

GET YOUR CATTLE PERFORMANCE READY WITH MULTIMIN



**PROMOTING A HEALTHY
IMMUNE SYSTEM IN BEEF CATTLE**

Shaping the future of animal health

Virbac

BOOSTING THE IMMUNE SYSTEM

Pathogens, including bacteria, viruses or other microbial agents, can cause a wide range of economically-significant diseases in cattle. These include bovine ephemeral fever (three day sickness), calf scours, clostridial infections (e.g. blackleg, pulpy kidney, black disease, botulism and tetanus), pestivirus (BVDV), mastitis, pinkeye, leptosporosis, tick fever, theileriosis and vibriosis.¹

Combined, these diseases cost Australian beef producers more than \$290 million in lost productivity and treatment costs every year.¹ Other multifactorial diseases, such as calf mortality and internal parasites that also involve the immune system, cost the industry an additional \$190 million.¹

The immune system helps to keep the body safe from pathogens. It comprises three components that work synergistically to repel disease-causing pathogens:

- 1. Physical barriers.** The skin, hooves and the mucous lining of the respiratory and gastrointestinal systems are the first lines of defence against pathogens. Any damage to these physical barriers may allow pathogens to enter the bloodstream.
- 2. Non-specific (or inflammatory) immune response.** The immune system mounts a rapid, non-specific inflammatory response if pathogens are detected in the bloodstream. Non-specific immune cells, assisted by antibacterial or antiviral proteins in the blood, locate and destroy a wide variety of pathogens.
- 3. Specific (or adaptive) immune response.** If the body has previously been exposed to specific pathogens via vaccination or disease, the immune system may 'recognise' certain parts of the pathogen and create antibodies specifically designed to attack them. These antibodies are carried by white blood cells known as lymphocytes.

- **Clinical disease can cause obvious signs of sickness or even death.**
- **Even sub-clinical (non-visible) disease can still cause significant production losses via reduced weight gain, fertility or milk yield.**
- **Any compromise to the immune system caused by poor nutrition, environmental conditions or physiological stresses increases the animal's risk of disease.**

IMMUNE FUNCTION CAN BE BOOSTED BY:

- 1. Genetic Improvements**
- 2. High quality colostrum to newborns**
- 3. Correct use of vaccines**
- 4. Reducing stress and protecting overall health**
- 5. Good nutrition (especially adequate protein and optimised trace minerals)**



MULTIMIN GETS YOUR CATTLE PERFORMANCE READY

One of the easiest ways to boost the immune system is to ensure weaners receive a rapidly absorbed top up of trace minerals. Often, milk or pastures do not provide sufficient levels of these essential minerals during periods of 'high demand', such as weaning. Furthermore, oral supplements can take months to increase trace mineral status.

Multimin is a unique trace mineral injection that contains chelated forms of the essential minerals, copper, manganese, selenium and zinc. Applied at weaning and four weeks before other 'high demand' periods, such as joining, calving, drying-off or sale, Multimin is scientifically proven to improve reproductive performance and immune function in beef cattle.^{3,9-17} Multimin has also been shown to be beneficial for use before the stress of transport and/or feedlot induction.²

