

RESEARCH SUMMARY

MULTIMIN[®] AND CALF IMMUNITY



Virbac

KEEP OUT OF REACH OF CHILDREN
FOR ANIMAL TREATMENT ONLY

MULTIMIN[®]

An injectable supplemental source of zinc, manganese, copper and selenium providing the minerals zinc, copper and manganese in a chelated form for cattle and deer.

500 ml



MULTIMIN® AND CALF IMMUNITY

There is increasing awareness of the complex roles trace elements play in the immune system, and the potential to improve immunity through supplementation prior to periods of high challenge and trace element demand. This Research Summary covers three recent studies on the use of MULTIMIN® to improve immune responses in dairy calves.

STUDY ONE:

Bates, A., Wells, M., Laven, RA., Simpson, M. (2019).

Reduction in morbidity and mortality of dairy calves from an injectable trace mineral supplement.

Veterinary Record, Published Online First: 25 April 2019.

doi: [10.1136/vr.105082](https://doi.org/10.1136/vr.105082).

↓52%

REDUCTION IN MORBIDITY

↓58%

REDUCTION IN MORTALITY

This study was conducted in four herds in South Canterbury in the spring of 2017. All herds enrolled in the study were fully supplemented with trace elements and had liver and blood tests during the dry period confirming that levels were within normal reference ranges.

From the start of calving, 971 calves were randomly allocated to a treatment group that received MULTIMIN® at birth and/or day 35 and/or day 70, or an untreated group. The design allowed for comparison between treatment and no treatment, but also between the different options of timing. Calves were weighed regularly, and disease and death events were recorded by farmers.

There was no significant increase in weight gain in treated animals. There were highly significant ($p < 0.001$) reductions in morbidity and mortality for all disease categories (scours, navel ill and neonatal death/disease) after all treatments. In each case death and disease was approximately halved in the weeks after birth, day 35 and day 70. However, the greatest impact was from the injection at birth, as the highest morbidity and mortality occurred in the 3-35 day period (morbidity reduced from 15.6% to 7.5%, mortality reduced from 10.4% to 4.4%).

The mechanisms behind the large effects seen in this study can only be speculated on, although the findings of both the other studies reviewed in this document provide some potential explanation.



STUDY TWO:

Teixeira G V, Lima FS, Bicalho MLS, Kussler A, Lima SF, Felipe MJ, Bicalho RC (2014).

Effect of an injectable trace mineral supplement containing selenium, copper, zinc, and manganese on immunity, health, and growth of dairy calves.

Journal of Dairy Science 97, 4216–26.
doi:10.3168/jds.2013-7625.

▲ 20%

HIGHER GSHPX BY DAY 14

▲ 11%

MORE BACTERIAL INGESTION
BY NEUTROPHILS

Conducted through Cornell University, this study looked at the effects of injections with MULTIMIN® in 790 animals at 3 days of age, and again at 30 days.

Blood samples were collected to evaluate glutathione peroxidase (GSHPx) activity, superoxide dismutase (SOD) activity, haptoglobin, neutrophil and monocyte function. The incidence of disease and average daily gain was also measured over the first 50 days of life.

At 14 days of age, MULTIMIN® treated calves had increased neutrophil function compared to the control calves. The neutrophils of treated calves ingested greater numbers of bacteria compared to the control group ($P=0.03$) and the percentage of neutrophils that performed phagocytosis tended to be higher ($P=0.08$). GSHPx activity was also greater in MULTIMIN® treated calves compared to control calves 14 days after birth, suggesting treatment contributed positively to the antioxidant status of these animals.

Treated animals had significantly less diarrhoea (41.7% vs 49.7%, $p = 0.03$), and the combined incidence of pneumonia and otitis was lower in the MULTIMIN® group. However, weight gain did not differ between the groups.

In comparison with Bates et. al, the reduction in morbidity is relatively small, and effects on mortality were not significant. Potential explanations for this are the different management of the North American calf-rearing systems (individual stalls), and the likely different pathogens in calf sheds (otitis and pneumonia are symptoms of *Mycoplasma bovis*). The delay of first supplementation to 3 days rather than within 24 hours of birth may also have reduced the effectiveness of the initial treatment.

STUDY THREE:

^50%

HIGHER SEROCONVERSION
TO BVD BY DAY 28

>>14^{DAYS}

EARLIER PROLIFERATION
OF WBCS

R.A. Palomares, D.J. Hurley, J.H.J. Bittar, J.T. Saliki, A.R. Woolums, F. Moliere, L.J. Havenga, N.A. Norton, S.J. Clifton, A.B. Sigmund, C.E. Barber, M.J. Clark, M.A. Frattoa (2016).

Effects of injectable trace minerals on humoral and cell-mediated immune responses to Bovine viral diarrhoea virus, Bovine herpes virus 1 and Bovine respiratory syncytial virus following administration of a modified-live virus vaccine in dairy calves.

Veterinary Immunology and Immunopathology 178 (2016) 88-98.

Thirty dairy calves on a farm in Georgia, USA were vaccinated with multivalent live viral and bacterial respiratory vaccines at 14 weeks of age, and boosted three weeks later. Half were given a simultaneous injection of MULTIMIN®* at the time of both vaccinations. Antibody production, interferon gamma (IFN-γ) and white blood cell (WBC) proliferation were compared between groups.

Treated calves had significantly enhanced IFN-γ production, WBCs that responded more rapidly and effectively to antigen stimulation and increased antibody production against BVD virus.

This study found benefits for both humoral and cell-mediated immunity, and in conjunction with Teixeira et. al (Study Two) provides some insight into the effects of trace elements on immunity.

Based on these studies, it appears that there are multiple factors which might explain the clinical effects seen in Bates et.al (Study One), ranging from enhanced antioxidant activity to improved antibody production, WBC activity and immune system signalling via interferons.

Further work to confirm these mechanisms in New Zealand conditions has been completed and is also planned for publication.

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of animal health**