

Curriculum Vitae of Dr. Ben Hayes

Qualifications

Expertise in genetic improvement of livestock and aquaculture species, with a focus on integration of molecular information into breeding programs, and breeding program design. More recently development of bioinformatic pipelines for sequence analysis. Author and co-author of book chapters and papers contributing to knowledge of genetic mechanisms underlying quantitative traits, linkage and linkage disequilibrium mapping and marker assisted selection in livestock and aquaculture species.

Major Accomplishments

- Publication of three book chapters and many papers in the area of application of genomic technologies and bioinformatics in livestock and aquaculture industries.
- Delivery of courses in genomics, marker assisted selection, and bioinformatics in Australia, Norway, Canada and Italy.
- Principal investigator or project leader on projects applying marker assisted selection in pig, abalone, dairy goat, Atlantic salmon and Atlantic cod industries.
- Dec 2001 – July 2002. Project leader for Aquaculture Innovation team at Victorian Institute of Animal Science. This team was set up with the purpose of generating innovative projects in the aquaculture area.

Research Experience

- Sept 2005 – current. State Wide Leader Computational Biology, Animal Genetics and Genomics, Department of Primary Industries, Victoria Australia
- April 2003 – Aug 2005. Senior Researcher in Genetics and Breeding, AKVAFORSK, Norway
- Oct 2001 – May 2003 Quantitative Geneticist, Natural Resources and Environment, Australia
- May 1999 – Oct 2001. Research Fellow, University of Melbourne, Australia
- Jan 1996-Jan 2000. PhD student, Central Queensland University, Australia
- July 1997 – Dec 1997. Visiting Scientist, Centre for Genetic Improvement of Livestock, University of Guelph, Ontario, Canada

Education

PhD - "Mate selection for multi-breed beef populations" - Central Queensland University (1996-Jan 2000)

Postgraduate Certificate in Rural Science (Pass with Merit) - University of New England (July-Dec 1996)

Bachelor of Agricultural Science (Hons Class 1) - University of Queensland (1992-1995)

Invited Presentations and Workshops given

June 5-10. 2005. Gene Detection and Marker Assisted Selection: Putting The Theory Into Practice". Centre for Genetic Improvement of Livestock, Guelph, Canada.

April 25. 2005. "Linkage disequilibrium in humans, cattle and Norwegian goats - what does it tell us and how can we use it?" Danish Ministry of Agricultural Science, Foulum, Denmark

March 14. 2005. "Large detection of SNPs from ESTs". University of Life Sciences, Ås, Norway.

February 25-26 2003. From linkage to gene detection. University of New England Summer School, Armidale, New South Wales, Australia.

August 2002. Murray cod genetics and potential industry benefits. 2nd Murray Cod Aquaculture Workshop, Attwood, Victoria.

August 2002 Presented 'Using marker and phenotypic information to increase profitability of farmed abalone' at Fisheries Research and Development Abalone Sub-program workshop, Queenscliff Victoria.

June 2002. Marker assisted selection in livestock species. Workshop on the Development of the R&D Program in Marker-assisted selection (MAS) in pasture plant breeding, Attwood, Victoria.

June 2000 "Distribution of the effects of genes affecting quantitative traits" at Centre for Genetic Improvement of Livestock, Guelph, Canada.

Publications

Book chapters

[Hayes B.J.](#), [Kinghorn B.P.](#) and [Ruvinsky A.](#) (2005) Genome scanning and identification of quantitative trait loci in mammals. In Ruvinsky, A. and Graves, J. (eds) *Mammalian Genomics*. CAB International, Wallingford, Oxon, OX10 8DE. UK

Hayes, B. J. and Andersen, Ø. (2005) Modern biotechnology and aquaculture. In. Gjedrem, T. (ed) *Selection and breeding programs in aquaculture*. Kluwer International.

Andersen, Ø. And Hayes, B. J. (2005) Population genetics. In. Gjedrem, T. (ed) *Selection and breeding programs in aquaculture*. Kluwer International.

Invited papers

Hayes, B. J., Chamberlain, A. and Goddard, M. E. (2006). Use of linkage markers in linkage disequilibrium with QTL in breeding programs. *Proc. 8th World. Congr. Genet. Appl. Livest. Prod.* Belo Horizonte, Brazil, Vol. pp.

Hayes, B. J., Moen, T. and Goddard, M. E. (2005). Dissection of complex traits in livestock and aquaculture species. November 2005 *AgBiotech Journal*, CABI International.

Goddard, M. E. and Hayes, B. J. (2002) Optimisation of selection response using molecular data. *Proc. 7th World. Congr. Genet. Appl. Livest. Prod.* Montpellier, France, Vol. pp.

Patents

Hayes, B, Goddard. M. E., Chamberlain, A. and MacLeod, I. 2005. SNPs for improved feed conversion efficiency, Provisional.

