



## DAFTAR PUSTAKA

- Allende, R., Lewis, T.L., Lu, Z., Rock, D.L., Kutish, G.F., Ali, A., Doster, A.R and Osorio, F.A. 1999. North American and European porcine reproductive and respiratory syndrome viruses differ in non-structural protein coding regions. *Journal of General Virology*. 80: 307–315.
- An, T.Q., Tian, Z.J., Xiao, Y., Li, R., Peng, J.M., and Wei, T.C. 2010. Origin of highly pathogenic porcine reproductive and respiratory syndrome virus in China. *Emerging Infectious Diseases*. 16: 365-367.
- Andreyev, V.G., Wesley, R.D., Mengeling, W.L., Vorwald, A.C., and Lager, K.M. 1997. Genetic variation and phylogenetic relationships of 22 porcine reproductive and respiratory syndrome virus (PRRSV) field strains based on sequence analysis of open reading frame 5. *Archives of Virology*. 142: 993-1001.
- Ansari, I.H., Kwon, B., Osorio, F.A., and Pattnaik, A.K., 2006. Influence of N-linked glycosylation of porcine reproductive and respiratory syndrome virus GP5 on virus infectivity, antigenicity and ability to induce neutralizing antibodies. *Journal of Virology*. 80: 3994-4004.
- Badaoui, B., Grande, R., Calza, S., Cecere, M., Luini, M., Stella, A, and Botti, S. 2013. Impact of genetic variation and geographic distribution of porcine reproductive and respiratory syndrome virus on infectivity and pig growth. *Veterinary Research*, 9 (58) 1-9
- Baranowski, E., Sevilla, N., Verdaguer, N., Ruiz-Jarabo, C. M., Beck, E., and Domingo, E. 1998. Multiple virulence determinants of foot-and-mouth disease virus in cell culture. *Journal of Virology*. 72: 6362-72.
- Bautista, E.M., S.M. Goyal, I.J. Yoon, H.S. Joo, and J.E. Collins. 1993. Comparison of porcine alveolar macrophages and CL2621 for the detection of porcine reproductive and respiratory syndrome (PRRS) virus and anti-PRRS antibody. *Journal of Veterinary Diagnostic Investigation*. 5:163-165.
- Behrens, G and Stoll, M. 2006. *Pathogenesis and Immunology* dalam Influenza report 2006, eds. Kamps, B.S., Hoffmann C. and Preiser, W. Flying Publisher, Chapter 4: 92-100.
- Benfield, D.A., Nelson, E., Collins, J.E., Harris, L., Goyal, S.M., Robison, D., Christianson, W.T., Morrison, R.B., Gorcyca, D and Chladek, D. 1992. Characterization of swine infertility and respiratory syndrome (SIRS) virus (isolate ATCC VR-2332). *Journal of Veterinary Diagnostic Investigation*. 4: 127–133.



- Beura, L.K., Sarkar, S.N., Kwon, B., Subramaniam, S., Jones, K., Pattnaik, A.K and Osorio, F.A. 2010. Porcine reproductive and respiratory syndrome virus nonstructural protein 1b modulates host innate immune response by antagonizing IRF3 activation. *Journal of Virology*. 84: 1574–1584.
- Braakman, I., and Van Anken, E. 2000. Folding of viral envelope glycoproteins in the endoplasmic reticulum. *Traffic*, 1(7): 533-539.
- Cancel-Tirado, S.M., Evans, R.B., and Yoon, K.J. 2004. Monoclonal antibody analysis of porcine reproductive and respiratory syndrome virus epitopes associated with antibody-dependent enhancement and neutralization of virus infection. *Veterinary Immunology and Immunopathology*. 102:249–262.
- Cavanaugh, D. 1997. *Nidovirales*: A new order comprising *Coronaviridae* and *Arteriviridae*. *Archives of Virology*. 142: 629-633.
- Cha, S.H., Choi, E.J., Park, J.H., Yoon, S.R., Song, J.Y., Kwon, J.H., Song, H.J., and Yoon, K.J. 2006. Molecular characterization of recent Korean porcine reproductive and respiratory syndrome (PRRS) viruses and comparison to other Asian PRRS viruses. *Veterinary Microbiology*. 117: 248-257.
- Chang, C.C., Chuang, W. E., and Lin, M. W. 1993. Porcine reproductive and respiratory syndrome in Taiwan. I. Viral isolation. *Journal. China. Society. Veterinary. Science*. 19: 268-276.
- Charpentier, C., Nora, T., Tenaillon, O., Clavel, F., and Hance, A. J. 2006. Extensive recombination among human immunodeficiency virus type 1 quasispecies makes an important contribution to viral diversity in individual patients. *Journal of Virology* 80: 2472-2482.
- Chauhan, H.C., Kher, H.N., Chandel, B.S., Dadawala, A.L., Jain, L., Agrawal, S.M., and Bhadaniya, A. 2009. Evaluation of group specific nested pcr for detection of bluetongue virus. *Veterinary World*. 2(5):179-182.
- Chen, J., Liu, T., Zhu, C.G., Jin, Y.F., and Zhang, Y.Z., 2006. Genetic variation of Chinese PRRSV strains based on ORF5 sequence. *Biochemical. Genetica*. 44: 421–431.
- Chen, Z., Sun, L.Z., Zhou, X., Guan, X., Christopher-Hennings, J., Nelson, E.A. and Fang, Y. 2010. Identification of two auto-cleavage products of nonstructural protein 1 (nsp1) in porcine reproductive and respiratory syndrome virus infected cells: nsp1 function as interferon antagonist. *Virology*. 398: 87–97.
- Cho, H.J., Mcnab, B., Dubuc, C., Jordan, L., Afshara, A., Magar, R., Prins, S. and Eernisse, K. 1997. Comparative study of serological methods for the



