

돼지 썬코 바이러스 타입 2 (PCV2)의 유전형(Genotype) 과 교차방어(Cross Protection)

참고 문헌

- Afghah Z, Webb B, Meng XJ, Ramamoorthy S. Ten years of PCV2 vaccines and vaccination: Is eradication a possibility? *Vet Microbiol.* 2017 Jul;206:21-28.
- Allan GM, McNeilly F, Kennedy S, Daft B, Clarke EG, Ellis JA, Haines DM, Meehan BM, Adair BM. Isolation of porcine circovirus-like viruses from pigs with a wasting disease in the USA and Europe. *J Vet Diagn Invest.* 1998 Jan;10(1):3-10.
- Bao F, Mi S, Luo Q, Guo H, Tu C, Zhu G, Gong W. Retrospective study of porcine circovirus type 2 infection reveals a novel genotype PCV2f. *Transbound Emerg Dis.* 2018 Apr;65(2):432-440.
- Beach NM, Ramamoorthy S, Opriessnig T, Wu SQ, Meng XJ. Novel chimeric porcine circovirus (PCV) with the capsid gene of the emerging PCV2b subtype cloned in the genomic backbone of the non-pathogenic PCV1 is attenuated *in vivo* and induces protective and cross-protective immunity against PCV2b and PCV2a subtypes in pigs. *Vaccine.* 2010 Dec 16;29(2):221-32.
- Carman S, McEwen B, DeLay J, van Dreumel T, Lusis P, Cai H, Fairles J. Porcine circovirus-2 associated disease in swine in Ontario (2004 to 2005). *Can Vet J.* 2006 Aug;47(8):761-2.
- Cheung AK. Porcine circovirus: transcription and DNA replication. *Virus Res.* 2012 Mar;164(1-2):46-53.
- Czyżewska-Dors EB, Dors A, Pomorska-Mól M, Podgórska K, Pejsak Z. Efficacy of the Porcine circovirus 2 (PCV2) vaccination under field conditions. *Vet Ital.* 2018 Sep 30;54(3):219-224.
- Davies B, Wang X, Dvorak CM, Marthaler D, Murtaugh MP. Diagnostic phylogenetics reveals a new Porcine circovirus 2 cluster. *Virus Res.* 2016 Jun 2;217:32-7.
- Dorr PM, Baker RB, Almond GW, Wayne SR, Gebreyes WA. Epidemiologic assessment of porcine circovirus type 2 coinfection with other pathogens in swine. *J Am Vet Med Assoc.* 2007 Jan 15;230(2):244-50.
- Dupont K, Nielsen EO, Baekbo P, Larsen LE. Genomic analysis of PCV2 isolates from Danish archives and a current PMWS case-control study supports a shift in genotypes with time. *Vet Microbiol.* 2008 Apr 1;128(1-2):56-64.
- Fachinger V, Bischoff R, Jedidia SB, Saalmüller A, Elbers K. The effect of vaccination against porcine circovirus type 2 in pigs suffering from porcine respiratory disease complex. *Vaccine.* 2008 Mar 10;26(11):1488-99.
- Fenaux M, Opriessnig T, Halbur PG, Elvinger F, Meng XJ. A chimeric porcine circovirus (PCV) with the immunogenic capsid gene of the pathogenic PCV type 2 (PCV2) cloned into the genomic backbone of the nonpathogenic PCV1 induces protective immunity against PCV2 infection in pigs. *J Virol.* 2004 Jun;78(12):6297-303.
- Finsterbusch T, Mankertz A. Porcine circoviruses-small but powerful. *Virus Res.* 2009 Aug;143(2):177-83.
- Firth C, Charleston MA, Duffy S, Shapiro B, Holmes EC. Insights into the evolutionary history of an emerging livestock pathogen: porcine circovirus 2. *J Virol.* 2009 Dec;83(24):12813-21.
- Fraile L, Grau-Roma L, Sarasola P, Sinovas N, Nofrarias M, López-Jimenez R, López-Soria S, Sibila M, Segalés J. Inactivated PCV2 one shot vaccine applied in 3-week-old piglets: improvement of production parameters and interaction with maternally derived immunity. *Vaccine.* 2012 Mar 2;30(11):1986-92.
- Franzo G, Cortey M, de Castro AM, Piovezan U, Szabo MP, Drigo M, Segalés J, Richtzenhain LJ. Genetic characterisation of Porcine circovirus type 2 (PCV2) strains from feral pigs in the Brazilian Pantanal: An opportunity to reconstruct the history of PCV2 evolution. *Vet Microbiol.* 2015 Jul 9;178(1-2):158-62.
- Franzo G, Segalés J. Porcine circovirus 2 (PCV-2) genotype update and proposal of a new genotyping methodology. *PLoS One.* 2018 Dec 6;13(12):e0208585.
