REFERENCES

Abdulrahim, S.M., Haddadin, M. S., Odetallah, N. H., and Robinson, P. K., 1999, "Effects of Lactobacillus acidophilus and zinc bacitracin as dietary additive to broilers chickens", **British Poultry Science**, Vol. 40, pp. 91-94.

Akita, E.M. and Nakai, S., 1992, "Immunoglobulins from egg yolk: Isolation and purification", **Journal of Food Science**, Vol. 57, pp. 629-634.

Allen, P.C., and Fetterer, R.H., 2002, "Recent advances in biology and immunobiology of *Eimeria* species and in diagnosis and control of infection with these coccidian parasites of poultry", **Clinical Microbiology Review**, Vol. 15, pp. 58-65.

Amaral, J.A., De Franco, M.T., Carneiro-Sampaio, M. M. S., and Carbonare, S. B., 2002, "Antienteropathogenic *Escherichia coli* immunoglobulin Y isolated from eggs laid by immunized Leghorn chickens", **Research in Veterinary Science**, Vol. 72, pp. 229-234.

Anon, 1986, **European Convention for the protection of vertebrate animals used for experimental and other scientific purposes**, Council of Europe, Strasbourg, pp. 51.

Baker, R.C. and Bruce, C., 1994, "Effects of processing on the microbiology of eggs" In **Microbiology of the Avian Egg**, Chapman and Hall, London, ISBN 0412475707, pp. 153-173.

Baxter-Jones, C., 1991, "Egg hygine: Microbial contamination, significance and control, in Avian Incubation, (Ed. S.G. Tullett)", **22rd Poultry Science Symposium**, Butterworth-Heinemann, Northants, pp. 269-76.

Behn, I., Hommel, U., Oertel, M. and Hauschildt, S., 1996, "Kenetics of IgY formation of hens with different protein antigens", **ALTEX**, Vol. 13, pp. 18-21.

Bernardi, G. and Cook W.H., 1960, "An electrophoretic and ultracentifugal study on the proteins of the high density fraction of egg yolk", **Biochimia Biophysica ACTA/ General Subjects**, Vol. 44, pp. 86-96.

Blankenship, L.C., Hudspeth, J.P. and Craven, S.E., 1982, "Microbiology of ova harvested from commercially slaughtered mature chicken", **Poultry Science**, Vol. 57, pp. 1550-1553.

Board, R.G., 1966, "Review article: the course of microbial infection of the hen's egg", **Journal of Applied Bacteriology**, Vol. 29, pp. 319-341.

Board, R.G., 1968, "Microbiology of the egg: a review", In **Egg quality: A Study of the Hen's egg (ed. T.C. Carter)**, Oliver and Boyd, Edinburgh, pp. 133-62.

Board, R.G., 1969, "The microbiology of the hen's egg", **Advances in Applied Microbiology**, Vol. 11, pp. 245-281.

Board, R.G., Clay, C.E. and Lock, J.L., 1989, "The behavior of Salmonella in egg contents and raw egg products", **Abstracts Summer Meeting of Society for Applied Bacteriology**, July 1989, Edinburgh, pp. 19.

Boersma, W.J.A., Bogaerts, W.J.C., Bianchi, A.I.J. and Claassen, E., 1992, "Adjuvant properties of stable water-in-oil emulsions: evaluation of the experience with Specol", **Research in Immunology**, Vol. 143, pp. 503-512.

Bollen, L.S. and Hau, J., 1997, "Immunoglobulin G in the developing oocytes of the domestic hen and immunospecific antibody response in serum and corresponding egg yolk", **In Vivo**, Vol. 11, pp. 395.

Brooks, J. and Taylor, D.J., 1995, "Eggs and egg products", **Report of the Food Investigation Board**, No. 60, HMSO, London.

Bruce, J. and Drysdale, E.M., 1991, "Egg hygiene: routes of infection, in Avian Incubation (ed. S.G. Tullett)", **Poultry Science Symposium Number 22**. Butterworth-Heinemann, Northants, Chapter 16.

Bruce, J. and Drysdale, E.M., 1994, "Tran-shell transmission", In **Microbiology of Avian Egg**, Chapman and Hall, London, ISBN 0412475707, pp. 63-91.

Burley, R.W. and Cook, W.H., 1961, "Isolation and composition of avian egg yolk granuals and their constituent alpha and beta-lipovitellins", **Canadian Journal of Biochemistry and Physiology**, Vol. 39, pp. 1295-1307.

Camenisch, G., Tini, M., Chilow, D., Kvietikova, I. and Srinivas, V., Caro, J., Spielmann, P., Wenger, R.H. and Gassmann, M., 1999, "General applicability of chicken egg yolk immunoglobulins simultaneously directed against *Salmonella Enteridis* and Salmonella Typhimurium in the same egg yolk", **FASEB Journal**, Vol. 13, pp. 81–88.

Carlander, D., Kollberg, H., Wejaker, P.E. and Larsson, A., 2000, "Peroral Immunotheraphy with Yolk Antibodies for the Prevention and Treatment of Enteric Infections", **Immunologic Research**, Vol. 21, pp. 1–6.

Carlander, D., Wilhelmson, M. and Larsson, A., 2001, "Limited day to day variation of IgY levels in eggs from individual laying hens", **Food and Agricultural Immunology**, Vol. 13, pp. 87-92.

Carlander, D., Wilhelmson, M. and Larsson, A., 2003, "Immunoglobulin Y levels in egg yolk from three chicken genotypes", **Food and Agricultural Immunology**, Vol. 15, pp. 35-40.

Chalghoumi, R., Beckers, Y., Portetelle, D. and Thewis, A., 2009, "Hen egg yolk antibodies (IgY), production and use for passive immunization against bacterial enteric infections in chicken: a review", **Biotechnol. Agron. Soc. Environ**, Vol. 13, pp. 295-308.

Chang, H.M., Ou-Yang, R.F., Chen, Y.T. and Chen, C.C., 1999, "Productivity and some properties of immunoglobulin specific against *streptococcus mutans* serotype C in chicken egg yolk (IgY)", **Journal of Agricultural and Food Chemistry**, Vol. 47, pp. 61-66.

Chansarkar, N.L., 1998, **Studies on structural stability of hen's egg yolk immunoglobulin (IgY)**, PhD Thesis, University of British Columbia, Canada.

Chapman, H.D., 1994, "Sensitivity of field isolates of *Eimeria* to monensin following the use of coccidiosis vaccine in broiler chickens", **Poultry Science**, Vol. 73, pp. 476-478.

Chapman, H. D., 1997, "Biochemical, genetic and applied aspects of drug resistance in *Eimeria* parasite of the fowl", **Avian Pathology**, Vol. 26, pp. 221-244.

Chapman, H. D., 1998, "Evaluation of the efficacy of anticoccidial drugs against *Eimeria* species in the fowl", **International Journal of Parasitology**, Vol. 28, pp. 1141-1144.

Chapman, H.D., Cherry, T. E., Danforth, H.D., Richards, G., Shirley, M.W. and Williams, R.B., 2002, "Sustainable coccidiosis control in poultry production: The role of live vaccines", **International Journal of Parasitology**, Vol. 32, pp. 617-629.

Chen K., Xu, W., Wilson, M., He, B., Miller, N.W., Bengten, E., Edholm, E.S., Santini, P.A., Rath, P., Chiu, A., Cattalini, M., Litzman, J.B., Bussel, J., Huang, B., Meini, A., Riesbeck, K., Cunningham-Rundles, C., Plebani, A. and Cerutti, A., 2009, "Immunoglobulin D enhances immune surveillance by activating antimicrobial, proinflammatory and B cell-stimulating programs in basophils", **Nature Immunology**, Vol. 10, pp. 889–898.

Clark, A., Befus, D., Hashi, P.O., Hart, F., Schunk, M., Fletch, A. and Griffin,G., 2002, **Guidelines on: Antibody production,** Canadian Council on Animal Care, ISBN: 0-919087-37-X.

