

References

- Abplanalp, H. (1979) The role of genetics in the immune response. *Avian Diseases* **Vol. 23**: 299-308.
- Albers, G.A.A., Gray, G.D., Piper, L.R., Baker, J.S.F., Le Jambre, L.F. and Barger, I.A (1987) The genetics of resistance and resilience to *Haemonchus contortus* infection in young Merino sheep. *International Journal for Parasitology* **Vol. 17** : 1355-1363.
- Albers, G.A.A., Gray, G.D. (1988) The genetics of parasite resistance in sheep. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J. Van Der Zijpp and W. Sybesma (eds.) pp.153-159. W. Kluwer Academic Publishers.
- Almlid, T., Steine, T., Lund, A. and Larsen, H.J. (1980) Selection for high and low immune response in goats. Experimental design and results after two years of selection. *Animal Blood Groups Biochemical Genetics* **14**: 4.
- Almlid, T. (1981) Indirect selection of bulls for improved resistance to disease in dairy cattle. *Livestock Production Science* **8**: 321-330.
- Amanuelson, U. (1988) Recording of production diseases in cattle and possibilities for genetic improvements: A review. *Livestock Production Science* **20**: 89-106.
- Anderson, R.M. (1991) The population biology and genetics of resistance to infection. In: *Genetics of Resistance to Bacterial and Parasitic Infection*. D.M. Wakelin and J.M. Blackwell (ed.). pp. 233-263. Taylor and Francis, 1988.
- Antezak, D.F. (1982) Structure and function of the MHC in domestic animals. *Journal of American Veterinary Medicine Association* **181**: 1030-1042.
- Appleyard, B.N., Wilkie, B.N., Kenedy, B.W. and Mallard, B.A. (1992) Antibody avidity in Yorkshire pigs of high and low immune response groups. *Veterinary Immunology and Immunopathology* **31**: 229-240.
- Archibald, A.L. (1991) Molecular biological approaches and their possible applications. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp: 100-115. Commonwealth Agricultural Bureau International, Wallingford.

- Axford, R.F.E and Owen, J.B (1991) Strategies for disease control. In : *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp. 8-10. Commonwealth Agricultural Bureau International, Wallingford.
- Bacon, L.P. (1987) Influence of the MHC on dairy cattle and production *Poultry Science* **66**: 802-811.
- Baker, R.L. (1991) Breeding for disease resistance - some historical perspective, problems and prospects. *Proceedings of the New Zealand Society of Animal Production* **Vol. 51**: 1-13.
- Baker, R.L. and Rege, J.E.O. (1994) Genetic resistance to diseases and other stresses in improvement of ruminant livestock in the tropics. *Proceedings of 5th Congress on Genetics Applied to Livestock Production*. Edinburgh.UK. **Vol. 20** : 405-413. Guelph, Ontario, Canada, 1994.
- Barron, N. (1974) In: *The Pig Farmer's Veterinary Book*. Norman Barron (ed.). IPSWICH : Farming Press.
- Biozzi, G., Mouton, D., and Stiffel, C. (1984) A major role of the macrophage in quantitative genetic regulation of immune responsiveness and anti-infections immunity. *Advances in Immunology* **36**: 189-230.
- Biozzi, G., Mouton, D., Heumann, A.M. and Bouthiller, Y. (1982) Genetic regulation of immune responsiveness in relation to resistance against infectious disease. *IInd World Congress on Genetics Applied to Livestock Production*. **Vol. 7**: 150-163. Madrid, 1982.
- Blattman, A.N. and Beh, K.J. (1995) Genetic markers for disease resistance. In : *Breeding for Resistance to Infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 239-252. ACIAR, Canberra, Australia, 1995.
- Brascamp, E.W., van Arendonk, J.A.M. and Groen, A.F. (1993) Economic appraisal of the utilization of genetic markers in dairy cattle breeding. *Journal of Dairy Science* **76**: 1204-1213.
- Bumstead, N., Millard, B.M., Barrow, P. and Cook, J.K.A. (1991). Genetic basis of disease resistance in chickens. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp: 10-20. Commonwealth Agricultural Bureau International, Wallingford.
- Burton, J.L., Burnside, E.B., Kennedy, B.W., Wilkie, B.N. and Burton, J.H. (1989) Antibody responses to human erythrocytes and ovalbumin as marker traits of disease resistance in dairy calves. *Journal Dairy Science* **72**: 1252-1265.

- Buschman, H., Jurge, V., Krausslich, H. and Radzikowski, A. (1974) A study the immune response to sheep erythrocytes in several breeds of swine. *Medical and Microbiological Immunology* **159**: 179-185.
- Buschman, H. (1980) A selector experiment on the antibody forming capacity to DNP-hapten in pigs. *Animal Blood Groups and Biochemical Genetics* **14**: 4-12
- Buschman, H. (1982) Development of an immunocompetence profile for pigs as basis for future selection on disease resistance. *IInd World Congress on Genetics Applied to Livestock Production Vol. 7*: 351-356. Madrid, 1982.
- Buschman, H. and Meyer, J. (1989) An Immune Competence Profile in Swine. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J. Van Der Zijpp and W. Sybesma (eds.) pp. 145-152. W. Kluwer Academic Publishers.
- Cameron, H.S., Hughes, E.H. and Gregory, P.W. (1942) Genetic resistance to Brucellosis in swine. *Journal of Animal Science* **1**: 106-110.
- Cameron, R.D.A. (1990) In: *Pig Production in Australia*. 2nd ed. J.A.A. Gardner, A.C. Dukin, A.C. Lloyd (eds.) pp. 160-164. Butterworths Publisher, 1990.
- Canhaner, A., Pitkovski, J., Heller, E.D. and Peleg, B.A. (1982) Divergent selection of meat type chickens for high and low early antibody reproduction to *Escherichia Coli* and to Newcastle disease viruses vaccine. *IInd World Congress on Genetic Applied to Animal Production Vol. 7*: 648-653. Madrid, 1982.
- Chin, J.C. and Watts, J.E. (1991) Dermal and serological response against *Pseudomonas aeroginosa* in sheep bred for resistance and susceptibility to fleece-rot. *Australia Veeerinary Journal* **68**: 28-31.
- Cole, R.K. (1968) Studies on genetic resistance to Marek's Disease. *Avian Disease* **12**: 2-28.
- Cowther, J.R. (1995) ELISA Theory and Practice. John. R. Cowther (ed.). pp. 22. Humana Press. Inc. 1995.
- Crittenden, L.B. and Gavora, J.S. (1986) Genetic resistance to virus diseases. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Azford (eds.) pp 10-20. Commonwealth Agricultural Bureau International, Wallingford.