detection of antibodies to porcine reproductive and respiratory syndrome virus. *Canadian Journal of Veterinary Research.* 61: 161–166.

Christopher-Hennings, J., Nelson E.A., Nelson J.K. and Benfield, D.A. 1997. Effects of a modified-live virus vaccine against porcine reproductive and respiratory syndrome in boars. *American Journal of Veterinary Research.* 58: 40–45.

Christopher-Hennings, J., Holler, L.D., Benfield, D.A., and Nelson, E.A. 2001. Detection and duration of porcine reproductive and respiratory syndrome virus in semen, serum, peripheral blood mononuclear cells, and tissues from yorkshire, hampshire, and landrace boars. *Journal of Veterinary Diagnostic Investigation.* 13: 133-142.

Das, P.B., Dinh, P.X., Ansari, I.H., de Lima, M., Osorio, F.A., and Pattnaik, A.K., 2010. The minor envelope glycoproteins GP2a and GP4 of porcine reproductive and respiratory syndrome virus interact with the receptor CD163. *Journal of Virology.* 84: 1731-1740.

De Lima, M., Ansari, I. H., Das, P. B., Ku, B. J., Martinez-Lobo, F. J., Pattnaik, A. K., and Osorio, F. A. 2009. GP3 is a structural component of the PRRSV type II (US) virion. *Virology,* 390(1): 31-36.

Dea, S., Gagnon, C.A., Mardassi, H., Pirzadeh, B., and Rogan, D. 2000. Current knowledge on the structural proteins of porcine reproductive and respiratory syndrome (PRRS) virus: Comparison of the north american and european isolates. *Archives of Virology.* 145: 659-688.

Delputte, P.L., and Nauwynck, H.J. 2004. Porcine arterivirus infection of alveolar macrophages is mediated by sialic acid on the virus. *Journal of Virology* 78: 8094–8101.

Delputte, P.L., Costers, S., and Nauwynck, H.J., 2005. Analysis of porcine reproductive and respiratory syndrome virus attachment and internalization: Distinctive roles for heparin sulphate and sialoadhesin. *Journal of General Virology* 86: 1441-1445.

Delputte, P.L., Vanderheijden, N., Nauwynck, H.J., and Pensaert, M.B. 2002. Involvement of the matrix protein in attachment of porcine reproductive and respiratory syndrome virus to a heparinlike receptor on porcine alveolar macrophages. *Journal of Virology.* 76: 4312-4320.

den Boon, J.A., Snijder, E.R., Chirnside, E.D., de Vries, A.A.F., Horzinek, M.C., and Spaan, W.J.M. 1991. Equine arteritis virus is not a togavirus but belongs to the coronaviruslike superfamily. *Journal of Virology.* 65: 2910-2920.

Denac, H., Moser, C., Tratschin, J.D. and Hofmann, M.A. 1997. An indirect ELISA for the detection of antibodies against porcine reproductive and