Cook, G.C., 1988, "Small-intestinal coccidiosis: an emergent clinical problem", **Journal of Infection**, Vol. 16, pp. 213-219.

Crouch, C.F., Andrews, S. J., Ward, R.G. and Francis, M.J., 2003, "Protective efficacy of a live attenuated anti-coccidial vaccine administrated to 1-day-old chickens", **Avian Pathology**, Vol. 32, pp. 297-304.

Cummings, J.H. and MacFarlane, G.T., 2000, "Gastrointestinal effects of prebiotics", **British Journal of Nutrition**, Vol. 87, pp. 145S-151S.

Current, W.L., Upton, S.J. and Long, P.L., 1990, **Coccidiosis of Man and Domestic Animals: Taxonomy and life cycles**, CRC Press, Boca Raton, FL.

Dalloul, R., Lillehoj, H.S., Shellem, T.A. and Doerr, J.A., 2003, "Enhanced mucosal immunity against *Eimeria acervulina* in broilers fed Lactobacillus-based probiotic", **Poultry Science**, Vol. 82, pp. 62-66.

Dalloul, R.A. and Lillehoj, H.S., 2006, "Poultry coccidiosis: recent advancements in control measures and vaccine development", **Expert Review of Vaccines**, Vol. 5, pp. 143–163.

Danforth, H.D., 1998, "Use of live oocyst vaccines in the control of avian coccidiosis: experimental studies and field trials", **International Journal of Parasitology**, Vol. 28, pp. 1099-1109.

Davalos P.L., Ortega, V.J.L., Bastos, G.D. and Hidalgo, A.R., 2000, "A comparative study between the absorption of IgY and IgG on latex particles", **Biomaterials, Science and Education**, Vol. 11, pp. 657-573.

Davies, S.F.M., Jonyer, S.B. and Kendall, S.B., 1963, **Coccidiosis: Coccidia of the domestic fowl**, Oliver and Boyd Ltd., Tweeddale Court, Edinburgh,UK.

Davis, C. and Reeves, R., 2002, **High value opportunities from the chicken egg**, Rural industries research and development corporation publishing, Kingston, Australia.

Delzenne, N.M., 2003, "Oligosaccharides: state of the art", **Proceedings of Nutrition Society**, Vol. 62, pp. 177-182.

Demeulenaer, B. and Huyghebaert, A., 2001, "Isolation and Purification of Chicken Egg Yolk Immunoglobulins: A Review", **Food and Agricultural Immunology**, Vol. 13, pp. 275-288.

Elgert, K. D., 1996, **Immunology: Understanding the immune system**, Wiley-Liss.

Elmusharaf, M.A., Peek, H.W., Nollet, L. and Beynen, A.C., 2007, "The Effect of an in-feed mannanoligosaccharide preparation (MOS) on a coccidiosis infection in broilers", **Animal Feed Science and Technology**, Vol. 134, pp. 347-354.

Elmusharaf, M.A., Bautista, V., Nollet, L. and Beynen, A.C., 2006, "Effect of a mannanoligosaccharide preparation on *Eimeria tenella* infection in broiler chickens", **International Journal of Poultry Science**, Vol. 5, pp. 583-588.

Erhard, M.H., Mahn, K., Schmidt, P., Oltmer, S., Preisinger, R., Zinsmeister, P. and Stangassinger, M., 2000, "Evaluation of various immunisation procedures in laying hens to induce high amounts of specific egg yolk antibodies", **ATLA**, Vol. 28, pp. 63-80.

Farr, M.M. and Wehr, E.E., 1949, "Survival of Emirian acervulina, *E. tenella*, and *E. maxima* oocysts on soil under various field conditions", **Annual N.Y. Academy of Science**, Vol. 52, pp. 468-472.

Farrant, J., 2001, "Minister knocks out six anticoccidials", **Poultry World**, Vol. 15, pp. 15.

Fernandez, F., Hinton, M. and van Gils, B., 2002, "Dietary mannanoligosaccharides and effects on chicken caecal microflora in relation to Salmonella enteritidis", **Avian Pathology**, Vol. 31, pp. 49-58.

Fu, C.Y., Huang, H., Wang, X.M., Liu, Y.G., Wang, Z.G., Cui, S.J., Gao, H.L., Li, Z., Li, J.P. and Kong, X.G., 2006, "Preparation and evaluation of anti-SARS coronavirus IgY from yolks of immunized SPF chickens", **Journal of Virology Methods**, Vol. 133, pp. 112-115.

Fuller, R., 1989, "Probiotics in man and animals", **Journal of Applied Bacteriology**, Vol. 66, pp. 365-378.

Garvey, J.S., Cremer, N.E. and Sussdorf, D.H., 1977, **Methods in Immunology**, 3rdEd., Reading MA: W.A. Benjamin, Inc.

Gassmann, M., Thommes, P., Weiser, T. and Hubscher, U., 1990, "Efficient production of chicken egg antibodies against a conserved mammalian protein", **FASEB Journal**, Vol. 4, pp. 2528-2532.

Geisberger R., Lamers M. and Achatz G., 2006, "The riddle of the dual expression of IgM and IgD", **Immunology**, Vol. 118, ID. 060526021554006.

Gibson, G.R., 1999, "Dietary modulation of the human microflora using the prebiotics oligofructose and inulin", **Journal of Nutrition**, Vol. 129, pp. 1438S-1441S.

Gibson, G.R. and Roberfroid, M.B., 1995, "Dietary manipulation of the human colonic microbiota: Introducing the concept of prebiotics", **Journal of Nutrition**, Vol. 25, pp. 1401-1412.

Gibson, G.R. and Fuller, R., 2000, "Aspects of *in vitro* and *vivo* research approaches directed towards identifying probiotics and prebiotics for human use", **Journal of Nutrition**, Vol. 130, pp. 391S-395S.

Gibson, G.R., Bestty, E.B., Wang, X. and Cumming, J.H., 1995, "Selective stimulation of Bifidobacteria in the human colon by oligofructose and inulin", **Gastroenterol**, Vol. 108, pp. 975-982.

Goldsby, R.A., Kindt, T.J., Osborne, B.A. and Kuby, J., 2003, **Immunology** 5th ed., Freeman W.H. and Company, New York, USA.

Haines, R.B., 1938, "Bacterial flora of hen eggs with a description of a new species of proteus and pseudomonas causing rots in eggs", **Journal of Hygiene, Epidemiology, Microbiology and Immunology**, Vol. 38, pp. 338-55.

Hammond, D.M., 1973, **The Coccidia: *Eimeria, Isospora,* and Related Genera; Life cycles and development of coccidian**, D. M. Hammond and P. L. Long, eds., University Park Press, Baltimore, MD.

Hanly W.C., Artwohl J.E. and Bennett B. T., 1995, "Review of polyclonal antibody production procedures in mammals and poultry", **ILAR Journal**, Vol. 37, pp. 93-118.

Hansen P., Scoble J.A., Hanson B. and Hoogenraad, N.J., 1998, "Isolation and purification of immunoglobulins from chicken eggs using thiophilic interaction chromatography", **Journal of Immunology Methods**, Vol. 215, pp. 1–7.

Harry, E.G., 1963a, "Some observations on the bacterial content of the ovary and oviduct of the fowl", **British Poultry Science**, Vol. 4, pp. 63-70.

Harry, E.G., 1963b. "The relationship between egg spoilage and the environment of the egg when laid", **British Poultry Science**, Vol. 4, pp. 91-100.

Hatta, H., Kim, M. and Yamamoto T., 1990, "Novel isolation method for hen egg yolk antibody (IgY)", **Agricultural and Biological Chemistry**, Vol. 54, pp. 2531-2535.

