative effect at the animals. By using high quality food and a well calculated ration the toxic effects of sulphur can be tolerated.

The use of anionic rations needs a very good management. The amount of anions as well as the ration should be optimal calculated. Also the check of the effect of the anions is essential. For this the acid-base status has to be controlled on the basis of urine ph and the net acid-base excretion. The calcium homeostasis has to be controlled on the basis of the urine calcium excretion. Additionally the ration has to be analysed regularly and the incidence of the diseases in the herd has to be listed. This study describes when and which analyse should be made and leads to a guidance to control the effect of anions. This makes the use of anionic rations safer.