



Transcriptional Expression Profile of Toll Like Receptor 1 - 10 mRNA in Bovine Peripheral Mononuclear Cells in Response to Foot and Mouth Disease Antigens

PDF (Size: 1074KB) PP. 417-425 DOI: 10.4236/aim.2012.24053

Author(s)

Sathish Gaikwad, Sowmya Kumar, Thimmareddy Prashanth, Golla Rama Reddy, Veluvarthy Sanyasi Suryanarayana, Hosur Joyappa Dechamma

ABSTRACT

Toll like receptors are the primary component of innate immune response. The comparison of expression of innate immune genes TLR 1 - 10 was carried out by real time PCR by quantifying mRNA in bovine PBMCs. The bovine PBMCs *in vitro* stimulated with FMD infectious virus lead to up regulation of TLR 2, 3, 4 and down regulation of TLR 9. But stimulation with DNA vaccine carrying VP1 genes of FMDV leads to up regulation of TLR 2 only. Difference in the TLR gene expression by the virus and DNA vaccine, may be related to the outcome of the vaccine and carrier or persistent state of the animal which is seen in FMDV.

KEYWORDS

Innate Immunity; FMDV; DNA Vaccine; TLR Genes

Cite this paper

S. Gaikwad, S. Kumar, T. Prashanth, G. Rama Reddy, V. Sanyasi Suryanarayana and H. Joyappa Dechamma, "Transcriptional Expression Profile of Toll Like Receptor 1 - 10 mRNA in Bovine Peripheral Mononuclear Cells in Response to Foot and Mouth Disease Antigens," *Advances in Microbiology*, Vol. 2 No. 4, 2012, pp. 417-425. doi: 10.4236/aim.2012.24053.

References

- [1] D. Werling, J. Piercy and T. J. Coffey, " Expression of Toll-Like Receptors (TLR) by Bovine Antigen-Presenting Cells-Potential Role in Pathogen Discrimination?" *Veterinary Immunology and Immunopathology*, Vol. 112, No. 1-2, 2006, pp. 2-11. doi:10.1016/j.vetimm.2006.03.007
- [2] P. V. Barnett and H. Carabin, " A Review of Emergency Foot-and-Mouth Disease (FMD) Vaccines," *Vaccine*, Vol. 20, No. 11-12, 2002, pp. 1505-1514. doi:10.1016/S0264-410X(01)00503-5
- [3] R. C. Rigden, C. P. Carrasco, P. V. Barnett, A. Summerfield and K. C. McCullough, " Innate Immune Responses Following Emergency Vaccination against Foot-and-Mouth Disease Virus in Pigs," *Vaccine*, Vol. 21, No. 13-14, 2003, pp. 1466-1477. doi:10.1016/S0264-410X(02)00663-1
- [4] A. L. Barnard, A. Arriens, S. Cox, P. Barnett, B. Kristensen, A. Summerfield and K. C. McCullough, " Immune Response Characteristics Following Emergency Vaccination of Pigs against Foot-and-Mouth Disease," *Vaccine*, Vol. 23, No. 8, 2005, pp. 1037-1047. doi:10.1016/j.vaccine.2004.07.034
- [5] Q. Yao, P. Qian, Q. Huang, Y. Cao and H. Chen, " Comparison of Immune Responses to Different Foot-and-Mouth Disease Genetically Engineered Vaccines in Guinea Pigs," *Journal of Virological Methods*, Vol. 147, No. 1, 2008, pp. 143-150. doi:10.1016/j.jviromet.2007.08.027
- [6] D. Dory, M. Remond, V. Beven, R. Cariolet, S. Zientara and A. Jestin, " Foot-and-Mouth Disease Virus neutralizing Antibodies Production Induced by pcDNA3 and Sindbis Virus Based Plasmid Encoding FMDV P1-2A3C3D in Swine," *Antiviral Research*, Vol. 83, No. 1, 2009, pp. 45-52. doi:10.1016/j.antiviral.2009.03.004
- [7] A. K. Chockalingam, S. Thiyagarajan, N. Govindasamy, R. Patnaikuni, S. Garlapati, R. R. Golla, D. H.

[AiM Subscription](#)[Most popular papers in AiM](#)[About AiM News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

| | |
|------------|--------|
| Downloads: | 20,829 |
|------------|--------|

| | |
|---------|---------|
| Visits: | 116,075 |
|---------|---------|

[Sponsors >>](#)