- Cummins, L.J., Thomson, R.L., Yong, W.K., Riffkin, G.G., Goddard, M.E., Cllinan, A.P.L. and Sauders, M.J. (1991) Genetics of *Ostertagia* selection lines. In : *Breeding for Disease Resistance in Sheep*. G.D.Gray and R.R.Woolaston (eds.) pp. 11-18. Australian Wool Corporation, Melbourne.
- Davis, G.D. (1993) Genetic parameters for tropical beef cattle in Northern Australia: A review. *Australian Journal of Agriculture Research* **44**: 179-198.
- De Vries, R.R.P. (1989) Biological significance of the MHC. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J.Van Der Zijpp and W.Sybesma (eds.) pp. 6-11. W. Kluwer Academic Publishers.
- Doanh, P.H. (1994) Gene conservation of the indigenous Mong Cai pig breed. In: *The Results of studies on Gene Conservation of Domestic Animals*. pp. 97-102. Agricultural Publishing House, Hanoi, 1994.
- Doenhoff, M.J. and Davies, A.J.S. (1991) Genetic improvement of the immune system possibilities for animal. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Azford (eds.) pp. 24-53. Commonwealth Agricultural Bureau International, Wallingford.
- Eady, S.J. (1995). Phenotypic traits associated with resistance to internal parasites. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 119-236. ACIAR, Canberra, Australia, 1995.
- Eaton, B.T. and Gray, G.D. (1995). Genetic variation in resistance to viruses. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 1-14. ACIAR, Canberra, Australia, 1995.
- Edfors-Lilja, I., Persson, H. and Gahne, B. (1982) The intestinal reception for E.coli K88 in relation to performance of Sw. Yorkshire and Sw. Landrace pigs. *IInd World Congress on Genetic Applied to Animal Production Vol. 7*: 390-394. Madrid, 1982.
- Edfors-Lilja, I., Wattrang, E., Magnusson. U. and Fossum.C. (1990) Differences between paternal half sib pigs in various immune response traits. *Proceedings 4th World Congress on Genetics Applied to Livestock Production Vol. 16*: 411-414. Edinburgh.UK, 1990.
- Edfors-Lilja, I. and Fossu, C. (1991) Variation in number and functional capacity of circulating leucocytes between half-sib pigs. *Animal Genetics Vol. 22*: 119.

- Edfors-Lilja, I. (1991) *Escherichia coli* resistance in pigs. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp. 424-435. Commonwealth Agricultural Bureau International, Wallingford.
- Edfors-Lilja, I., Watrang, E., Magnasson, V., Fossum, C. (1994) Genetic variation in parameters reflecting immune competence of swine. *Veterinary Immunology and Immunopathology* **40** :1-16.
- Edfors-Lilja, I., Fossum, C., Watrang, E., Gustafsson, U., Ellegren, H., Jonhansson, M., Marklud, L. and Andersson, L. (1994) Genetic influence of total and differential white blood cell counts in pigs. *Proceedings of the Vth World Congress on Genetics Applied to Livestock Production Vol. 20*: 257-260. Guelph, Ontario, Canada, 1994.
- Egan, I.T., Harris D.L., Joens, L.A. (1982) Comparison of the microtitration agglutination test and the enzyme linked immunosorbent assay for the detection of herds affected with swine desentry. *American Journal of Veterinary Research* **44**: 1323- 1328.
- Eide, D.M., Adnøy, T. and Larsen, H.J. (1992) Selection for immune response in goats: The effect of immunization procedure on antibody response to Diphtheria toxoid and human serum albumin. *Journal of Animal Science* **70**: 1432-1439.
- Emanuelson, U. (1988) Recording of production disease in cattle and possibilities for genetic improvements: a review. *Livestock Production Science* **20**: 89-105.
- Facolner, D.S. (1989) Introduction to quantitative genetics. 3rd ed. Longman Scientific and Technical Publisher.
- Freeman, B.M. and Bumstead, N. (1987) Breeding for disease resistance - The prospective role of genetic manipulation. *Avian Pathology* **16**: 353-365.
- Friers, G.W., Chambers, J.R., Kennedy, A. and Smith, A.D. (1972) Selection for resistance to Marek's disease in conjunction with other economic traits in chickens. *Avian Disease* **16**: 2-10.
- Gavora, J.S. and Spencer, J.L. (1978) Breeding for genetic resistance to disease. *World Poultry Science* **34**: 137-148.
- Gavora, J.S. and Spencer, J. L. (1983) Breeding for immune responsiveness and disease resistance. *Animal Blood Groups Biochemical Genetics* **14**: 159-186.

- Gavora, J.S. (1990). Genetic disease resistance : Mechanisms and strategies for improvement. *Proceedings 4th World Congress on Genetics Applied to Livestock Production* **16**: 427-435. Edinburgh.UK, 1990.
- Giang, D., Quang, T.L. and Dong, N.H. (1973) The survey on the three local pig breeds in Hai Phong. *Journal of Agricultural Science and Technology*, 1973. pp. 360 -363.
- Gibbons, R.A., Sellwood, R., Barrows, M. and Hunter, P.A. (1977) Inheritance of resistance to neonatal *E.coli* diarrhoea in the pig: Examination of the genetic system. *Theoretical Applied Genetics* **51**: 65-70.
- Gill, H.S., Gray, G.D. and Watson, D.L. (1991) Mechanism underlying genetic resistance to *Haemonchus contortus* in sheep. In : *Breeding for Disease Resistance in Sheep* pp. 67-75. G.D. Gray and R.R. Woolaston (eds.). "Workshop on Breeding for Disease Resistance in Sheep". Appendix A.
- Gill, H.S. (1993) Immune responsiveness of lambs selected for resistance to haemonchosis. *Research in Veterinary Science* **54**: 361-365.
- Gill, H.S. (1994) Cell-mediated immunity in merino lambs with genetic resistance to *Haemonchus contortus*. *Int. J. Parasitol.* **24**: 749-756.
- Glass, E.J. (1990) The role of MHC class II in immune responses in cattle. *Proceedings 4th World Congress on Genetics Applied to Livestock Production* **16**: 388-395. Edinburgh.UK.
- Gonzalez, V.D., Cisneros, M.I., Vega Lopez, M.A. and Morilla Gonzalez, A. (1993) Immunological profile of pigs during the first ten weeks of life. *Veterinaria Mexico* **24**: 217-221.
- Gray, G.D., Presson, B.L., Albers, G.A.A., Le Jambre, L.F., Piper, L.R. and Barker, J.S.F.(1987) Comparison of within and between breed variation in resistance to Haemonchosis in sheep. *Proceedings of a National Symposium Leura, New South Wales 1987*.
- Gray, G.D. (1987) Genetic resistance to haemonchosis in sheep. *Parasitology Today* **3**: 253-255.
- Gray, G.D. (1991) Breeding for resistance to trichostrongyle Nematodes in sheep. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Azford (eds.) pp. 139-156. Commonwealth Agricultural Bureau International, Wallingford.
- Gray, G.D. (1995) Genetic variation in resistance to parasites. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 44-52. ACIAR, Canberra, Australia, 1995.

