

ScourGuard® 4(K)

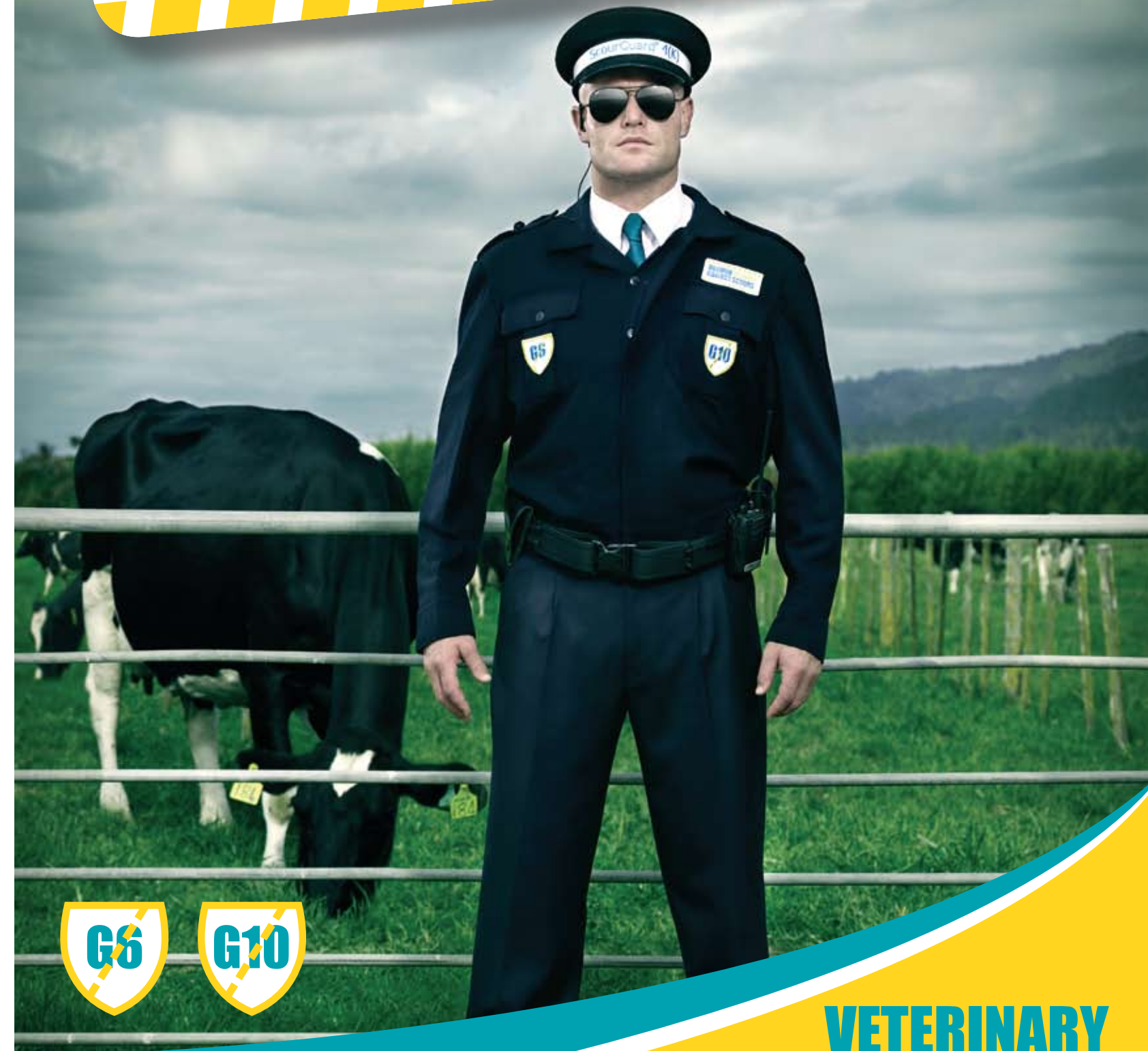
MAXIMUM SECURITY AGAINST SCOURS

ScourGuard® 4(K)

- PREMIUM, BROAD SPECTRUM SCOURS VACCINE.
- SUPERIOR PROTECTIVE ANTIBODY RESPONSES TO MAIN TARGET PATHOGENS.
- SAFE AND TISSUE FRIENDLY.
- CLINICALLY PROVEN AND TRIALLED IN NEW ZEALAND.
- IDEALLY SUITED FOR NEW ZEALAND'S CALF SCOURS PATHOGENS AND CALF MANAGEMENT SYSTEMS.



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VETERINARY
Technical Reference Manual

CALF SCOURS



CALF SCOURS IS ONE OF THE MOST STRESSFUL AND COSTLY DISEASE SYNDROMES FOR VETS AND FARMERS TO DEAL WITH.

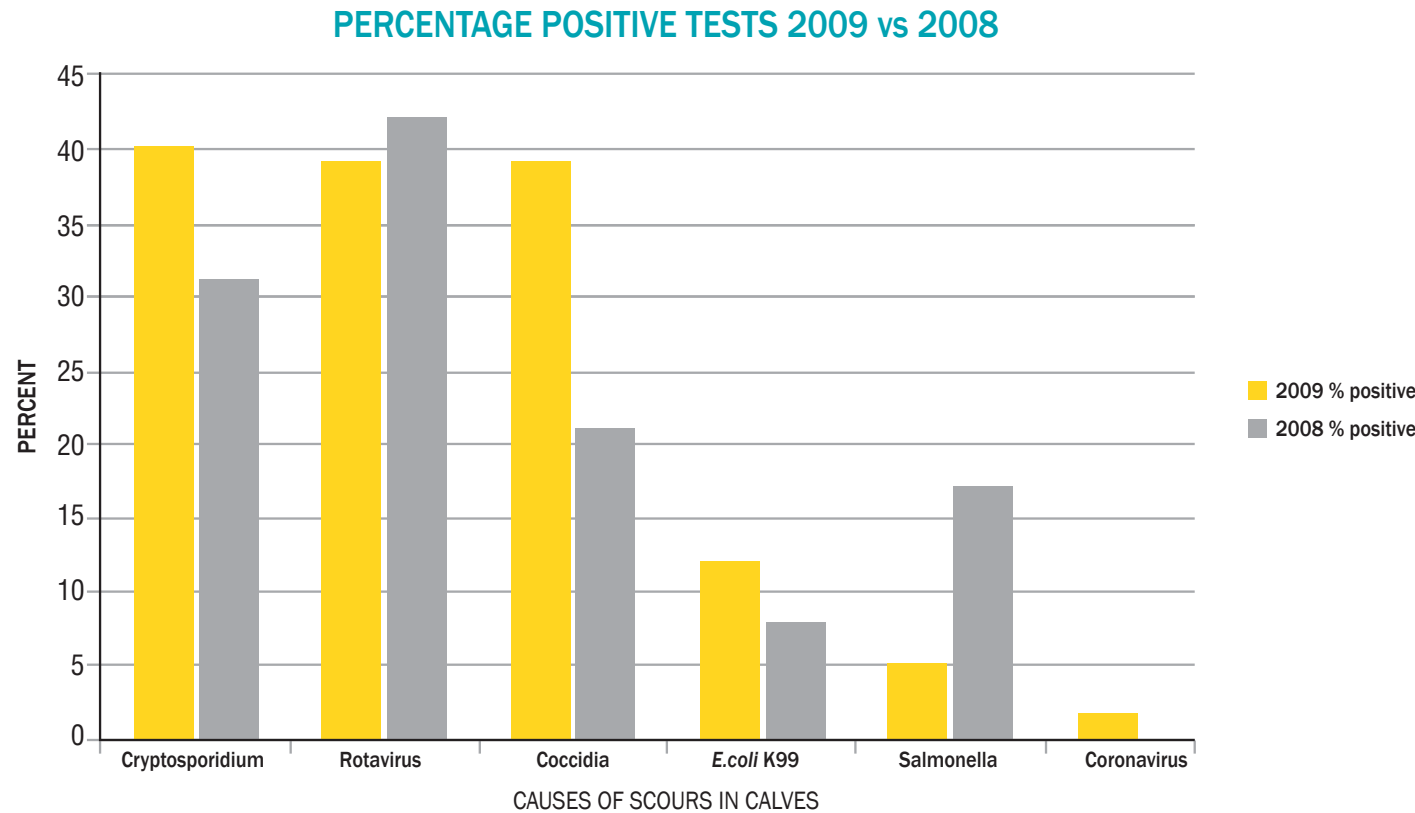
The costs in time, labour, treatment and mortalities are very significant.