Hatta, H., Tsuda, K., Akachi, S., Kim, M., Yamamoto, T. and Ebina, T., 1993, "Passive immunization against dental plaque formation in human: effect of mouth rinse containing egg yolk antibodies (IgY) specific to Streptococcus mutans", **Caries Research**, Vol. 31, pp. 268-274.

Hatta, H., Tsuda, K., Akachi, S., Kim, M., Yamamoto, T. and Ebina, T., 1993, "Productivity and some properties of egg yolk antibody (IgY) against human rotavirus

compared with rabbit IgG", **Bioscience, Biotechnology and Biochemistry**, Vol. 57, pp. 450-454.

Hau, J. and Hendriksen, C.F.M., 2005, "Refinement of Polyclonal Antibody Production by Combining Oral Immunization of Chickens with Harvest of Antibodies from the Egg Yolk", **ILAR Journal**, Vol. 46, pp. 294-299.

Hendriksen, C. and Hau, J., 2003, **Handbook of Laboratory Animal Science**: Production of polyclonal and monoclonal antibodies, 2nd ed., Boca Raton: CRC Press LLC, pp. 391-411.

Herbert, W.J., 1967, **Handbook of Experimental Immunology: Methods for the preparation of water-in-oil and multiple emulsions for use as antigen adjuvants** and notes on their use in immunization procedures (Ed. D.M. Weir), Oxford: Blackwell, pp.1207-1214.

Hidaka, H., Eida, T., Takiwaza, T., Tokungo, T. and Tashiro, Y., 1986, "Effects of fructooligosaccharide on intestinal flora and human health", **Bifid. Microflora**, Vol. 5, pp. 37-50.

Hlinak, A., Schade, R., Bartels, T. and Ebner, D., 1996, "Das Huhn als Versuchstier und Quelle spezifischer Dotterantikorper Erfahrungen zur Haltung", **Immunisierung und Legeleistung, Tierarztliche Umschau**, Vol. 51, pp. 408-411.

Holley, R.A. and Proulx, M., 1986, "Use of egg washwater pH to prevent survival of salmonella at moderate temperature", **Poultry Science**, Vol. 65, pp. 922-928.

Humphrey, T.J., Lanning, D.G. and Leeper, D., 1981, "The effect of pH adjustment on the microbiology of chicken scald-tank water with particular reference to the death rate of salmonellas", **Journal of Applied Bacteriology**, Vol. 51, pp. 517-527.

Innes, E.A. and Vermeulen, A.N., 2006, "Vaccination as a control strategy against the coccidial parasites Eimeria, Toxoplasma and Neospora", **Cambridge journals: Parasitology**, Vol. 133, pp. S145–S168.

International Association of Milk, Food and Environmental Sanitarians (IAMFES), 1976, "Sanitary standards for shell egg washers", **Journal of Milk Food Technology**, Vol. 39, pp. 654-656.

Jacobs, L.A., McDaniel, G. R. and Broughton, C.W., 1978, "Microbial flora observed within sections of the oviduct in naturally mated, artificially inseminated and virgin hens", **Poultry Science**, Vol. 57, pp. 1550-1553.

Jeffers, T., 1997, "Control of Coccidiosis in the Next Millennium", **Proceedings of VIIth International Coccidiosis Conference**, pp. 16.

Jeurissen, S.H.M., and Veldman, B., 2002, **Nutrition and Health of the Gastrointestinal Tract: The interaction between feed (components) and *Eimeria* infection in poultry health**, Wageningen Academic Publisher, Wageningen, Netherlands, pp. 159-182.

Jin, L.Z., Ho, Y.W., Ali, M., Abdullah, A.N., Ong, K.B. and Jalaludin S., 1996, "Adhesion of Lactobacillus isolates to the intestinal cells of chickens", **Letters in Applied Microbiology**, Vol. 22, pp. 229-232.

Jin, L.Z., Ho, Y.W., Ali, M., Abdullah,A.N., Ong, K.B. and Jalaludin S., 1998, "Effects of adherent Lactobacillus culture on growth, weight of organs and intestinal microflora and volatile fatty acids in broilers", **Animal Feed Science and Technology**, Vol. 70, pp. 197-209.

Jin, L.Z., Ho, Y.W., Ali, M., Abdullah,A.N., Ong, K.B. and Jalaludin S., 2000, "Digestive and bacterial enzymes activities in broilers fed diet supplemented with Lactobacillus cultures", **Poultry Science**, Vol. 79, pp. 886-891.

Jordan, F.T.W. and Pattison M., 1996, **Poultry diseases**, WB Saunders, London.

Juneja, L.R., Koketsu, M., Nishimoto, K., Kim, M., Yamamoto, T. and Itoh, T., 1991, "Large-scale preparation of sialic acid from chalaza and egg-yolk membrane", **Carbohydrate Research**, Vol. 214, pp. 179-186.

Kapoor, P., Compton M. M. and Howarth, B., 2000, "Immunization of chickens with quail and turkey perivitelline membrane proteins: production of antibodies and their effects on fertility", **Poultry Science**, Vol. 79, pp. 245-256.

Karlsson, M., Kollberg, H. and Larsson, A., 2004, "Chicken IgY: utilizing the evolutionary advantage", **World's Poultry Science Journal,** Vol. 60, pp. 341-8.

Kennedy, M.J., 2001, "Coccidiosis in Chickens", Food Safety Division, **Agri-fact, Practical information for alberla's Agriculture industry**.

Kim, M., Higashiguchi, S., Iwamoto, H., Yang, H.C., Cho, H.Y. and Hatta, H., 2000, "Egg yolk anitibody and its application", **Biotechnology and Bioprocess Engineering**, Vol. 5, pp. 79-83.

Kinner, J.A. and Moats, W.A., 1981, "Effect of temperature, pH, and detergent on survival of bacteria associated with shell eggs", **Poultry Science**, Vol. 60, pp. 761-770.

Ko, K. Y. and Ahn, D. U., 2007, "Preparation of immunoglobulin Y from egg yolk using ammonium sulfate precipitation and Ion exchange chromatography", **Poultry Science**, Vol. 86, pp. 400-407.

Kovac-Nolan, J. and Mine, Y., 2005, "Microencapsulation for the gastric passage and controlled intestinal release of immunoglobulin Y", **Journal of Immunology Methods**, Vol. 296, pp. 199-209.

Larson, A., Balow, R.M., Lindhal, T. and Forsberg, P.O., 1993, **Poultry Science**, Vol. 72, pp. 1807–1812.

Larsson, A., Carlander, D. and Wilhelmsson, M., 1998, "Immune response in chicken with different amounts of antigen", **Food Agricult. Immunol**, Vol. 10, pp. 29-36.

Lee, K.A. *et al.,* 2002, "Acid stability of anti-*Helicobacter pyroli* IgY in aqueous polyol solution", **Journal of Biochemistry and Molecular Biology**, Vol. 35, pp. 488-493.

Lee, S.H., Lillehoj, H.S., Dalloul, R.A., Park, D.W., Hong, Y.H. and Lin, J.J., 2007, "Influence of *Pediococcus*-based probiotic on coccidiosis in broiler chickens", **Poultry Science**, Vol. 86, pp. 63-66.

Lee, S.H., Lillehoj, H.S., Park, D.W., Jang, S.I., Morales, A., Garcia, D., Lucio, E., Larios, R., Victoria, G., Marrufo, D. and Lillehoj, E.P., 2009, "Protective effect of hyperimmune egg yolk IgY antibodies against Eimeria tenella and Eimeria maxima infections", **Veterinary Parasitology**, Vol. 163, 123–126.

Lee, S.H., Lillehoj, H.S., Park, D.W., Jang, S.I., Morales, A., Garcia, D., Lucio, E., Larios, R., Victoria, G., Marrufo, D. and Lillehoj, E.P., 2009, "Induction of passive immunity in broiler chickens against Eimeria acervulina by hyperimmune egg yolk immunoglobulin Y", **Poultry Science**, Vol. 88, pp. 562–566.

