INVITED PAPER - *"The Genetic Future - More Than Just GMO's"*
Australian Institute of Agricultural Science and Technology (AIAST) Symposium,
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Use of Gene Marker Technology for Livestock Improvement

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Abstract

Early animal breeders practised selective breeding by identifying what they considered worthwhile characteristics and sought a means of increasing the frequency of such desirable qualities in future generations. This has resulted to the present day specialised breeds of livestock like the Belgian Blue well known for its lean meat, the Holstein-Friesian noted for its milk-production, Superfine Merino for good quality wool and the Japanese Wagyu renowned for its highly marbled beef. For many farm animals, conventional breeding has already achieved high producing animals, but it seems increases in productivity by this means have peaked and are at the sedentary plateau phase. World population on the other hand is on the increase and so is the demand for animal products. Selective breeding cannot keep up with the pace of population growth because it is a painfully slow process and can take many years (especially in cattle with long gestation periods and generation intervals) to establish the desired phenotypic changes. However, the advent of DNA marker technology and its application to animal breeding programmes now provides a fast-tracking of selective breeding and livestock improvement.

A genetic marker for a trait is a DNA segment which is associated with, and hence segregates in a predictable pattern, as the trait. Genetic markers facilitate the "tagging" of individual genes or small chromosome segments containing genes, which influence the trait of interest. Availability of large numbers of such markers has enhanced the detection of major genes influencing quantitative traits. The method involves screening the genome for genes with a large effect on traits of economic importance through a procedure known as linkage analysis The process of selection for a particular trait using genetic markers is called marker assisted selection (MAS). MAS can accelerate the rate of genetic progress by increasing accuracy-of selection and by reducing the generation interval. About 50% additional genetic gain can be obtained if the marker explains 20% of the additive genetic variance and the economic trait has a heritability of 0.2. This paper discusses the use of gene marker technology for the improvement of economic traits in beef cattle, sheep and pigs covering aspects of the Ryanodine receptor (Halothane) gene in pigs, Myostatin (double muscling) gene in cattle, Callipyge gene in sheep, TG5 (marbling) gene in cattle and the use of DNA profiling for parentage testing, carcass traceability, worm parasite resistance testing in sheep and the identification of the Inverdale gene for prolificacy in sheep. The paper will conclude with our current collaborative research in SNP Markers for healthy omega-3 fatty acids in crossbred prime lambs at the University of Tasmania.

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The Speaker

Dr Aduli Malau-Aduli is a Senior Lecturer in Animal Production and Genetics at the School of Agricultural Science (SAS), University of Tasmania (UTAS), Hobart. He earned his PhD degree in Animal Genetics and Breeding from The University of Adelaide. He has nearly 20 years of research and teaching experience in Universities and National Research Institutes in Australia, Japan and Nigeria where he has supervised 19 honours, masters and PhD research students. He currently serves as an elected member of the UTAS Academic Senate and Honours Degree Coordinator at SAS. His research interests with sheep, beef and dairy cattle include genetics-nutrition interactions and DNA marker associations with meat, milk and wool quality. He has been a Consultant Reviewer of Milestone and Final Reports for Dairy Australia, Australian Greenhouse Office Canberra, International Livestock Research Institute Kenya and regularly reviews scientific journal articles for *Livestock Science* (The Netherlands), *Journal of Animal Science* (USA) and *Animal* (UK). He is an Editor (Breeding and Genetics Section) for *Animal* published by the Cambridge University Press; Editor, *Animal Science and Genetics* E-Book Series Published by Bentham Science Publishers, Associate Editor, *Journal of Cell and Animal Biology* published by Academic Journals Inc., Advisory Board Member, *Journal of Applied Agricultural Research* published by the Agricultural Research Council of Nigeria. He has published 96 scientific papers in local and international peer-reviewed journals, abstracts, conference proceedings and invited seminars Dr Malau-Aduli was a recipient of the prestigious AUGU/Heddle Award of the University of Adelaide, Excellent Journal Paper Award from the Japanese Society of Animal Science, ADCOS Award of the Australian Agency for International Development, Postdoctoral Research Fellowship Award of the Japanese Society for the Promotion of Science, Alan Roberts Award for Animal Genetics from the British Society of Animal Science, Junior Scientist Award of the Australian Association of Animal Breeding and Genetics and Life Membership Award of the Nigerian Society for Animal Production. He is a member of the Association for the Advancement of Animal Breeding and Genetics (Australia & New Zealand), Japanese Society of Animal Breeding and Genetics, American Society of Animal Science, American Dairy Science Association, Australian Society of Animal Production, Japanese Society of Animal Science and Nigerian Society of Animal Production. He has won research grants and scholarships from the Australian Wool Education Trust, Commonwealth Scientific and Industrial Research Organisation's Food Futures National Research Flagship, Dairy Australia, University of Tasmania Internal Research Grants, Tasmania Feedlot Pty, Australian Alpaca Association and the UTAS Central Conference Support Scheme.