

REFERENCES

- Abubakar, M. B., Aini, I., Omar, A. R., & Hair-Bejo, M. (2011). Cloning and expression of highly pathogenic avian influenza virus full-length nonstructural gene in *Pichia pastoris*. *BioMed Research International*, 2011.
- Aggarwal, S., Bradel-Tretheway, B., Takimoto, T., Dewhurst, S., & Kim, B. (2010). Biochemical characterization of enzyme fidelity of influenza A virus RNA polymerase complex. *PLoS One*, 5(4), e10372.
- Aguilar-Yáñez, J. M., Portillo-Lara, R., Mendoza-Ochoa, G. I., García-Echauri, S. A., López-Pacheco, F., Bulnes-Abundis, D., . . . Rivero-Aranda, R. E. (2010). An influenza A/H1N1/2009 hemagglutinin vaccine produced in *Escherichia coli*. *PLoS One*, 5(7), e11694.
- Alexander, D. J. (2005). Avian influenza viruses and human health. *Developments in biologicals*, 124, 77-84.
- Alexander, D. J. (2007). An overview of the epidemiology of avian influenza. *Vaccine*, 25(30), 5637-5644.
- Athmaram, T. N., Saraswat, S., Santhosh, S. R., Singh, A. K., Suryanarayana, V. V. S., Priya, R., . . . Vijayaraghavan, R. (2011). Yeast expressed recombinant Hemagglutinin protein of novel H1N1 elicits neutralising antibodies in rabbits and mice. *Virology Journal*, 8(1), 524.
- Beare, A. S., & Webster, R. G. (1991). Replication of avian influenza viruses in humans. *Archives of Virology*, 119(1-2), 37-42.
- Beck, J. R., Swayne, D. E., Davison, S., Casavant, S., & Gutierrez, C. (2003). Validation of egg yolk antibody testing as a method to determine influenza status in white leghorn hens. *Avian diseases*, 47(s3), 1196-1199.
- Beigel, J. H., Farrar, J., Han, A. M., Hayden, F. G., Hyer, R., De Jong, M. D., . . . Yuen, K. Y. (2005). Avian influenza A (H5N1) infection in humans. *New England Journal of Medicine*, 353(13), 1374-1385.

- Biesova, Z., Miller, M. A., Schneerson, R., Shiloach, J., Green, K. Y., Robbins, J. B., & Keith, J. M. (2009). Preparation, characterization, and immunogenicity in mice of a recombinant influenza H5 hemagglutinin vaccine against the avian H5N1 A/Vietnam/1203/2004 influenza virus. *Vaccine*, 27(44), 6234-6238.
- Boulay, F., Doms, R. W., Wilson, I., & Helenius, A. (1987). The influenza hemagglutinin precursor as an acid-sensitive probe of the biosynthetic pathway. *The EMBO Journal*, 6(9), 2643.
- Bouvier, N. M., & Palese, P. (2008). The biology of influenza viruses. *Vaccine*, 26, D49-D53.
- Brandes, H. K., Hartman, F. C., Lu, T. Y. S., & Larimer, F. W. (1996). Efficient expression of the gene for spinach phosphoribulokinase in *Pichia pastoris* and utilization of the recombinant enzyme to explore the role of regulatory cysteinyl residues by site-directed mutagenesis. *Journal of Biological Chemistry*, 271(11), 6490-6496.
- Brethauer, R. K., & Castellino, F. J. (1999). Glycosylation of *Pichia pastoris*-derived proteins. *Biotechnology and Applied Biochemistry*, 30(3), 193-200.
- Bridges, C. B., Katz, J. M., Seto, W. H., Chan, P. K., Tsang, D., Ho, W., ... Fukuda, K. (2000). Risk of influenza A (H5N1) infection among health care workers exposed to patients with influenza A (H5N1), Hong Kong. *Journal of Infectious Diseases*, 181(1), 344-348.
- Brown, E. G. (2000). Influenza virus genetics. *Biomedicine & Pharmacotherapy*, 54(4), 196-209.
- Burdychova, R., Ruzicka, V., & Bartos, M. (2002). PCR-based method for identification of integration events in the *Pichia pastoris* genome. *BioTechniques*, 33(6), 1214-1218.
- Canales, M., Enríquez, A., Ramos, E., Cabrera, D., Dandie, H., Soto, A., . . . de la Fuente, J. (1997). Large-scale production in *Pichia pastoris* of the recombinant vaccine Gavac™ against cattle tick. *Vaccine*, 15(4), 414-422.
- Capua, I., & Alexander, D. J. (Eds.). (2001). *Avian influenza and Newcastle disease*. Springer Science & Business Media.