Leenaars, M., Claassen, E. and Boersma, W.J.A., 1997, "Antigens and antigen presentation in **Immunology Methods Manual**", Academic Press Ltd., London, pp. 989-1013.

Leenaars, M. and Hendriksen, C.F.M., 2005, "Critical Steps in the Production of Polyclonal and Monoclonal Antibodies: Evaluation and Recommendations", **ILAR Journal**, Vol. 46, pp. 269-279.

Leenaars, M., Claassen, E. and Boersma, W.J.A., 1996, "Modulation of the humoral immune response: antigens and antigen presentation" in **Immunology methods manual**, Academic Press Ltd., London, pp. 989-1013.

Lemamy G.J., Roger P., Mani J.C., Robert M., Rochefort H. and Brouillet J.P., 1999, "Highaffinity antibodies from hen's-egg yolk against human mannose-6-phosphate/insulin-like growth-factor-II receptor (MGP/IGFII-R): Characterization and potential use in clinical cancer studies", **International Journal of Cancer**, Vol. 80, pp. 896-902.

Leslie, G.A. and Martin, L.N., 1973, "Studies on the secretory immunologic system of fow l.3. Serum and secretory IgA of the chicken", **Journal of Immunology**, Vol. 110, pp. 1-9.

Leslie, G.A. and Clem, L.W., 1969, "Phylogen of immunoglobulin structure and function: Immunoglobulins of the chicken", **Journal of Experimental Medicine**, Vol. 130, pp. 1337–1352.

Leslie, G.A. and Clem, L.W., 1970, "Chicken immunoglobulins: biological halflives and normal adult serum concentrations of IgM and IgY", **Proceedings of The Society for Experimental Biology and Medicine**, Vol. 134, pp. 195–198.

Levine, N.D., 1973, **Protozoan Parasites of Domestic Animals and of Man, 2nded.**, Burgess, Minneapolis.

Li, G.Q., Kanu, S., Xiang, F.Y., Xiao, S.M., Zhang, L., Chen, H.W. and Ye, H.J., 2004, "Isolation and selection of ionophore-tolerant *Eimeria* precocious lines: *E. tenella, E. maxima, E. acervulina*", **Veterinary Parasitolology**, Vol. 119, pp. 261–276.

Li, G.Q., Kanu, S., Xiao, S.M. and Xiang, F.Y., 2005, "Responses of chickens vaccinated with a live attenuated multi-valent ionophore-tolerant *Eimeyria* vaccine", **Veterinary Parasitology**, Vol. 129, pp. 179–186.

Li, X., Nakano, T., Sunwoo, H.H., Paek, B.H., Chae, H.S. and Sim, J.S., 1998, "Effects of egg and yolk weights on yolk antibody (IgY) production in laying chickens", **Poultry Science**, Vol. 77, pp. 266-270.

Li, X., Shuai, J. and Fang, W., 2006, "Protection of Carassius auratus Gibelio against infection by Aeromonas hydrophila using specific immunoglobulins from hen egg yolk", **Journal of Zheijiang University Sci. B**, Vol. 7, pp. 922-928.

Lillehoj, H.S., Min, W. and Dalloul, R.A., 2004, "Recent progress on the cytokine regulation of intestinal immune responses to *Eimeria*", **Poultry Science**, Vol. 83, pp. 611-62.

Lillejoh, H.S. and Lillejoh, E., 2000, "Avian coccidiosis: a review of acquired intestinal immunity and vaccination strategies", **Avian Diseases**, Vol. 44, pp. 408-4025.

Lipman, N.S., Jackson, L.R., Trudel, L. J. and Garcia, F.W., 2005, "Monoclonal Versus Polyclonal Antibodies: Distinguishing Characteristics, Applications, and Information Resources", **ILAR Journal**, Vol. 46, pp. 258-268.

Loeken, M. R. and Roth, T. F., 1983, "Analysis of maternal IgG subpopulations which are transported into the chicken oocyte", **Immunology**, Vol. 49, pp. 21-28.

Lorenz, F.W. and Starr, P.B., 1952, "Spoilage of washed eggs", **Poultry Science**, Vol. 31, pp. 204-214.

Losch, U., Schranner, I., Wanke, I. and Jugens, L., 1986, "The chicken egg, an antibody source", **Journal of Veterinary Medicine B**, Vol. 33, pp. 609-619.

Mahn, K., 1998, **Etablierung eines Immunisierungsschemas fur Legehennen**, PhD Thesis, University of Munich, Germany.

Male, D., Brostoff, J., Roth, D.B. and Roitt, I., 2006, **Immunology** (Seventh edition). Mosby Elsevier

March, B.E., 1969, "Bacterial infection of washed and unwashed eggs with respect to salmonella", **Applied Microbiology**, Vol. 17, pp. 98-101.

Matsuda, H., Mitsuda, H., Nakamura, N., Furusawa, S., Mohri, S. and Kitamoto, T., 1999, "A chicken monoclonal antibody with specificity for the N-terminal of human prion protein", **FEMS Immunology and Medical Microbiology**, Vol. 23, pp. 89-194.

Mayes, F.J. and Takeballi, M.A., 1983, "Microbial contamination of the hen's egg: A review", **Journal of Food Protection**, Vol. 46, pp. 1092-8.

McCully, K.A., Mok, C.C. and Common, R.H., 1962, "Paper electrophoratic characterization of proteins and lipoproteins of hen's egg yolk", **Canadian Journal of Biochemistry and Physiology**, Vol. 40, pp. 937-952.

McDougald, L.R., 1982, **The Biology of Coccidia: Chemotherapy of coccidiosis**, University Park Press: Baltimore, pp. 373-427.

McDougald, L.R., 2003, **Poultry Diseases: Coccidiosis**, Iowa State Press, Iowa, USA, pp. 974-991.

McEvoy J., 2001, "Safe limit for veterinary drug residues, what do they mean?", **Northern Ireland Veterinary Today**, pp. 37-40.

Meenatchisundaram, S. and Michael, A., 2010, "Comparison of four different purification methods for isolation of anti Echis carinatus antivenom antibodies from immunized chicken egg yolk", **Iranian Journal of Biotechnology**, Vol. 8, pp. 50-55.

Metwally, M., Abd EL-R. and Majeid, L.A., 1984, "Microbial contamination in relation to embryonic mortalities", **Iraqi Journal of Agricultural Science**, Vol. 2, pp. 115-25.

Michael, A., Meenatchisundaram, S., Parameswari, G., Subbraj, T., Selvakumaran, R. and Ramalingam, S., 2010, "Chicken egg yolk antibodies (IgY) as an alternative to mammalian antibodies", **Canadian Journal of Science and Technology**, Vol. 3, pp. 468-474.

Miller, W.A. and Crewford, L.B., 1953, "Some factors influencing bacterial populations of eggs", **Poultry Science**, Vol. 32, pp. 303-309.

Mine, Y., 2008, "Egg bioscience and biotechnology of a live attenuated anticoccidial vaccine administered to 1-day-old chickens", **Avian Pathology**, Vol. 32, pp. 297-304.

Mine, Y. and Nolan, J. K., 2002, "Chicken egg yolk antibodies as therapeutics in enteric infectious disease", **Journal of Medicinal Food**, Vol. 5, pp. 159-169.

Moats, W.A., 1978, "Egg washing", **Journal of Food Protection**, Vol. 41, pp. 919-925.

Moats, W.A., 1981, "Factors affecting bacterial loads on shells of commercially washed eggs", **Poultry Science**, Vol. 60, pp. 2084-2090.

Narat, M., 2003, "Production of Antibodies in chicken", **Food Technology and Biotechnology**, Vol. 41, pp. 259-267.

Newcombe, C. and Newcombe, A.R., 2007, "Antibody production: Polyclonal-derived biotherapeutics", **Journal of Chromatography B**, Vol. 848, pp. 2–7.