- Franzo G, Tucciarone CM, Cecchinato M, Drigo M. Porcine circovirus type 2 (PCV2) evolution before and after the vaccination introduction: A large scale epidemiological study. *Sci Rep.* 2016 Dec 19;6:39458.
- Gillespie J, Opriessnig T, Meng XJ, Pelzer K, Buechner Maxwell V. Porcine circovirus type 2 and porcine circovirus-associated disease. *J Vet Intern Med.* 2009 Nov-Dec;23(6):1151-63.
- Han K, Seo HW, Oh Y, Park C, Kang I, Jang H, Chae C. Efficacy of a piglet-specific commercial inactivated vaccine against Porcine circovirus type 2 in clinical field trials. *Can J Vet Res.* 2013 Jul;77(3):237-40.
- Harding JC. The clinical expression and emergence of porcine circovirus 2. *Vet Microbiol.* 2004 Feb 4;98(2):131-5. Review.
- Harmon KM, Gauger PC, Zhang J, Piñeyro PE, Dunn DD, Chriswell AJ. Whole-genome sequences of novel porcine circovirus type 2 viruses detected in swine from Mexico and the United States. *Genome Announc.* 2015 Dec 17;3(6). pii: e01315-15.
- Huan C, Fan M, Cheng Q, Wang X, Gao Q, Wang W, Gao S, Liu X. Evaluation of the Efficacy and cross-protective

- immunity of live-attenuated chimeric PCV1-2b Vaccine against PCV2b and PCV2d subtype challenge in pigs. *Front Microbiol.* 2018 Mar 15;9:455.
- Jeong J, Park C, Choi K, Chae C. Comparison of three commercial one-dose porcine circovirus type 2 (PCV2) vaccines in a herd with concurrent circulation of PCV2b and mutant PCV2b. *Vet Microbiol.* 2015 May 15;177(1-2):43-52.
 - Ju C, Fan H, Tan Y, Liu Z, Xi X, Cao S, Wu B, Chen H. Immunogenicity of a recombinant pseudorabies virus expressing ORF1-ORF2 fusion protein of porcine circovirus type 2. *Vet Microbiol.* 2005 Aug 30;109(3-4):179-90.
 - Karuppanan AK, Opriessnig T. Porcine Circovirus Type 2 (PCV2) Vaccines in the Context of Current Molecular Epidemiology. *Viruses.* 2017 May 6;9(5).
 - Kim YS, Kim SW, Weaver MA, Lee CY. Increasing the pig market weight: world trends, expected consequences and practical considerations. *Asian-Australasian Journal of Animal Sciences.* 2005 8(4): 590-600.
 - Li J, Yu T, Zhang F, Wang X, Zhou J, Gao X, Gao S, Liu X. Inactivated chimeric porcine circovirus (PCV) 1-2 vaccines based on genotypes 2b and 2d exhibit similar immunological effectiveness in protecting pigs against challenge with PCV2b strain 0233. *Arch Virol.* 2017 Jan;162(1):235-246.
 - Liu J, Wei C, Dai A, Lin Z, Fan K, Fan J, Liu J, Luo M, Yang X. Detection of PCV2e strains in Southeast China. *PeerJ.* 2018 Mar 27;6:e4476.
 - Lyoo K, Joo H, Caldwell B, Kim H, Davies PR, Torrison J. Comparative efficacy of three commercial PCV2 vaccines in conventionally reared pigs. *Vet J.* 2011 Jul;189(1):58-62.
 - Lv QZ, Guo KK, Zhang YM. Current understanding of genomic DNA of porcine circovirus type 2. *Virus Genes.* 2014 Aug;49(1):1-10.
 - Martelli P, Ferrari L, Morganti M, De Angelis E, Bonilauri P, Guazzetti S, Caleffi A, Borghetti P. One dose of a porcine circovirus 2 subunit vaccine induces humoral and cell-mediated immunity and protects against porcine circovirus-associated disease under field conditions. *Vet Microbiol.* 2011 May 5;149(3-4):339-51.
 - McGlone JJ. The Future of Pork Production in the World: Towards Sustainable, Welfare-Positive Systems. *Animals (Basel).* 2013 May 15;3(2):401-15.
 - Meehan BM, McNeilly F, Todd D, Kennedy S, Jewhurst VA, Ellis JA, Hassard LE, Clark EG, Haines DM, Allan GM. Characterization of novel circovirus DNAs associated with wasting syndromes in pigs. *J Gen Virol.* 1998 Sep;79 (Pt 9):2171-9.
