

SABRE's Cutting Edge

CUTTING EDGE GENOMICS FOR SUSTAINABLE ANIMAL BREEDING

Contents

SABRE Review	1
4 th SABRE Conference	1
European Food Science Day	1
Highlights of SABRE Results	2
Pig SNP60 iSelect Beadchip	2
Post-analyses Papers	2
Mastitis in Dairy Cattle	2
Egg Quality Phenotypes	3
REProduction Ontology: REPO	4
SABRE Training/Travel Funds	4

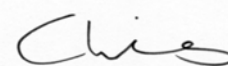
SABRE Review "Good"

Although the full 3rd Periodic Report has still to be completed and submitted to the EC in Brussels, the SABRE Board and OMG members were present at the Periodic Review in Brussels on 24th June 2009. Based on the scientific reports that have been submitted, our EC Project Officer and the two external reviewers evaluated the project to date with a preliminary 'Good'. A final evaluation (and further payments) can be expected after the financial and management reports have been submitted.

During the review process, the SABRE Board has made a decision to request a 6-month extension to the project. If granted, SABRE will be able to provide more detailed analysis on the tremendous amount of data we have produced.



Toine Roozen - SABRE Operations Manager



Chris Warkup - SABRE Co-ordinator

4th SABRE Conference at EAAP

This year, the 4th SABRE Conference will be integrated with the 60th Annual Meeting of the European Association for Animal Production (EAAP) in Barcelona from 24th-27th August 2009.

There will be 21 theatre presentations and 13 posters arising from SABRE research, distributed throughout the four days of the conference, and there will be one dedicated EADGENE-SABRE session, titled "Molecular tools for disease resistance" on Thursday 27th August, during which the SABRE Work Packages on Gut Health (WP4) and Udder Health (WP5) will be addressed. A list with all SABRE presentations at the 60th EAAP is available on the SABRE website at www.sabre-eu.eu > News and Events > 4th SABRE Conference.

The EAAP meetings attract typically 600-800 scientists, guaranteeing a broad dissemination of results. From the EAAP's point of view, the inclusion of the SABRE Conference into EAAP programme adds some 'spice' to the Genetics sessions. From the SABRE perspective it aids dissemination of our results to a wider audience than we would usually reach at our annual conferences.

Further information for the meeting is available from EAAP at www.eaap2009.com and the book of abstracts can be downloaded from www.wageningenacademic.com/eaap2009.



European Food Science Day

SABRE results will be presented to Members of the European Parliament (MEPs) and other stakeholders during the European Food Science Day on 18th November 2009 in Brussels. The event, organised for the first time, consists of a workshop during which the results of 10 or more EU funded projects will be presented, a lunch debate hosted by MEP Mrs Lena Ek (Sweden), and a reception for MEPs and European Officials.

SABRE Coordinator Chris Warkup will present "Improving egg safety through genetics", highlighting the results of SABRE's WP7 on Product Safety.

Further information on www.sabre-eu.eu > News and Events > SABRE and the European Food Science Day, or www.commnet.eu.

Photo: European Parliament in Brussels (Wikipedia)





SABRE Success Stories: Highlights of Year 3

The 33 organisations and 200 scientists united in the SABRE Consortium utilise the latest techniques in genetic science to develop more economically and environmentally sustainable production systems for cattle, pigs and chickens. SABRE is designed to provide a range of new breeding strategies to improve animal health and welfare; reduce chemical and energy inputs; minimise livestock waste and pollution; and, maximise food safety and quality.

The 'headline' objectives for the SABRE Consortium are to:

- ♦ Provide fundamental knowledge on the genomics and epigenetics relating to livestock
- ♦ Provide understanding of biological systems central to sustainability
- ♦ Identify genes and markers allowing focused breeding for sustainability goals
- ♦ Demonstrate the effectiveness of genomics for sustainable breeding
- ♦ Disseminate existing knowledge and new results to the user community
- ♦ Develop skills and training to best capitalise on new genomics knowledge

With many of the larger studies well underway, substantial progress has been made and is reported on www.sabre-eu.eu > SABRE Results. A selection of the successes is reported on this page and the next page.