- Cereghino, G. P. L., & Cregg, J. M. (1999). Applications of yeast in biotechnology: protein production and genetic analysis. *Current Opinion in Biotechnology*, *10*(5), 422-427.
- Cereghino, J. L., & Cregg, J. M. (2000). Heterologous protein expression in the methylotrophic yeast *Pichia pastoris*. *FEMS Microbiology Reviews*, *24*(1), 45-66.
- Cereghino, G. P. L., Cereghino, J. L., Ilgen, C., & Cregg, J. M. (2002). Production of recombinant proteins in fermenter cultures of the yeast *Pichia pastoris*. *Current Opinion in Biotechnology*, *13*(4), 329-332.
- Charlwood, J., Bryant, D., Skehel, J. M., & Camilleri, P. (2001). Analysis of N-linked oligosaccharides: progress towards the characterization of glycoprotein-linked carbohydrates. *Biomol Eng*, *(18)*, 229-240.
- Chen, J., & Deng, Y. M. (2009). Influenza virus antigenic variation, host antibody production and new approach to control epidemics. *Virology Journal*, *6*(30), 3.
- Chenavas, S., Estrozi, L. F., Slama-Schwok, A., Delmas, B., Di Primo, C., Baudin, F., . . . Ruigrok, R. W. (2013). Monomeric nucleoprotein of influenza A virus. *PLoS pathogens*, *9*(3), e1003275.
- Chiu, F. F., Venkatesan, N., Wu, C. R., Chou, A. H., Chen, H. W., Lian, S. P., . . . Leng, C. H. (2009). Immunological study of HA1 domain of hemagglutinin of influenza H5N1 virus. *Biochemical and Biophysical Research Communications*, *383*(1), 27-31.
- Clare, J. J., Romanes, M. A., Rayment, F. B., Rowedder, J. E., Smith, M. A., Payne, M. M., . . . Henwood, C. A. (1991). Production of mouse epidermal growth factor in yeast: high-level secretion using *Pichia pastoris* strains containing multiple gene copies. *Gene*, *105*(2), 205-212.
- Claas, E. C., Osterhaus, A. D., Van Beek, R., De Jong, J. C., Rimmelzwaan, G. F., Senne, D. A., . . . Webster, R. G. (1998). Human influenza A H5N1 virus related to a highly pathogenic avian influenza virus. *The Lancet*, *351*(9101), 472-477.
- Connor, R. J., Kawaoka, Y., Webster, R. G., & Paulson, J. C. (1994). Receptor specificity in human, avian, and equine H2 and H3 influenza virus isolates. *Virology*, *205*(1), 17-23.

- Cornelissen, L. A., De Vries, R. P., de Boer-Luijtzte, E. A., Rigter, A., Rottier, P. J., & de Haan, C. A. (2010). A single immunization with soluble recombinant trimeric hemagglutinin protects chickens against highly pathogenic avian influenza virus H5N1. *PLoS One*, 5(5), e10645.
- Cox, N. J., & Subbarao, K. (1999). Influenza. *The Lancet*, 9186(354), 1277-1282.
- Crawford, J., Wilkinson, B., Vosnesensky, A., Smith, G., Garcia, M., Stone, H., & Perdue, M. L. (1999). Baculovirus-derived hemagglutinin vaccines protect against lethal influenza infections by avian H5 and H7 subtypes. *Vaccine*, 17(18), 2265-2274.
- Cregg, J. M., Tschopp, J. F., Stillman, C., Siegel, R., Akong, M., Craig, W. S., . . . Thill, G. P. (1987). High-Level Expression and Efficient Assembly of Hepatitis B Surface Antigen in the Methylophilic Yeast, *Pichia pastoris*. *Nature Biotechnology*, 5(5), 479-485.
- Cregg, J. M., Vedvick, T. S., & Raschke, W. C. (1993). Recent advances in the expression of foreign genes in *Pichia pastoris*. *Nature Biotechnology*, 11(8), 905-910.
- Cregg, J. M., Cereghino, J. L., Shi, J., & Higgins, D. R. (2000). Recombinant protein expression in *Pichia pastoris*. *Molecular biotechnology*, 16(1), 23-52.
- Daly, R., & Hearn, M. T. (2005). Expression of heterologous proteins in *Pichia pastoris*: a useful experimental tool in protein engineering and production. *Journal of Molecular Recognition*, 18(2), 119-138.
- Damasceno, L. M., Pla, I., Chang, H. J., Cohen, L., Ritter, G., Old, L. J., & Batt, C. A. (2004). An optimized fermentation process for high-level production of a single-chain Fv antibody fragment in *Pichia pastoris*. *Protein expression and purification*, 37(1), 18-26.
- Davis, M. O., Hata, D. J., Johnson, S. A., Walker, J. C., & Smith, D. S. (1996). Cloning, expression and characterization of a blood group B active recombinant α -D-galactosidase from soybean (*Glycine max*). *IUBMB Life*, 39(3), 471-485.
- De Jong, M. D., Cam, B. V., Qui, P. T., Hien, V. M., Thanh, T. T., Hue, N. B., ... & Farrar, J. (2005). Fatal avian influenza A (H5N1) in a child presenting with diarrhea followed by coma. *New England Journal of Medicine*, 352(7), 686-691.
- De Jong, M. D., & Hien, T. T. (2006). Avian influenza A (H5N1). *Journal of Clinical Virology*, 35(1), 2-13.