 - Onuki A, Abe K, Togashi K, Kawashima K, Taneichi A, Tsunemitsu H. Detection of porcine circovirus from lesions of a pig with wasting disease in Japan. *J Vet Med Sci.* 1999 Oct;61(10):1119-23.
 - Opriessnig T, Meng XJ, Halbur PG. Porcine circovirus type 2 associated disease: update on current terminology, clinical manifestations, pathogenesis, diagnosis, and intervention strategies. *J Vet Diagn Invest.* 2007 Nov;19(6):591-615.
 - Opriessnig T, Patterson AR, Elsener J, Meng XJ, Halbur PG. Influence of maternal antibodies on efficacy of porcine circovirus type 2 (PCV2) vaccination to protect pigs from experimental infection with PCV2. *Clin Vaccine Immunol.* 2008 Mar;15(3):397-401.
 - Opriessnig T, Langohr I. Current state of knowledge on porcine circovirus type 2-associated lesions. *Vet Pathol.* 2013 Jan;50(1):23-38.
 - Opriessnig T, O'Neill K, Gerber PF, de Castro AM, Giménez-Lirola LG, Beach NM, Zhou L, Meng XJ, Wang C, Halbur PG. A PCV2 vaccine based on genotype 2b is more effective than a 2a-based vaccine to protect against PCV2b or combined PCV2a/2b viremia in pigs with concurrent PCV2, PRRSV and PPV infection. *Vaccine.* 2013 Jan 7;31(3):487-94.
 - Opriessnig T, Gerber PF, Xiao CT, Halbur PG, Matzinger SR, Meng XJ. Commercial PCV2a-based vaccines are effective in protecting naturally PCV2b-infected finisher pigs against experimental challenge with a 2012 mutant PCV2. *Vaccine.* 2014a Jul 23;32(34):4342-8.
 - Opriessnig T, Gerber PF, Xiao CT, Mogler M, Halbur PG. A commercial vaccine based on PCV2a and an experimental vaccine based on a variant mPCV2b are both effective in protecting pigs against challenge with a 2013 U.S. variant mPCV2b strain. *Vaccine.* 2014b Jan 3;32(2):230-7.
 - Opriessnig T, Xiao CT, Gerber PF, Halbur PG, Matzinger SR, Meng XJ. Mutant USA strain of porcine circovirus type 2 (mPCV2) exhibits similar virulence to the classical PCV2a and PCV2b strains in caesarean-derived, colostrum-deprived pigs. *J Gen Virol.* 2014c Nov;95(Pt 11):2495-503.
 - Opriessnig T, Xiao CT, Halbur PG, Gerber PF, Matzinger SR, Meng XJ. A commercial porcine circovirus (PCV) type 2a-based vaccine reduces PCV2d viremia and shedding and prevents PCV2d transmission to naïve pigs under experimental conditions. *Vaccine.* 2017 Jan 5;35(2):248-254.
 - Opriessnig T, Castro AMMG, Karuppanan AK, Gauger PC, Halbur PG, Matzinger SR, Meng XJ. A Porcine circovirus type 2b (PCV2b)-based experimental vaccine is effective in the PCV2b-*Mycoplasma hyopneumoniae* coinfection pig model. *Vaccine.* 2019 Oct 16;37(44):6688-6695.
 - Ouyang T, Zhang X, Liu X, Ren L. Co-Infection of Swine with Porcine Circovirus Type 2 and Other Swine Viruses. *Viruses.* 2019 Feb 21;11(2).
 - Park KH, Oh T, Yang S, Cho H, Kang I, Chae C. Evaluation of a porcine circovirus type 2a (PCV2a) vaccine efficacy against experimental PCV2a, PCV2b, and PCV2d challenge. *Vet Microbiol.* 2019 Apr;231:87-92. doi: 10.1016/j.vetmic.2019.03.002.
 - Patterson AR, Opriessnig T. Epidemiology and horizontal transmission of porcine circovirus type 2 (PCV2). *Anim Health Res Rev.* 2010 Dec;11(2):217-34.
 - Pejsak Z, Podgórska K, Truszczyński M, Karbowiak P, Stadejek T. Efficacy of different protocols of vaccination against porcine circovirus type 2 (PCV2) in a farm affected by postweaning multisystemic wasting syndrome (PMWS). *Comp Immunol Microbiol Infect Dis.* 2010 Dec;33(6):e1-5.

- Palinski R, Piñeyro P, Shang P, Yuan F, Guo R, Fang Y, Byers E, Hause BM. A novel porcine circovirus distantly related to known circoviruses is associated with porcine dermatitis and nephropathy syndrome and reproductive failure. *J Virol*. 2016 Dec 16;91(1).