- Gross, W.G., Siegel, P.B., Hall, R.W., Domernuth, C.H. and Duboise, R.T. (1980) Resistance to infectious disease. *Poultry Science* **59**: 205-211.
- Gruner, L. and Lantier, F. (1995) Breeding for resistance to infectious diseases of small ruminants in Europe. In : *Breeding for Resistance to Infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 100-117. ACIAR, Canberra, Australia, 1995.
- Hai, L.T., Giai, D.V., Dai, L.P. and Phuong, V.T.L (1995) Studies on the growing and fattening capacity of two-way crosses with exotic pig breeds under the tropical condition in Vietnam. *Pig News and Information* **16** No. 2 61N-53N.
- Hamori, D. (1983) Resistance to diseases. In : *Constitutional disorders and hereditary diseases in domestic animals*. Elsevier Scientific Publishing Company. pp. 633-659.
- Hessing, M.J.C., Scheepens, C.J.M., Schouten, W.G.P., Tielen, M.J.M. and Wiepkema, P.R. (1994) Social rank and disease susceptibility in pigs. *Veterinary Immunology and Immunopathology*. **43** :373-387.
- Hessing, M.J.C., Coenen, G.J., Vaiman, M. and Renard, C. (1995) Individual differences in cell-mediated and humoral immunity in pigs. *Veterinary Immunology and Immunopathology* **45** :97-113.
- Hodgin, C.C., McGuire, T.C., Perryman, L.E., Grant, B.D. (1978) Evaluation of delayed hypersensitivity response in normal horses and immunodeficient foals. *American Journal of Veterinary Research* **39**: 1161-1166.
- Hoffbrand, A.V. and Pettit, J.E. (1978) *Essential Haematology*. Third edition. Oxford. Blackwell Scientific Publications. pp. 141.
- Hood, L.E., Weisman, I.L. (1984) *Immunology*. Menlo Park, USA, Benjamin & Cumming.
- Hutt, F.B. (1958) *Genetic resistance to disease in domestic animals*. Comstock Publishing Association. Ithaca, USA.
- Hutt, F.B. (1974) Genetic indicators of resistance to disease in domestic animals. *1st Proceedings of World Congress on Genetics Applied to Livestock Production* **Vol. 2**:179-183. Madrid, 1974.
- Kinghorn, B.P. (1995) Methods of using genetic variation - A primer on selection, nucleus flock, and crossbreeding. In : *Breeding for Resistance to Infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 291-308. ACIAR, Canberra, Australia, 1995.

- Kreukniet, M.B., Pametier, H.K. and Niewland, M.G.B. (1994) Effect of divergent selection for antibody response to sheep erythrocytes on immune mechanism in chickens. *Proceedings Vth World Congress on Genetic Applied to Animal Production* **Vol. 20**: 231-237. Guelph, Ontario, Canada, 1994.
- Jain, N.C. (1986) *Veterinary Haematology*. Fourth Edition. Nemi C. Jain (ed.). Lea & Febiger, Philadelphia, 1986.
- Jankovic, D., Sher, A. and Bethesda, Md. Initiation and regulation of CD4+ T cell function in host-parasite models. (1996) In: *Th1 and Th2 Cells in Health and Disease*. Florence, S. R.(Ed). Karger, Basel. pp. 51-65.
- Jensen, P.T. and Christensen (1981) In vitro evaluation of porcine lymphocyte response to phytohaemagglutinin using a modified "whole blood" technique. *Veterinary Immunology and Immunopathology* **2**: 121-132.
- Joling, P., Wever, P.J.M, Mok, K.S, De Vries Reilingh, G. and Oskam, J.P.H. (1991) Estimation of porcine immune competence with help of keyhole limpet haemocyanin (KLH). *Animal Genetics* **22**: 119.
- Joling, P., Wever, P.J.M., Oskam, J.P.H. and Henken, A.M. (1993) Lymphocyte stimulation by Phytohaemagglutinin and Concanavalin A in different swine breeds. *Livestock Production Science* **35**: 314-350.
- Lacey, C., Wickie, B.N., Kennedy, B.W. and Mallard, B.A. (1989) Genetic and other effect on bacterial phagocytosis and killing by cultured peripheral blood monocytes of SLA-defined miniature pigs. *Animal Genetic* **20**: 371-382.
- Lamont, S.J. (1989) The chicken MHC in Disease Resistance and Poultry Breeding. *Journal of Dairy Science* **72**: 1429-1333.
- Lamont, S.J. (1991) Immunogenetics and the Major Histocompatibility Complex. *Veterinary Immunology and Immunopathology* **30**: 121-127
- Lande, R. and Thomson, R. (1990) Efficiency of marker-assisted selection in the improvement of quantitative traits. *Genetics* **124**: 743-756.
- Laundoovaris, T., Yoo, B.H., and Fahey, K.J. (1991) Genetic resistance to infectious Laryotracheitis in breed lines of White Leghorn chickens. *Avian Pathology* **20**: 357-361.
- Legates, J.E. and Grinuells, C.D. (1952) Genetic relationships in resistance to mastitis in dairy cattle. *Journal of Dairy Science* **35**: 829-833.

- Lewin, H.A., and Bernoco, D. (1986) Evidence for BOLA linked resistance and susceptibility to subclinical progression of bovine leukemia virus infection. *Animal Genetic* **17**: 197-207.
- Lie, Ø. (1990) Genetic of disease resistance. *Proceedings of the 4th World Congress on Genetics Applied to Livestock Production* **16**: 421-425. Edinburgh.UK, 1990.
- Lilja, I. E. (1986) Genetic resistance to bacterial disease. 3rd *Proceedings of Congress on Genetic Applied for Livestock Production* **11**: 614-623. Lincoln, Nebraska, USA, 1986.
- Lilja, E. and Fossu, C. (1991) Variation in number and functional capacity of circulating leucocytes between half-sib pigs. *Animal Genetics* **22**: 119.
- Ling, N.R. and Kay, J.E. (1975) Lymphocyte Stimulation, 2 ed. pp.398-404. North-Holland, Amsterdam .
- Luffau, G., Nguyen, T.C, Culler, P., Khang, J.V.T., Bouix, J. and Ricordeau, G. (1984) Genetic resistance to *Haemonchus contortus* in Romanov sheep. 3rd *Proceedings of Congress on Genetic Applied for Livestock Production* **11**: 683-688. Lincoln, Nebraska, USA.
- Luhney, J.K., Sun, D.C, Ivannoska, D., Pescovitz, M.D. and Davis, W.C. (1988) SLA monoclonal antibodies. In: *The Molecular Biology of MHC of Domestic Animal Species*. Carlo, M. Waner, Max.F. Rothschild, Sussan J. Lammont (eds.) pp. 97-119. Iowa State University Press/Ames, 1988.
- Luhney, J.K. (1994) Current status of swine leucocyte antigen complex. *Veterinary Immunology and Immunopathology* **43**: 19-28
- Luhney, J.K and Grimm, D.R. (1994) Major histocompatibility complex : Current state of knowledge and its use in and impact on livestock improvement. *Proceedings Vth World Congress on Genetic Applied to Animal Production* **Vol. 20**: 231-237. Guelph, Ontario, Canada, 1994.
- Lyman, B.C. (1985) Recent advances in the genetics of disease resistance. *Avian Pathology* **12**: 1-8.
- Madsen, P. (1989) Genetic resistance to bovine mastitis. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J.Van Der Zijpp and W.Sybesma (eds.) pp. 168-177. Kluwer Academic Publishers, 1989.
- Mallard, B.A., Wilkie, B.N. and Kennedy, B.W. (1989) The influence of the Swine Major Histocompatibility Genes (SLA) on variation in Serum Immunoglobulin (Ig) concentration. *Veterinary Immunology and Immunopathology* **21**: 139-153.

