



This Table is an extended version of Table 3 included in the April 2011 article in European Biopharmaceutical Review (<http://www.samedanltd.com/magazine/12>) on virus contamination control.

Table 1: Bovine Viruses of Concern and their Presence in Europe, Australia and New Zealand

Virus or Family	Virus Family	Zoo-notic?	Present in?			Level of Viremia (Titre)	Ref.
			EU	AUS	NZ		
Akabane viruses	<i>Bunyaviridae</i>	No	X	✓	X	High	[1, 2]
Aujeszky's disease virus	<i>Herpesviridae</i>	No	X	X	X	Low	[1, 3]
Adenovirus virus	<i>Adenoviridae</i>	No	✓	✓	✓	Medium (10^3)	[1, 4]
Bluetongue virus	<i>Reoviridae</i>	No	✓	✓	X	High (10^5)	[1, 5, 6]
Borna disease virus	<i>Bornaviridae</i>	?	✓	✓	X	Low	[1, 7]
Bovine calicivirus	<i>Caliciviridae</i>	No	✓	✓	✓	Low	[1, 8]
Bovine corona virus	<i>Coronaviridae</i>	No	✓	✓	✓	Low	[1]
Bovine herpesviruses	<i>Herpesviridae</i>	No	✓	✓	✓	Low	[1, 9]
Bovine leukemia virus	<i>Retroviridae</i>	No	✓	✓	✓	High	[1, 10]
Bovine parvovirus	<i>Parvoviridae</i>	No	?	?	?	High	[1, 11]
Bovine papilloma virus	<i>Papillomaviridae</i>	No	✓	✓	✓	Low	[1, 12]
Bovine polyoma virus	<i>Polyomaviridae</i>	Yes	✓	✓	✓	High	[1, 13]
Bovine respiratory syncytial disease virus	<i>Paramyxoviridae</i>	Yes	✓	✓	✓	Low	[1, 14]
Bovine rhinovirus	<i>Picornaviridae</i>	No	✓	✓	✓	Low	[1]
BSE	<i>Unclassified</i>	Yes	✓	X	X	Low	[1]
Bovine viral diarrhoea virus	<i>Flaviviridae</i>	No	✓	✓	✓	High (10^7)	[1, 15]
Bunyaamwera group viruses	<i>Bunyaviridae</i>	Yes	✓	✓	✓	High (10^5)	[1, 16]
Ephemeral fever virus	<i>Rhabdoviridae</i>	No	X	✓	X	High	[1, 17]
Epizootic haemorrhagic disease	<i>Reoviridae</i>	No	X	✓	X	High	[1, 18]
Foot and mouth disease virus	<i>Picornaviridae</i>	No	X	X	X	High (10^8)	[1, 19]
Ibaraki virus	<i>Reoviridae</i>	No	X	✓	X	High	[1, 20]
Influenza virus	<i>Orthomyxoviridae</i>	Yes	✓	✓	✓	Low	[21, 22]
Jembrana disease virus	<i>Retroviridae</i>	No	X	X	X	High ($>10^6$)	[1, 23]
Lumpy skin disease virus	<i>Poxviridae</i>	No	X	X	X	Low	[1, 24]
Miscellaneous Arboviruses	Various	Yes	X	✓	X	High	[1, 6]
Palyam virus group	<i>Reoviridae</i>	No	X	✓	X	High	[1, 25]
Parainfluenza virus	<i>Paramyxoviridae</i>	No	✓	✓	✓	High	[1]
Pseudocowpox virus	<i>Poxviridae</i>	No	✓	✓	✓	Low	[1, 26]
Rabies virus	<i>Rhabdoviridae</i>	Yes	✓	X	X	Low	[1]
Rift Valley fever virus	<i>Bunyaviridae</i>	Yes	X	X	X	High	[1]
Rinderpest virus	<i>Paramyxoviridae</i>	No	X	X	X	High	[1]
Rotavirus	<i>Reoviridae</i>	No	✓	✓	✓	Low	[1]
Ross River/Barmah Forest virus	<i>Togaviridae</i>	Yes	X	✓	X	High (10^8)	[1, 27]
Tick borne encephalitis virus	<i>Flaviviridae</i>	Yes	✓	X	X	High	[1, 28]
Vesicular stomatitis virus	<i>Rhabdoviridae</i>	Yes	X	X	X	Low	[1, 29]
West Nile disease virus	<i>Flaviviridae</i>	Yes	✓	X	X	Low	[1]
Whataroa virus	<i>Togaviridae</i>	Yes	X	X	✓	High	[30]