But the human cost is equally severe, with significant stress on the calf rearer who has to deal with sick and dying calves at the most busy time in the farming year.

CALF SCOURS PATHOGENS

The pathogens associated with infectious neonatal calf scours in New Zealand include Rotavirus, *E.coli*, cryptosporidia, coccidia, salmonella and coronavirus.

Rotavirus is recognised as the most clinically significant pathogen while coronavirus is of minor importance in New Zealand.¹



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ROTAVIRUS



Bovine Rotavirus



Normal villi (A) line the intestinal wall and help absorb fluids, electrolytes and nutrients.



Blunted rotavirus-infected villi (B) no longer have the capacity to absorb essential fluids and electrolytes, resulting in profuse diarrhea.

ROTAVIRUS IS RECOGNISED AS THE MOST CLINICALLY SIGNIFICANT PATHOGEN INVOLVED IN NEONATAL CALF SCOURS.²

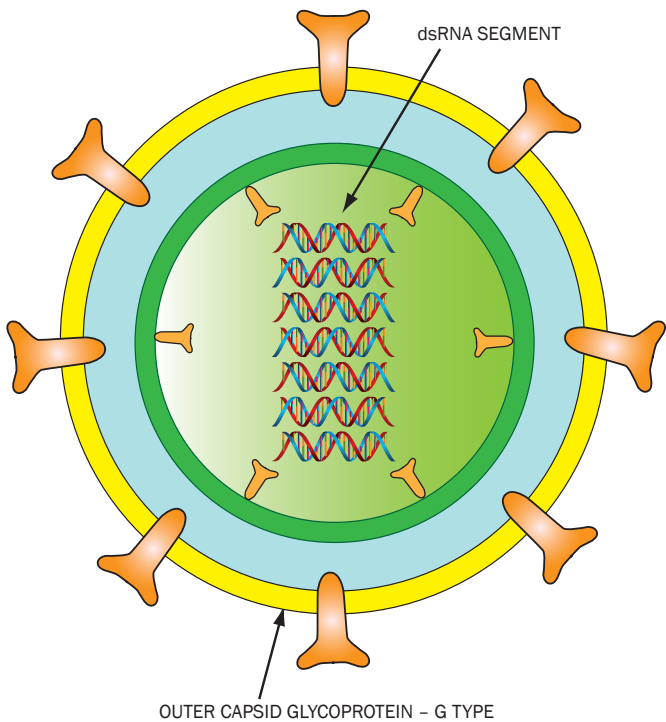
ROTAVIRUS SEROTYPES

Globally the main types of Rotavirus that cause scours in cattle are G6, G10 and G8.³⁻⁷

The G-type refers to the antigenically distinct **glycoprotein envelope** of the virus.

The glycoprotein envelope is the main immunogenic structure on the virus and is critical for the development of protective immunity.⁸⁻¹¹

Cross protection between different G types may be weak or absent.¹²⁻¹⁷



NEW ZEALAND ROTAVIRUS

In New Zealand, G6 and G10 Rotavirus strains have been identified.

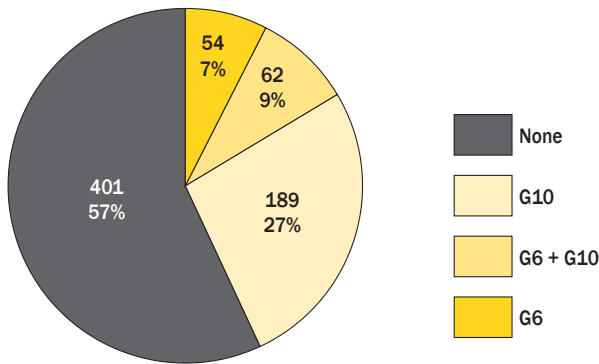
STUDY 1

A serological survey was conducted in 2008, involving 706 yearling heifers from 7 farms in Manawatu and one farm from Ashburton.¹⁸

All 8 herds showed widespread exposure to both G6 & G10 Rotavirus. Overall 16% and 36% of heifers were seropositive to G6 and G10 Rotavirus respectively, with 9% of heifers showing evidence of dual infection with both types.

(39 heifers (5.5%) were seropositive to coronavirus).

ROTAVIRUS EXPOSURE IN 706 HEIFERS



STUDY 3

Twenty rotavirus positive faecal scour samples were obtained from Gribbles Veterinary Pathology locations in the North and South Island through the winter-spring period of 2009 and 18 were able to be G typed by PCR.

Based on these studies it is estimated that at least 10% of Rotavirus scours in NZ are caused by G10 Rotavirus.

STUDY 2

Another study was conducted in 7 regions of the North Island during 2006/07.¹⁹

Faecal samples were taken from 730 scouring calves less than 6 weeks of age.

385 calves (53%) were positive for Rotavirus by ELISA.

A subset of 41 Rotavirus ELISA positive faecal scours samples were PCR tested for G type.

G6 was predominant, while 4/41 samples were positive for G10, with one calf showing a dual infection.

ROTAVIRUS SEROTYPE	G6	G6 + G10	G10	G8
Number Positive	37	1	3	0

ROTAVIRUS SEROTYPE	G6	G10	G8
Number Positive	16	2	0

MATERNAL VACCINATION



MATERNAL PRE-NATAL VACCINATION IS AN EFFECTIVE METHOD TO CONTROL NEONATAL CALF SCOURS.

Vaccination stimulates a specific serum antibody response against the target pathogens. The dam then concentrates those serum antibodies into colostrum (during colostrogenesis).

Colostrum antibody titres tend to be 2-10x higher than found in pre-parturient serum, providing a rich concentrated source of antibodies for the calf.^{20,21}

When the calf suckles or is fed colostrum within the first 12-24 hours after birth, the calf absorbs antibodies into its systemic circulation, which is critical for protection against systemic infections.

Systemic antibodies are also important for protection against enteric pathogens because they are re-secreted into the

intestinal lumen.²²⁻²⁴ The concentration of secreted antibody in the intestine is proportional to the systemic antibody in the calf's serum,²² hence high intakes of colostrum antibody in the first 12-24 hours are important to provide ongoing protection against neonatal calf scour pathogens.

Continued feeding of colostrum to calves also provides direct intra-luminal activity against calf scours pathogens.²⁵⁻²⁸

High antibody levels can be maintained for a number of weeks in well managed stored colostrum.²⁹⁻³¹

Effective vaccination, timing of vaccination, calf management and colostrum management is essential to maximise protection against calf scours.

THE PRINCIPLES OF MATERNAL VACCINATION

The greater the serum antibody response in the dam the higher the antibody titre in colostrum and the higher the post suckling antibody level in calf serum.