Pig SNP60 iSelect Beadchip (WP3)	Post-analyses Papers (WP1 & 3)	Mastitis in Dairy Cattle (WP5)
<p>A SNP chip with a panel of ~60,000 high quality SNPs will facilitate genetic mapping in pigs and genomic selection by the pig breeding industry. The development of the "Pig SNP60 iSelect Beadchip" has been made possible by funding from a variety of sources including the EU (SABRE), the USDA (through the project "High-density SNP Discovery, Validation and Characterization in Swine"), the Institute for Pig Genetics (IPG) and others.</p> <p>More information about the panel including allele-frequencies of individual SNPs has been submitted for publication (Ramos et al, 2009, PLoS One. 2009; 4(8)). This paper also describes the complete dataset of 400,000 SNPs identified using Illumina GA sequencing (Solexa). These SNPs have been deposited in dbSNP (NCBI) under accession numbers ss131027063 to ss131629651.</p> <p>Scientists interested in details about the design of the SNP60 Beadchip or in the total set of 400,000 SNPs identified using Illumina GA sequencing should contact Martien Groenen: Martien.Groenen@wur.nl</p>	<p>A joint SABRE and EADGENE working group was established to evaluate existing methods and software, and propose new methods to deal with the annotation and post-analyses of microarray data.</p> <p>The area of biology addressed by this workshop was gene expression studies in livestock looking at transcriptomic differences between treatments as well as genotypes and combinations of these. During a three-day workshop in November 2008, we discussed five aspects of these so-called post analyses of microarray data: 1) re-annotation of the probe set on DNA microarrays, 2) pathway analyses to identify significantly affected biological processes from microarray results, 3) reverse engineering of regulatory networks from microarray results, 4) the integration of gene expression studies with QTL detection studies and 5) the prediction of phenotypic outcomes using gene expression results.</p> <p>The 15 papers arising from this working group are published together in BMC Proceedings July 2009, Vol. 3 (Suppl. 4). Please see www.sabre-eu.eu > SABRE Publications for further information.</p>	<p>We have biologically validated that a small genomic region on Bovine Chromosome 9 (Bta9) is associated with resistance to clinical mastitis in the Danish Holstein breed.</p> <p>Using complementary experimental approaches it was shown that genetic polymorphisms in the region are associated with:</p> <ol style="list-style-type: none"> 1) clinically important mastitis traits including somatic cell count, pathogen count and duration of infection, and 2) expression changes in immunologically important genes and genetic pathways underlying the clinically verified resistance to clinical mastitis. <p>Collectively these findings provide us with strong evidence that genetic polymorphisms in this region on Bta9 can increase resistance to clinical mastitis in Danish Holstein cattle.</p> <p>For further information about this research please contact Peter Sørensen: ps@agrsci.dk, or see the presentation on this work at EAAP 2009 (session 45, presentation 9).</p>





Egg Quality Phenotypes (WP7)

We have developed a novel method of quantifying a commonly used method to assess the cuticle coverage of eggs which involves measuring the % reflectance at 650nm with a spectrophotometer before and after staining whole eggs with a protein based dye (Fig 1 and Fig 2). The pre-stain % reflectance data can also be used to provide a novel measurement of shell colour.

A Rhode Island Red pedigree line that contributes to the male line used to produce Lohmann Brown commercial laying hens was used in our study. Cuticle assessment was carried out on 2 eggs from the offspring. The estimates of heritability for the cuticle based on the sire model were moderate whilst that for our novel shell colour measurement was considerably higher. The phenotypic correlations between the cuticle measurement and shell colour were very low suggesting that these two characteristics were not related but there is evidence for a genetic correlation between these traits. It might be expected that because a large amount of pigment is present in the cuticle, the quantity of cuticle would have a relationship to colour or at least its density. We are now investigating this possibility.