- respiratory syndrome virus using recombinant nucleocapsid protein as antigen. *Journal of Virology*. 65: 169–181.
- Dokland, T., 2010. The structural biology of PRRSV. *Virus Res.* 154: 86-97.
- Doms, R. W., R. A. Lamb, J. K. Rose, and A. Helenius. 1993. Folding and assembly of viral membrane proteins. *Virology*. 193: 545-562.
- Drake, J.W. 1993. Rates of Spontaneous Mutation Among RNA Viruses. *Proceedings of the National Academy of Sciences of the United States of America. Genetics*. Vol. 90: 4171-4175.
- Duan, X., H.J. Nauwynck, and M.B. Pensaert. 1997. Effects of origin and state of differentiation and activation of monocytes/macrophages on their susceptibility to porcine reproductive and respiratory syndrome virus (PRRSV). *Archives of Virology*. 142(12): 2483-97.
- Fang, Y., D. Y. Kim, S., Ropp, P. Steen, J., Christopher-Hennings, E. A., Nelson, and Rowland, R. R. 2004. Heterogeneity in Nsp2 of European-like porcine reproductive and respiratory syndrome viruses isolated in the United States. *Virus Research*. 100: 229-235.
- Fang, Y., Schneider, P., Zhang, W. P., Faaberg, K. S., Nelson, E. A., and Rowland R. R. 2007. Diversity and evolution of a newly emerged North American Type 1 porcine arterivirus: analysis of isolates collected between 1999 and 2004. *Archives of Virology*. 152: 1009–1017
- FAO. 2011. Focus on: Porcine reproductive and respiratory syndrome (PRRS) virulence jumps and persistent circulation in Southeast Asia. EMPRES, Issue No: 5.
- Frias-Staheli, N., Giannakopolous, N.V., Kikkert, M., Taylor, S.L., Bridgen, A., Paragas, J., Richt, J.A., Rowland, R.R., Schmaljohn, C.S., Lenschow, D.J., Snijder, E.J., Garcia-Sastre, A., and Virgin, H.W. 2007. Ovarian tumor domain-containing viral proteases evade ubiquitin- and ISG15-dependent innate immuneresponses. *Cell Host Microbe* 2: 404–416.
- Gagnon, C.A., Lachapelle, G., Langelier, Y., Massie, B, and Dea, S. 2003. Adenoviral-expressed GP5 of porcine respiratory and reproductive syndrome virus differs in its cellular maturation from the authentic viral protein but maintains known biological functions. *Archives of Virology*. 148: 951–972.
- Gilbert, S.A., Laroche, R., Magar, R., Cho, H. J. and Deregt, D. 1997. Typing of porcine reproductive and respiratory syndrome viruses by a multiplex PCR assay. *Journal of Clinical Microbiology*, 35: 264–267.



- Goldberg, T.L., Lowe, J.F., Milburn, S.M and Firkins, L.D. 2003. Quasispecies variation of porcine reproductive and respiratory syndrome virus during natural infection. *Virology*. 317:197–207.
- Gonin, P., Pirzadeh, B., Gagnon, C. A., and S. Dea. 1999. Seroneutralization of porcine reproductive and respiratory syndrome virus correlates with antibody response to the GP5 major envelope glycoprotein. *Journal of Veterinary Diagnostic Investigation*. 11: 20-26.
- Greiser-Wilke.I. ,Oguzoglu, T. C., Tan, M. T., Toplu, N., Demir, A. B., Bilge-Dagpal, S., and Karaoglu, T. 2009. Border disease virus (BDV) infections of small ruminants in Turkey: A new BDV subgroup 2. *Veterinary Microbiology*, 135(3): 374-379.
- Guarino, H., Goyal, S.M., Murtaugh, M.P., Morrison, R.B., and Kapur, V.1999. Detection of porcine reproductive and respiratory syndrome virus by reverse transcription polymerase chain reaction using different region of the viral genome. *Journal of Veterinary Diagnostic Investigation*. 11: 27–33.
- Han, J., Wang, Y. and Faaberg, K.S. 2006. Complete genome analysis of RFLP 184 isolates of porcine reproductive and respiratory syndrome virus. *Virus Research*. 122: 175–182.
- Han, J., Liu, G., Wang, Y and Faaberg, K.S. 2007. Identification of nonessential regions of the nsp2 replicase protein of porcine reproductive and respiratory syndrome virus strain VR-2332 for replication in cell culture. *Journal of Virology*. 81: 9878–9890.
- Hao, X., Lu, Z., Kuang, W., Sun, P., Fu, Y., Wu, L., Zhao, Q., Bao, H., Fu, Y., Cao, Y., Li, P., Bai, X., Li, D, and Liu Z. 2011. Polymorphic genetic characterization of the ORF7 gene of porcine reproductive and respiratory syndrome virus (PRRSV) in China. *Journal of Virology*. 8:73.
- Helenius, A. 1994. How N-linked oligosaccharides affect glycoprotein folding in the endoplasmic reticulum. *Molecular Biology of the Cell*. 5 (3): 253.
- Helenius, A., and Aebi, M. 2004. Roles of N-linked glycans in the endoplasmic reticulum. *Annual Review of Biochemistry*. 73(1): 1019-1049.
- Hill, H. 1990. *Overview and history of mystery swine disease (swine infertility and respiratory syndrome)*. In Mystery Swine Disease Communication Meeting. Denver, Colorado. 29-31.
- Hirose, O., Kudo, H., Yoshizawa, S., Hiroike, T., and Nakane, T., 1995. Prevelance of porcine reproductive and respiratory syndrome virus in