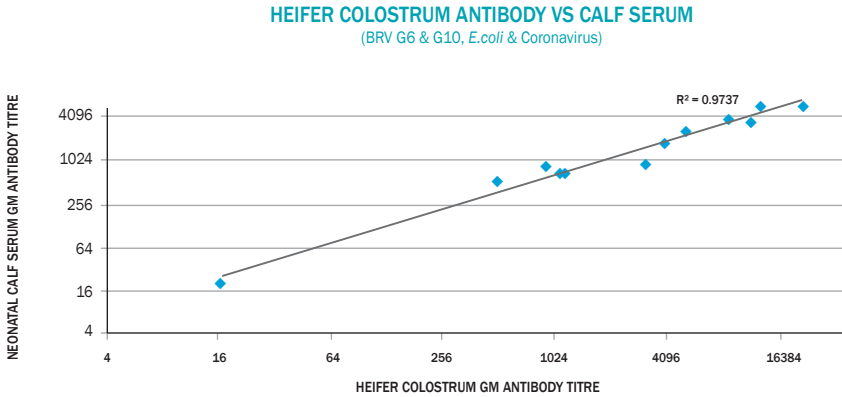
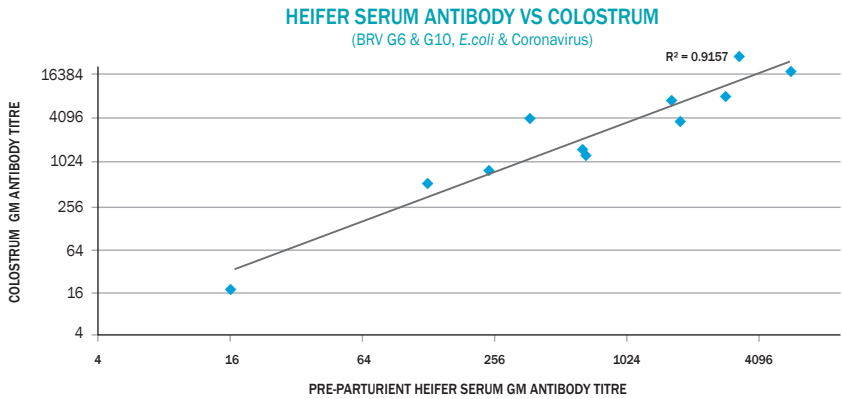
PREGNANT COW/HEIFER



COLOSTRUM



CALF



The goal of a neonatal scours vaccine is to induce high serum antibody responses in the dam to ensure high & protective colostral antibody titres are available to the calf.



PRODUCT PROFILE

- For vaccination of healthy, pregnant cows and heifers as an aid in preventing diarrhoea in their calves caused by bovine rotavirus (serotypes G6 and G10), bovine coronavirus, and *E.coli* having the K99 pili adherence factor.
- Inactivated vaccine with tissue friendly Quil A adjuvant.
- 100 mL (50 dose) Plastic PET bottles.
- Dosage 2 mL by i/m injection in the neck.
- Previously unvaccinated heifers or cows should receive two i/m doses at least 3 weeks apart, with the second dose given 2-12 weeks prior to calving.
- Extended inter-vaccination intervals allow the first injection to be given at dry off and the booster to be given up to 2 weeks before the planned start of calving.
- Annual revaccination with a single dose 2-12 weeks prior to each subsequent calving.
- **ScourGuard 4(K)** can be given as an annual booster vaccination to animals vaccinated with Rotavec® Corona (A8132) in the previous year.

ScourGuard 4(K) is a premium, broad spectrum, neonatal calf scours vaccine in a tissue friendly formulation.

ScourGuard 4(K) induces greatly enhanced antibody titres against Rotavirus G6, Rotavirus G10, *E.coli* and coronavirus.

ScourGuard 4(K) is the only neonatal calf scours vaccine in New Zealand containing Rotavirus G6 and G10 for truly broad spectrum Rotavirus protection.

ScourGuard 4(K) ensures maximal antibody titres are available for valuable replacement calves born in the first months of calving.

CLINICALLY PROVEN



SCOURGUARD STACKS UP UNDER THE MOST SEVERE CHALLENGE.

Pfizer has conducted several efficacy studies using an extremely stringent experimental challenge model.

This model uses massive infective doses and generally results in higher mortality than would be seen in a typical scours outbreak.

CHALLENGE MODEL

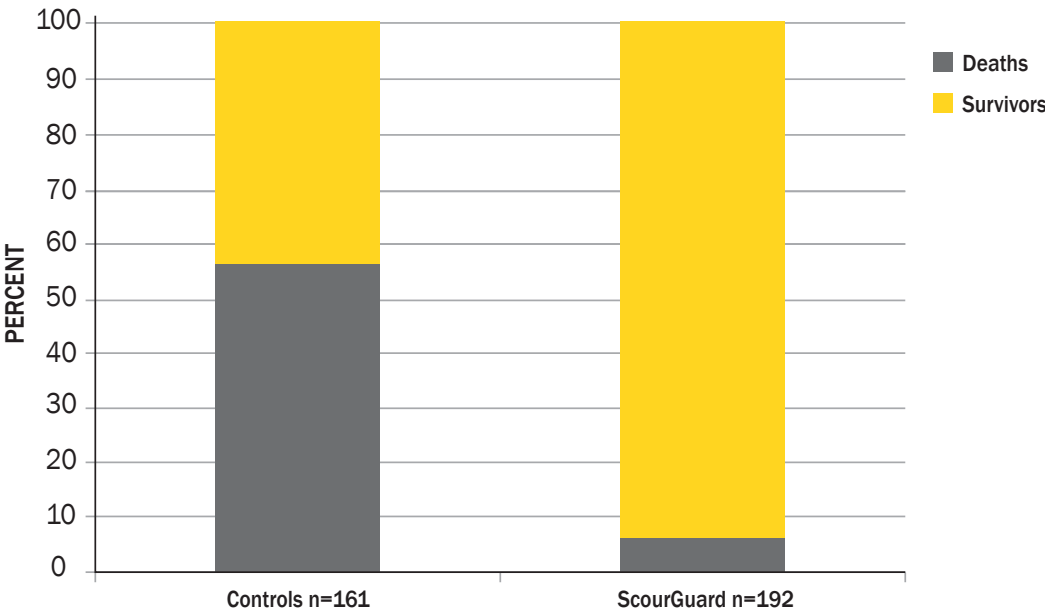
- Pregnant cows/heifers are given two vaccinations with the booster given 3-6 weeks (range 2-12 weeks) before calving.
- Calves are removed from dams and given first milking colostrum from vaccinated or placebo dams within 6 hours of birth, followed by milk or colostrum from vaccinated or placebo dams (relative to the age of the calf).
- Group sizes are typically 20 per treatment group vs 20 control calves.
- All calves are given an oral challenge with a specific pathogen between 8-12 hours after birth.
- Clinical parameters are monitored over the following days.

SUMMARY OF 9 CHALLENGE STUDIES³³

(3 x Rotavirus G6, 1 x Rotavirus G10, 1 x Coronavirus, 4 x *E.coli*)

- Significant* reductions in mortality for all four pathogens.
- Significant reductions in morbidity and clinical symptoms including scouring, anorexia, depression and dehydration for all four pathogens.
- Significant reductions in faecal shedding of Rotavirus G6, G10 and coronavirus.