Nolan, J.K. and Mine, Y., 2004, "Avian egg antibodies: basic and potential applications", **Avian Poultry Biology Reviews**, Vol. 15, pp. 25–46.

Olbrich, C., Muller, R.H., Tabatt, K., Kayser, O., Schulze, C. and Schade, R., 2002, "Stable biocompatible adjuvants: a new type of adjuvant based on solid lipid nanoparticles: a study on cytotoxicity, compatibility and efficacy in chicken", **ATLA**, Vol. 30, pp. 443-458.

Olovsson, M. and Larsson, A., 1993, "Biotin labelling of chicken antibodies and their subsequent use in ELISA and immunohistochemistry", **Comparative Immunology, Microbiology and Infectious Diseases**, Vol. 16, pp. 145-152.

Otani, H., Matsumoto, K., Saeki, A. and Hosono, A., 1991, "Comparative studies on properties of hen egg yolk IgY and rabbit serum IgG antibodies", **Lebensm Wiss. Techonol.**, Vol. 24, pp. 152-158.

Parvari, R., Avivi, A., Lantner, F., Ziv, E., Tel-Or, S., Burstein,Y. and Schechter, I., 1988, "Chicken immonuglobulin γ-heavy chain: limited VH repertoire, combinatorial diversification by D gene segments and evolution of heavy chain locus", **EMBO Journal**, Vol. 7, pp. 739.

Pier, G.B, Lyczak J. B. and Wetzler, L.M., 2004, **Immunology, Infection and Immunity**, ASM Press. ISBN 1-55581-246-5.

Polson, A., Von Wechmar, M.B. and Regenmortel, M.H.V.V., 1980, "Isolation of viral IgY antibodies from yolk of immunized hens", **Immunology**, Vol. 9, pp. 475-493.

Quarles, C.L., Gentry, R.F., and Bressler, G.O., 1970, "Bacterial contamination in poultry houses and its relationship to egg hatchability", **Poultry Science**, Vol. 49, pp. 60-6.

Rao, C.V., 2006, **Immunology (Second edition)**, Alpha science international Ltd., Oxford, U.K.

Rose, M.E. and Long, P. L., 1980, **Vaccination Against Parasites: Vaccination against coccidiosis in chickens**, Blackwell Scientific, Oxford, UK, pp. 57-74.

Rose, M.E. and Orlans, E., 1981, "Immunoglobulins in the egg, embryo and young chick", **Developmental and Comparative Immunology**, Vol. 5, pp. 15-20.

Rose, M.E., Orlans, E. and Buttress, N., 1974, "Immunoglobulin classes in the hen's eggs: their segregation in yolk and white", **European Journal of Immunology**, Vol. 4, pp. 521-523.

Ruff, M.D. and Danforth, H.D., 1966, "Resistance of coccidia to medications", **Proceedings of XX World's Poultry Congress**, Vol. 11, pp. 427-430.

Ryley, J.F., 1973, **The Coccidia: Cytochemistry, physiology and biochemistry**, University Park Press, Baltimore and Butterworth's, London, pp: 145-181.

Schade R. and Hlinak, A., 1996, "Egg yolk antibodies, state of the art and future prospects", **ALTEX**, Vol. 13, pp. 5-9.

Schade, R., *et al.*, 2005, "Chicken egg yolk antibodies (IgY-technology): a review of progress in production and use in research and human and veterinary medicine", **ATLA**, Vol. 33, pp. 129-154.

Schade, R., Staak, C., Hendriksen, C., Erhard, M., Hugl, H., Koch, G., Larsson, A., Pollmann, W., van Regenmortel, M., Rijke, E., Spielmann, H., Steinbusch, H. and Straughan, D., 1996, "The production of avian (egg yolk) antibodies: IgY, The Report and Recommendations of ECVAM Workshop 21", **ATLA**, Vol. 24, pp. 925-934,

Schawarzkopf, C., Staak, C., Behn, I. and Erhard, M., 2000, "Chicken egg yolk antibodies, production and application: IgY technology", **Springer Lab Mannuals**, New York, USA, pp. 25-64.

Schwarzkopf, C. and Thiele, B., 1997, **Animal Alternatives, Welfare and Ethics: Chicken IgY, efficacy of alternative adjuvants compared to CFA**, Elsevier, Amsterdam, pp. 983–988.

Shimizu, M., Nagashima, H., Hashimoto, K. and Suzuki, T., 1994, "Egg yolk antibody (IgY) stability in aqueous solution with high sugar concentrations", **Journal of Food Science**, Vol. 59, pp. 763-772.

Shimizu, M., Nagashima, H., Sano, K. and Hashimoto, K., 1993, "Comparative studies on molecular stability of immunoglobulins G from different species", **Comparative Biochemistry and Physiology**, Vol. 106, pp. 255-261.

Shimizu, M., Nagashima, H., Sano, K., Hashimoto, K., Ozeki, M., Tsuda, K. and Hatta, H., 1992, "Molecular stability of chicken and rabbit immunoglobulin G", **Bioscience, Biotechnology and Biochemistry**, Vol. 56, pp. 270-274.

Shimizu, M., Nakai, S. and Fitzsimmons, R.C., 1988, "An-*E.coli* immunoglobulin Y isolated from egg yolk of immunized chickens as a potential food ingredient", **Journal of Food Science**, Vol. 5, pp. 1360-1366.

Shirley, M.W., 1992, "Research on avian coccidia: an update", **Brazilian Veterinary Journal**, Vol. 148, pp. 479–499.

Shirley, M.W. and Long, P.L., 1990, **Coccidiosis of Man and Domestic Animals: Control of coccidiosis in chickens: immunization with live vaccines**, CRC Press, Boca Raton, Florida, pp. 321-341

Skrabanja, A.T., De Meere, A.L., De Ruiter,R.A. and Van Den Oetelaar, P.J., 1994, "Lyophilization of biotechnology products", **PDA Journal of Pharmaceutical Science and Technology**, Vol. 48, pp. 311-317.

Spring, P.C., Dawson, K.A. and Newman, K.E., 2000, "The effects of dietary mannanoligosaccharides on caecal parameters and concentration of enteric bacteria in the caeca of salmonella-challenged broiler chicks", **Poultry Science**, Vol. 79, pp. 205-211.

Stadeklman, W.J. and Cotterill, O.J., 1977, **Egg science and technology**, AVI Pub. Co., Westport, CT, USA.

Stills H. F. Jr., 1994, **The Biology of the Laboratory Rabbit: Polyclonal antibody production**, Academic Press Inc., San Diego, pp. 435-448.

Stills, H.F. Jr., 2005, "Adjuvants and antibody production: Dispelling the myths associated with Freund's complete and other adjuvants", **ILAR Journal**, Vol. 46, pp. 280-293.

Sugino, H., Nitoda, T. and Juneja L.R., 1997, **Hen Eggs, Their Basic and Applied Science: General chemical composition of hen eggs**, CRC Press, New York, pp. 13-24.

Sunwoo, H.H., Lee, E.N., Gujral, N. and Suresh, M.R., 2002, "Growth inhibitory effect of chicken egg yolk antibody (IgY) on *Escherichia coli* O157:H7", **Journal of Food Science**, Vol. 75, pp. 342-345.

Sunwoo, H.H., Nakano, T., Dixon, W.T. and Sim, J.S., 1996, "Immune responses in chickens against lipopolysaccharide of Escherichia coli and Salmonella typhimurium", **Poultry Science**, Vol. 75, pp. 342-345.

Svendsen, L., Crowley, A., Stodulski, G. and Hau, J., 1996, "Antibody production in rabbits and chickens immunized with human IgG: A comparison of titer and avidity development in rabbit serum, chicken serum and egg yolk using three different adjuvants", **Journal of Immunology Methods**, Vol. 191, pp. 113-120.