- De Vries, R. P., Smit, C. H., de Bruin, E., Rigter, A., de Vries, E., Cornelissen, L. A., ... & Hokke, C. H. (2012). Glycan-dependent immunogenicity of recombinant soluble trimeric hemagglutinin. *Journal of virology*, *86*(21), 11735-11744.
- Doms, R. W., Helenius, A., & White, J. (1985). Membrane fusion activity of the influenza virus hemagglutinin. The low pH-induced conformational change. *Journal of Biological Chemistry*, *260*(5), 2973-2981.
- Doms, R. W., & Helenius, A. (1986). Quaternary structure of influenza virus hemagglutinin after acid treatment. *Journal of Virology*, *60*(3), 833-839.
- Duan, L., Bahl, J., Smith, G. J. D., Wang, J., Vijaykrishna, D., Zhang, L. J., . . . Guan, Y. (2008). The development and genetic diversity of H5N1 influenza virus in China, 1996–2006. *Virology*, *380*(2), 243-254.
- DuBois, R. M., Aguilar-Yañez, J. M., Mendoza-Ochoa, G. I., Oropeza-Almazán, Y., Schultz-Cherry, S., Alvarez, M. M., . . . Russell, C. J. (2011). The receptor-binding domain of influenza virus hemagglutinin produced in *Escherichia coli* folds into its native, immunogenic structure. *Journal of Virology*, *85*(2), 865-872.
- Ebrahimi, S. M., Tebianian, M., Toghyani, H., Memarnejadian, A., & Attaran, H. R. (2010). Cloning, expression and purification of the influenza A (H9N2) virus M2e antigen and truncated *Mycobacterium tuberculosis* HSP70 as a fusion protein in *Pichia pastoris*. *Protein Expression and Purification*, *70*(1), 7-12.
- Eckart, M. R., & Bussineau, C. M. (1996). Quality and authenticity of heterologous proteins synthesized in yeast. *Current opinion in biotechnology*, *7*(5), 525-530.
- Errington, W., Steward, M., & Emmerson, P. T. (1995). A diagnostic immunoassay for Newcastle disease virus based on the nucleocapsid protein expressed by a recombinant baculovirus. *Journal of Virological Methods*, *55*(3), 357-365.
- Faber, K. N., Harder, W., Ab, G., & Veenhuis, M. (1995). Methylotrophic yeasts as factories for the production of foreign proteins. *Yeast*, *11*(14), 1331-1344.
- Fischer, R., Drossard, J., Emans, N., Commandeur, U., & Hellwig, S. (1999). Towards molecular farming in the future: *Pichia pastoris*-based production of single-chain antibody fragments. *Biotechnology and Applied Biochemistry*, *30*(2), 117-120.

- Fouchier, R. A., Munster, V., Wallensten, A., Bestebroer, T. M., Herfst, S., Smith, D., . . . Osterhaus, A. D. (2005). Characterization of a novel influenza A virus hemagglutinin subtype (H16) obtained from black-headed gulls. *Journal of Virology*, 79(5), 2814-2822.
- Freyre, F. M., Vázquez, J. E., Ayala, M., Canaán-Haden, L., Bell, H., Rodríguez, I., . . . Gavilondo, J. V. (2000). Very high expression of an anti-carcinoembryonic antigen single chain Fv antibody fragment in the yeast *Pichia pastoris*. *Journal of biotechnology*, 76(2), 157-163.
- Gocnik, M., Fislova, T., Sladkova, T., Mucha, V., Kostolanský, F., & Varečková, E. (2007). Antibodies specific to the HA2 glycopolyptide of influenza A virus haemagglutinin with fusion-inhibition activity contribute to the protection of mice against lethal infection. *Journal of General Virology*, 88(3), 951-955.
- Goochee, C. F., Gramer, M. J., Andersen, D. C., Bahr, J. B., & Rasmussen, J. R. (1991). The oligosaccharides of glycoproteins: bioprocess factors affecting oligosaccharide structure and their effect on glycoprotein properties. *Nature Biotechnology*, 9(12), 1347-1355.
- Gough, S., Dostal, L., Howe, A., Deshpande, M., Scher, M., & Rosazza, J. N. P. (2005). Production of pyruvate from lactate using recombinant *Pichia pastoris* cells as catalyst. *Process Biochemistry*, 40(8), 2597-2601.
- Gething, M. J., & Sambrook, J. (1981). Cell-surface expression of influenza haemagglutinin from a cloned DNA copy of the RNA gene. *Nature*, 293(5834), 620-625.
- Gething, M. J., Sambrook, J. F., Braciale, T. J., & Brand, C. M. (1984). Comparison of different eukaryotic vectors for the expression of hemagglutinin glycoprotein of influenza virus. *Modern Approaches to Vaccines*, 263-268.
- Han, Y., Kanbe, T., Cherniak, R., & Cutler, J. E. (1997). Biochemical characterization of *Candida albicans* epitopes that can elicit protective and nonprotective antibodies. *Infection and Immunity*, 65(10), 4100-4107.
- Higgings, D. R., & Cregg, M. (1998). *Methods in Molecular Biology—Pichia Protocols*.
- Horimoto, T., & Kawaoka, Y. (2001). Pandemic threat posed by avian influenza A viruses. *Clinical Microbiology Reviews*, 14(1), 129-149.