- chiba prefecture. *Journal Japan Veterinary Medical Association.* 48: 650-653.
- Holger, M., Robert, H.G., Emily,P., Janeth P. Castillo., Yeny O. Tinoco., Hector H. Garcia., Gonzales, A. E., and Sterling, C.R., 2008. Nested PCR for Specific Diagnosis of *Taenia solium* Taeniasis. *Jounal of Clinical Microbiology.* Vol: 46 (1): 286–289.
- Holmes, E. C, and Rambaut, A. 2004. Viral evolution and the emergence of SARS coronavirus. *Philos Trans R Soc Lond B Biol. Sci.* 359: 1059-65.
- Hutagaol, N.M., Faisal, dan Sumaryani, H.D. 2010. Kejadian porcine reproductive and respiratory syndrome virus (PRRSV) di Sumatera Utara. *Buletin Balai Penyidikan dan Pengujian Veteriner Medan*, Vol 1: 6-12.
- Innis, M.A., Gelfand, D.H., Sninsky, J.J, and White, T.J. 1990. *PCR Protocols : A Guide to Methods and Applications.* Academic Press, Inc., San Diego, California.
- Johnson, C.R., Yu, W and Murtaugh, M.P. 2007. Cross-reactive antibody responses to nsp1 and nsp2 of porcine reproductive and respiratory syndrome virus. *Journal of General Virology.* 88: 1184–1195.
- Johnson, W.E., Sanford, H., Schwall, L., Burton, D.R., Parren, P.W., Robinson, J.E., and Desrosiers, R.C. 2003. Assorted mutations in the envelope gene of simian immunodeficiency virus lead to loss of neutralization resistance against antibodies representing a broad spectrum of specificities. *Journal of Virology.* 77: 9993–10003.
- Karniychuk, U.U., Saha, D., Geldhof, M., Vanhee, M., Cornillie, P., Van den Broeck, W. 2011. Porcine reproductive and respiratory syndrome virus (PRRSV) causes apoptosis during its replication in fetal implantation sites. *Microbial Pathogenesis.* 51: 194-202.
- Kawaoka, Y. and Webster, R. G. 1985. Evolution of the /Chicken/Pennsylvania/83 H5N2 influenza virus. *Virology.* 146: 130-7
- Key, K.F., Haqshenas, G., Guenette, D.K., Swenson, S.L., Toth, T.E., and Meng, X.J. 2001. Genetic variation and phylogenetic analyses of the ORF5 gene of acute porcine reproductive and respiratory syndrome virus isolates. *Veterinary Microbiology.* 83: 249 – 263.
- Kim, D.Y., Calvert, J.G., Chang, K.O., Horlen, K., Kerrigan, M and Rowland, R.R. 2007. Expression and stability of foreign tags inserted into nsp2 of porcine reproductive and respiratory syndrome virus (PRRSV). *Virus Research* 128:106–114.



- Kleiboeker, S.B., Schommer, S.K., Lee, S.M., Watkins, S., Chittick, W., and Polson D. 2005. Simultaneous detection of North American and European porcine reproductive and respiratory syndrome virus using real-time quantitative reverse transcriptase-PCR. *Journal of Veterinary Diagnostic Investigation.* 17:165–170.
- Kreutz, L.C., and Ackermann, M.R., 1996. Porcine reproductive and respiratory syndrome virus enters cells through a low pH-dependent endocytic pathway. *Virus Research.* 42: 137-147.
- Lee, C., Calvert, J.G., Welch, S.K and Yoo, D. 2005. A DNA-launched reverse genetics system for porcine reproductive and respiratory syndrome virus reveals that homodimerization of the nucleocapsid protein is essential for virus infectivity. *Virology.* 331: 47–62.
- Lee, C., Hodgins, D., Calvert, J.G., Welch, S.K., Jolie, R and Yoo, D. 2006a. Mutations within the nuclear localization signal of the porcine reproductive and respiratory syndrome virus nucleocapsid protein attenuate virus replication. *Virology.* 346: 238–250.
- Li, B., F. Lang., S. Liu., F. Zhao., Y. Jiang., K. He., H. Chen, and S. Xiao. 2010. The genomic diversity of Chinese porcine reproductive and respiratory syndrome virus isolates from 1996 to 2009. *Veterinary Microbiology.* 4888: 12.
- Li, J., Y. Yin., B, Guo., S, Zhou., Y, Zhang., X, Liu and T, Sun. 2012. Sequence analysis of the NSP2, ORF5, and ORF7 genes of 11 virus isolates from China. *Virus Genes.* 45: 256-264.
- Li, Y., Wang, X., Bo, K., Tang, B., Yang, B., Jiang, W and Jiang, P. 2007. Emergence of a highly pathogenic porcine reproductive and respiratory syndrome virus in the Mid-Eastern region of China. *Veterinary Journal.* 174:577-584.
- Lin, D., Lan, J, and Zhang, Z. 2007. Structure and Function of The NS1 Protein of Influensa A Virus. *Acta Biochimica et Biophysica Sinica.* 39: 155–162.
- Liu, J.K., Wei, C.H., Yang, X. Y., Hou, X.L., Dai, A.L., Li, X.H., Wei, M.K, and Pan, X.Z. 2013. Genetic diversity and evolutionary characterization of Chinese porcine reproductive and respiratory syndrome viruses bases on NSP2 and ORF5. *Archives of Virology.* The online version of this article (doi:10.1007/s00705-013-1669-8)
- Loembra, H.D., Mounir, S., Mardassi, H., Archambault, D and Dea, S. 1996. Kinetics of humoral immune response to the major structural proteins of the porcine reproductive and respiratory syndrome virus. *Archives of Virology.* 141:751–761.