- Mallard, B.A., Wilkie, B.N. and Kennedy, B.W. (1989) Genetic and other effects on antibody and cell mediated immune response in swine leucocyte antigen (SLA)-defined miniature pigs. *Animal Genetics* **20**: 107-118.
- Mallard, B.A., Wilkie, B.N. and Kennedy, B.W. (1991) Use of estimated breeding value in a selection index to breed Yorkshire pigs for high and low immune responsiveness. *Animal Genetics* **22**: 119-121.
- McDevitt, H.O. and Benacerraf, B. (1969) Genetic Control of Specific Immune Responses. *Advances in Immunology* **11**: 31-71.
- McDevitt, H.O. and Chinitz. (1969) Genetic control of the antibody response : Relationship between immune response and heritability (H-Z) type. *Science* **163**:1207-1208.
- McTaggad, H.S. and Rowntree, P.G.M. (1969) The haematology of "minimal disease" bacon pigs: A comparison with genetically - related conventionally - reared pigs. *British Veterinary Journal* **125**: 240-247
- Meeker, D.L., Rothschild, M.F., Christian, L.L., Waner, C.F. and Hill, H.T. (1987) Genetic control of immune response to Pseudorabies and Atrophicrhinitis vaccines. II: Comparison of additive direct and maternal genetic effects. *Journal of Animal Science* **64**: 414-419.
- Meredith, D., Elser, A.H., Wolf, B., Sama, L.R., Donawick, W.J., Lazary, S. (1986) Equine leucocyte antigens : relationships with sarcoid tumours and laminitis in two pure breeds. *Immunogenetics* **23**: 221-225.
- Meuwissen, T.H.E. and van Arendonk, J.A.M. (1992) Potential improvement in rate of genetic gain from marker-assisted selection in dairy cattle breeding schemes. *Journal of Dairy Science* **75**: 1651-1659.
- Millot, P., Chatelain, J., Dautheville, C., Salmon, D., Cathala, F. (1988) Sheep major histocompatibility (OLA) complex : Linkage between a scrapie susceptibility/resistance locus and the OLA complex in the Ile-de-France sheep progenies. *Immunogenetics* **27**: 1-11.
- Miquel, M.C., Sadir, A.M., Lager, I., Zamorano, P., Mezzadra, C.A., Esterban, E. (1994) Antibody prevalence to virus infections in different breeding groups. *Proceedings Vth World Congress on Genetic Applied to Animal Production Vol. 20*: 307-309. Guelph, Ontario, Canada, 1994

- Morris, C.A. (1991) Screening and selection for disease resistance - repercussion for genetic improvement. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Azford (eds.) pp. 123-133. Commonwealth Agricultural Bureau International, Wallingford.
- Muller, M. and Brem, G. (1991) Disease resistance in farm animal. *Experientia* **47**: 923-924.
- Newman, W., Stoner, G.L.et.al. (1977) Primary *in vitro* human T cells. *Nature* **269**: 151-153.
- Nicholas, F.W. (1987) *Veterinary Genetics*. Nicholas, F.W. (ed.) pp. 580-591. Oxford Science Publication, Clarendon Press.
- Nicholas, F.W. and Blattman, A.N. (1995) Application of genetic marker. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 259-274. ACIAR, Canberra, Australia,1995.
- O'bleness, G.V. and Van Vleck, L.D. (1960) Heritabilities of some type appraisal traits and their genetic and phynotypic correlations with production. *Journal of Dairy Science* **43**: 1409- 1414.
- Okabayashi, H. and Okada, I. (1977) Genetic control of immune response in lines of chickens selected for Graft- Versus host competences. *Ani. Biolo. Gen. Bio. Genetic* **8**: 55-64.
- O'Meabra, T.J. and Raadsma, H.W. (1995) Phenotypic and genetic indicators of resistance to Ectopathogens. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 187-218. ACIAR, Canberra, Australia,1995.
- Oppenheim, T.T. and Schecter, B. (1976) *Manual of Clinical Immunology*. N.R. Rose and H. Friedman (ed.). pp. 81-94. American Society for Microbiology, Washington, C.D.
- Ostergard, H. (1989) Statistical aspects of cattle MHC (BoLA) and disease associations exemplified by an investigation of subclinical mastitis. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J.Van Der Zijpp and W.Sybesma (eds.) pp. 115-122. Kluwer Academic Publishers.
- Outteridge, P.M. (1985) Transplantation antigens and disease resistance or susceptibility. In: *Veterinary Immunology*. P.M Outtridge (ed.) pp. 205-206. CSIRO, Mc Master Laboratory, Glebe Laboratory, NSW, Australia. Academic Press,1985.

- Outteridge, P.M. (1993) High and low responsiveness to vaccine in farm animals. *Immunology and Cell Biology* **71**: 355-366.
- Owen, J.B. and Axford, R.F.E.(1991) *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp. 8-10. Commonwealth Agricultural Bureau International, Wallingford.
- Pani, P.K and Biggs, P.M. (1973) Genetic control of susceptibility to an animal subgroup Sarcora virus in commercial chickens. *Avian Pathology* **2**: 27-41.
- Parker, A.G.H. (1991) Selection for resistance to parasites in sheep. *Proceeding of the New Zealand Society of Animal Production* **Vol. 51**: 291-295.
- Payne, P.N. (1973) Genetics and Control of Avian Diseases. *Avian Pathology* **2**: 237-250.
- Peleg, B.A., Soller, M., Ron, N., Hornstein, K., Brody, T. and Kalman, E. (1976) Familial differences in antibody response of broiler chickens to vaccination with attenuated and inactivated Newcastle disease virus vaccine. *Avian Disease* **20**: 661-668.
- Perry, G.C. and Watson, J.H. (1967). Sources of variation in uptake of marker antibody by piglets. *Animal Production* **9**: 377-384.
- Pescovitz, M.D., Sakopoulos, A.G., Gaddy, J.A., Husmann, R.J. and Zuckermann, F.A. (1994) Porcine peripheral blood CD4+/CD8+ dual expressing T-cells. *Vet Immunol. Immunopathol.* **43**: 53-62
- Pevzner, I.Y., Stone, H.A., Nordskog, A.W., (1981) Immune response and disease resistance in chicken. I. Selection for high and low titre to *Salmonella Pullorum* antigen. *Poultry Science* **60** : 920-926.
- Philipsson, J., Thafvelin, B. and Velander, I. H. (1980) Genetic studies on disease recordings in first lactation cows of Swedish dairy breeds. *Acta Agricultura Scandinavica* **30**: 327-335.
- Pinard, M.H., van Arendonk, J.A.M., Nieuwland, M.G.B. and van der Zijpp, A.J. (1992) Divergent selection for immune responsiveness in chickens: Estimation of realised heritability with an animal model. *Journal Animal Science* **70**: 2986-2993.
- Piper, L.R. and Barger, I.A. (1988) Resistance to gastro-intestinal strongyles: feasibility of breeding programme. *Proceedings of the 3rd World Congress on Sheep and Beef Cattle Breeding*, Paris. **2**: 593-611.