- Horváth, A., Tóth, G. K., Gogolák, P., Nagy, Z., Kurucz, I., Pecht, I., & Rajnavölgyi, É. (1998). A hemagglutinin-based multi-peptide construct elicits enhanced protective immune response in mice against influenza A virus infection. *Immunology Letters*, 60(2), 127-136.
- Hoy, P. M., Cameron, D. R., Helle, S. S., & Duff, S. J. (2006). Production of a recombinant protein using *Pichia pastoris* grown in evaporator condensate from a Kraft pulp mill. *Enzyme and Microbial Technology*, 38(3), 317-323.
- Invitrogen Corp. (1998). A manual of methods for expression of recombinant proteins in *Pichia pastoris*. *Invitrogen, Leek, The Netherlands*.
- Juge, N., Andersen, J. S., Tull, D., Roepstorff, P., & Svensson, B. (1996). Overexpression, Purification, and Characterization of Recombinant Barley α -Amylases 1 and 2 Secreted by the Methylophilic Yeast *Pichia pastoris*. *Protein Expression and Purification*, 8(2), 204-214.
- Kanagarajan, S., Tolf, C., Lundgren, A., Waldenström, J., & Brodelius, P. E. (2012). Transient expression of hemagglutinin antigen from low pathogenic avian influenza A (H7N7) in *Nicotiana benthamiana*. *PLoS One*, 7(3), e33010.
- Kalthoff, D., Giritch, A., Geisler, K., Bettmann, U., Klimyuk, V., Hehnen, H. R., . . . Beer, M. (2010). Immunization with plant-expressed hemagglutinin protects chickens from lethal highly pathogenic avian influenza virus H5N1 challenge infection. *Journal of Virology*, 84(22), 12002-12010.
- Kandun, I. N., Wibisono, H., Sedyaningsih, E. R., Hadisoedarsuno, W., Purba, W., Santoso, H., . . . Uyeki, T. M. (2006). Three Indonesian clusters of H5N1 virus infection in 2005. *New England Journal of Medicine*, 355(21), 2186-2194.
- Katz, J. M., Lim, W., Bridges, C. B., Rowe, T., Hu-Primmer, J., Lu, X., . . . Fukuda, K. (1999). Antibody response in individuals infected with avian influenza A (H5N1) viruses and detection of anti-H5 antibody among household and social contacts. *Journal of Infectious Diseases*, 180(6), 1763-1770.
- Khurana, S., Verma, S., Verma, N., Crevar, C. J., Carter, D. M., Manischewitz, J., . . . Golding, H. (2010). Properly folded bacterially expressed H1N1 hemagglutinin globular head and ectodomain vaccines protect ferrets against H1N1 pandemic influenza virus. *PLoS One*, 5(7), e11548.

- Khurana, S., Larkin, C., Verma, S., Joshi, M. B., Fontana, J., Steven, A. C., . . . Golding, H. (2011). Recombinant HA1 produced in *E. coli* forms functional oligomers and generates strain-specific SRID potency antibodies for pandemic influenza vaccines. *Vaccine*, 29(34), 5657-5665.
- Kida, H., Ito, T., Yasuda, J., Shimizu, Y., Itakura, C., Shortridge, K. F., . . . Webster, R. G. (1994). Potential for transmission of avian influenza viruses to pigs. *Journal of General Virology*, 75, 2183-2188.
- Kreijtz, J. H., Suezzer, Y., Van Amerongen, G., De Mutsert, G., Schnierle, B. S., Wood, J. M., . . . Rimmelzwaan, G. F. (2007). Recombinant modified vaccinia virus Ankara-based vaccine induces protective immunity in mice against infection with influenza virus H5N1. *Journal of Infectious Diseases*, 195(11), 1598-1606.
- Kuroda, K., Hauser, C., Rott, R., Klenk, H. D., & Doerfler, W. (1986). Expression of the influenza virus haemagglutinin in insect cells by a baculovirus vector. *The EMBO Journal*, 5(6), 1359.
- Laemmli, U. K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*, 227(5259), 680.
- Lamb, R. A., & Choppin, P. W. (1976). Synthesis of influenza virus proteins in infected cells: translation of viral polypeptides, including three P polypeptides, from RNA produced by primary transcription. *Virology*, 74(2), 504-519.
- Lamb, R. A., & Takeda, M. (2001). Death by influenza virus protein. *Nature Medicine*, 7(12), 1286-1288.
- Lewis, D. B. (2006). Avian flu to human influenza. *Annual Review of Medicine*, 57, 139-154.
- Liem, N. T., Team, I. A. I. I., & Vietnam, W. L. (2005). Lack of H5N1 avian influenza transmission to hospital employees, Hanoi, 2004. *Emerging Infectious Diseases*, 11(2), 210.
- Ligon, B. L. (2005, October). Avian influenza virus H5N1: a review of its history and information regarding its potential to cause the next pandemic. In *Seminars in Pediatric Infectious Diseases* (Vol. 16, No. 4, pp. 326-335). WB Saunders.