- Joyappa, P. Krishnamshetty and V. V. Veluvarti, " Study of a Chimeric Foot-and-Mouth Disease Virus DNA Vaccine Containing Structural Genes of Serotype O in a Genome Backbone of Serotype Asia 1 in Guinea pigs," *Acta Virologica*, Vol. 54, No. 3, 2010, pp. 189-195. doi:10.4149/av_2010_03_189
- [8] A. Summerfield, L. Guzylack-Piriou, L. Harwood and K. C. McCullough, " Innate Immune Responses against Foot-and-Mouth Disease Virus: Current Understanding and Future Directions," *Veterinary Immunology and Immunopathology*, Vol. 128, No. 1-3, 2009, pp. 205-210. doi:10.1016/j.vetimm.2008.10.296
- [9] J. Sambrook and D. W. Russell, " The Condensed Protocols from Molecular Cloning: A Laboratory Manual," Cold Spring Harbor Laboratory Press, Cold Spring Harbor, 2006.
- [10] A. Boyum, " Isolation of Mononuclear Cells and Granulocytes from Human Blood. Isolation of Monuclear Cells by One Centrifugation, and of Granulocytes by Combining Centrifugation and Sedimentation at 1 g," *Scandinavian Journal of Clinical & Laboratory Investigation*, Vol. 97, 1968, pp. 77-89.
- [11] S. A. Altman, L. Randers and G. Rao, " Comparison of Trypan Blue Dye Exclusion and Fluorometric Assays for Mammalian Cell Viability Determinations," *Biotechnology Progress*, Vol. 9, No. 6, 1993, pp. 671-674. doi:10.1021/bp00024a017
- [12] P. Konstantinova, O. Brake, J. Haasnoot, P. De Haan and B. Berkhout, " Trans-Inhibition of HIV-1 by a Long Hairpin RNA Expressed within the Viral Genome," *Retrovirology*, Vol. 4, 2007, p. 15. doi:10.1186/1742-4690-4-15
- [13] K. W. Boehme, M. Guerrero and T. Compton, " Human Cytomegalovirus Envelope Glycoproteins B and H Are Necessary for TLR2 Activation in Permissive Cells," *Journal of Immunology*, Vol. 177, No. 10, 2006, pp. 7094-7102.
- [14] G. M. Barton, " Viral Recognition by Toll-Like Receptors," *Seminars in Immunology*, Vol. 19, No. 1, 2007, pp. 33-40. doi:10.1016/j.smim.2007.01.003
- [15] Y. Sato, M. Roman, H. Tighe, D. Lee, M. Corr, M. D. Nguyen, G. J. Silverman, M. Lotz, D. A. Carson and E. Raz, " Immunostimulatory DNA Sequences Necessary for Effective Intradermal Gene Immunization," *Science*, Vol. 273, No. 5273, 1996, pp. 352-354. doi:10.1126/science.273.5273.352
- [16] D. M. Klinman, G. Yamshchikov and Y. Ishigatsubo, " Contribution of CpG Motifs to the Immunogenicity of DNA Vaccines," *Journal of Immunology*, Vol. 158, No. 8, 1997, pp. 3635-3639.
- [17] W. W. Leitner, H. Ying and N. P. Restifo, " DNA and RNA-Based Vaccines: Principles, Progress and Prospects," *Vaccine*, Vol. 18, No. 9-10, 1999, pp. 765-777. doi:10.1016/S0264-410X(99)00271-6
- [18] E. Pfaff, H. J. Thiel, E. Beck, K. Strohmaier and H. Schaller, " Analysis of Neutralizing Epitopes on Foot-and-Mouth Disease Virus," *Journal of Virology*, Vol. 62, No. 6, 1988, pp. 2033-2040.
- [19] M. Leippert, E. Beck, F. Weiland and E. Pfaff, " Point Mutations within the Beta G - Beta H Loop of Foot-and-Mouth Disease Virus O1K Affect Virus Attachment to Target Cells," *Journal of Virology*, Vol. 71, No. 2, 1997, pp. 1046-1051.
- [20] S. B. Nagendrakumar, G. S. Reddy, D. Chandran, D. Thiagarajan, P. N. Rangarajan and V. A. Srinivasan, " Molecular Characterization of Foot-and-Mouth Disease Virus Type C of Indian Origin," *Journal of Clinical Microbiology*, Vol. 43, No. 2, 2005, pp. 966-969. doi:10.1128/JCM.43.2.966-969.2005
- [21] A. Rudensky, P. Preston-Hurlburt, S. C. Hong, A. Barlow and C. A. Janeway Jr., " Sequence Analysis of Peptides Bound to MHC Class II Molecules," *Nature*, Vol. 353, No. 6345, 1991, pp. 622-627. doi:10.1038/353622a0
- [22] A. A. Andersen, " Cross Reactions of Normal Bovine Sera with Foot-and-Mouth Disease Virus: Incidence, Duration, and Effect of Shipping Stress," *American Journal of Veterinary Research*, Vol. 39, No. 4, 1978, pp. 603-606.
- [23] K. Tabeta, P. Georgel, E. Janssen, X. Du, K. Hoebe, K. Crozat, S. Mudd, L. Shamel, S. Sovath, J. Goode, L. Alexopoulou, R. A. Flavell and B. Beutler, " Toll-Like Receptors 9 and 3 as Essential Components of Innate Immune Defense against Mouse Cytomegalovirus Infection," *Proceedings of the National Academy of Sciences USA*, Vol. 101, No. 10, 2004, pp. 3516-3521. doi:10.1073/pnas.0400525101
- [24] K. Crozat and B. Beutler, " TLR7: A New Sensor of Viral Infection," *Proceedings of the National Academy of Sciences USA*, Vol. 101, No. 18, 2004, pp. 6835-6836. doi:10.1073/pnas.0401347101

- [25] Z. Zhang, J. B. Bashiruddin, C. Doel, J. Horsington, S. Durand and S. Alexandersen, " Cytokine and Toll-Like Receptor mRNAs in the Nasal-Associated Lymphoid Tissues of Cattle during Foot-and-Mouth Disease Virus Infection," *Journal of Comparative Pathology*, Vol. 134, No. 1, 2006, pp. 56-62.
doi:10.1016/j.jcpa.2005.06.011