- Mardassi, H., Mounir, S, and Dea S. 1995. Molecular analysis of the ORF3-7 of porcine reproductive and respiratory syndrome virus, Quebec reference strain. *Archives of Virology*. 140(1): 1405–1418.
- Mardassi, H., B. Massie, and S. Dea. 1996. Intracellular synthesis, processing, and transport of proteins encoded by ORFs 5 to 7 of porcine reproductive and respiratory syndrome virus. *Virology*. 221: 98-112.
- Martines-Lobo, F.J., Dies-Fuertes, F., Segales, J., Garcia-Artiga, C., and Simarro, I. 2011. Comparative pathogenicity of type 1 and type 2 isolates of porcine reproductive and respiratory syndrome virus (PRRSV) in a young pig infection model. *Veterinary Microbiology*. 154: 58-68.
- Mateu, E., Diaz, I., Darwich, L., Casal, J., Martin, M., and Pujols, J. 2006. Evolution of ORF5 of Spanish porcine reproductive and respiratory syndrome virus strains from 1991 to 2005. *Virus Research*. 115: 198-206.
- Meng, X.J., Paul, P.S., Halbur, P.G, and Morozov, I. 1995. Sequence comparison of open reading frames 2 to 5 of low and high virulence United States isolates of porcine reproductive and respiratory syndrome virus. *Journal of General Virology*. 76 (12): 3181-8.
- Meng, X.J., P.S. Paul, P.G. Halbur, and M.A. Lum. 1996. Characterization of a high-virulence US isolate of porcine reproductive and respiratory syndrome virus in a continuous cell line, ATCC CRL11171. *Journal of Veterinary Diagnostic Investigation*. 8(3):374-81.
- Mengeling, W. L., Lager, K. M., and Vorwald, A. C. 1998. Clinical consequences of exposing pregnant gilts to strains of porcine reproductive and respiratory syndrome (PRRS) virus isolated from field cases of "atypical" PRRS. *American Journal of Veterinary Research*. 59: 1540-1544.
- Meulenberg, J. J., Petersen-den Besten, A., De Kluyver, E. P., Moormann, R. J., Schaaper, W. M, and Wensvoort, G. 1995. Characterization of proteins encoded by ORFs 2 to 7 of Lelystad virus. *Virology*. 206: 155-163.
- Meulenberg, J.J., Hulst, M.M., de Meijer, E.J., Moonen, P.L., den Besten, A., de Kluyver, E.P. 1993. Lelystad virus, the causative agent of porcine epidemic abortion and respiratory syndrome (PEARS), is related to LDV and EAV. *Virology*. 192: 62-72.
- Meulenberg, J.J., van Nieuwstadt, A.P., van Essen-Zandbergen, A., Bos-de Ruijter, J.N., Langeveld, J.P and Meloen, R.H. 1998. Localization and fine mapping of antigenic sites on the nucleocapsid protein N of porcine reproductive and respiratory syndrome virus with monoclonal antibodies. *Virology*. 252: 106–114.
- Misinzo, G.M., Delputte, P.L., and Nauwynck, H.J., 2008. Involvement of proteases in porcine reproductive and respiratory syndrome virus



uncoating upon internalization in primary macrophages. *Veterinary Research*. 39, 55.

Murtaugh, M. P, and Genzow, M. 2011. Immunological solutions for treatment and prevention of porcine reproductive and respiratory syndrome (PRRS). *Vaccine*. 29 (46): 8192-8204.

Murtaugh, M.P., Stadejek, T., Abrahante, J.E., Lam, T.T., and Leung, F.C. 2010. The ever- expanding diversity of porcine reproductive and respiratory syndrome virus. *Virus Research*. 154: 18-30.

Music, N and Gagnon, C. A. 2010. The role of porcine reproductive and respiratory syndrome (PRRS) virus structural and non-structural proteins in pathogenesis. *Animal Health Research Reviews*. 11 (2): 135-163.

Nam, E., Park, C.K., Kim, S.H., Joo, Y.S., Yeo, S.G, and Lee, C. 2009. Complete genomic characterization of a European type 1 porcine reproductive and respiratory syndrome virus isolate in Korea. *Archives of Virology*. 154: 629–638.

Nauwynck, H.J., X. Duan, Favoreel, H.W., van-Oostveldt, P, and Pensaert, M.B. 1999. Entry of porcine reproductive and respiratory syndrome virus into porcine alveolar macrophages via receptor-mediated endocytosis. *Journal of General Virology*. 80(2):297-305.

Nei, M., and Kumar, S. 2000. *Molecular Evolution and Phylogenetics*. Oxford University Press. New York.

Nelsen, C.J., Murtaugh, M.P and Faaberg, K.S. 1999. Porcine reproductive and respiratory syndrome virus comparison: divergent evolution on two continents. *Journal of Virology*. 73: 270–280.