Taylor, M.A., Coop, R.L. and Wall, R.L., 2007, **Veterinary Parasitology, 3rd ed.**, Blackwell Publishing Ltd, Garsington Road, Oxford, pp. 39-50.

Tierney, J., Gowing, H., Van Sinderen, D., Flynn, S., Stanley, L., McHardy, N., Hallahan, S. and Mulcahy, G., 2004, "*In vitro* inhibition of *Eimeria tenella* invasion by indigenous chicken *Lactobacillus* species", **Veterinary Parasitology**, Vol. 122, pp. 171-182.

Timmerman, H.M., Koning, C.J.M., Mulder, L., Rombouts, F.M. and Beynen, A.C., 2004, "Monostrain, multistrain, and multispecies probiotics: A comparison of functionality and efficacy", **International Journal of Food Microbiology**, Vol. 96, pp. 219-233.

Tini, M., Jewell, U.R., Camenisch, G., Chilov, D. and Gassmann, M., 2002, "Generation and application of chicken egg-yolk antibodies", **Comparative Biochemistry and Physiology A**, Vol. 131, pp. 569-574.

Tortuero, F., 1973, "Influence of the implantation of *Lactobacillus acidophilus* in chicks on the growth, feed conversion, malabsorption of fats syndrome and intestinal flora", **Poultry Science**, Vol. 52, pp. 197-203.

Trout, J.M. and Lillehoj, H.S., 1996, "T lymphocyte roles during Eimeria acervulina and Eimeria tenella infections", **Veterinary Immunology and Immunopathology**, Vol. 53, pp. 163-72.

Turk, D.E., 1978, **Avian Coccidiosis: The effect of coccidiosis on intestinal function and gut microflora**, British Poultry science Ltd., Edinburgh, pp. 227-267

Underdown, B. and Schiff, J., 1986, "Immunoglobulin A: Strategic defense initiative at the mucosal surface", **Annual Review of Immunology**, Vol. 4, pp. 389-417.

USDA, 2000, "Egg Grading Manual", **Agricultural Handbook**, [Electronic], Vol. 75, Available : http:/www.ams.usda.gov/poultry/pdfs/EggGrading%20manual.pdf [2006, December 5].

Wang, X. and Gibson, G.R., 1993, "Effects of the *in vitro* fermentation of oligofructose and inulin by bacteria growing in the human large intestine", **Journal of Applied Bacteriology**, Vol. 75, pp. 373-380.

Wanker, E.E., Sittler, A., Lurz, R., Lueder, G., Hayer-Harti, M.K., Harti, F.U. and lehrach, H., 1996, "Freund's complete adjuvant in the chicken: efficient immunostimulation with severe local inflammatory reaction", **Zentralblatt Veterinarmed A**, Vol. 43, pp. 243-253.

Warr, G.W., Magor, K.E. and Higgins, D.A., 1995, "Clues to the origin of modern antibodies". **Immunology Today**, Vol. 16, pp. 392-398.

Wilkie, D.C., 2006, **Non-antibiotic approaches to control pathogens in the gastrointestinal tract of the broiler chicken**, Ph.D. Thesis, University of Saskatchewan.

Williams, J., 1962, "Serum proteins and for livetins of hen ' s egg yolk", **Biochemistry Journal**, Vol. 82, pp. 346 – 355.

Williams, R.B., 1998, "Epidemiological aspects of the use of live anticoccidial vaccines for chickens", **International Journal of Parasitology**, Vol. 28, pp. 1089-1098.

Williams, R.B., 2003, "Anticoccidial vaccination: the absence or reduction of numbers of endogenous parasites from gross lesions in immune chickens after virulent coccidial challenge", **Avian Pathology**, Vol. 32, pp. 535-543.

Williams, R.B., 2002, "Anticoccidial vaccines for broiler chickens: pathways to success". **Avian Pathology**, Vol. 31, pp. 317-353.

Wilson, D., 2007, **Poultry : A Guide to anatomy and selected species**, University of Illinois Board of Trustees (Chicken digestive).

Yamamura, J., Adachi, T., Aoki, N., Nakajima, H., Nakamura, R. and Matsuda, T., 1995, "Precursor - product relationship between chicken vitellogenin and the yolk proteins: The 40 kDa yolk plasma glycoprotein is derived from the C - terminal cysteine – rich domain of vitellogenin II", **Biochemical and Biophysical Acta**, Vol. 1244, pp. 384 – 394 .

Yokoyama, H., Peralta, R.C., Diaz, R., Sendo, S., Ikemori, Y. and Kodama, Y., 1992, "Passive protective effect of chicken egg yolk immunoglobulins against experimental enterotoxigenic *Escherichia coli* infection in neonatal piglets", **Infection and Immunity**, Vol. 60, pp. 998-1007.

Young, R. and Craig, A., 2001, "Resistance of dangerous drugs in intensively produced chicken meat and eggs", **The use and misuse of antibiotics in the UK agriculture. Part 3**, The soil Association, UK.

Yun, C.H., Lillehoj, H.S. and Lillehoj, E.S., 2000, "Intestinal immune responses to coccidiosis", **Developmental and Comparative Immunology**, Vol. 24, pp. 303-324.

Zhang, W.W., 2003, "The use of gene-specific IgY antibodies for drug target discovery", **Drug Disccovery Today** Vol. 8(8), pp. 364-371.

Zulkifli, I., Abdullah, N., Azrin, M.N. and Ho, Y.H., 2000, "Growth performance and immune response of two commercial broilers strain fed diet containing Lactobacillus cultures and Oxytetracyclin under heat stress conditions", **Br. Poult. Sci**, Vol. 41 pp. 593-597.

APPENDICES

APPENDIX A

CHEMICAL PREPARATION

A.1 Blocking buffer for indirect ELISA (PBS-Tween, pH 7.4 containing 1.5% BSA)

NaCl	8	grams
KH_2PO_4	0.24	grams
$Na_2HPO_4.12H_2O$	2.9	grams
KCl	0.2	grams
Tween 20	0.5	mL
Bovine serum albumin (BSA)	15	grams

Mix all reagents and dissolve in 800 mL distilled water.

Adjust pH to 7.4, make the volume to 1 liter.

A.2 Coating buffer for indirect ELISA (Carbonate/Bicarbonate pH 9.6)

Na_2CO_3	1.59	grams
$NaHCO_3$	2.93	grams

Both reagents were mixed dissolved in 1 liter distilled water.

A.3 Washing buffer for indirect ELISA (PBS-Tween, pH 7.4)

NaCl	8	grams
KH_2PO_4	0.24	grams
$Na_2HPO_4.12H_2O$	2.9	grams
KCl	0.2	grams
Tween 20	0.5	mL

Mix all reagents and dissolve in 800 mL distilled water.

Adjust pH to 7.4, make the volume to 1 liter.

A.4 Modified Sheather solution

Sucrose	500	grams
Phenol	5	mL
Tap water	350	mL

A.5 Phosphate buffer saline (PBS buffer, pH 7.4)

NaCl	8	grams
KH_2PO_4	0.24	grams
Na_2HPO_4	1.44	grams
KCl	0.2	grams

Mix all reagents and dissolve in 800 mL distilled water.

Adjust pH to 7.4, make the volume to 1 liter.

A.6 100 mM sodium phosphate buffer, pH 7.6

$NaHPO_4.H_2O$	13.8	grams
Na_2HPO_4	14.2	grams

Both reagents were mixed and dissolved in 800 mL distilled water.

Adjust pH to 7.6, make the volume to 1 liter.