MORTALITIES ACROSS ALL STUDIES



MORTALITIES	AVERAGE	RANGE
Controls	56%	20-100%
Scourguard	5%	0-21%

**Unless otherwise specified, all significant differences quoted in this document are at the 95% confidence level (p<0.05).*

GENERATING HYPER-IMMUNITY

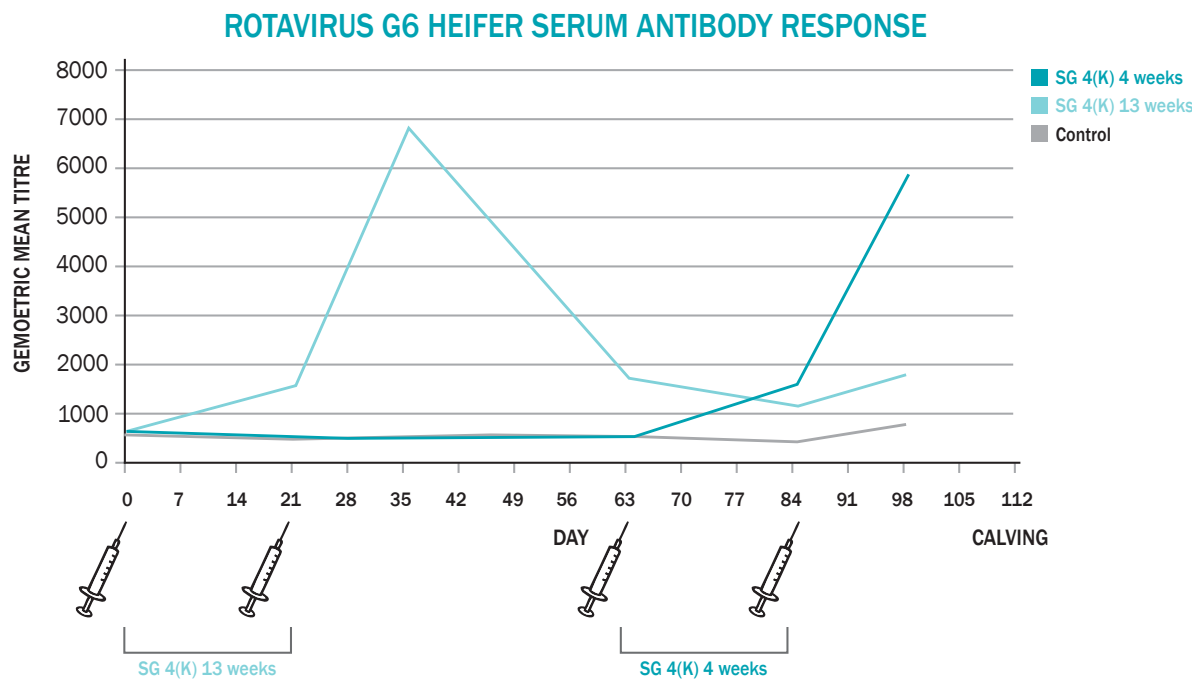
ScourGuard 4(K) induces rapid, greatly enhanced, broad spectrum and long lasting antibody responses in serum and colostrum.

STUDY NO. 181²¹

Investigator	AgResearch
Locations	Massey University Palmerston North, Apiti (Manawatu) and Ashburton
Study Animals	35 pregnant R2 heifers per group
Control	Placebo injections
SG 4(K) 4 weeks	ScourGuard 4(K), vaccinated 7 and 4 weeks prior to calving
SG 4(K) 13 weeks	ScourGuard 4(K), vaccinated 16 and 13 weeks prior to calving
Outcomes	Serum antibody responses for all pathogens measured up to 2 weeks prior to calving. First milking colostrum titres measured for all pathogens.

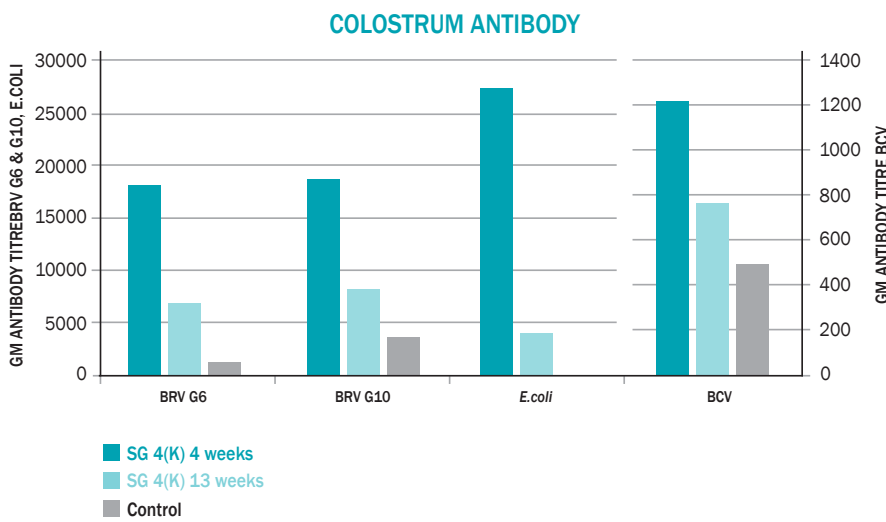
SERUM ANTIBODY

For all target pathogens; Peak serum titres were achieved **within 14 days** of the booster vaccination. Serum titres gradually declined over the following 3 months, but remained significantly elevated compared to controls. (Results for Rotavirus G6 shown below – representative of all target pathogens).



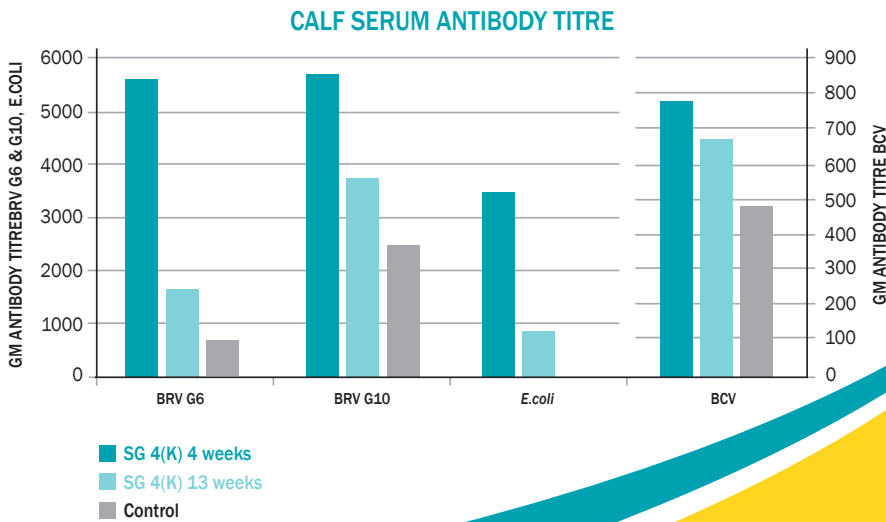
COLOSTRUM ANTIBODY

For all target pathogens; Colostrum titres for both **ScourGuard 4(K)** groups were significantly elevated compared to controls. Significantly higher titres were observed in the cows boosted 4 weeks before calving compared to cows boosted 13 weeks before calving. Colostrum antibody titres in heifers boosted 13 weeks before calving were similar to or above titres shown to be protective in **ScourGuard** challenge studies for G6, G10 and coronavirus.³³



CALF SERUM ANTIBODY

After feeding to calves (n=44), significant increases in BRV G6, G10 and *E.coli* serum titres were seen with titres for all pathogens above those shown to be protective in calf challenge studies.^{32,33}



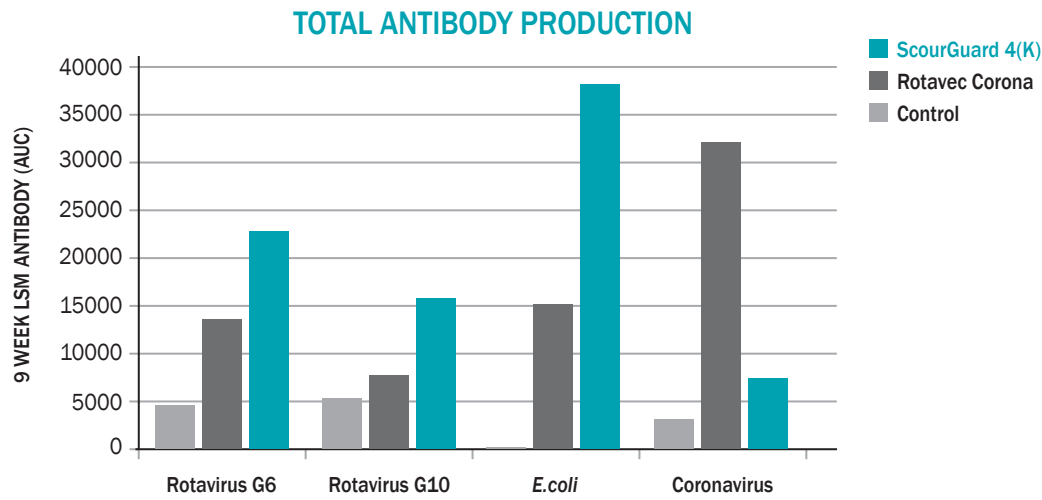
SUPERIOR PROTECTIVE ANTIBODY RESPONSES

When compared to a reference vaccine (Rotavec Corona), **ScourGuard 4(K)** induces significantly higher antibody titres against the main target pathogens, Rotavirus and *E.coli*.