Neumann E. J., Kleibenstein J. B., Johnson C. D., Mabry J. W., Bush E. J. Seitzinger A. H., Green A. L., and Zimmerman J. J. 2005. Assessment of the economic impact of porcine reproductive and respiratory syndrome on swine production in the United States. *Journal of the American Veterinary Medical Association*. 227(3): 385-392.

Nilubol, D., T. Tripipat., T. Hoonsuwan., P. Tipsombatboon and, J. Piriyapongsa. 2013. Genetic diversity of the ORF5 gene of porcine reproductive and respiratory syndrome virus (PRRSV) genotypes I and II in Thailand. *Archives of Virology*. 158: 943-953.

Pirzadeh, B., C.A. Gagnon, and S. Dea. 1998. Genomic and antigenic variations of porcine reproductive and respiratory syndrome virus major envelope GP5 glycoprotein. *Canadian Journal of Veterinary Research*,. 62(3):170-177.



- Plagemann PGW. 2004. The primary GP5 neutralization epitope of North American isolates of porcine reproductive and respiratory syndrome virus. *Veterinary Immunology and Immunopathology*. 102: 263 -75.
- Plagemann, P.G., Rowland, R.R., and Faaberg, K.S., 2002. The primary neutralization epitope of porcine respiratory and reproductive syndrome virus strain VR-2332 is located in the middle of the GP5 ectodomain. *Archives of Virology*. 147: 2327-2347.
- Ran, Z.G., Chen, X.Y., Guo, X., Ge, X.N., Yoon, K.J and Yang, H.C. 2008. Recovery of viable porcine reproductive and respiratory syndrome virus from an infectious clone containing a partial deletion within the Nsp2-encoding region. *Archives of Virology*. 153: 899–907.
- Rowland, R.R., and Yoo, D. 2003. Nucleolar-cytoplasmic shuttling of PRRSV nucleocapsid protein: A simple case of molecular mimicry or the complex regulation by nuclear import, nucleolar localization and nuclear export signal sequences. *Virus Research*. 95: 23-33.
- Rowland, R.R., Lawson,S., Rossow, S.K, and Benfield, D.A. 2003. Lymphoid tissue tropism of porcine reproductive and respiratory syndrome virus replication during persistent infection of pigs originally exposed to virus *in utero*. *Veterinary Microbiology*. 96(3): 219-35.
- Rowland, R.R., Schneider, P., Fang, Y., Woottton, S., Yoo, D and Benfield, D.A. 2003. Peptide domains involved in the localization of the porcine reproductive and respiratory syndrome virus nucleocapsid protein to the nucleolus. *Virology*. 316: 135–145.
- Sambrook, J., Fristsch, and Maniatis, T. 1989. *Molecular Cloning. A Laboratory manual*. Second edition. Cold Spring Harbor Laboratory press.
- Santhia, K., Dewi, A. A. S., Purnatha, N., Sutami, N., dan Faesal, M. 2010. Seroprevalensi dan kasus klinis hog cholera di Propinsi Bali dan Nusa Tenggara Timur tahun 2010. *Laporan Teknis tahun 2010 BBVet Denpasar*. Dirjenak keswan. Hal: 41-51.
- Sawicki, S.G., Sawicki, D.L, and Siddell, S.G. 2007. A contemporary view of coronavirus transcription. *Journal of Virology*. 81: 20-29.
- Sendow, I., S. Bahri, and A. Sarosa. 1997. The detection antibody of porcine reproductive and respiratory syndrome (PRRS) in pig sera in Eastern part of Indonesia. *Jurnal Ilmu Ternak dan Veteriner*. 2 (3): 184-187.
- Shi,Y., Hu.Z., Xiong, Z., Zhou,Y., Jin, X., Gu, C., Hu, X., Cheng, G,G., Song, N, and Zhang,W. 2013. Analysis of molecular variation of porcine reproductive and respiratory syndrome virus in central China from 2006 to 2012. *Archives of Virology*. 158: 717-721.