APPENDIX B

EXPERIMENTAL RESULTS

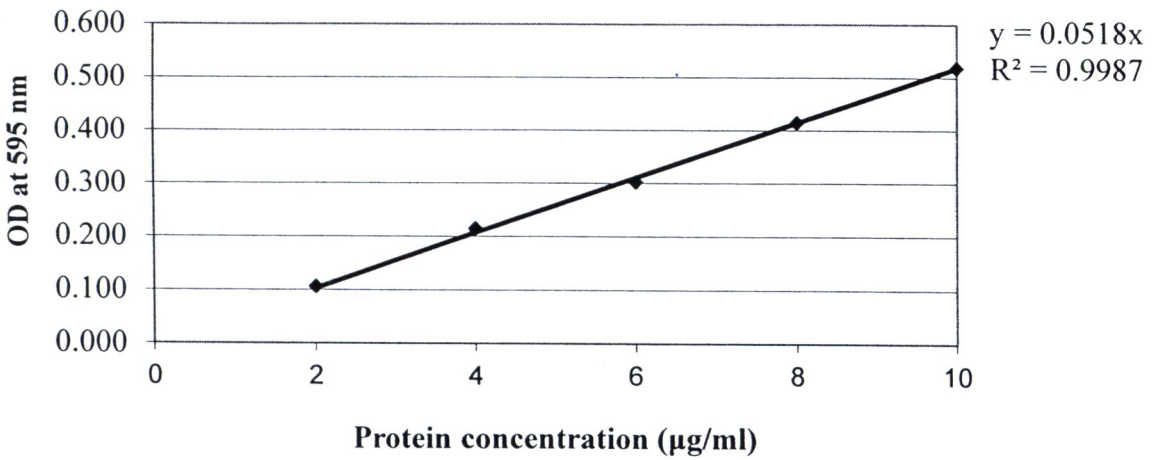

Figure B.1 Standard curve for Bradford protein assay

Table B.1 Titer determination of extracted IgY in pooled fresh egg from week 13 after first immunization

Samples	Dilutions	Protein Conc. (ug/mL)	O.D at 450 nm			Av. OD
Blank	-	-	0.063	0.065	0.064	0.064
No Ag.	1:160	35	0.410	0.464	0.421	0.432
Negative Control (Extracted IgY against adipocyte membrane)	1:160	35	0.647	0.626	0.641	0.638
	1:320	17.5	0.505	0.497	0.511	0.504
	1:640	8.75	0.361	0.364	0.348	0.358
	1:1280	4.38	0.238	0.241	0.249	0.243
	1:2560	2.12	0.161	0.175	0.186	0.174
No Ag.	1:160	35	1.218	1.169	1.173	1.187
Extracted anti-chicken coccidia IgY	1:160	35	2.097	2.097	2.041	2.078
	1:320	17.5	1.549	1.561	1.541	1.550
	1:640	8.75	1.012	0.991	1.001	1.001
	1:1280	4.38	0.557	0.544	0.578	0.560
	1:2560	2.12	0.314	0.307	0.326	0.316
No IgY	-	-	0.074	0.077	0.070	0.074

Table B.2 Titer determination of anti-chicken coccidia IgY in pooled fresh yolk from week 14 -21 after first immunization

Samples	Dilutions	OD at 450 nm			Av. OD
Blank I	-	0.053	0.053	0.052	0.053
Negative Control (IgY against adipocyte membrane protein)	No Ag (1 :160)	0.831	0.815	0.826	0.824
	1 : 160	1.395	1.408	1.371	1.391
	1 : 320	0.940	0.922	0.911	0.924
	1 : 640	0.673	0.619	0.629	0.640
	1 :1280	0.393	0.404	0.401	0.399
	1 : 2560	0.229	0.225	0.222	0.225
Week 6	No Ag (1 :160)	1.302	1.298	1.286	1.295
	1 : 160	2.206	2.228	2.219	2.218
	1 : 320	1.626	1.660	1.643	1.643
	1 : 640	1.062	1.049	1.053	1.055
	1 :1280	0.634	0.647	0.628	0.636
	1 : 2560	0.388	0.396	0.380	0.388
Week 14	No Ag (1 :160)	1.142	1.137	1.090	1.123
	1 : 160	2.239	2.272	2.296	2.269
	1 : 320	1.664	1.665	1.660	1.663
	1 : 640	1.014	1.056	1.044	1.038
	1 :1280	0.640	0.612	0.601	0.618
	1 : 2560	0.381	0.370	0.386	0.379
Blank II	-	0.050	0.050	0.050	0.050
Week 15	No Ag (1 :160)	1.596	1.581	1.556	1.578
	1 : 160	2.201	2.176	2.206	2.194
	1 : 320	1.560	1.568	1.569	1.566
	1 : 640	1.128	1.155	1.148	1.144
	1 :1280	0.783	0.781	0.747	0.770
	1 : 2560	0.401	0.403	0.405	0.403
Week 16	No Ag (1 :160)	1.490	1.496	1.528	1.505
	1 : 160	2.199	2.235	2.187	2.207
	1 : 320	1.546	1.519	1.519	1.528
	1 : 640	1.009	0.967	0.966	0.981
	1 :1280	0.584	0.571	0.588	0.581
	1 : 2560	0.341	0.358	0.341	0.347
Week 17	No Ag (1 :160)	0.858	0.854	0.856	0.856
	1 : 160	1.981	1.993	1.988	1.987
	1 : 320	1.366	1.359	1.376	1.367
	1 : 640	0.979	0.976	0.986	0.980
	1 :1280	0.599	0.586	0.584	0.590
	1 : 2560	0.331	0.349	0.375	0.352

Table B.2 Titer determination of anti-chicken coccidia IgY in pooled fresh yolk from week 14 - 21 after first immunization (Cont.)

Samples	Dilutions	OD at 450 nm			Av. OD
Blank III	-	0.055	0.053	0.054	0.054
Week 18	No Ag (1 :160)	0.912	0.936	0.928	0.925
	1 : 160	1.983	1.982	1.972	1.979
	1 : 320	1.414	1.422	1.393	1.410
	1 : 640	0.968	0.950	0.921	0.946
	1 :1280	0.554	0.572	0.585	0.570
	1 : 2560	0.320	0.330	0.342	0.331
Week 19	No Ag (1 :160)	1.159	1.192	1.242	1.198
	1 : 160	1.868	1.876	1.888	1.877
	1 : 320	1.357	1.346	1.320	1.341
	1 : 640	0.839	0.854	0.853	0.849
	1 :1280	0.513	0.532	0.539	0.528
	1 : 2560	0.296	0.312	0.327	0.312
Week 20	No Ag (1 :160)	1.074	1.063	1.053	1.063
	1 : 160	1.816	1.831	1.805	1.817
	1 : 320	1.256	1.234	1.231	1.240
	1 : 640	0.781	0.747	0.771	0.766
	1 :1280	0.408	0.413	0.396	0.406
	1 : 2560	0.206	0.204	0.211	0.207
Week 21	No Ag (1 :160)	0.704	0.723	0.737	0.721
	1 : 160	1.592	1.623	1.598	1.604
	1 : 320	1.021	1.008	1.014	1.014
	1 : 640	0.620	0.616	0.597	0.611
	1 :1280	0.328	0.330	0.323	0.327
	1 : 2560	0.185	0.187	0.191	0.188

Table B.3 Titer determination of anti-chicken coccidia IgY in pooled dried yolk from week 14 -21 after first immunization