- Quddus, J., Prakash, S., Bahn, R., Banerjee, S. and Davit, C. (1986) Genetics of immune response and susceptibility to disease. *3rd Proceedings of the World Congress on Genetic Applied to Livestock Production* **11**: 593-613. Lincoln, Nebraska, USA, 1986..
- Raadsma, H.W., O'Meara, T.J., Egerton, J.R., Nicholas, F.W and Attart, G. (1994) Genetic factors in protective antibody response to ovine footrot vaccines. *Proceedings Vth World Congress on Genetic Applied to Animal Production* **Vol. 20**: 296-299. Guelph, Ontario, Canada, 1994.
- Raadsma, H.W. (1995) Genetic variation in resistance to bacteria. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 259-274. ACIAR, Canberra, Australia, 1995.
- Reddy, N.R.J., Wilkie, B.N., Mallard, B.A. and Rosendal, S. (1995) Cytokines in pigs bred selectively for high and low immune response. In: *the Fourth International Veterinary Immunology Symposium*. International Union of Immunological Society, UC Davis, July 16-21.
- Rothschild, M.F., Chen, H.L., Lie, W.R., Venier, L., Cooper, M., Briggs, C. and Warner, C.M. (1984a) Breed and swine lymphocyte antigen haplotype differences in agglutination titres of pigs following vaccination with *Pseudorabies B. bronchiseptica*. *Journal of Animal Science* **59**: 643-649.
- Rothschild, M.F., Chen, H.L., Christian, L.L., Lie, W.R., Venier, L., Cooper, M., Briggs, C. and Warner, C.M. (1984b) Breed and swine lymphocyte antigen haplotype differences in agglutination titres following vaccination with *B. Bronchiseptica*. *Journal of Animal Science* **59**: 644-649.
- Rothschild, M.F., Hill, H.T., Christain. L.L and Warner, C.M. (1984c) Genetic differences in serum-neutralization titres of pig after vaccination with *pseudorabies* modified live virus vaccine. *American Journal of Veterinary Research* **45**: 1216-1218.
- Rothschild, M.F., Zimmerman, D.R., Johnon, R.K., Venier, L. and Warner, C.M. (1984d) SLA haplotype differences in lines of pigs which differ in ovulation rate. *Animal Blood Genetic and Biology* **15**: 155-158.
- Rothschild, M.F. (1985) Selection for disease resistance in pig. *Pig News and Information* **6**: 277-180.
- Rothschild, M.F. (1989) Selective breeding for immune responsiveness and disease resistance in livestock. *Agbiotech News and Information* **1**: 355-360.

- Rothschild, M.F. (1990) Selection under challenging environments. In : *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Azford (eds.) pp. 73-85. Commonwealth Agricultural Bureau International, Wallingford.
- Rothschild, M.F. (1994) Effects of genetic changes on pork production. *Pig-Misset January, '94* pp. 20-21.
- Rutter, J.M., Burrows, M.R., Sellwood, R., Gibbons, R.A. (1975) A genetic basis for resistance to enteric disease caused by *E.Coli*. *Nature* **257**: 135-136.
- Saalumuler, A., Bryant, J. (1994) Characteristics of porcine T lymphocytes and T-cell lines *Veterinary Immunology and Immunopathology* **43**: 45-52.
- Schwartz, R.H. (1986) Immune response (Ir) genes of the murine MHC. *Advances in Immunology* **38**: 31-201.
- Seibert, G.W. (1971) Variation between and within breeds of cattle in resistance to field infection of the cattle tick. *Australian Journal of Agriculture Research* **22**: 159-168.
- Sergre, D. and Kaebule, M.L. (1962a) The immunologic behaviour of baby pigs. I. Production of antibodies in three week old pigs. *Journal of Immunology* **89**: 782-789.
- Sergre, D. and Kaebule, M.L. (1962b) The immunologic behaviour of baby pigs. II. Production of antibodies in new born pigs. *Journal of Immunology* **89**: 790-793.
- Sellwood, R. (1979) *Escherichia coli* diarrhoea in pigs with or without the K88 receptor. *Veterinary Record* **105**: 228-130.
- Shook, G.E. (1989) Selection for disease resistance. *Journal of Dairy Science* **72**:1355-1362
- Siba, P.M., Pethick, D.W. and Hamson, D.J. (1993) In: *Manipulating Pig Production IV. Proceedings of the Biennial Conference of the Australisian Pig Science Association*. Publisher Australasian Pig Science Association, 1993.
- Siegel, P.B. and Gross, W.B. (1978) Production and persistence of antibodies in chickens to sheep erythrocytes. 1. Directional selection. *Poultry Science* **59**: 1-5.

- Simonsen, M., Arnul, M and Soresen, P. (1989) The chicken MHC and its importance. In: *Improving Genetic Disease Resistance in Farm Animals*. A.J. Van Der Zijpp and W. Sybesma (eds.) pp. 42-61. Kluwer Academic Publishers, 1989.
- Sivarajasingam, S. (1995) Incorporating disease resistance in breeding programs. In : *Breeding for Resistance to infectious Disease in Small Ruminants*. G.D.Gray, R.R.Woolaston and B.T.Eaton (eds.) pp. 275-288. ACIAR, Canberra, Australia, 1995.
- Skerman, T.M. and Moorhouse, S.R. (1987) Broomfield Corriedales: A strain of sheep selectively bred for resistance to footrot. *New Zealand Veterinary Journal* **35**: 101-106.
- Soller, M., Hller, D., Peleg, B , Ron-Kuper, N. and Hornstein, K. (1981) Genetic and phenotypic correlation between immune response to *Escherichia coli* and to Newcastle disease virus vaccines. *Poultry Science* **60**: 49-53.
- Spooner, R.L., Bradley, J.S. and Young, G.B. (1975) Genetics and disease in domestic animals with particular reference to dairy cattle. *The Veterinary Record* **97**: 125-130.
- Spooner, R.L., Brown, P., Glass, E.J., Innes, E.A. and Williams, J.L. (1988) Characterisation and function of the bovine MHC. In: *The Molecular Biology of the Major Histocompatibility Complex of Domestic Animal Species*. Carol M. Waner, Max F. Rothchild and Susan J. Lamont (eds.) pp. 79-96. Iowa State University Press/Ames, 1988.
- Spooner, R.L. (1990) Genetic of immune responses and their implications for vaccine design and disease resistance. *Proceedings of the IVth World Congress of Genetic Applied in Domestic Animals* **16**: 385-387. Edinburgh, UK, 1990.
- Stear, M.J. (1982) The future role of immunogenetics in animal breeding . In: *Future Development in the Genetic Improvement of Animal*. J.S.F. Barker, Keith Hammond and A. E. Mc Clintock (eds.) pp. 45-56.
- Stobo, J.D., Rosenthal, A.S. and Paul, W.E. (1972) Functional heterogeneity of murine lymphoid cells. I. Responsiveness to and surface binding of concanavalin A and phytohemagglutinin. *Journal of Immunology* **108**:1-7.
- Sutherst, R.W., Maywald, G.F., Bourne, A.S., Sutherland, I.D. and Stegman, D.A. (1988) Ecology of the cattle tick (*Boophilus microplus*) in subtropical Australia. II Resistance of different breeds of cattle. *Australian Journal of Agriculture Research* **39**: 299-308.