Journals

Olsen, H., Nilsen, H., Hayes, H., Berg, P. R. Svendsen, M. Lien, S. and Meuwissen, T. 2007. Genetic confirmation of the causality of the ABCG2 quantitative trait nucleotide in affecting milk composition. Proceedings National Academy of Sciences. Submitted.

Hayes, B. J., Baranski, M., Goddard M. E., Robinson, N. R. 2006. Optimisation of marker assisted selection for abalone breeding programs. Aquaculture . Submitted.

Opsal, M. A., Våge D. I., Hayes, B., Berget I., and Lien, S. 2006. Genomic organization and transcript profiling of the bovine Toll-Like Receptor Gene Cluster (TLR6-TLR1-TLR10). Gene. 384: 45-50.

Gjuvsland, A. B. Hayes, B. J., Omholt, S. W. Carlborg, O. 2006. Statistical epistasis is a generic feature of gene regulatory networks. Genetics. doi: 10.1534.

Hayes, B., Hagesæther, N., Ådnøy, T., Pellerud, G., Berg, P. Lien, S. 2006. Haplotype structure of casein genes in Norwegian goats and effects on milk production traits. Genetics 174: 455-464.

Tenesa, A. Hayes, B. J. Meuwissen, T. H. E., Duffy, D. L. Cardon, L. R. Goddard, M. E. and Visscher, P. M. 2006. Human effective population size estimated from linkage disequilibrium Genome Research. Submitted.

Moen, T., Hayes, B. Sonesson A., Lien, S., Høyheim, B., Munck, H., Meuwissen, T. H. E. 2006. Mapping of a Quantitative Trait Loci for Resistance against Infectious Salmon Anemia in Atlantic Salmon (*Salmo Salar*) Using a Proportional Hazard Model. Genetics. Submitted.

Gjuvsland, A. B., Hayes, B. J., Meuwissen, T. H. E., Plahte E., Omholt, S. W. 2005. Genes underlying expression phenotypes – when do they become eQTLs? Proc. Natl. Acad. Sci. submitted.

Hayes, B. J. Gjuvsland, A. B., Omholt, S. W. 2006. Power of QTL mapping experiments in commercial Atlantic salmon populations, exploiting linkage and linkage disequilibrium and effect of limited recombination in males. Heredity 97:19-26.

Hayes, B. Lærdahl, J., Lien, S, Moen, T, Davidson, W., Koop, B., Adzhubei, A., Høyheim, B. 2005. Detection of SNPs from Atlantic Salmon ESTs. Genomics. Submitted.

Hayes, B., Jie, H. I. E., Moen, T. and Bennewitz, J. 2006. Use of molecular markers to maximise diversity of founder populations for aquaculture breeding programs. Aquaculture. 255: 573-578.

B. J. Hayes, Sonesson, A. K. and Gjerde, B. (2005) Evaluation of three strategies using DNA markers for trace ability in aquaculture species. Aquaculture. 250: 70-81.

B. J. Hayes and M. E. Goddard (2004) Break even cost of genotyping genetic mutations affecting economic traits in commercial pig enterprises. Livest. Prod. Sci. 89: 235-242.

Baranski, M., Rourke, M., Loughnan, S., Robinson, N. Hayes, B. and Austin, C. (2004). Finding gene markers to enhance abalone aquaculture in Australia. Finding gene markers to enhance abalone production in Australia. Aquaculture International, In press.

B. J. Hayes, Visscher, P. M., McPartlan, H. and Goddard, M. E. (2003) A novel multi-locus measure of linkage disequilibrium and its use to estimate past effective population size. *Genome Research* 13:635-643.

Hayes, B. Carrick, M. Bowman, P. and Goddard, M. E. (2003) Genotype x Environment Interaction for Milk Production of Daughters of Australian Dairy Sires from Test-Day Records. *J. Dairy Sci.* 86: 3736-3744

B. J. Hayes and M. E. Goddard (2003) Evaluation of Marker Assisted Selection in Pig Enterprises. *Livest. Prod. Sci.* 81:197-211

B. J. Hayes and M. E. Goddard (2001) The distribution of the effects of genes affecting quantitative traits in livestock. *Genetics Selection Evolution* 33(3):209-229

Meuwissen, T.H.E., B.J. Hayes, and M.E. Goddard (2001) Prediction of total genetic value using genome wide dense marker maps, *Genetics* 157:1819-1829.

B. J. Hayes, R. K. Shepherd and S. Newman (2001) Review of selection and mating strategies for multi-breed populations. *Animal Breeding Abstracts* 70:1-11.

B. J. Hayes, R. K. Shepherd and S. Newman (2001) Look ahead mate selection strategies for multi-breed populations. *Animal Science* 74:13-24.

B. J. Hayes and S. P. Miller (2000) Mate selection to exploit across and within breed dominance affects. *Journal of Animal Breeding and Genetics* 117(5) 347-359

B. J. Hayes, S. Newman and R. K. Shepherd (2000) Technical note: Constrained Optimization of Breed Composition in Composite Populations to Balance Net Merit and Risk. *Journal of Animal Science* 78(8) 2105