STUDY NO. 207¹⁵

Investigator	AgResearch		
Locations	Massey University Palmerston North		
Study Animals	105 pregnant R2 heifers		
Groups	Control	(n= 15)	Saline
	Rotavec Corona (RC)	(n=30)	2mL i/m, single injection
	ScourGuard 4(K) (SG)*	(n=30)	2mL i/m, 2 shots, 3 weeks apart
	ScourGuard 4(K) (SG)*	(n=30)	2mL i/m, 2 shots, 9 weeks apart
Outcomes	Serological response for each pathogen to 9 weeks after booster vaccination. (All boosters given on day 0).		

*Results for both ScourGuard 4(K) groups were identical with no significant differences and are presented as one dataset from the 60 heifers combined.



TOTAL ANTIBODY PRODUCTION (DAY 0 - 63)

ROTAVIRUS G6

- **ScourGuard 4(K)** 1.6 x Rotavec Corona ($p<0.0004$).

ROTAVIRUS G10

- **ScourGuard 4(K)** 2.1 x Rotavec Corona ($p<0.0001$).

E.COLI

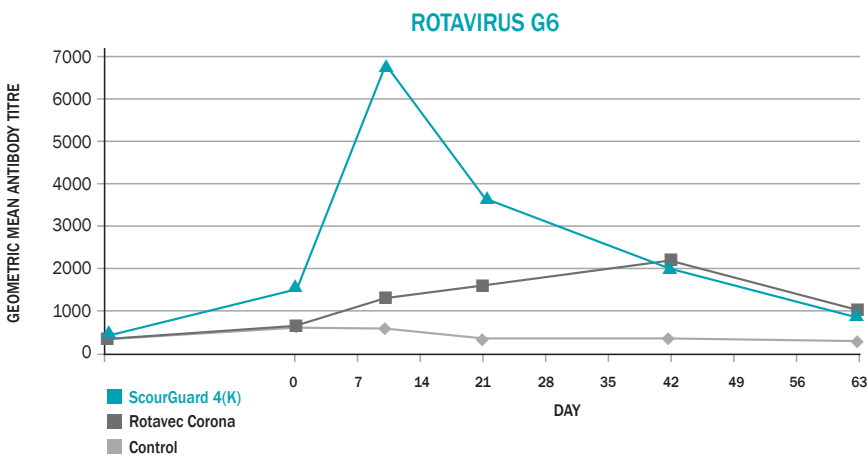
- **ScourGuard 4(K)** 2.5 x Rotavec Corona ($p<0.0001$).

CORONAVIRUS

- Rotavec Corona 4.2 x **ScourGuard 4(K)** ($p<0.0001$).

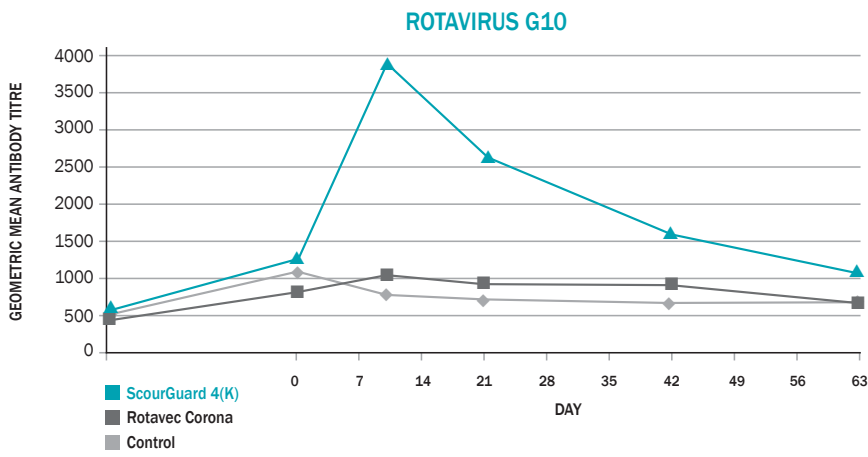
ROTAVIRUS G6

- **ScourGuard 4(K)** was significantly higher than Rotavec Corona at 10 days and 3 weeks post vaccination.
- No significant differences from 6 weeks post vaccination.



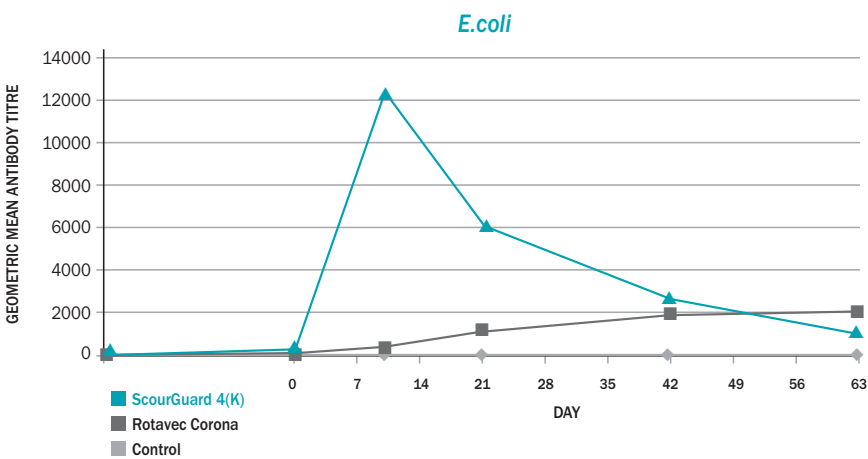
ROTAVIRUS G10

- **ScourGuard 4(K)** significantly higher than Rotavec Corona from 10 days to 9 weeks post vaccination.
- Rotavec Corona showed no significant differences vs controls at any time point.



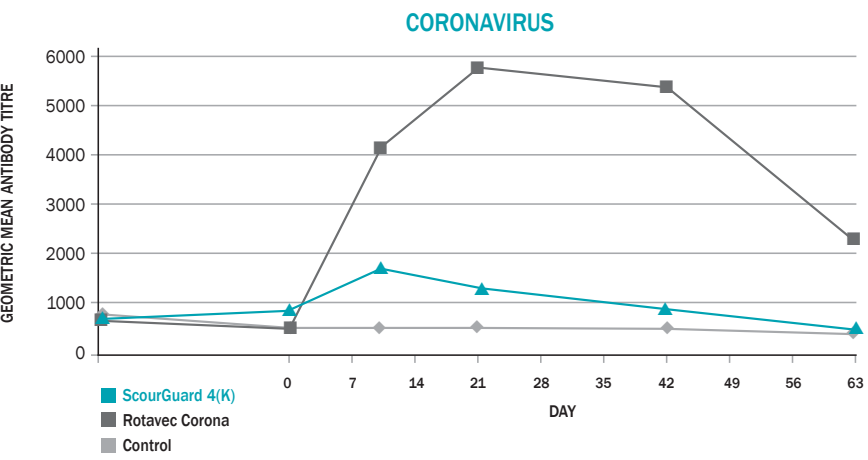
E.COLI

- **ScourGuard 4(K)** was significantly higher than Rotavec Corona on days 10 and 21 post vaccination.