- Lin, S. C., Jan, J. T., Dionne, B., Butler, M., Huang, M. H., Wu, C. Y., . . . Wu, S. C. (2013). Different immunity elicited by recombinant H5N1 hemagglutinin proteins containing pauci-mannose, high-mannose, or complex type N-glycans. *PLoS one*, 8(6), e66719.
- Lin-Cereghino, J., Wong, W. W., Giang, W., Luong, L. T., Vu, J., Johnson, S. D., & Lin-Cereghino, G. P. (2005). Condensed protocol for competent cell preparation and transformation of the methylotrophic yeast *Pichia pastoris*. *Biotechniques*, 38(1), 44.
- Liu, D., Si, B., Li, C., Mi, Z., An, X., Qin, C., . . . Tong, Y. (2011). Prokaryotic expression and purification of HA1 and HA2 polypeptides for serological analysis of the 2009 pandemic H1N1 influenza virus. *Journal of Virological Methods*, 172(1), 16-21.
- Lu, B. L., Webster, R. G., & Hinshaw, V. S. (1982). Failure to detect hemagglutination-inhibiting antibodies with intact avian influenza virions. *Infection and Immunity*, 38(2), 530-535.
- Martin, K., & Helenius, A. (1991). Nuclear transport of influenza virus ribonucleoproteins: the viral matrix protein (M1) promotes export and inhibits import. *Cell*, 67(1), 117-130.
- Martinet, W., Maras, M., Saelens, X., Jou, W. M., & Contreras, R. (1998). Modification of the protein glycosylation pathway in the methylotrophic yeast *Pichia pastoris*. *Biotechnology Letters*, 20(12), 1171-1177.
- Matlin, K. S., Reggio, H., Helenius, A., & Simons, K. (1981). Infectious entry pathway of influenza virus in a canine kidney cell line. *The Journal of Cell Biology*, 91(3), 601-613.
- Matlin, K. S., Skibbens, J., & McNeil, P. L. (1988). Reduced extracellular pH reversibly inhibits oligomerization, intracellular transport, and processing of the influenza hemagglutinin in infected Madin-Darby canine kidney cells. *Journal of Biological Chemistry*, 263(23), 11478-11485.
- McMaster, G. K., & Carmichael, G. G. (1977). Analysis of single- and double-stranded nucleic acids on polyacrylamide and agarose gels by using glyoxal and acridine orange. *Proceedings of the National Academy of Sciences*, 74(11), 4835-4838.
- Medina, R. A., & García-Sastre, A. (2011). Influenza A viruses: new research developments. *Nature Reviews Microbiology*, 9(8), 590-603.