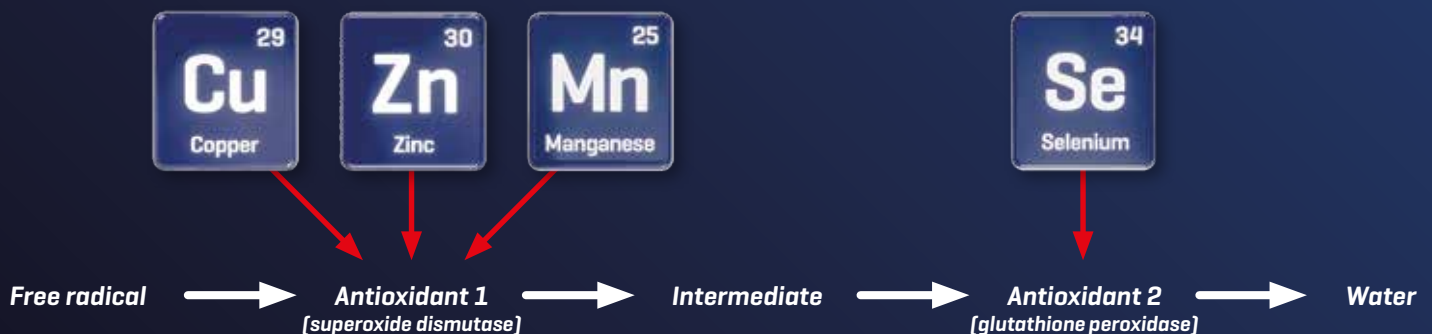
- **Boosts availability of essential trace minerals in 'high demand' periods**
- **Absorbed into the blood within 8 hours and the liver within 24 hours³**
- **Prolonged antioxidant action for months⁴**
- **Balanced, chelated and tissue-friendly formulation⁵**
- **Nil milk and meat WHP and ESI**
- **Can be used up to nine months after opening**

4 ESSENTIAL TRACE MINERALS TO INCREASE ANTIOXIDANT LEVELS



Normal bodily processes, such as metabolism, ovulation, pregnancy or fighting disease, produce 'free radicals'. These unbalanced molecules cause chemical reactions that may damage cells. Antioxidants are substances that neutralise free radicals. A rapidly absorbed top up of the four trace minerals found in Multimin can quickly

synthesise the two antioxidants needed to protect the body's reproductive and immune systems. These four trace minerals also provide essential nutrients for the same systems. Multimin is absorbed into the bloodstream within eight hours and the liver by 24 hours, and provides prolonged antioxidant action for several months.^{3,4}



Trace minerals in Multimin are needed for the synthesis of antioxidants that neutralise harmful free radicals into harmless water.

MULTIMIN SUPPORTS ALL THREE PARTS OF THE IMMUNE SYSTEM

In combination with good animal husbandry, including vaccination and nutrition, Multimin makes your herd 'performance ready' by strengthening all three parts of the immune system. Multimin increases the production of antioxidants, which protects the physical barrier, specific immune cells, and non-specific immune cells from 'free radicals', which are produced during disease challenge.

Multimin also has the following benefits on the immune system:

1. Multimin provides a direct source of nutrients used to maintain the health of the physical barrier [skin, hoof and the mucous linings of the respiratory/gastrointestinal system]. Supplementation with zinc and copper has been shown to protect against skin and hoof disease.^{6,7}

2. Multimin provides a direct source of nutrients for non-specific immune cells, such as macrophages.^{6,8} For example, supplementation with selenium has been shown to increase the ability of immune cells to kill mastitis germs in cattle.⁹

3. Activation of the specific immune system requires a high input of trace minerals. For example, each time an animal is vaccinated, large amounts of copper, zinc, selenium, and manganese are used up to develop antibodies.⁶

MULTIMIN

FOR OPTIMAL

REDUCES SEVERITY OF DISEASE

Multimin has been scientifically proven to reduce the incidence or severity of economically-significant diseases in cattle:

- 8% reduction in calf scours¹⁰
- 7% reduction in pneumonia and otitis¹⁰
- 27% reduction in somatic cell count, with significant reductions at 3–5 months of lactation¹¹
- 5% reduction in clinical mastitis in mature cows¹¹
- 2% reduction in subclinical mastitis in all age groups¹¹
- 5% reduction in endometritis¹¹
- Reduced need for veterinary treatments [e.g. antibiotics]¹²

This is likely due to enhanced antioxidant status, which improves health.^{10,11} Maintaining health has a direct impact on survivability, growth rates and fertility.