CORONAVIRUS

- Rotavec Corona was significantly higher than **ScourGuard 4(K)** from 10 days to 9 weeks after vaccination.



SAFE AND TISSUE FRIENDLY



SCOURGUARD VACCINES HAVE BEEN USED IN THE UNITED STATES FOR MANY YEARS WITH A HISTORY OF SAFE AND EFFECTIVE USE IN CONTROLLING CALF SCOURS.

Safety was also monitored in all New Zealand studies, and **ScourGuard 4(K)** was found to be safe and very well tolerated.

STUDY NO. 189³⁵

Investigator	AgResearch		
Locations	Massey University Palmerston North		
Study Animals	39 pregnant R2 heifers		
Groups	Control	(n=19) placebo adjuvant injections	(Overdose)
	ScourGuard 4(K)	(n=20) 4mL i/m then 2mL i/m, 3 weeks later then 2mL i/m, 3 weeks later	

RESULTS

- Mild transient pyrexia, approximately 0.5 °C for 1-2 days.
- No palpable lesions in **ScourGuard 4(K)** vaccinated heifers.
- No adverse effects.

SUPERIOR SAFETY AND TOLERANCE

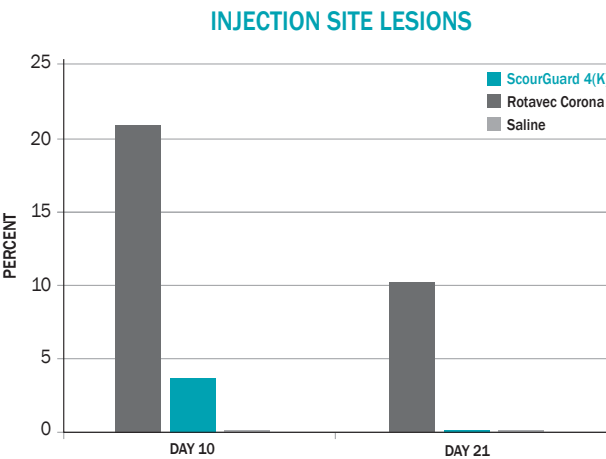
TISSUE TOLERANCE

ScourGuard 4(K) was compared to a reference vaccine, Rotavec Corona.

STUDY NO. 207¹⁵

Investigator	AgResearch		
Locations	Massey University Palmerston North		
Study Animals	Pregnant R2 heifers		
Groups	Control	(n=15)	saline
	Rotavec Corona	(n=30)	2mL i/m, single injection
	ScourGuard 4(K)	(n=60)	2mL i/m, 2 shots 3 or 9 weeks apart
Outcomes	Palpable and visual injection site reactions were recorded.		

Group	Day 10	Day 21
Control	10	10
Rotavec Corona	4	0
ScourGuard 4(K)	0	1



RESULTS

ScourGuard 4(K) tolerance was significantly better than Rotavec Corona at day 10 ($p=0.004$) and day 21 ($p<0.02$) post vaccination.

OCCUPATIONAL SAFETY AND HEALTH

ScourGuard 4(K) does not contain an oil-based adjuvant and may be administered through standard vaccination guns.

There are no specific occupational safety and health issues associated with **ScourGuard 4(K)** and standard precautions should be taken to avoid skin or eye contact.

ANNUAL BOOSTER VACCINATION



CATTLE PREVIOUSLY VACCINATED WITH SCOURGUARD 4(K) REQUIRE A SINGLE ANNUAL BOOSTER VACCINATION 2-12 WEEKS BEFORE CALVING.

In seasonal calving herds booster vaccination can be timed to match the calving spread and herd management practices. Booster vaccination 2 weeks before the planned start of calving will protect all calves born in the first 10 weeks of calving.

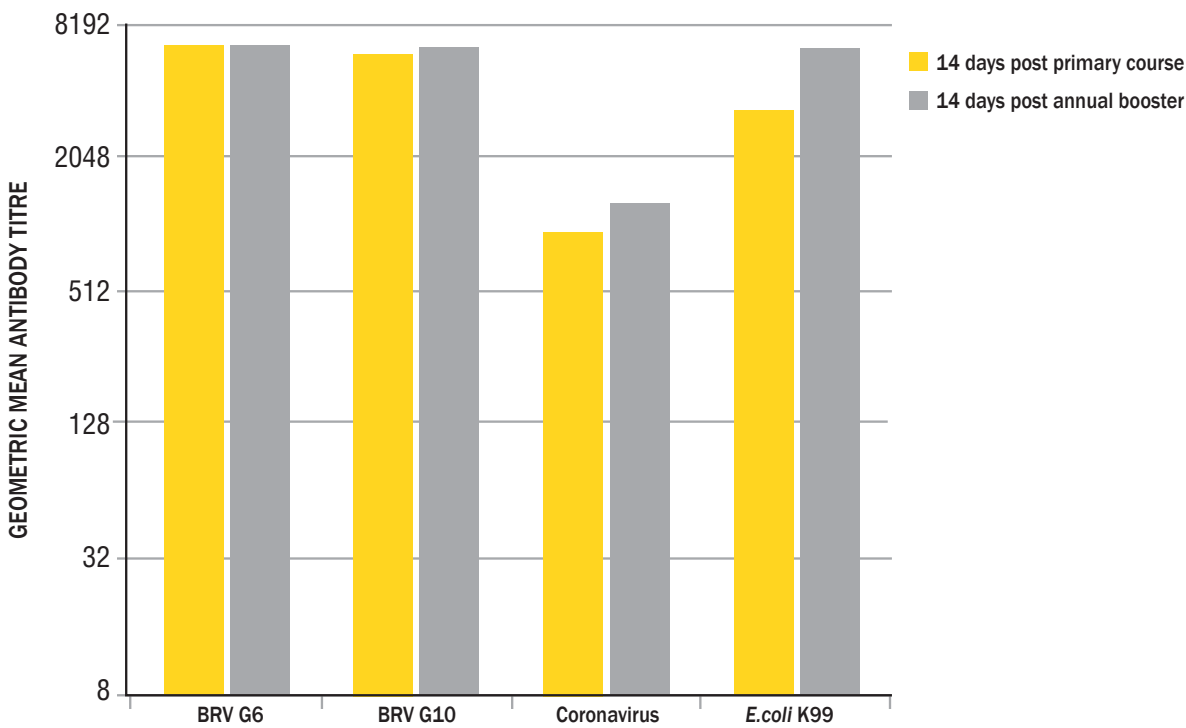
The response to annual booster vaccination was studied in NZ cows.

ScourGuard® 4(K) BOOSTING ScourGuard® 4(K)

STUDY NO. 198⁶

Investigator	AgResearch		
Locations	Massey University Palmerston North		
Study Animals	38 Pregnant R3 heifers, vaccinated 12 months previously		
Groups	Controls (n=12)	Placebo injection	
	ScourGuard 4(K) (n=26)	2mL i/m, single injection	
Outcomes	Serological antibody response for each pathogen.		

RESPONSE TO PRIMARY AND BOOSTER VACCINATION



A single annual booster injection with ScourGuard 4(K) results in serum antibody titres which are equivalent to the maximum titres seen following the two shot primary course, for all pathogens.

ANNUAL BOOSTER VACCINATION



ScourGuard 4(K) can be given as an annual booster vaccination to animals vaccinated with Rotavec Corona (A8132) in the previous year.

STUDY NO. 200¹⁴

Investigator	AgResearch		
Locations	Dunsandel, Canterbury		
Study Animals	73 pregnant R3 cows, vaccinated 12 months previously with Rotavec Corona		
Groups	Controls	(n=15)	Saline injections
	Rotavec Corona	(n=29)	2 mL i/m, single injection
	ScourGuard 4(K)	(n=29)	2 mL i/m, single injection
Outcomes	Serum antibody responses for all pathogens measured up to 6 weeks post vaccination.		