- Takahashi, S., Inooka, S. and Mizuma, Y. (1984) Selective breeding for high and low antibody responses to inactivated Newcastle disease virus in Japanese quails. *Poultry Science* **63**: 595-599.
- Teale, A.J. (1994) Conventional and molecular immunogenetics: Potential impact on livestock improvement. *Proceedings Vth World Congress on Genetic Applied to Animal Production Vol. 20*: 215-221. Guelph, Ontario, Canada, 1994.
- Titus, R.G. and Chiller, J.M. (1981) A simple and effective method to assess murine delayed type hypersensitivity to protein. *Journal of Immunological Methods* **45**: 65-78.
- Tizard, I.R. (1995) In: *An Introduction to Veterinary Immunology*. I.R. Tizard (ed.). Philadelphia: Saunders, 4th ed. 1995.
- Tizard, I.R. (1984). Mechanism of antibacterial resistance. I.R. Tizard (ed.). Saunder College Publishing, 1984.
- Utech, K.B.W., Wharton, R.H., Kerr, J.D. (1978) Resistance to *Boophilus microplus* in different breeds of cattle. *Australian Journal of Agriculture Research* **29**: 885-895.
- Vaiman, M., Hauptman and Mayer, S. (1978a) Influence of major histocompatibility in the pig (SLA) on serum haemolytic complement levels. *Journal of Immunogenetics* **5**: 59-63.
- Vaiman, M., Metzger, J.J, Renard, C. and Vila, J.P. (1978b) Immune response gene(s) controlling the humoral anti-lysozyme response (IR-Lys) linked to the major histocompatibility complex (SLA) in the pig. *Journal of Immunogenetics* **7**: 231-238.
- Vaiman, M., Renard, Ch. and Bourgeaux, N. (1988) SLA, the Major Histocompatibility Complex in swine : It's influence on physiological and pathological traits. Vaiman, M., Metzger, J.J, Renard, C. and Vila, J.P. In: *The Molecular Biology of the Major Histocompatibility Complex of Domestic Animal Species*. Carol M. Waner, Max F. Rothschild and Susan J. Lamont (eds.) pp. 23-35. Iowa State University Pree/Ames, 1988.
- Van der Zijpp, A.J and Leenstra, f.r. (1980) Genetic analysis of the humoral immune response of White Leghorn chicks. *Poultry Science* **59**: 1363-1369.
- Van Der Zijpp, A.S. (1983a) The effect of genetic origin, source of antigen and dose of antigen on the immune response of cockerels. *Poultry Science* **62**: 205-211.

- Van Der Zijpp, A.S. (1983b) Breeding for immune responsiveness and disease resistance. *World Poultry Journal* **39**: 118-127.
- Viet, D.D. and Tho, T.T. (1993) Haematological parameters of Mong Cai and E pig breeds. In : The Results of Studies on Genetic Conservations of Domestic Animals 1990 - 1993. Ministry of Biotechnology and Environment - Ministry of Agriculture and Food Industry published. pp. 127-131.
- Von Krosigk, C.M., Mc Clary, Vietitz, E. and Zander, D.V. (1972) Selection for Resistance to Marek's disease and its expected effects on the important traits in White Leghorn strains crosses. *Avian Disease* **16**: 11-19.
- Wakelin, D. (1978) Genetic control of susceptibility and resistance to parasitic infections. *Advance Parasite* **16**: 219-308.
- Wakelin, D. (1991) Model systems on the genetic basis of Disease resistance. In: *Breeding for Disease Resistance in Farm Animals*. J.B. Owen and R.F.E. Axford (eds.) pp. 54-70. Commonwealth Agricultural Bureau International, Wallingford.
- Wakelin, D. (1992) Genetic variation in resistance to parasitic infection : Experimental approaches and practical application. *Research in Veterinary Science* **53**: 139-147.
- Walter, J.R. and Sellwood, R. (1982) Aspects of genetic resistance of K88 E. coli in pigs. *2nd Proceedings of the World Congress on Genetics Applied to Animal Production* **7**: 362-363. Madrid, Spain, 1982.
- Warner, C.M., Meeker, D.L. and Rothchild, M.F. (1987) Genetic control of immune responsiveness: A review of its use as a tool for selection for disease resistance. *Journal Animal Science* **64**: 394-406.
- Waters, N.F. and Prickett, C.O. (1944) The development of families of chicken free of lymphomatosis. *Poultry Science* **23**: 321-333.
- Waters, N.F. (1945) Breeding for resistance and susceptibility to lymphomatosis. *Poultry Science* **24**: 259-269.
- Wilkie, B.N, Mallard, B.A., Kennedy, B.W., Lacey, C. Lumsden, J.S., Appleyard, G. (1990) Towards enhanced inherent resistance to infection disease: experiments involving SLA-defined miniature pigs and selection of Yorkshire pigs using estimated breeding values. *Proceedings of the 4th World Congress on Genetics Applied to Livestock Production* **Vol. 16**: 421-425. Edinburgh, UK, 1990.

- Wilton, J.W., Van Vleck, L.D., Everett, R.W., Guthrie, R.S. and Robert, S.J. (1972) Genetic and Environmental aspects of udder infection. *Journal of Dairy Science* **55**: 183-192.
- Winton, R.G., Dineen, J.K. and Wagland, B.M. (1987) Genetic control of immunological responsiveness against the intestinal nematode *Trichostrongylus colubriformis* in lambs. In: Merino Improvement programs in Australia. McGuirk, B.J. (ed.) pp. 371-375. Melbourne, Australia Wool Corporation.
- Woldehiwet, Z., Hussin, A.A. (1994) Distribution of Border disease virus antigen in lymphocyte subpopulations in the peripheral blood of experimentally infective lambs. *Veterinary Immunology and Immunopathology* **43**: 389-400.
- Woolaston, R.R (1990) Genetic improvement of resistance to internal parasites in sheep. *Proceedings of the Australian Association of Animal Breeding and Genetics* **8**: 163-171.
- Woolaston, R.R. (1994) Preliminary evaluation of strategies to breed Merinos for resistance to roundworm. *Proceedings Vth World Congress on Genetic Applied to Animal Production Vol. 20*: 281-284. Guelph, Ontario, Canada, 1994.
- Yamada, Y. (1974) Genetic resistance to Marek's disease and Lymphoid leucosis in chickens. *Ist Proceedings of World Congress on Genetics Applied to Livestock Production Vol. 2*:191-203. Madrid, 1974.

Appendix

Results of all experiments conducted in this study which indicated no significant sire variation within individual breeds are presented in the following tables.