- Smirnov, Y. A., Gitelman, A. K., Govorkova, E. A., Lipatov, A. S., and Kaverin, N. V. 2004. Influenza H5 virus escape mutants: immune protection and antibody production in mice. *Virus Research*. 99: 205-8.
- Snijder, E.J., and Meulenbergh, J.J., 1998. The molecular biology of arteriviruses. *Journal of General Virology*. 79 (Pt5): 961-979.
- Snijder, E.J., Dobbe, J.C. and Spaan, W.J. 2003. Heterodimerization of the two major envelope proteins is essential for arterivirus infectivity. *Journal of Virology*. 77: 97-104.
- Spilman, M.S., Welbon, C., Nelson, E., Dokland, T. 2009. Cryo-electron tomography of porcine reproductive and respiratory syndrome virus: Organization of the nucleocapsid. *Journal of General Virology*. 90: 527-535.
- Stadejek, T., Oleksiewicz, M.B., Potapchuk, D., and Podgorska, K. 2006. Porcine reproductive and respiratory syndrome virus strains of exceptional diversity in eastern europe support the definition of new genetic subtypes. *Journal of General Virology*. 87: 1835-1841.
- Stadejek, T., Stankevicius, A., Storgaard, T., Oleksiewicz, M. B., Belak, S., Drew, T. W, and Pejsak, Z. 2002. Identification of radically different variants of porcine reproductive and respiratory syndrome virus in Eastern Europe: towards a common ancestor for European and American viruses. *Journal of General Virology*. 83: 1861-1873.
- Storgaard, T., Oleksiewicz, M., and Botner, A. 1999. Examination of the selective pressures on a live PRRS vaccine virus. *Archives of Virology*. 144: 2389 – 2401.
- Suarez, P., Diaz-Guerra, M., Prieto, C., Esteban, M., Castro, J.M., Nieto, A, and Ortin, J. 1996. Open reading frame 5 of porcine reproductive and respiratory syndrome virus as a cause of virus-induced apoptosis. *Journal of Virology*. 70:2876–2882.
- Therese, K.L., Jayanthi, U, and Madhavan, H.N. 2005. Application of Nested Polymerase Chain Reaction (nPCR) Using MPB 64 Gene Primers to Detect Mycobacterium Tuberculosis DNA in Clinical Specimens From Extrapulmonary Tuberculosis Patients. *Indian Journal of Medical Research*. 122:165–170.
- Tian, K., Yu X., Zhao T., Feng Y., Cao Z., Wang C., Hu Y., Chen X., Hu D., Tian X., Liu D., Zhang S., Deng X., Ding Y., Yang L., Zhang Y., Xiao H., Qiao M., Wang B., Hou L., Wang X., Yang X., Kang L., Sun M., Jin P., Wang S., Kitamura Y., Yan J. and Gao G.F. 2007. Emergence of fatal PRRSV variants: unparalleled outbreaks of atypical PRRS in China and molecular dissection of the unique hallmark. *PLoS. One*. 2: 526.



- Tun, H.M., Shi, M., Wong, C.L., Ayudhya, S.N., Amonsin, A., Thanawonguwech, R, and Leung, F.C. 2011. Genetic diversity and multiple introductions of porcine reproductive and respiratory syndrome viruses in Thailand. *Journal of Virology*. 8:164.
- Vanderheijden, N., Delputte , P.L., Favoreel, H.W., Vandekerckhove, J., Van Damme, J., van Woensel , P.A., and Nauwynck ,H.J. 2003. Involvement of sialoadhesin in entry of porcine reproductive and respiratory syndrome virus into porcine alveolar macrophages. *Journal of Virology*. 77(15): 8207-15.
- Vanhee, P., van der Sloot, A. M., Verschueren, E., Serrano, L., Rousseau, F, and Schymkowitz, J. 2011. Computational design of peptide ligands. *Trends in Biotechnology*. 29 (5): 231-239.
- Van-Reeth, K. 2007. Avian and swine influenza viruses: our current understanding of the zoonotic risk. *Veterinary Research*. 38: 243-60.
- Verheije, M.H., Welting, T.J., Jansen, H.T., Rottier, P.J., and Meulenberg, J.J. 2002. Chimeric arteriviruses generated by swapping of the M protein ectodomain rule out a role of this domain in viral targeting. *Virology*. 303: 364-373.
- Vignuzzi, M., Stone, J. K., Arnold, J. J., Cameron, C. E., and Andino, R. 2006. Quasispecies diversity determines pathogenesis through cooperative interactions in a viral population. *Nature* 439: 344-8.
- Wasilk, A., Callahan, J.D., Christopher-Henings, J., Gay, T.A., Fang, Y., Dammen, M., Reos, M.E., Torremorell, M., Polson, D., Mellencamp, M., Nelson, E. and Nelson, W.M. 2002. Detection of U.S., Lelystad, and European-like porcine reproductive and respiratory syndrome viruses and relative quantitation in boar semen and serum samples by real-time PCR. *Journal of Clinical Microbiology*. 42; 4453–4461.
- Wei, T. C., Tian, ZJ., Zhou, Y.J., An, T.Q., Jiang Y.P., Xiao, Y., Hu, S.P., Peng, J.M., Hao, X.F., Zhang, S.R, and Tong, G.Z. 2011. Evaluation of the Pathogenicity of a Highly Pathogenic Porcine Reproductive and Respiratory Syndrome Virus Variant in Piglets. *Agricultural Sciences in China*. 10 (8): 1280-1291.
- Wei, X., Decker, J.M., Wang, S., Hui, H., Kappes, J.C., Wu, X., Salazar-Gonzalez,J.F., Salazar, M.G., Kilby, J.M., Saag, M.S., Komarova, N.L., Nowak,M.A., Hahn,B.H., Kwong, P.D., and Shaw, G.M. 2003. Antibody neutralization and escapeby HIV-1. *Nature*. 422: 307–312.
- Wensvoort, G. 1993. Lelystad virus and the porcine epidemic abortion and respiratory syndrome. *Veterinary Research*. 24:117-124.