- Mitnaul, L. J., Matrosovich, M. N., Castrucci, M. R., Tuzikov, A. B., Bovin, N. V., Kobasa, D., & Kawaoka, Y. (2000). Balanced hemagglutinin and neuraminidase activities are critical for efficient replication of influenza A virus. *Journal of Virology*, 74(13), 6015-6020.
- Mohan, C. M., Dey, S., Rai, A., & Kataria, J. M. (2006). Recombinant haemagglutinin neuraminidase antigen-based single serum dilution ELISA for rapid serological profiling of Newcastle disease virus. *Journal of Virological Methods*, 138(1), 117-122.
- Mu, X., Kong, N., Chen, W., Zhang, T., Shen, M., & Yan, W. (2008). High-level expression, purification, and characterization of recombinant human basic fibroblast growth factor in *Pichia pastoris*. *Protein Expression and Purification*, 59(2), 282-288.
- Murugan, S., Ponselaran, S., Kannivel, L., Mangamoori, L. N., Chandran, D., Alwar, S. V., . . . Lal, S. K. (2013). Recombinant haemagglutinin protein of highly pathogenic avian influenza A (H5N1) virus expressed in *Pichia pastoris* elicits a neutralizing antibody response in mice. *Journal of Virological Methods*, 187(1), 20-25.
- Nicholson, K. G., Wood, J. M., Zambon, M. (2003) Influenza. *Lancet*, (362), 1733-45.
- Olsen, B., Munster, V. J., Wallensten, A., Waldenström, J., Osterhaus, A. D., & Fouchier, R. A. (2006). Global patterns of influenza A virus in wild birds. *Science*, 312(5772), 384-388.
- Oner, A. F., Bay, A., Arslan, S., Akdeniz, H., Sahin, H. A., Cesur, Y., ... Ceyhan, M. (2006). Avian influenza A (H5N1) infection in eastern Turkey in 2006. *New England Journal of Medicine*, 355(21), 2179-2185.
- Palese, P., & Shaw, M. L. (2007). Fields virology. *Orthomyxoviridae: The Viruses and Their Replication*, 5th edn, Philadelphia, PA: Lippincott Williams & Wilkins, Wolters Kluwer Business, 1647-1689.
- Peiris, J. S. M., Yu, W. C., Leung, C. W., Cheung, C. Y., Ng, W. F., Nicholls, J. A., . . . Guan, Y. (2004). Re-emergence of fatal human influenza A subtype H5N1 disease. *The Lancet*, 363(9409), 617-619.
- Perez, D. R., Sorrell, E. M., & Donis, R. O. (2005). Avian influenza: an omnipresent pandemic threat. *The Pediatric Infectious Disease Journal*, 24(11), S208-S216.

- Perez, J. T., Varble, A., Sachidanandam, R., Zlatev, I., Manoharan, M., & García-Sastre, A. (2010). Influenza A virus-generated small RNAs regulate the switch from transcription to replication. *Proceedings of the National Academy of Sciences*, 107(25), 11525-11530.
- Raemaekers, R. J., de Muro, L., Gatehouse, J. A., & Fordham-Skelton, A. P. (1999). Functional phytohemagglutinin (PHA) and *Galanthus nivalis* agglutinin (GNA) expressed in *Pichia pastoris*. *European Journal of Biochemistry*, 265(1), 394-403.
- Roberts, P. C., Lamb, R. A., & Compans, R. W. (1998). The M1 and M2 proteins of influenza A virus are important determinants in filamentous particle formation. *Virology*, 240(1), 127-137.
- Romanos, M., Scorer, C., Sreekrishna, K., & Clare, J. (1998). The generation of multicopy recombinant strains. *Pichia Protocols*, 55-72.
- Rose, A. H., & Harrison, J. S. (1987). *The yeasts. v. 1: Biology of yeasts.-v. 2: Yeasts and the environment.*
- Rosenfeld, S. A., Nadeau, D., Tirado, J., Hollis, G. F., Knabb, R. M., & Jia, S. (1996). Production and purification of recombinant hirudin expressed in the methylotrophic yeast *Pichia pastoris*. *Protein Expression and Purification*, 8(4), 476-482.
- Roth, M. G., Compans, R. W., Giusti, L., Davis, A. R., Nayak, D. P., Gething, M. J., & Sambrook, J. (1983). Influenza virus hemagglutinin expression is polarized in cells infected with recombinant SV40 viruses carrying cloned hemagglutinin DNA. *Cell*, 33(2), 435-443.
- Rowe, T., Abernathy, R. A., Hu-Primmer, J., Thompson, W. W., Lu, X., Lim, W., . . . Katz, J. M. (1999). Detection of antibody to avian influenza A (H5N1) virus in human serum by using a combination of serologic assays. *Journal of Clinical Microbiology*, 37(4), 937-943.
- Sainz-Pastor, N., Tolner, B., Huhlov, A., Kogelberg, H., Lee, Y. C., Zhu, D., . . . Chester, K. A. (2006). Deglycosylation to obtain stable and homogeneous *Pichia pastoris*-expressed N-A1 domains of carcinoembryonic antigen. *International Journal of Biological Macromolecules*, 39(1), 141-150.
- Sambrook, J., Fritsch, E. F., & Maniatis, T. (1989). *Molecular cloning: a laboratory manual, 3 Vol. Set (NY, USA: Cold Spring Harbor Laboratory Press, Cold Spring Harbor, 2001), 2344.*