Table 1. Mean values (Log_2 titres) of the level of serum antibody against KLH for serum various sire groups of individual breeds used in Chapter 3.

| Breed | Sire | Days | | | | | | |
|-----------|------|------|-----|------|-----|-----|------|-----|
| | | 0 | 7 | 14 | 21 | 28 | 35 | 42 |
| Mong cai | 1 | 3.8 | 6.7 | 10.0 | 7.1 | 5.9 | 11.2 | 9.3 |
| | 2 | 3.5 | 6.2 | 9.7 | 7.8 | 6.3 | 10.8 | 8.7 |
| | 3 | 4.1 | 5.9 | 9.6 | 9.5 | 7.1 | 9.2 | 8.8 |
| | 4 | 4.2 | 5.7 | 11.0 | 9.2 | 6.8 | 10.7 | 8.9 |
| | 5 | 3.9 | 5.8 | 9.3 | 7.9 | 6.2 | 9.7 | 8.8 |
| Landrace | 1 | 4.2 | 6.8 | 9.7 | 7.9 | 6.5 | 10.9 | 8.8 |
| | 2 | 4.6 | 7.8 | 8.9 | 7.2 | 6.8 | 11.5 | 7.9 |
| | 3 | 3.9 | 5.8 | 9.2 | 8.5 | 7.1 | 9.3 | 8.5 |
| | 4 | 4.6 | 7.3 | 10.0 | 8.1 | 7.0 | 9.8 | 7.9 |
| | 5 | 4.2 | 6.5 | 9.5 | 7.9 | 6.9 | 11.0 | 8.1 |
| | 6 | 3.9 | 5.8 | 9.2 | 8.5 | 7.2 | 9.8 | 8.3 |
| | 7 | 4.0 | 6.7 | 10.1 | 8.2 | 7.1 | 9.3 | 8.4 |
| Yorkshire | 1 | 3.9 | 5.8 | 10.8 | 7.2 | 6.3 | 9.8 | 7.9 |
| | 2 | 4.2 | 6.1 | 10.5 | 7.8 | 7.1 | 8.6 | 7.5 |
| | 3 | 4.1 | 6.5 | 11.0 | 7.8 | 5.9 | 8.9 | 7.5 |

Table 2. Mean values of total and differential leucocyte counts for various sire groups of individual breeds used in Chapter 3.

| Breed | Sire | Total (10 ⁶ /ml) | Cell Type (%) | | | |
|------------------|------|--------------------------------|---------------|------|-----|-----|
| | | | L | N | E | M |
| Mong cai | 1 | 20.3 | 63.0 | 32.0 | 3.0 | 2.5 |
| | 2 | 17.5 | 57.5 | 37.5 | 2.5 | 2.8 |
| | 3 | 18.7 | 52.5 | 31.6 | 2.3 | 3.3 |
| | 4 | 23.2 | 55.6 | 38.6 | 3.2 | 3.8 |
| | 5 | 22.7 | 63.5 | 31.0 | 2.8 | 3.5 |
| Landrace | 1 | 22.8 | 55.3 | 38.6 | 2.5 | 3.8 |
| | 2 | 19.6 | 56.5 | 36.6 | 2.8 | 4.1 |
| | 3 | 20.3 | 56.2 | 37.2 | 2.4 | 4.2 |
| | 4 | 21.2 | 61.7 | 34.2 | 2.5 | 3.7 |
| | 5 | 22.7 | 46.8 | 37.8 | 2.7 | 3.6 |
| | 6 | 21.3 | 59.4 | 33.5 | 2.6 | 4.3 |
| | 7 | 19.5 | 52.3 | 39.7 | 3.1 | 3.7 |
| Yorkshire | 1 | 20.8 | 57.2 | 31.9 | 2.8 | 3.1 |
| | 2 | 21.3 | 49.4 | 43.2 | 3.5 | 4.0 |
| | 3 | 22.1 | 63.2 | 32.4 | 2.1 | 3.2 |

L = Lymphocytes; N = Neutrophils; E = Eosinophils; M = Monocytes

Table 3. Mean values (thickness, mm) of skin responses to DNCB for various sire groups of individual breeds used in Chapter 3.

| Breed | Sire | Days | | | |
|-----------|------|------|-----|-----|-----|
| | | 0 | 24 | 48 | 72 |
| Mong cai | 1 | 3.2 | 3.8 | 3.1 | 3.0 |
| | 2 | 3.1 | 4.9 | 3.0 | 3.4 |
| | 3 | 3.1 | 4.2 | 3.3 | 3.2 |
| | 4 | 2.7 | 3.5 | 2.7 | 2.9 |
| | 5 | 2.7 | 3.8 | 2.2 | 2.8 |
| Landrace | 1 | 2.8 | 4.1 | 2.5 | 4.0 |
| | 2 | 3.1 | 3.5 | 3.3 | 4.1 |
| | 3 | 2.8 | 4.9 | 2.9 | 3.3 |
| | 4 | 2.9 | 3.2 | 3.4 | 3.0 |
| | 5 | 3.5 | 4.2 | 3.7 | 2.8 |
| | 6 | 2.9 | 3.8 | 3.6 | 2.7 |
| | 7 | 3.1 | 3.9 | 3.9 | 3.2 |
| Yorkshire | 1 | 2.5 | 4.1 | 3.7 | 3.5 |
| | 2 | 3.2 | 4.5 | 3.5 | 4.1 |
| | 3 | 3.2 | 4.5 | 3.8 | 4.1 |

Table 4. Mean values (thickness, mm) of skin responses to PHA for various sire groups of individual breeds used in Chapter 3.

| Breed | Sire | Days | | | |
|-----------|------|------|-----|-----|-----|
| | | 0 | 24 | 48 | 72 |
| Mong cai | 1 | 3.1 | 4.0 | 3.5 | 3.0 |
| | 2 | 3.3 | 3.8 | 3.5 | 3.4 |
| | 3 | 2.8 | 3.7 | 3.3 | 3.2 |
| | 4 | 2.3 | 3.4 | 3.2 | 2.9 |
| | 5 | 2.3 | 3.5 | 3.2 | 2.8 |
| Landrace | 1 | 2.7 | 3.8 | 2.3 | 4.0 |
| | 2 | 2.8 | 3.5 | 3.6 | 4.1 |
| | 3 | 2.8 | 3.7 | 3.3 | 3.3 |
| | 4 | 2.9 | 4.0 | 3.5 | 3.0 |
| | 5 | 3.3 | 3.9 | 3.2 | 2.8 |
| | 6 | 3.2 | 3.8 | 3.7 | 2.7 |
| | 7 | 2.8 | 3.7 | 3.4 | 3.2 |
| Yorkshire | 1 | 2.9 | 4.2 | 3.8 | 3.5 |

| | | | | |
|---|-----|-----|-----|-----|
| 2 | 3.0 | 3.6 | 4.2 | 4.1 |
| 3 | 3.1 | 3.8 | 3.4 | 4.1 |

Table 5. Mean values of packed cell volume (%), red cell count ($\times 10^9/\text{ml}$), total leucocyte count ($\times 10^6/\text{ml}$), differential leucocyte counts (%) for various sire groups of individual breeds used in Chapter 4.