- Wensvoort, G., Terpstra, C., Pol, J.M., ter Laak, E.A., Bloemraad, M., de Kluyver, E.P., Kragten, C., van Buiten, L., den Besten, A., and Wagenaar, F. 1991. Mystery swine disease in The Netherlands: the isolation of Lelystad virus. *Veterinary Quarterly.* 13(3): 121-30.
- Wesley, R. D., Mengeling , W. L., Lager , K. M., Clouser , D. F., Landgraf , J. G, and Frey, M. L. 1998. Differentiation of a porcine reproductive and respiratory syndrome virus vaccine strain from North American field strains by restriction fragment length polymorphism analysis of ORF 5. *Journal of Veterinary Diagnostic Investigation.* 10: 140-144.
- Wesley, R.D., Mengeling, W.L., Lager, K.M., Vorwald, A.C., and Roof, M.B. 1999. Evidence for divergence of restriction fragment length polymorphism patterns following in vivo replication of porcine reproductive and respiratory syndrome virus. *American Journal of Veterinary Research.* 60: 463–467.
- Wissink, E. H., van Wijk , H. A., Kroese , M. V., Weiland, E., Meulenberg , J. J., Rottier , P. J, and van Rijn, P. A. 2003. The major envelope protein, GP5, of European porcine reproductive and respiratory syndrome virus contains a neutralization epitope in its N-terminal ectodomain. *Journal of General Virology.* 84: 1535-1543.
- Wissink, E.H., Kroese, M.V., van Wijk, H.A., Rijsewijk, F.A., Meulenberg, J.J., and Rottier, P.J. 2005. Envelope protein requirements for the assembly of infectious virions of porcine reproductive and respiratory syndrome virus. *Journal of Virology.* 79: 12495-12506.
- Wootton, S., Koljesar, G., Yang, L., Yoon, K.J and Yoo, D. 2001. Antigenic importance of the carboxy-terminal beta-strand of the porcine reproductive and respiratory syndrome virus nucleocapsid protein attenuate virus replication. *Virology.* 346: 238–250.
- Wootton, S.K., and Yoo, D. 2003. Homo-oligomerization of the porcine reproductive and respiratory syndrome virus nucleocapsid protein and the role of disulfide linkages. *Journal of Virology.* 77: 4546-4557.
- Wootton, S.K., Nelson, E.A and Yoo, D. 1998. Antigenic structure of the nucleocapsid protein of porcine reproductive and respiratory syndrome virus. *Clinical and Diagnostic Laboratory Immunology.* 5: 773–779.
- Wootton, S.K., Rowland, R.R and Yoo, D. 2002. Phosphorylation of the porcine reproductive and respiratory syndrome virus nucleocapsid protein. *Journal of Virology.* 76: 10569–10576.



- Wurm, T., Chen, H., Hodgson, T., Britton, P., Brooks, G, and Hiscox, J.A. 2001. Localization to the nucleolus is a common feature of coronavirus nucleoproteins, and the protein may disrupt host cell division. *Journal of Virology*. 75: 9345–9356.
- Yang,S.X., Kwang,J., and Laegreid,W. 1998. Comparative sequence analysis of open reading frames 2 to 7 of the modified live vaccine virus and other North American isolates of the porcine reproductive and respiratory syndrome virus. *Archives of Virology*, 143:601-612
- Yoo, D., Wootton, S.K., Li, G., Song, C and Rowland, R.R. 2003. Colocalization and interaction of the porcine arterivirus nucleocapsid protein with the small nucleolar RNAassociated protein fibrillarin. *Journal of Virology*. 77:12173–12183.
- Yuwono, T. 2006. *Teori dan Aplikasi Polymerase Chain Reaction*. ANDI. Yogyakarta
- Zhou, L., Chen, S., Zhang, J., Zeng, J., Guo, X., and Ge, X. 2009. Molecular variation analysis of porcine reproductive and respiratory syndrome virus in China. *Virus Research*. 145: 97-105.
- Zhou, Y.J., Hao, X.F., Tian, Z.J., Tong, G.Z., Yoo, D., An, T.Q., Zhou, T., Li, G.X., Qiu, H.J., Wei, T.C and Yuan, X.F. 2008. Highly virulent porcine reproductive and respiratory syndrome virus emerged in China. *Transboundary and Emerging Diseases*. 55: 152–164.
- Zimmerman, J., Benfield, D.A., Murtaugh, M.P., Osorio, F., Stevenson, G.W., and Torremorell, M. 2006. *Diseases of swine. Porcine reproductive and respiratory syndrome virus (porcine arterivirus)*. Blackwell Publishing, 2121 State Avenue, Ames, Iowa 50014, USA, pp. 387- 417.
- Zimmerman, J., Epperson , W., Wills , R.W, and McKean, J.D. 1997. Results of the recent survey of the membership of the AASP for outbreaks of sow abortion and mortality. *Swine Health and Production*. 5:74-75.