- Shehata, A. A., Fiebig, P. P., Rall, K. & Liebert, U. G. (2012). Expression of truncated sequences of influenza A virus subtype H5 in *Pichia Pastoris*. *Journal of American Science* 2012, 8(8), 433-441.
- Shehata, A. A., Fiebig, P., Sultan, H., Hafez, M., & Liebert, U. G. (2012a). Development of a recombinant ELISA using yeast (*Pichia pastoris*)-expressed polypeptides for detection of antibodies against avian influenza A subtype H5. *Journal of Virological Methods*, 180(1), 18-25.
- Shen, S., Mahadevappa, G., Oh, H. L. J., Wee, B. Y., Choi, Y. W., Hwang, L. A., . . . Tan, Y. J. (2008). Comparing the antibody responses against recombinant hemagglutinin proteins of avian influenza A (H5N1) virus expressed in insect cells and bacteria. *Journal of Medical Virology*, 80(11), 1972-1983.
- Shoham, D. (2006). Review: Molecular evolution and the feasibility of an avian influenza virus becoming a pandemic strain—a conceptual shift. *Virus Genes*, 33(2), 127-132.
- Shoji, Y., Chichester, J. A., Bi, H., Musiychuk, K., de la Rosa, P., Goldschmidt, L., . . . Yusibov, V. (2008). Plant-expressed HA as a seasonal influenza vaccine candidate. *Vaccine*, 26(23), 2930-2934.
- Shoji, Y., Bi, H., Musiychuk, K., Rhee, A., Horsey, A., Roy, G., . . . Mytle, N. (2009). Plant-derived hemagglutinin protects ferrets against challenge infection with the A/Indonesia/05/05 strain of avian influenza. *Vaccine*, 27(7), 1087-1092.
- Sieczkarski, S. B., & Whittaker, G. R. (2002). Influenza virus can enter and infect cells in the absence of clathrin-mediated endocytosis. *Journal of virology*, 76(20), 10455-10464.
- Singh, I., Doms, R. W., Wagner, K. R., & Helenius, A. (1990). Intracellular transport of soluble and membrane-bound glycoproteins: folding, assembly and secretion of anchor-free influenza hemagglutinin. *The EMBO Journal*, 9(3), 631.
- Skehel, J. J., Bayley, P. M., Brown, E. B., Martin, S. R., Waterfield, M. D., White, J. M., . . . Wiley, D. C. (1982). Changes in the conformation of influenza virus hemagglutinin at the pH optimum of virus-mediated membrane fusion. *Proceedings of the National Academy of Sciences*, 79(4), 968-972.

- Skehel, J. J., & Wiley, D. C. (2000). Receptor binding and membrane fusion in virus entry: the influenza hemagglutinin. *Annual Review of Biochemistry*, 69(1), 531-569.
- Stevens, J., Blixt, O., Tumpey, T. M., Taubenberger, J. K., Paulson, J. C., & Wilson, I. A. (2006). Structure and receptor specificity of the hemagglutinin from an H5N1 influenza virus. *Science*, 312(5772), 404-410.
- Suarez, D. L., & Schultz-Cherry, S. (2000). Immunology of avian influenza virus: a review. *Developmental & Comparative Immunology*, 24(2), 269-283.
- Subbarao, K., Klimov, A., Katz, J., Regnery, H., Lim, W., Hall, H., . . . Cox, N. (1998). Characterization of an avian influenza A (H5N1) virus isolated from a child with a fatal respiratory illness. *Science*, 279(5349), 393-396.
- Subbarao, K., & Joseph, T. (2007). Scientific barriers to developing vaccines against avian influenza viruses. *Nature Reviews Immunology*, 7(4), 267.
- Suphawilai, C., Wipasa, J. & Pratanaphon, R. (2015). Avian influenza hemagglutinin protein-subunit recognized by antibodies found in poultry workers, exposed individuals and recovered patients. Retrieved February 14, 2017, from National Research Council of Thailand homepage: http://doi.nrct.go.th/ListDoi/listDetail?Resolve_DOI=10.14455/NRCT.res.2015.76
- Swayne, D. E. (2006). Principles for vaccine protection in chickens and domestic waterfowl against avian influenza. *Annals of the New York Academy of Sciences*, 1081(1), 174-181.
- Swayne, D. E. (2008). *Avian Influenza*, Blackwell Publishing, Iowa, USA.
- Tamura, S. I., Tanimoto, T., & Kurata, T. (2005). Mechanisms of broad cross-protection provided by influenza virus infection and their application to vaccines. *Japanese Journal of Infectious Diseases*, 58(4), 195.
- The World Organisation for Animal Health. (2007). Recommendations and laboratory procedures for detection of avian influenza A (H5N1) virus in specimens from suspected human cases. *World Health Organization*.
- The World Organisation for Animal Health. (2009). Update on Highly Pathogenic Avian Influenza in animals (type H5). Available as: http://www.oie.int/downld/AVIANINFLUENZA/A2009_AI.php. Accessed 20 January 2011.