RESULTS FOR *E. COLI* & CORONAVIRUS

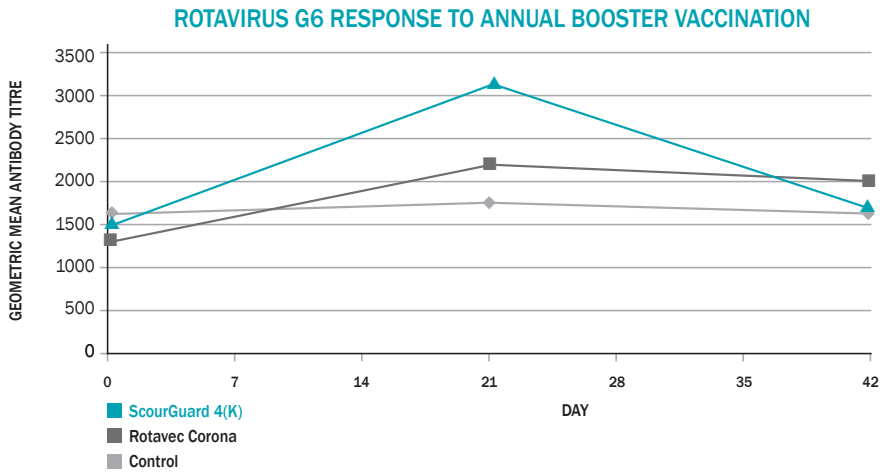
ScourGuard 4(K) induced titres at least equivalent to the protective antibody titres seen following **ScourGuard 4(K)** booster vaccination of cows previously vaccinated with **ScourGuard 4(K)**.

ScourGuard[®] 4(K) BOOSTING Rotavec Corona

RESULTS FOR ROTAVIRUS G6 & G10

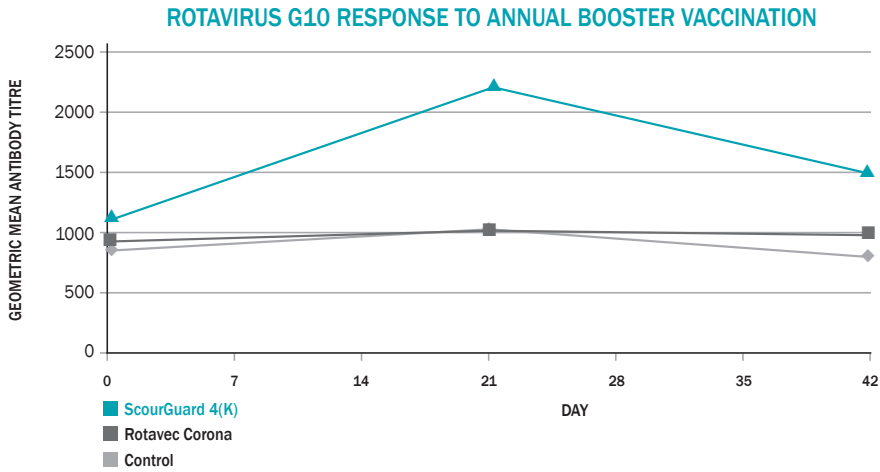
ROTAVIRUS G6

- ScourGuard 4(K)** significantly higher than Rotavec Corona on day 21 post vaccination.
- No significant differences at day 42.



ROTAVIRUS G10

- ScourGuard 4(K)** significantly higher than Rotavec Corona on day 21 and 42 post vaccination ($p < 0.01$).
- Rotavec Corona showed no anamnestic response to G10 and no significant differences vs controls at any time point.



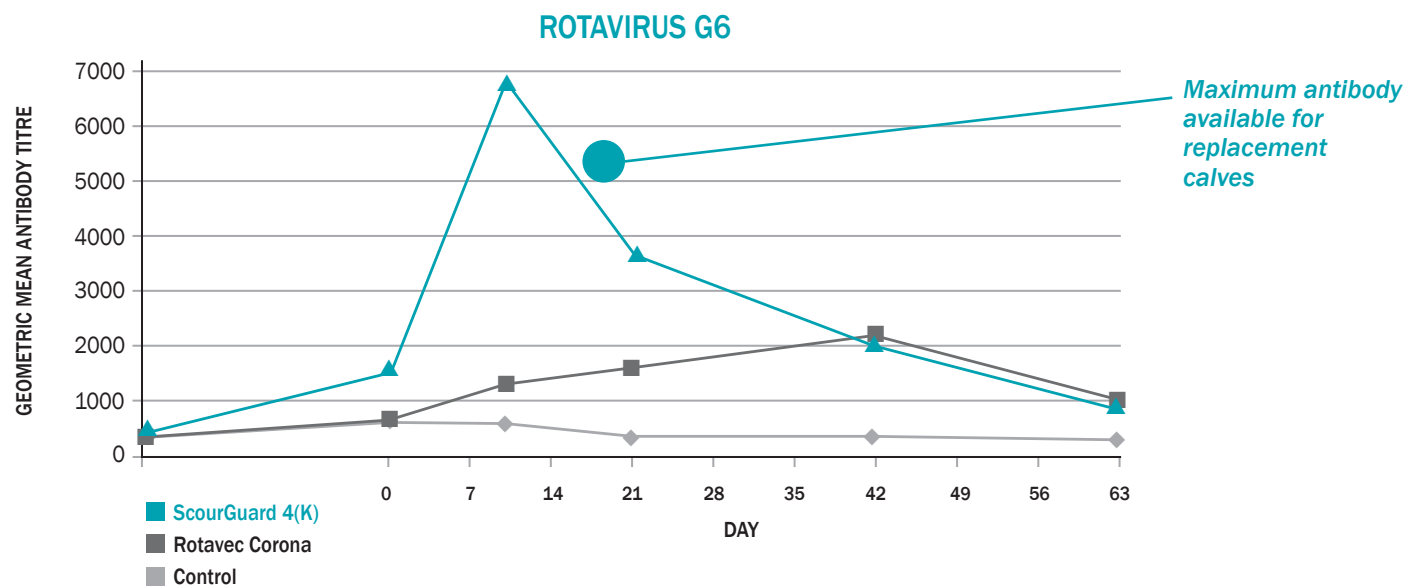
MAXIMISING EFFICACY WITH ScourGuard® 4(K)

STUDIES SHOW THAT MAXIMUM ANTIBODY TITRES IN SERUM ARE GENERATED VERY RAPIDLY, WITHIN 10 DAYS OF VACCINATION, AND MAXIMUM COLOSTRUM TITRES ARE GENERATED WHEN THE BOOSTER VACCINATION IS GIVEN WITHIN 12-28 DAYS OF CALVING.^{15, 21, 34}

Therefore to ensure the maximum amount of antibody is available to the calf in colostrum, seasonal calving herds should be vaccinated 2-4 weeks before the planned start of calving.

This ensures the following practical benefits:

- All calves born in the first 8-10 weeks of calving receive protective colostrum titres*.
- Valuable replacement calves receive the highest antibody titre colostrum:
 - which provides maximum protection to early born calves
 - and minimises any potential pathogen load in the calf barn for later born calves.



* Calves should be collected twice daily and fed fresh, first milking, hyperimmune ScourGuard 4(K) colostrum. Aim for 2 Litres within 6 hours and a total of 4 Litres (or approximately 10% of bodyweight) within 12 hours of birth.