| Count* | Duroc | | | | Large White | | | | |
|--------|--------|--------|--------|--------|-------------|--------|--------|--------|--------|
| | Sire 1 | Sire 2 | Sire 3 | Sire 4 | Sire 1 | Sire 2 | Sire 3 | Sire 4 | Sire 5 |
| T 1 | 10.1 | 9.0 | 11.4 | 9.3 | 11.3 | 8.4 | 9.3 | 14.1 | 13.2 |
| T 2 | 16.2 | 18.1 | 21.4 | 14.3 | 18.7 | 20.7 | 22.4 | 19.5 | 20.2 |
| T 3 | 18.3 | 19.5 | 20.5 | 16.7 | 23.2 | 21.2 | 25.5 | 21.4 | 23.2 |
| L 1 | 66.7 | 54.6 | 51.5 | 55.3 | 57.1 | 47.7 | 56.5 | 50.7 | 48.2 |
| L 2 | 59.7 | 47.2 | 49.2 | 43.7 | 57.0 | 41.7 | 44.2 | 47.2 | 45.1 |
| L 3 | 54.5 | 49.1 | 45.6 | 40.9 | 52.4 | 42.8 | 40.1 | 39.9 | 41.8 |
| N 1 | 30.0 | 41.6 | 46.0 | 39.5 | 39.1 | 47. | 38.7 | 45.7 | 40.2 |
| N 2 | 38.7 | 51.6 | 47.1 | 54.0 | 39.7 | 56.5 | 52.7 | 50.5 | 52.1 |
| N 3 | 41.7 | 58.3 | 45.8 | 58.6 | 48.7 | 54.7 | 58.4 | 55.7 | 57.3 |
| E 1 | 1.5 | 1.3 | 1.5 | 1.6 | 1.5 | 1.7 | 1.7 | 1.5 | 1.6 |
| E 2 | 0.5 | 0.1 | 1.3 | 1.0 | 1.6 | 0.7 | 1.0 | 1.0 | 1.4 |
| E 3 | 1.2 | 1.6 | 2.4 | 1.8 | 0.5 | 2.1 | 1.5 | 1.2 | 1.8 |
| M 1 | 2.2 | 1.8 | 2.6 | 2.3 | 2.7 | 3.0 | 3.0 | 2.0 | 2.5 |
| M 2 | 1.0 | 0.8 | 2.2 | 1.5 | 1.7 | 1.0 | 2.0 | 1.5 | 1.6 |
| M 3 | 2.6 | 2.2 | 1.8 | 2.5 | 2.2 | 1.8 | 2.5 | 2.8 | 1.8 |
| RBC 1 | 6.1 | 6.9 | 7.0 | 6.7 | 7.2 | 6.8 | 6.7 | 6.2 | 7.1 |
| RBC 2 | 6.4 | 7.5 | 7.3 | 6.2 | 7.3 | 7.1 | 7.3 | 6.6 | 6.8 |
| RBC 3 | 7.0 | 7.1 | 7.2 | 7.1 | 7.5 | 8.1 | 7.2 | 7.7 | 7.4 |
| PCV 1 | 40.2 | 39.5 | 36.2 | 36.0 | 35.3 | 32.7 | 25.5 | 31.0 | 34.2 |
| PCV 2 | 33.6 | 37.4 | 36.5 | 36.1 | 33.8 | 34.1 | 32.6 | 36.2 | 37.1 |
| PCV 3 | 31.8 | 35.5 | 38.2 | 32.1 | 32.5 | 33.8 | 35.7 | 36.7 | 37.8 |

(* T = Total leucocyte; L = Lymphocytes; N = Neutrophils; E = Eosinophils; M = Monocytes; RBC = Red Blood Cell; PCV = Packed Cell Volume
1 = 7 days before immunisation; 2 = 14 days after the first immunisation; 3 = 7 days after the second immunisation.)

Table 6. Mean values (x10⁶/ml) of blood lymphocyte phenotypes for various sire groups of individual breeds used in Chapter 4.

| Breed | Lymphocyte Phenotype | | | |
|--------------------|----------------------|--|----------|---------|
| | CD 2 | CD 4 | CD 8 | CD4/CD8 |
| Duroc | | 7 days before immunisation | | |
| Sire 1 | 710.2 | 1554.1 | 16967.2 | 375.5 |
| Sire 2 | 893.5 | 13369.1 | 11192.9 | 478.6 |
| Sire 3 | 1043.1 | 15915.7 | 14961.7 | 854.9 |
| Sire 4 | 473.0 | 8452.4 | 9233.0 | 487.3 |
| Large White | | | | |
| Sire 1 | 33355.9 | 13892.1 | 11634.1 | 541.6 |
| Sire 2 | 21958.7 | 9541.9 | 7759.9 | 487.9 |
| Sire 3 | 15137.1 | 10980.9 | 9960.4 | 698.8 |
| Sire 4 | 46385.4 | 15916.1 | 24180.5 | 1524.6 |
| Sire 5 | 24350.9 | 10007.1 | 8410.0 | 451.7 |
| Duroc | | 14 days after the 1 st immunisation | | |
| Sire 1 | 48030.1 | 15574.6 | 2584.5 | 485.4 |
| Sire 2 | 43412.6 | 14899.4 | 784.6 | 592.8 |
| Sire 3 | 51695.1 | 16517.4 | 984.9 | 1109.5 |
| Sire 4 | 26722.8 | 13025.3 | 784.9 | 494.3 |
| Large White | | | | |
| Sire 1 | 52859.2 | 24010.5 | 651.5 | 389.2 |
| Sire 2 | 45901.7 | 21981.8 | 832.9 | 820.9 |
| Sire 3 | 59987.2 | 25046.1 | 1176.5 | 1124.4 |
| Sire 4 | 41299.1 | 19330.0 | 739.8 | 5666.3 |
| Sire 5 | 72525.1 | 30086.1 | 1123.5 | 897.7 |
| Duroc | | 7 days after the 2 nd immunisation | | |
| Sire 1 | 63199.6 | 15988.4 | 35278.4 | 3057.5 |
| Sire 2 | 56933.4 | 17161.6 | 29103.7 | 2423.2 |
| Sire 3 | 50120.1 | 18773.0 | 23850.3 | 2852.2 |
| Sire 4 | 45681.9 | 17001.6 | 19517.5 | 1635.1 |
| Large White | | | | |
| Sire 1 | 73171.4 | 27948.2 | 34602.4 | 2772.4 |
| Sire 2 | 71908.6 | 23769.2 | 39465.9 | 4796.4 |
| Sire 3 | 68145.8 | 25344.0 | 375257.8 | 2351.3 |
| Sire 4 | 68301.1 | 20666.2 | 30884.8 | 2808.3 |
| Sire 5 | 46249.2 | 25011.6 | 16963.2 | 883.2 |

Table 7. Mean values of the stimulation index (SI) of Con A-stimulated lymphocyte proliferation for various sire groups of individual breeds used in Chapter 4.

| | Duroc | | | | | |
|---|--------------------|---------------|---------------|---------------|---------------|--|
| | Sire 1 | Sire 2 | Sire 3 | Sire 4 | | |
| 7 days before immunisation | 4.43 | 4.93 | 7.69 | 16.97 | | |
| 14 days after the first immunisation | 39.45 | 34.46 | 29.03 | 27.56 | | |
| 7 days after the second immunisation | 183.36 | 96.30 | 147.24 | 80.57 | | |
| | Large White | | | | | |
| | Sire 1 | Sire 2 | Sire 3 | Sire 4 | Sire 5 | |
| 7 days before immunisation | 10.84 | 5.17 | 10.80 | 5.75 | 7.21 | |
| 14 days after the first immunisation | 20.89 | 27.26 | 23.09 | 19.79 | 21.15 | |
| 7 days after the second immunisation | 83.41 | 22.48 | 48.70 | 83.64 | 92.76 | |