- Pérez-Martín E, Gómez-Sebastián S, Argilagué JM, Sibila M, Fort M, Nofrarias M, Kurtz S, Escibano JM, Segalés J, Rodríguez F. Immunity conferred by an experimental vaccine based on the recombinant PCV2 Cap protein expressed in *Trichoplusia ni*-larvae. *Vaccine*. 2010 Mar 8;28(11):2340-9.
- Phan TG, Giannitti F, Rossow S, Marthaler D, Knutson TP, Li L, Deng X, Resende T, Vannucci F, Delwart E. Detection of a novel circovirus PCV3 in pigs with cardiac and multi-systemic inflammation. *Virol J*. 2016 Nov 11;13(1):184.
- Ren L, Chen X, Ouyang H. Interactions of porcine circovirus 2 with its hosts. *Virus Genes*. 2016 Aug;52(4):437-44.
- Rose N, Andraud M, Bigault L, Jestin A, Grasland B. A commercial PCV2a-based vaccine significantly reduces PCV2b transmission in experimental conditions. *Vaccine*. 2016 Jul 19;34(33):3738-45.
- Seo HW, Han K, Park C, Chae C. Clinical, virological, immunological and pathological evaluation of four porcine circovirus type 2 vaccines. *Vet J*. 2014 Apr;200(1):65-70.
- Shen HG, Beach NM, Huang YW, Halbur PG, Meng XJ, Opriessnig T. Comparison of commercial and experimental porcine circovirus type 2 (PCV2) vaccines using a triple challenge with PCV2, porcine reproductive and respiratory syndrome virus (PRRSV), and porcine parvovirus (PPV). *Vaccine*. 2010 Aug 23;28(37):5960-6.
- Shen HG, Halbur PG, Opriessnig T. Prevalence and phylogenetic analysis of the current porcine circovirus 2 genotypes after implementation of widespread vaccination programmes in the USA. *J Gen Virol*. 2012 Jun;93(Pt 6):1345-55.
- Ssemadaali MA, Ilha M, Ramamoorthy S. Genetic diversity of porcine circovirus type 2 and implications for detection and control. *Res Vet Sci*. 2015 Dec;103:179-86.
- Steinfeldt T, Finsterbusch T, Mankertz A. Rep and Rep' protein of porcine circovirus type 1 bind to the origin of replication *in vitro*. *Virology*. 2001 Dec 5;291(1):152-60.
- Tischer I, Gelderblom H, Vettermann W, Koch MA. A very small porcine virus with circular single-stranded DNA. *Nature*. 1982 Jan 7;295(5844):64-6.
- Tischer I, Rasch R, Tochtermann G. Characterization of papovavirus- and picornavirus-like particles in permanent pig kidney cell lines. *Zentralbl Bakteriol Orig A*. 1974 Feb;226(2):153-67.
- Tischer I, Miels W, Wolff D, Vagt M, Griem W. Studies on epidemiology and pathogenicity of porcine circovirus. *Arch Virol*. 1986;91(3-4):271-6.
- Vincent IE, Carrasco CP, Guzylyak-Piriou L, Herrmann B, McNeilly F, Allan GM, Summerfield A, McCullough KC. Subset-dependent modulation of dendritic cell activity by circovirus type 2. *Immunology*. 2005 Jul;115(3):388-98.
- Xi X, Mo X, Xiao Y, Yin B, Lv C, Wang Y, Sun Z, Yang Q, Yao Y, Xuan Y, Li X, Yuan YA, Tian K. Production of *Escherichia coli*-based virus-like particle vaccine against porcine circovirus type 2 challenge in piglets: Structure characterization and protective efficacy validation. *J Biotechnol*. 2016 Apr 10;223:8-12. doi: 10.1016/j.jbiotec.2016.02.025. Epub 2016 Feb 22.
- Xiao CT, Halbur PG, Opriessnig T. Global molecular genetic analysis of porcine circovirus type 2 (PCV2) sequences confirms the presence of four main PCV2 genotypes and reveals a rapid increase of PCV2d. *J Gen Virol*. 2015 Jul;96(Pt 7):1830-41. doi: 10.1099/vir.0.000100. Epub 2015 Feb 23.
- Yao J, Qin Y, Zeng Y, Ouyang K, Chen Y, Huang W, Wei Z. Genetic analysis of porcine circovirus type 2 (PCV2) strains between 2002 and 2016 reveals PCV2 mutant predominating in porcine population in Guangxi, China. *BMC Vet Res*. 2019 Apr 25;15(1):118. doi: 10.1186/s12917-019-1859-z.
- Zhang Z, Luo Y, Zhang Y, Guo K. Enhanced protective immune response to PCV2 adenovirus vaccine by fusion expression of Cap protein with InvC in pigs. *J Vet Sci*. 2019 Jul;20(4):e35. doi: 10.4142/jvs.2019.20.e35.