- Tonegawa, K., Nobusawa, E., Nakajima, K., Kato, T., Kutsuna, T., Kuroda, K., . . . Itoh, M. (2003). Analysis of epitope recognition of antibodies induced by DNA immunization against hemagglutinin protein of influenza A virus. *Vaccine*, *21*(23), 3118-3125.
- Ungchusak, K., Auewarakul, P., Dowell, S. F., Kitphati, R., Auwanit, W., Puthavathana, P., . . . Chunsutthiwat, S. (2005). Probable person-to-person transmission of avian influenza A (H5N1). *New England Journal of Medicine*, *352*(4), 333-340.
- Varghese, J. N., & Colman, P. M. (1991). Three-dimensional structure of the neuraminidase of influenza virus A/Tokyo/3/67 at 2· 2 Å resolution. *Journal of molecular biology*, *221*(2), 473-486.
- Wang, C. Y., Luo, Y. L., Chen, Y. T., Li, S. K., Lin, C. H., Hsieh, Y. C., & Liu, H. J. (2007). The cleavage of the hemagglutinin protein of H5N2 avian influenza virus in yeast. *Journal of Virological Methods*, *146*(1), 293-297.
- Waterham, H. R., Digan, M. E., Koutz, P. J., Lair, S. V., & Cregg, J. M. (1997). Isolation of the *Pichia pastoris* glyceraldehyde-3-phosphate dehydrogenase gene and regulation and use of its promoter. *Gene*, *186*(1), 37-44.
- Webster, R. G., Bean, W. J., Gorman, O. T., Chambers, T. M., & Kawaoka, Y. (1992). Evolution and ecology of influenza A viruses. *Microbiological Reviews*, *56*(1), 152-179.
- Wei, C. J., Xu, L., Kong, W. P., Shi, W., Canis, K., Stevens, J., . . . Nabel, G. J. (2008). Comparative efficacy of neutralizing antibodies elicited by recombinant hemagglutinin proteins from avian H5N1 influenza virus. *Journal of Virology*, *82*(13), 6200-6208.
- Willott, E. (1999). Measuring Protein Concentration. Retrieved May 28, 2014, from Willott LabHomepage: <http://research.biology.arizona.edu/mosquito/willott/proj/LabPro/Prot/ProConc/OD280.html>.
- White, J., Matlin, K., & Helenius, A. (1981). Cell fusion by Semliki Forest, influenza, and vesicular stomatitis viruses. *The Journal of Cell Biology*, *89*(3), 674-679.
- White, J. M., Delos, S. E., Brecher, M., & Schornberg, K. (2008). Structures and mechanisms of viral membrane fusion proteins: multiple variations on a common theme. *Critical Reviews in Biochemistry and Molecular Biology*, *43*(3), 189-219.

- Wilson, I. A., Skehel, J. J., & Wiley, D. C. (1981). Structure of the haemagglutinin membrane glycoprotein of influenza virus at 3 Å resolution. *Nature*, 289(5796), 366.
- Wilson, I. A., & Cox, N. J. (1990). Structural basis of immune recognition of influenza virus hemagglutinin. *Annual review of immunology*, 8(1), 737-787.
- Wood, G. W., McCauley, J. W., Bashiruddin, J. B., & Alexander, D. J. (1993). Deduced amino acid sequences at the haemagglutinin cleavage site of avian influenza A viruses of H 5 and H 7 subtypes. *Archives of Virology*, 130(1-2), 209-217.
- World Health Organization. (2016). Avian and other zoonotic influenza. Retrieved April 24, 2017, from World Health Organization homepage: http://www.who.int/mediacentre/factsheets/avian_influenza/en/.
- Wu, H., Williams, K., Singh, S. R., Scissum-Gunn, K., Singh, N. K., Teresa, D., & Giambrone, J. J. (2009). Integrity of a recombinant hemagglutinin protein of an avian influenza virus. *Biotechnology Letters*, 31(10), 1511-1517.
- Wu, C. Y., Yeh, Y. C., Yang, Y. C., Chou, C., Liu, M. T., Wu, H. S., . . . Hsiao, P. W. (2010). Mammalian expression of virus-like particles for advanced mimicry of authentic influenza virus. *PLoS One*, 5(3), e9784.
- Yongkiettrakul, S., Boonyapakron, K., Jongkaewwattana, A., Wanitchang, A., Leartsakulpanich, U., Chitnumsub, P. . . . Yuthavong, Y. (2009). Avian influenza A/H5N1 neuraminidase expressed in yeast with a functional head domain. *Journal of Virological Methods*, 156(1), 44-51.
- Yuen, K. Y., Chan, P. K. S., Peiris, M., Tsang, D. N. C., Que, T. L., Shortridge, K. F., . . . H5N1 Study Group. (1998). Clinical features and rapid viral diagnosis of human disease associated with avian influenza A H5N1 virus. *The Lancet*, 351(9101), 467-471.
- Yuen, K. Y., & Wong, S. S. Y. (2005). Human infection by avian influenza A H5N1. *Hong Kong Medical Journal*.
- Zhu, A., Monahan, C., Zhang, Z., Hurst, R., Leng, L., & Goldstein, J. (1995). High-Level Expression and Purification of Coffee Bean α -Galactosidase Produced in the Yeast *Pichia pastoris*. *Archives of Biochemistry and Biophysics*, 324(1), 65-70.