Multimin can pay for itself with only a small improvement in survival rate across the herd. Multimin can also reduce the need for veterinary treatment [e.g. antibiotics] and increase protection beyond vaccination alone.^{13,14}

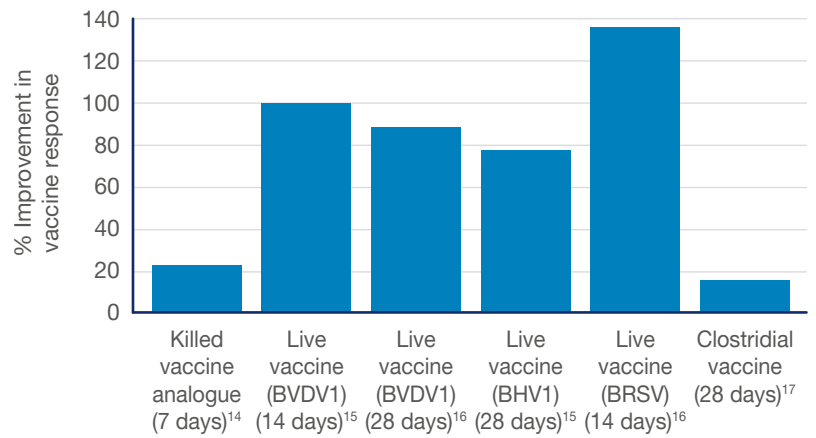
IMPROVES VACCINE RESPONSE

Australian and international studies have shown that administration of Multimin at the time of vaccination can improve an animal's response to most classes of vaccines, including the following:

- Modified live vaccines:
 - Bovine Herpesvirus [BHV1]¹⁵
 - Bovine viral diarrhoea virus [Pestivirus] [BVDV1]^{15,16}
 - Bovine Respiratory Syncytial Virus [BRSV]¹⁶
- Killed vaccine analogues¹⁴
- Clostridial vaccines¹⁷

In one study, Multimin halved the length of time required for a specific vaccine response from 56 days to 28 days.¹⁶

Effect of Multimin upon vaccine response¹⁴⁻¹⁷



FERTILITY, IMMUNITY AND PRODUCTIVITY



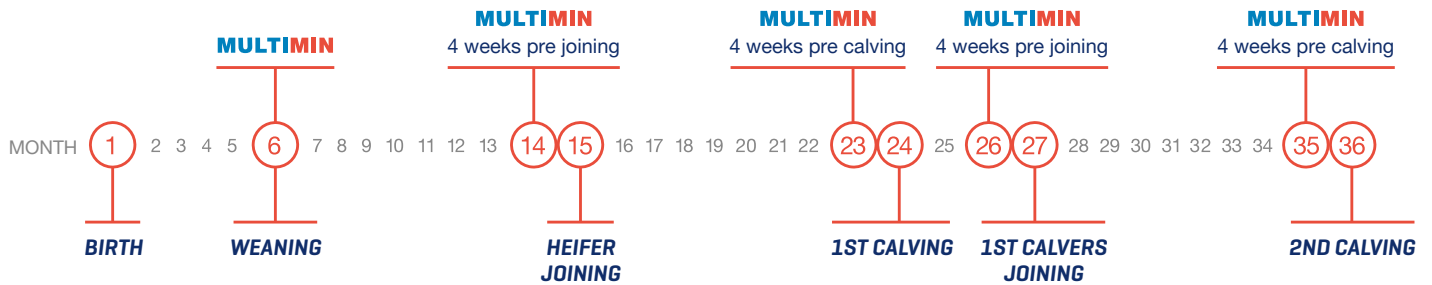
DOSAGE

Multimin is administered as a subcutaneous injection at 1 mL / 50 kg in young cattle (up to 12 months) and 1 mL / 75 kg in yearlings (1-2 years) and 1 mL / 100 kg in adult cattle (>2 years).