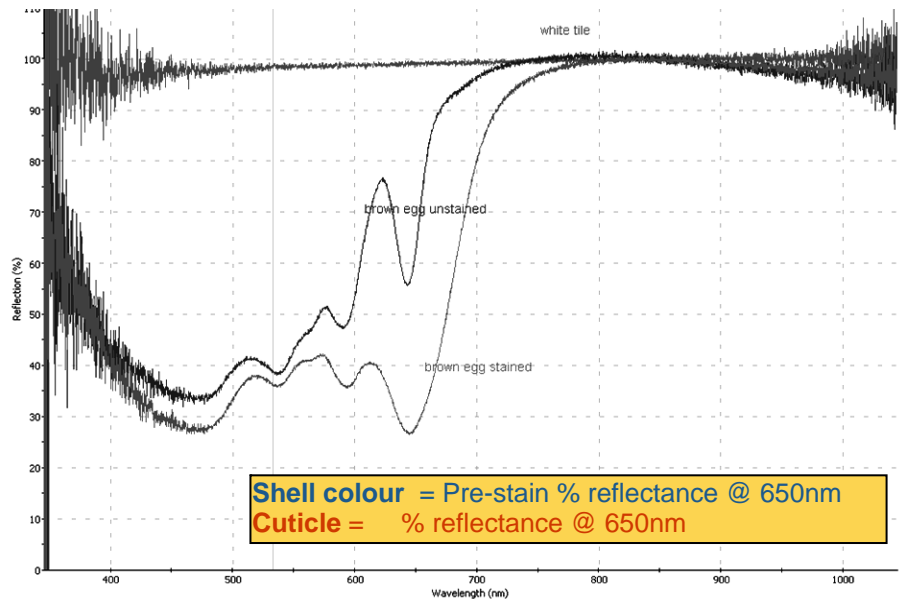


Fig 2: Example of a pre and post stain spectrum

effective thickness of the eggshell. However, unlike other ceramic materials we have found evidence that for eggshells, larger crystal size maybe desirable. The crystallographic properties or microtexture of other polycrystalline material are characterized by the size, shape, arrangement and orientation of crystal grains, and that the inherent strength of metals and ceramics increases with decreasing crystal size and increased disorientation of crystals. This does not appear to be the case for eggshells. However, this is the first study of its type and it is possible that the laying hen is using a trade-

off between thickness and microtextural organisation to provide her offspring with a protective environment for extra uterine development but at the same time is also ensuring that embryo can emerge at the end.

These novel measurements bring us nearer to reducing the measurement of eggshell quality to its component parts which will improve our understanding of eggshell quality and safety and the precision of how we define it in our ultimate goal of improvement through selection.

For further information contact Maureen Bain: m.bain@vet.gla.ac.uk



Fig 1: Eggs stained with protein based dye showing variation in cuticle coverage both within and between eggs

We have also established that there is a genetic basis to some of the crystallographic properties of eggshells as determined by X-Ray Diffraction in a similar pedigree population (Fig 3). The estimates of heritability for the total average intensity (which relates to crystal size) for both the sire and dam were especially high. These investigations have also revealed that the crystal size is related to other specific quality traits such as the eggshell thickness and more specifically the

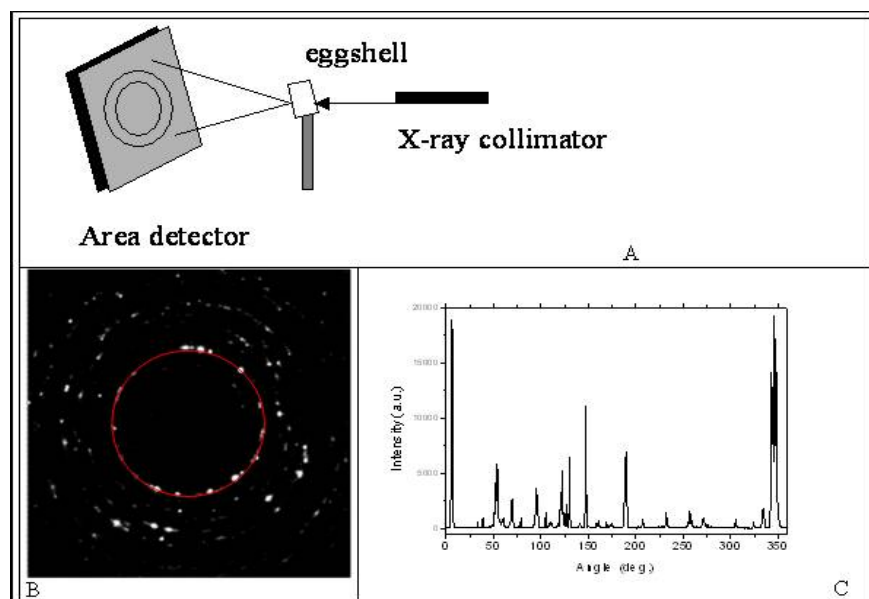
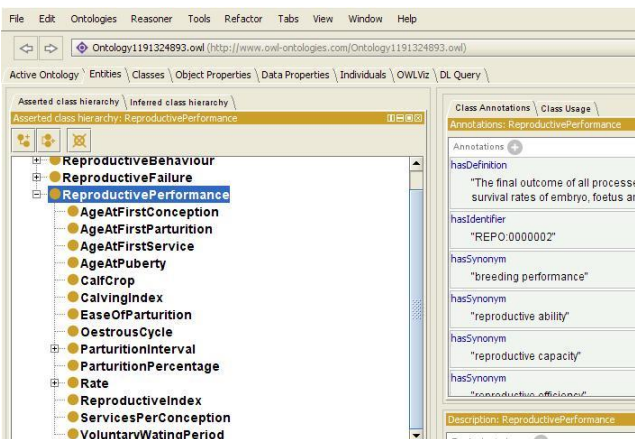