REFERENCES

1. Vermunt J, Parkinson T. (2000). Infectious diseases of cattle in New Zealand. Surveillance 27(2) 3-7. 2. Kapikian, A.a.C., (1996). Rotaviruses (cap 55), In: Fields, B.N., Knipe, D.M., Howley, P.M. (Eds.), Virology. Lippincott–Raven, Philadelphia. 3. Alkan F, Ozkul A, Oguzoglu TC, Timurkan MO, Caliskan E, Martella V and Burgu I. (2010). Distribution of G (VP7) and P (VP4) genotypes of group A bovine rotaviruses from Turkish calves with diarrhoea, 1997-2008. Veterinary Microbiology 141 231-237. 4. Falcone E, Tarantino M, Di Trani L, Cordioli P, Lavazza A and Tollis M. (1999). Determination of Bovine Rotavirus G and P Serotypes in Italy by PCR. J. Clin. Microbiol. 37 (12) 3879-3882. 5. Fukai K, Sakai T, Hirose M and Itou T. (1999). Prevalence of calf diarrhoea caused by bovine group A rotavirus carrying G serotype 8 specificity. Vet Microbiol. 66 301-311. 6. Parwani AV, Hussein HA, Rosen BI, Luchelli A and Navarro LJ. (1993). Characterisation of field strains of group A bovine rotaviruses by using polymerase chain reaction-generated G and P type cDNA probes. J. Clin. Microbiol. 31 2010-2015. 7. Garaicoechea, L, Bok K, Jones LR, Combessies G, Odeon A, Fernandez F and Parreno V. (2006). Molecular characterization of bovine rotavirus circulating in beef and dairy herds in Argentina during a 10-year period (1994–2003). Vet. Microbiol. 118, 1–11. 8. Hoshino Y, Sereno MM, Midthun, K, Flores J, Kapikian AZ and Chanock RM. (1985). Independent segregation of two antigenic specificities (VP3 and VP7) involved in neutralization of rotavirus infectivity. Proc. Natl. Acad. Sci. USA 82:8701-8704. 9. Snodgrass DR, Fitzgerald TA, Campbell I, Browning GF, Scott FMM, Hoshino Y and Davies RC. (1991) Homotypic and heterotypic serological responses to rotavirus neutralisation epitopes in immunologically naïve and experienced animals J Clin. Microbiol. 29. 2668-2672. 10. Xu Z, Hardy ME, Williams JD, Woode GN, Ramig RF. (1993). Immunodominant neutralising antigens depend on the virus strain during a primary immune response in calves to bovine rotaviruses. Vet Microbiol. 35 33-43. 11. Greenberg HB, Valdesuso J, van Wyke K, Midthun K, Walsh M, McAuliffe V, Wyatt RG, Kalica AR, Flores J and Hoshino Y. (1983) Production and preliminary characterisation of monoclonal antibodies directed at two surface proteins of Rhesus rotavirus. J. Virol. 47 (2) 267-275. 12. Chang KO., Parwani AV., and Saif LJ. (2000). Comparative sequence analysis of the VP7 genes of G6, G8 and G10 bovine group A rotaviruses and further characterization of G6 subtypes. Arch. Virol. 145:725-737. 13. Pfizer Data on File – 2001. Serum & Colostrum Neutralisation of Group A Rotaviruses with G6 & G10 Genotypes. Ref 044. 14. Pfizer Data on File – 2009. Evaluation of 12 month Booster Vaccinations in New Zealand Cattle Previously Vaccinated with Rotavec® Corona. Ref 200. 15. Pfizer Data on File – 2010. Immunogenicity and Safety Evaluation of ScourGuard 4(K) and Rotavec® Corona vaccines in cattle. Ref 207. 16. Matsuda Y, Isegawa Y, Woode GN, Zheng S, Kaga E, Nakagomi T, Ueda S and Nakagomi O. (1993). Two-Way Cross-Neutralization Mediated by a Shared P (VP4) Serotype between Bovine Rotavirus Strains with Distinct G (VP7) Serotypes. J. Clin. Microbiol., 31 (2) 354-358. 17. Snodgrass DR, Ojeh CK, Campbell I and Herring AJ. (1984) Bovine Rotavirus Serotypes and Their Significance for Immunization. J. Clin. Microbiol. 20 (3) 342-346. 18. Pfizer Data on file – 2008. 19. Howe L, Sugiarto H and Squires RA. (2008) Use of polymerase chain reaction for the differentiation of Group A bovine rotavirus G6, G8, and G10 genotypes in the North Island of New Zealand. NZ Vet. J. 56(5), 218-221. 20. Marnila & Korhonen (2002) Immunoglobulins. In: H. Roginski, J.W. Fuquay and P.F. Fox, Editors, Encyclopedia of dairy sciences, Academic Press, London, UK, pp. 1950–1956. 21. Pfizer Data on File – 2008. Evaluation of Vaccination to Calving Intervals in Pregnant Heifers Vaccinated with ScourGuard 4(K). Ref 181. 22. Besser T, McGuire TC, Gay CC and Pritchett LC. (1988) Transfer of Functional Immunoglobulin G (IgG) Antibody into the Gastrointestinal Tract Accounts for IgG Clearance in Calves J. Virol. 62 (7) 2234-2237. 23. Besser,T (1993) Concentrations of passively acquired IgG1 antibodies in the intestinal lumen of the neonatal calf. Vet. Immunol. Immunopath. 38 (1-2) 103-112. 24. Besser TE, Gay CC, McGuire TC and Evermann JF. (1988). Passive immunity to bovine rotavirus infection associated with transfer of serum antibody into the intestinal lumen. J. Virol. 62 (7) 2238-2242. 25. Berge ACB, Besser TE, Moore DA and Sischo WM. (2009). Evaluation of the effects of oral colostrum supplementation during the first fourteen days on the health and performance of preweaned calves. J. Dairy Sci. 92:286–295. 26. Snodgrass DR, Steart J. Taylor J, Krautill FL and Smith ML. (1982). Diarrhoea in dairy calves reduced by feeding colostrum from cows vaccinated with rotavirus. Res Vet Sci. 32(1):70-3. 27. Snodgrass DR, Fahey KJ, Wells PW, Campbell I and Whitelaw A. (1980). Passive Immunity in Calf Rotavirus Infections: Maternal Vaccination Increases and Prolongs Immunoglobulin G1 Antibody Secretion in Milk. Infect. Immun. 28 (2) 344-349. 28. Parreno V, Marcopido G, Vega C, Garaicoechea L, Rodriguez D, Saif L and Fernandez F. (2010) Milk supplemented with immune colostrum: Protection against rotavirus diarrhoea and modulatory effect on the systemic and mucosal antibody responses in calves experimentally challenged with bovine rotavirus. Vet. Immunol. Immunopathol. 136 12–27. 29. Mbuthia EW, Klobasa F, Gachui CK and Abate A. (1997) Effect of treatment with formaldehyde and formic acid on immunoglobulin content of stored bovine colostrum. Animal Feed Science Technology 67 291-298. 30. Schipper, IA, Kotta P, Staples GE, Fisher GR and Erickson GM. (1981) Immunoglobulin-G Content In Bovine Colostrum Preserved By Freezing, Fermentation and Chemical Preservatives. Farm Research 39 (2). 31. Carlson S. and Muller. L. (1977) Compositional and Metabolic Evaluation of Colostrum Preserved by Four Methods During Warm Ambient Temperatures. J. Dairy Sci. 60 (4) 566-571. 32. Pfizer Data on File – 2009. The evaluation of feeding colostrum from dairy heifers vaccinated with ScourGuard 4(K)™ on the resultant serum antibody levels in calves. Ref 188. 33. Pfizer Data on File. 34. Pfizer Data on File – 2000. Ref 092. 35. Pfizer Data on File – 2009. Ref 189. Safety evaluation of ScourGuard 4(K)™ in target aged pregnant dairy heifers. 36. Pfizer Data on File – 2009. Ref 198. Evaluation of 12 month Booster Vaccination in Cattle Previously Vaccinated with ScourGuard 4(K).