Sample	Dilutions	OD at 450 nm			Av. OD
Blank I	-	0.055	0.053	0.052	0.053
Negative Control IgY against adipocyte membrane protein)	No Ag (1 :160)	1.024	1.012	1.040	1.025
	1 : 160	1.507	1.513	1.535	1.518
	1 : 320	1.126	1.140	1.148	1.138
	1 : 640	0.716	0.722	0.739	0.726
	1 :1280	0.502	0.504	0.496	0.501
	1 : 2560	0.302	0.298	0.289	0.296
Week 12	No Ag (1 :160)	1.721	1.736	1.744	1.734
	1 : 160	2.414	2.417	2.439	2.423
	1 : 320	1.864	1.889	1.882	1.878
	1 : 640	1.464	1.458	1.488	1.470
	1 :1280	1.069	1.080	1.074	1.074
	1 : 2560	0.666	0.640	0.652	0.653
Week 13	No Ag (1 :160)	1.688	1.669	1.677	1.678
	1 : 160	2.348	2.379	2.363	2.363
	1 : 320	1.859	1.837	1.845	1.847
	1 : 640	1.435	1.430	1.437	1.434
	1 :1280	1.019	1.023	1.048	1.030
	1 : 2560	0.630	0.610	0.621	0.620
Week 14	No Ag (1 :160)	1.517	1.540	1.531	1.529
	1 : 160	2.271	2.244	2.262	2.259
	1 : 320	1.742	1.722	1.738	1.734
	1 : 640	1.287	1.257	1.266	1.270
	1 :1280	0.869	0.890	0.888	0.882
	1 : 2560	0.547	0.560	0.538	0.548
Blank II	-	0.051	0.052	0.054	0.052
Week 15	No Ag (1 :160)	1.791	1.779	1.798	1.789
	1 : 160	2.303	2.317	2.331	2.317
	1 : 320	1.882	1.878	1.857	1.872
	1 : 640	1.350	1.328	1.339	1.339
	1 :1280	0.974	0.969	0.955	0.966
	1 : 2560	0.549	0.557	0.574	0.560
Week 16	No Ag (1 :160)	1.568	1.548	1.572	1.563
	1 : 160	2.238	2.268	2.244	2.250
	1 : 320	1.769	1.744	1.762	1.758
	1 : 640	1.264	1.268	1.284	1.272
	1 :1280	0.928	0.933	0.941	0.934
	1 : 2560	0.539	0.524	0.532	0.532

Table B.3 Titer determination of anti-chicken coccidia IgY in pooled dried yolk from week 14 -21 after first immunization (Cont.)

Sample	Dilutions	OD at 450 nm			Av. OD
Week 17	No Ag (1 :160)	1.420	1.411	1.433	1.421
	1 : 160	2.146	2.151	2.175	2.157
	1 : 320	1.621	1.611	1.637	1.623
	1 : 640	1.239	1.247	1.251	1.246
	1 :1280	0.854	0.877	0.859	0.863
	1 : 2560	0.471	0.483	0.489	0.481
Week 18	No Ag (1 :160)	1.536	1.532	1.540	1.536
	1 : 160	2.238	2.220	2.240	2.233
	1 : 320	1.760	1.738	1.749	1.749
	1 : 640	1.332	1.322	1.346	1.333
	1 :1280	0.930	0.922	0.964	0.939
	1 : 2560	0.536	0.544	0.534	0.538
Blank III	-	0.052	0.054	0.054	0.053
Week 19	No Ag (1 :160)	1.355	1.339	1.351	1.348
	1 : 160	2.078	2.067	2.084	2.076
	1 : 320	1.679	1.686	1.659	1.675
	1 : 640	1.177	1.165	1.189	1.177
	1 :1280	0.789	0.763	0.749	0.767
	1 : 2560	0.449	0.468	0.435	0.451
Week 20	No Ag (1 :160)	1.132	1.144	1.150	1.142
	1 : 160	1.880	1.862	1.866	1.869
	1 : 320	1.324	1.340	1.332	1.332
	1 : 640	0.912	0.934	0.940	0.929
	1 :1280	0.518	0.528	0.536	0.527
	1 : 2560	0.292	0.288	0.296	0.292
Week 21	No Ag (1 :160)	1.199	1.184	1.207	1.197
	1 : 160	1.845	1.863	1.855	1.854
	1 : 320	1.311	1.332	1.307	1.317
	1 : 640	0.915	0.923	0.930	0.923
	1 :1280	0.509	0.521	0.513	0.514
	1 : 2560	0.287	0.295	0.281	0.288

CURRICULUM VITAE

NAME	Mr. Thanasit Intanorat
DATE OF BIRTH	29 October 1982
EDUCATIONAL RECORD	
HIGH SCHOOL	High School Graduation Prince Royal College, Chiang Mai, Thailand, 2000
BACHELOR'S DEGREE	Bachelor of Science (Biotechnology) Mae Fah Luang University (MFU), Chiang Rai, Thailand, 2004
MASTER'S DEGREE	Master of Science (Biotechnology) King Mongkut's University of Technology Thonburi (KMUTT), Bangkok, Thailand, 2011
SCHOLARSHIP	The Thailand Research Fund (TRF) during 2008-2009
PUBLICATION	Intanorat, T., Poomputsa, K., Akeprathumchai, S., Mekvichitsaeng, P., and Techkarnjanarak, S., 2010, "Production of Anti-chicken coccidia IgY", **The Eight Prince of Songkla Engieering Conference (PEC-8): Bioengineering for Medical,** April 22nd-23rd 2010, Prince of Songkla University, Songkla, Thailand.

King Mongkut's University of Technology Thonburi

Agreement on Intellectual Property Rights Transfer for Postgraduate Students

Date 1 November 2011

Name **Thanasit** Middle Name -

Surname/Family Name **Intanorat**

Student Number **51450601** who is a student of King's Mongkut's University of Technology Thonburi (KMUTT) in ☐ Graduate Diploma ☑ Master Degree ☐ Doctoral Degree

Program **Biotechnology** Field of Study **Biotechnology**

Faculty/School of **Bioresources and Technology**

Home Address **99/10, Moo. 2, Tambon Changpuek, Muang Chiangmai**

Postal Code **50300** Country **Thailand**

I, as 'Transferer', hereby transfer the ownership of my thesis copyright to King's Mongkut's University of Technology Thonburi who has **appointed Assoc. Prof. Narumon Jeyashoke** Dean of Faculty of **School of Bioresources and Technology** to be 'Transferee' of copyright ownership under the 'Agreement' as follows.

1. I am the author of the thesis entitled **Large Scale Production of Anti-chicken coccidia IgY** under the supervision of **Assoc. Prof. Dr. Kanokwan Poomputsa** who is my supervisor, and/or **Dr. Saengchai Akeprathumchai** who is my co-supervisor, in accordance with the Thai Copyright Act B.E. 2537. The thesis is a part of the curriculum of KMUTT.

2. I hereby transfer the copyright ownership of all my works in the thesis to KMUTT throughout the copyright protection period in accordance with the Thai Copyright Act B.E. 2537, effective on the approval date of thesis proposal consented by KMUTT.

3. To have the thesis distributed in any form of media, I shall in each and every case stipulate the thesis as the work of KMUTT.

4. For my own distribution of thesis or the reproduction, adjustment, or distribution of thesis by the third party in accordance with the Thai Copyright Act B.E. 2537 with remuneration in return, I am subject to obtain a prior written permission from KMUTT.

5. To use any information from my thesis to make an invention or create any intellectual property works within ten (10) years from the date of signing this Agreement, I am subject to obtain prior written permission from KMUTT, and KMUTT is entitled to have intellectual property rights on such inventions or intellectual property works, including entitling to take royalty from licensing together with the distribution of any benefit deriving partly or wholly from the works in the future, conforming with the Regulation of King Mongkut's Institute of Technology Thonburi *Re* the Administration of Benefits deriving from Intellectual Property B.E. 2538.

6. If the benefits arise from my thesis or my intellectual property works owned by KMUTT, I shall be entitled to gain the benefits according to the allocation rate stated in the Regulation of King Mongkut's Institute of Technology Thonburi *Re* the Administration of Benefits deriving from Intellectual Property B.E. 2538.

Signature.....Transferor
(Thanasit Intanorat)
Student

Signature.....Transferee
(Assoc. Prof. Dr. Narumon Jeyashoke)
Dean

Signature.....Witness
(Assoc. Prof. Dr. Kanokwan Poomputsa)

Signature.....Witness
(Dr. Saengchai Akeprathumchai)