Age	Liveweight (kg)	Dose (mL)	Doses per pack (500 mL)
Up to 1 year	50	1	500
	75	1.5	333
	100	2	250
	125	2.5	200
	150	3	167
	175	3.5	143
	200	4	125
	225	4.5	111
	250	5	100
	275	5.5	91
	300	6	83
	325	6.5	77
	350	7	71
	375	7.5	67
	400	8	63
1 - 2 years	190	2.5	200
	225	3	167
	265	3.5	143
	300	4	125
	340	4.5	111
	375	5	100
	415	5.5	91
	450	6	83
	490	6.5	76
	525	7	71
From 2 years	400	4	125
	500	5	100
	600	6	83
	700	7	71
	800	8	63
	900	9	56
	1000	10	50

WHEN TO ADMINISTER MULTIMIN

Multimin should be administered at weaning and four weeks before 'high demand' periods to allow antioxidant levels to peak. Multimin should be administered to all breeding females four weeks before joining and calving and to bulls 12 weeks before joining. For best results, Multimin should be administered every year, regardless of seasonal conditions, and as part of an integrated nutrition and animal health program. Multimin can be administered in combination with other animal health products, including vaccines [e.g. Websters 5 in 1 B12] and parasite control products [e.g. Cydectin Injection].*



General advice only. Contact your Virbac representative for more specific information or to develop a customised program.

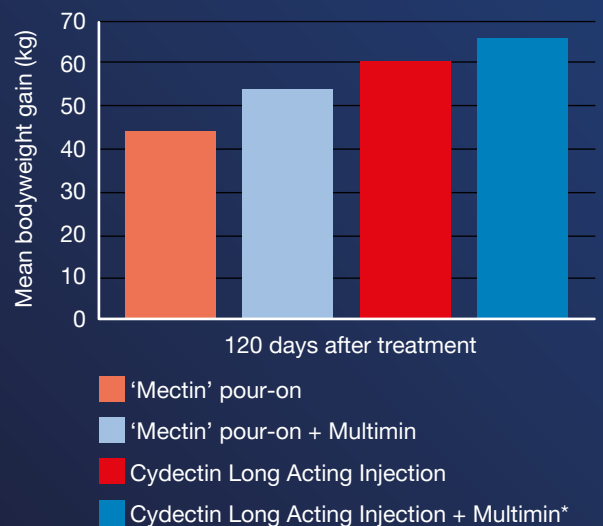
WITHHOLDING PERIODS

Milk Withholding Period:	NIL
Meat Withholding Period:	NIL
Export Slaughter Interval:	NOT REQUIRED

TEAM UP WITH CYDECTIN[®] LONG ACTING INJECTION!

Parasite burdens can have a significant impact on fertility in heifers and first-calf cows by suppressing appetite and competing for nutrients. An MLA-funded study showed that heifers treated with an effective drench were 60 kg heavier than untreated animals over a 12-month period.¹⁸ This study also found heifers treated with a long-acting moxidectin injection [i.e. Cydectin LA] were 22 kg heavier six months after treatment than the cattle treated with a short-acting 'mectin' pour-on.¹⁸ Another Australian study found the administration of Multimin and Cydectin Long Acting Injection increased weight gain by 51% [23 kg] 120 days after treatment compared to Angus heifers treated with a 'mectin' pour-on treatment only.¹⁹ Cydectin Long Acting Injection for Cattle provides persistent, broad spectrum control of internal parasites in cattle, including *Ostertagia*, *Cooperia* and *Trichostrongylus axei*. It also has persistent activity against a range of external parasites, including cattle tick and lice.

Effect of Multimin in combination with Cydectin Long Acting Injection upon growth rates¹⁹



*When used concurrently, Multimin should always be administered at a different injection site to other injectables.