Fig 3: X-Ray Diffraction analysis of eggshell microstructure (Images courtesy of University of Granada)



REProduction Ontology: REPO

The need for biological ontologies has risen in recent years in large part due to the rapid increase of the use of databases and other bioinformatics tools. In animal sciences there is a need for an Animal Trait Ontology (ATO). Precise definition of animal trait terms (phenotypes) will help to capture the biologically relevant distinctions at the desired level of detail in an unambiguous fashion. Correctly linking phenotypic data to structural and functional genome information in various databases will allow meaningful comparisons within and between species.



Ongoing work is focusing on the development of an ATO in the fields of host-pathogen interactions (EADGENE) and reproduction (SABRE). The objective is to develop ATO sub-domains by including relevant trait information for selected animals species and to create a database that allows the linkage of the trait with other information (QTLs, SNPs, mRNA, protein, etc.) within and across species including mouse, rat, and human. In this context, there is a collaboration between the U.S. (James Reecy, NRSP-8 Animal Trait Ontology Project) and Europe (Hein van der Steen, ATO coordinator, EADGENE and SABRE) with the objective of developing a unified ATO. Read more at www.sabre-eu.eu > Get Involved > Animal Trait Ontology

Especially in dairy cattle, fertility and calving traits are of significant economic importance. These traits are regulated by an unknown number of genes, and are strongly influenced by a variety of environmental factors. A vast amount of information about reproduction in dairy cattle will be acquired, stored and displayed in various formats and media. This ontology for farm animal reproduction will be valuable for animal production, veterinary and bio-medical scientists, as well as for industry. Within the SABRE Workpackages „Bioinformatics“ (WP3) and „Fertility“ (WP6) the first outlines of such ontology for reproduction in farm animals has been developed: “REPO”.

The current version of **REPO** includes the major terms for the domain female fertility in cattle, together with their synonyms and, in most cases, text definitions. This REPO has been developed in such a way that it can easily be integrated with ATO (www.animalgenome.org/bioinfo/projects/ATO/). **REPO is available for download from www.sabre-eu.eu > SABREResults > REProduction Ontology in Protege-OWL format.**

Contact SABRE

c/o Genesis Faraday
Roslin BioCentre
Roslin
EH25 9PS
UK
t: +44 (0)131 527 4358
f: +44 (0)131 527 4335
e: info@sabre-eu.eu
w: www.sabre-eu.eu

SABRE's Cutting Edge is edited by Toine Roozen and Caroline Channing.

Your comments and contributions are welcome.

© Genesis Faraday, 2009

SABRE is an Integrated Project supported by funding under the 6th Research Framework Programme of the European Union. European Commission, Directorate RTD E04.

Communication: We invite reproduction experts to contribute to the elaboration of REPO, suggesting new concepts, new relations between classes or anything else, and contacting us by e-mail.

Contacts: Ina Hulsegge: Ina.Hulsegge@wur.nl and Henri Woelders: Henri.Woelders@wur.nl

SABRE Training/Travel Funds Available

A call is open for 6 SABRE “Integrating Awards” and 2 placement awards for Early Stage Researchers:

SABRE Integrating Awards: These are a new type of award, to be used by scientists in SABRE to carry out a wider range of activities which help promote integration within the SABRE project. The awards can be applied for at any time and applications should be submitted to training@sabre-eu.eu.

Early Stage Researcher (ESR) Placement Awards: Placements can be for between 2 and 12 weeks, for an ESR at one SABRE organisation to visit another partner organisation. The deadline for applications is midnight on 30th November 2009.

For further information please visit www.sabre-eu.eu > Get Involved > Training.



This publication represents the views of the Authors, not the EC.
The EC is not liable for any use that may be made of the information.
Whilst all reasonable effort is made to ensure the accuracy of information contained in this newsletter, this newsletter is provided without warranty and we accept no responsibility for any use to which it may be put.



Food Quality and Safety