Design Biologix
ANIMAL VACCINES MANUFACTURER

Use of Micromin B to prevent pre-calving subclinical trace mineral deficiencies in dairy cows

By Dr Angela Buys, chief operations officer, Design Biologix

Trace mineral status in animals may vary depending on physiological status, dietary source and interactions among dietary constituents. During the transition period, dairy cows undergo physiological stress while preparing for and recovering from parturition, which dramatically alters their metabolism to supply the mammary gland with nutrients necessary for milk synthesis.

Trace minerals play an important role in dairy cow immunological functions, antioxidant activity and overall heard health and fertility. A reduction in trace mineral retention can also occur in transition cows, which may lead to subclinical mineral deficiencies that are easily undetected, even in well-fed herds.

Supplementing trace minerals

Uptake of free choice trace mineral supplementation (feed and forage) may be poorly absorbed by cattle because of rumen antagonism and variable intake by individual animals. Supplementing trace minerals through injection independently from dry matter intake, offers a consistent trace mineral status. The use of injectable multi-minerals at strategic stages of the production cycle of a dairy cow, could potentially provide an alternative method for supplementation of trace minerals and improvement of the performance of deficient and marginally deficient cows.

In dairy cattle, mineral supplementation may have beneficial effects on many parameters critical to the lactation cycle of cows such as milk yield, milk quality, weight gain and udder health. Mastitis in lactating cows is generally considered an expensive disease. The cells found in milk consist of around 75% white blood cells or leucocytes (including macrophages, lymphocytes and neutrophils) and around 25% epithelial cells. Somatic cell counts (SCC) increase in response to bacterial infection, tissue injury and stress. Ensuring adequate trace mineral availability could be a potential strategy to manage SCC.

In this study, we aimed to motivate the use of injectable multi-minerals in dairy cattle with specific focus on the use of Micromin B (Design Biologix cc). Micromin B is indicated for the supplementation of trace minerals to correct coexisting clinical or subclinical deficiencies of selenium, copper, manganese, chromium and zinc, commonly found during critical growth and production stages in cattle. Performance parameters in a selected dairy herd were evaluated based on bodyweight profiles and body condition scores before and after parturition and milk yield, and quality after parturition.

Materials and methods

A total number of 81 primiparous Jersey and Friesian heifers and cows in various lactation numbers were identified. The animals were randomly grouped into two groups in such a way, that each group represented cows in all five lactations. A comparative study was done by comparing the performance of Micromin B to a similar commercial product (control) to measure the performance of Micromin B in dairy herds as part of their health programme.

Cows were identified 25 days before calving, at which stage they received their first dose of the test items. A second administration was given to each cow four weeks post-partum. *Table 1* illustrates the experimental design.

Results

Raw data for the various parameters measured during the days in milk were summarised between and within lactation groups. The null hypothesis for this analysis is accepted when the distributions of any two groups compared give the same distribution of scores. Each set of comparisons between groups are illustrated in *Table 2*.

Average daily milk yield over a total lactation period of 44 days was compared between groups. The difference (two-tailed P-value) between the control group and Micromin B was statistically significant (t = 1,98; P = 1,6E-32). Micromin B performed better over the total days in milk with an evaluation period average of 25,11 liters compared to 22,86 liters for the control group over the same number of days – a difference of almost 10%.

Total lactation yields between groups were compared. The difference (two-tailed P-value) between control and Micromin B was statistically significant (t = 2,776; P = 0,007). Micromin B performed significantly better over 44 days in milk evaluated with 1 028,8 ± 38,28 litres compared to the control group of 875,3 ± 39,28 litres over the same evaluation period – again, a difference of almost 18%.

Lastly, the somatic cell counts between groups for samples taken at day 44 in

Table 1: Summary of experimental design indicating group numbers, test items, group sizes and dosages evaluated.

Group	n	Lactation 1 (n)	Lactation 2 (n)	Lactation 3 (n)	Lactation 4 (n)	Lactation 5 (n)	Dose
[a]Control	39	9	6	11	6	7	As per instructions
[b]Micromin B	42	11	11	7	6	5	1ml per 100kg subcutaneously

[a] Composition: zinc 40mg, manganese 10mg, selenium 5mg, copper 15mg, chromium 5mg.

[b] Composition: zinc 40mg, manganese 10mg, selenium 5mg, copper 7,5mg, chromium 5mg.

Table 2: Summary of the measured parameters across all groups over 44 days in milk.

	Treatment		% Higher or lower than control
Variable	**Control**	**Micromin B**	
Total milk yield (44 days)	**875,3 ± 39,28**	**1028,8 ± 38,28**	**18%**
Average daily milk yield (ℓ)	**22,86 ± 1,47**	**25,11 ± 1,95**	**10%**
Lactation 1	18,77 ± 1,41	19,40 ± 1,02	3%
Lactation 2	21,78 ± 1,68	22,59 ± 1,12	4%
Lactation 3	24,18 ± 1,21	25,87 ± 1,84	7%
Lactation 4	28,00 ± 1,45	30,34 ± 2,60	8%
Lactation 5	21,55 ± 1,61	27,34 ± 3,15	27%
Average SCC (x 10^3 cells/mℓ)	**314,59 ± 158,97**	**88,35 ± 39,28**	**-28%**
Lactation 1	211,89 ± 113,47	104,21 ± 32,88	-49%
Lactation 2	121,32 ± 52,99	74,45 ± 26,90	-61%
Lactation 3	136,14 ± 39,98	93,86 ± 39,17	-69%
Lactation 4	353,00 ± 156,69	64,02 ± 32,51	-18%
Lactation 5	750,58 ± 431,73	105,2 ± 64,94	-14%

lactation were compared. The difference (two-tailed P-value) between control and Micromin B treated cows was statistically significant (t = 1,859; P = 0,044). The average SCC reported for the control group was 314,59 ± 158,97 with fifth-lactation cows showing the highest SCC (750,58 ± 431,73) between subgroups. Micromin B treated cows had an average count of 88,35 ± 39,28 with fifth-lactation cows showing the highest SCC (105,2 ± 64,94) between subgroups.

Discussion

Micromin B treated cows showed a significant increase in average daily milk yield, total milk yield and reduction in SCC over a 44-day evaluation period in comparison with the control group. Body score condition and milk quality represented by total fat (%), protein (%), lactose (%) and milk urea (ppm/ℓ) were evaluated (data not shown). No statistical differences were observed between groups.

Current data were collected over a short period and cows had not yet reached the peak in their lactation cycle. However, preliminary data show that the use of Micromin B at the current recommended 1mℓ per 100kg dosage in pregnant cows one month before and after parturition, may have a statistically beneficial effect on milk yield (volume), milk quality and udder health.

For more information, email the author at angela@designbio.co.za.