GET YOUR CATTLE PERFORMANCE READY WITH MULTIMIN



- **Multimin is a unique trace mineral injection that makes your herd 'performance ready' by optimising fertility and immunity.^{3,9-17,20}**
- **Multimin enhances antioxidant systems to improve the health and performance of livestock.⁹**
- **Multimin improves all three parts of the immune system to make livestock 'performance ready'.^{3,9-17}**
- **Multimin is rapidly-absorbed, readily-utilised and provides prolonged antioxidant action to cover 'high demand' periods.^{8,9}**
- **Multimin is scientifically-proven to improve health and performance of livestock.^{3,9-17}**

For more information about how Multimin can improve the health and performance of your cattle, contact Virbac Customer Support 1800 242 100.

au.virbac.com

References: 1. Lane, J. *et al.* (2015). *Priority list of endemic diseases for the red meat industries*. Meat & Livestock Australia, B.AHE.0010. 2. Genther, O. & Hansen, S. (2014). Effect of dietary trace mineral supplementation and a multi-element trace mineral injection on shipping response and growth performance of beef cattle. *Journal of Animal Science*, 92(6): 2522–2530. 3. Hansen (2007). Iowa State University, Department of Animal Science.[^] 4. Machado, V. *et al.* (2014). The effect of injectable trace minerals (selenium, copper, zinc and manganese) on peripheral blood leucocyte activity and serum superoxide dismutase activity of lactating Holstein cows. *Vet. J.*, 200:299-304. 5. Arthington, J. & Havenga, L. (2012). Effect of injectable trace minerals on the humoral immune response to multivalent vaccine administration in beef calves. *J. Anim. Sci.*, 90:1966-1971.[^] 6. Suttle, N. (2010). *Mineral Nutrition of Livestock*, UK. 7. Xue-Jun, Z. *et al.* (2015). Effects of chelated Zn/ Cu/Mn on redox status, immune responses and hoof health in lactating Holstein cows. *J. Vet. Sci.*, 16(4): 439-446. 8. Spears, J. & Weiss, W. (2008). Role of antioxidants and trace elements in health and immunity of transition dairy cows. *Vet. J.*, 176:70-6. 9. Hogan, J. *et al.* (1990). Relationships among vitamin E, selenium, and bovine blood neutrophils. *J. Dairy Sci.* 73:2372-8. 10. Teixeira, A. *et al.* (2014). Effect of an injectable trace mineral supplement containing selenium, copper, zinc, and manganese on immunity, health, and growth of dairy calves. *J. Dairy Sci.*, 97:4216–4226.[^] 11. Machado, V. *et al.* (2013). Effect of an injectable trace mineral supplement containing selenium, copper, zinc, and manganese on the health and production of lactating Holstein cows. *Vet. J.* 197:451-6.[^] 12. Berry *et al.* (2000). *Oklahoma State University Animal Science Report*, 980:61-64.[^] 13. Richeson, J. *et al.* (2006). Supplemental trace minerals from injection for shipping-stressed cattle. *AAEP Research Series*, 574: 85-88.[^] 14. Arthington, J. *et al.* (2014). Effects of trace minerals on measures of performance and trace mineral status of pre- and post-weaned beef calves. *J. Anim. Sci.*, 92:2630-2640.[^] 15. Roberts *et al.* (2015). *J. Anim. Sci.*, 93:S3.[^] 16. Palomares, R. *et al.* (2016). Effects of injectable trace minerals on humoral and cell-mediated immune responses to Bovine Viral Diarrhea Virus, Bovine Herpes Virus 1 and Bovine Respiratory Syncytial Virus following administration of a modified-live virus vaccine in dairy calves. *Vet. Immunol. Immunopathol.*, 178:88-98.[^] 17. Ball, M. (2016). Trace mineral injection enhances antibody response to botulism vaccination. *AVA Proceedings*, Adelaide.[^] 18. Eppleston, J. *et al.* (2016). Post-weaning growth of beef heifers drenched with long-or short-acting anthelmintics. *Aust. Vet. J.*, 94(9):341-6. 19. Virbac trial protocol No. 572/10. 20. Mundell, L. *et al.* (2012). Effects of prepartum and postpartum bolus injections of trace minerals on performance of beef cows and calves grazing native range. *The Professional Animal Scientist*, 28:82-88.[^] [^]Multimin formulation examined in this study contained different levels of minerals compared to the current registered formulation. [^]Benefits determined by these scientific trials are not registered label claims.

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