References

1. MAF Biosecurity, N.Z., *Import Risk Analysis: Cattle from Australia, Canada, the European Union and the United States of America*. 2008: p. 182.
2. Charles, J.A., *Akabane virus*. Vet Clin North Am Food Anim Pract, 1994. **10**(3): p. 525-46.
3. Davidson, R.M., *Control and eradication of animal diseases in New Zealand*. N Z Vet J, 2002. **50**(3 Suppl): p. 6-12.
4. Heim, A., et al., *Rapid and quantitative detection of human adenovirus DNA by real-time PCR*. J Med Virol, 2003. **70**(2): p. 228-39.
5. MacLachlan, N.J., *Bluetongue: pathogenesis and duration of viraemia*. Vet Ital, 2004. **40**(4): p. 462-7.
6. Gard, G.P., et al., *Arboviruses recovered from sentinel livestock in northern Australia*. Vet Microbiol, 1988. **18**(2): p. 109-18.
7. Kamhieh, S., et al., *Borna disease virus: evidence of naturally-occurring infection in cats in Australia*. APMIS Suppl, 2008(124): p. 50-2.
8. Deng, Y., et al., *Studies of epidemiology and seroprevalence of bovine noroviruses in Germany*. J Clin Microbiol, 2003. **41**(6): p. 2300-5.
9. Vermunt, J.J. and T.J. Parkinson, *Infectious diseases of cattle in New Zealand*. Surveillance, 2000. **27**(2): p. 3-8.
10. Horner, G., *Serological evidence of bovine immunodeficiency-like virus and bovine syncytial virus in New Zealand*. Surveillance, 1992. **18**(2).
11. Durham, P.J., A. Lax, and R.H. Johnson, *Pathological and virological studies of experimental parvoviral enteritis in calves*. Res Vet Sci, 1985. **38**(2): p. 209-19.
12. Diniz, N., et al., *Simultaneous presence of bovine papillomavirus in blood and in short-term lymphocyte cultures from dairy cattle in Pernambuco, Brazil*. Genet Mol Res, 2009. **8**(4): p. 1474-80.
13. Wang, J., G.W. Horner, and J.S. O'Keefe, *Detection and molecular characterisation of bovine polyomavirus in bovine sera in New Zealand*. N Z Vet J, 2005. **53**(1): p. 26-30.
14. Porterfield, J.S., *Andrewes: Viruses of the Vertebrates (Fifth Edition)*. Balliere Tindall, London, 1989.
15. Brock, K.V., et al., *Changes in levels of viremia in cattle persistently infected with bovine viral diarrhea virus*. J Vet Diagn Invest, 1998. **10**(1): p. 22-6.
16. Blackmore, C.G. and P.R. Grimstad, *Cache Valley and Potosi viruses (Bunyaviridae) in white-tailed deer (*Odocoileus virginianus*): experimental infections and antibody prevalence in natural populations*. Am J Trop Med Hyg, 1998. **59**(5): p. 704-9.
17. Walker, P.J. and D.H. Cybinski, *Bovine ephemeral fever and rhabdoviruses endemic to Australia*. Aust Vet J, 1989. **66**(12): p. 398-400.
18. Abdy, M.J., E.E. Howerth, and D.E. Stallknecht, *Experimental infection of calves with epizootic hemorrhagic disease virus*. Am J Vet Res, 1999. **60**(5): p. 621-6.
19. Zhang, Z. and S. Andersen, *Quantitative analysis of foot-and-mouth disease virus RNA loads in bovine tissues: implications for the site of viral persistence*. J Gen Virol, 2004. **85**(Pt 9): p. 2567-75.
20. Uchinuno, Y., et al., *Differences in Ibaraki virus RNA segment 3 sequences from three epidemics*. J Vet Med Sci, 2003. **65**(11): p. 1257-63.
21. Jones-Lang, K., et al., *Prevalence of influenza A virus (H1N1) antibodies in bovine sera*. New Microbiol, 1998. **21**(2): p. 153-60.
22. Tsuruoka, H., et al., *[Viremia in influenza: detection by polymerase chain reaction]*. Nippon Rinsho, 1997. **55**(10): p. 2714-8.
23. Desport, M., et al., *Analysis of Jembrana disease virus replication dynamics in vivo reveals strain variation and atypical responses to infection*. Virology, 2009. **386**(2): p. 310-6.



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24. Babiuk, S., et al., *Quantification of lumpy skin disease virus following experimental infection in cattle*. Transbound Emerg Dis, 2008. **55**(7): p. 299-307.
25. Littlejohns, I.R., R.W. Burton, and J.M. Sharp, *Bluetongue and related viruses in New South Wales: isolations from, and serological tests on samples from sentinel cattle*. Aust J Biol Sci, 1988. **41**(4): p. 579-87.
26. Mercer, A., et al., *Molecular genetic analyses of parapoxviruses pathogenic for humans*. Arch Virol Suppl, 1997. **13**: p. 25-34.
27. Harley, D., A. Sleigh, and S. Ritchie, *Ross River virus transmission, infection, and disease: a cross-disciplinary review*. Clin Microbiol Rev, 2001. **14**(4): p. 909-32, table of contents.
28. Kreil, T.R., et al., *Detection of tick-borne encephalitis virus by sample transfer, plaque assay and strand-specific reverse transcriptase polymerase chain reaction: what do we detect?* J Virol Methods, 1997. **68**(1): p. 1-8.
29. Uren, M.F. and G.M. Murphy, *Studies on the pathogenesis of bovine ephemeral fever in sentinel cattle. II. Haematological and biochemical data*. Vet Microbiol, 1985. **10**(6): p. 505-515.
30. Miles, J.A., *The ecology of Whataroa virus, an alphavirus, in South Westland, New Zealand*. J Hyg (Lond), 1973. **71**(4): p. 701-13.

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