Why a COST Action on Rabbit Genome Biology?

The European rabbit (Oryctolagus cuniculus) is a key species in biology. Basic discoveries have been made investigating this mammal whose genome has been recently sequenced. The rabbit is a livestock, an animal model, a wild resource, a pest and a fancy animal and comprises a large number of breeding stocks/lines. RGB-Net brings together experts in all rabbit research areas and in other complementary research fields (breeders, geneticists, bioinformaticians, physiologists, evolutionists, embryologists, immunologists, industry experts, etc.) in order to facilitate the transition of rabbit genomic information from experimental data into usable benefits and applications by means of networking expertise. The outcome is a coordination of rabbit research activities and a transfer of knowledge which will produce a strong European added value across a broad spectrum of biology research fields.

Structure and Organization
RGB-Net is organized in 4 Working Groups (WG):

- **WG1 (Genomic Data and Tools)** works on the refinement of the rabbit genome sequence and on the development and sharing of genome-based platforms and tools;
- **WG2 (Applications in Agriculture)** works on genetics for rabbit meat and fur production and analysis and conservation of rabbit biodiversity, including fancy breeds;
- **WG3 (Applications in Biomedicine)** investigates the rabbit as a model in basic biology and human diseases and as a tool for biotechnology applications;
- **WG4 (Applications in Ecology)** works on genetic and comparative genomic aspects for the study, exploitation and management of wild lagomorphs.

What is a COST Action?
It is a science and technology network with a duration of four years, a minimum participation of five COST Member countries, and is organised through a range of networking tools, such as workshops, conferences, training schools, short-term scientific missions, publications, etc.
A few data

RGB-Net member countries

21 COST Countries are members of RGB-Net
+ 5 Non COST Countries
+ 2 International organizations (FAO and EMBL)

The Management Committee is composed by 32 Participants and 14 substitutes

Working Groups list 100 participants

RGB-Net is open to all interested people who would like to join this network

Associated non COST countries
A few RGB-Net people: the Steering Committee

Claire Rogel Gaillard
WG1 Leader
Director of the joint unit Génétique Animale et Biologie Intégrative INRA, Jouy en Josas, France

Hervé Garreau
Vice Chair of RGB-Net
Ingénieur de Recherche INRA-SAGA Toulouse, France

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Chair of RGB-Net
Associate Professor of Animal Breeding and Genetics Department of Agricultural and Food Sciences (DISTAL) University of Bologna Bologna, Italy

Miriam Piles
WG2 Leader
Cuniculture Subprogram Director IRTA, Barcelona, Spain

Ino Ćurik
STSM Leader
Professor of Animal Breeding and Genetics Director of the Animal Science Department Faculty of Agriculture, University of Zagreb Zagreb, Croatia

Zsuzsanna Bösze
WG3 Leader
Director of the Institute for Animal Biotechnology Agricultural Biotechnology Center Godollo, Hungary

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Zsuzsanna Bösze
WG3 Leader
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Carl-Gustaf Thulin
WG4 Leader
Director of the Centre for Wildlife, Fish and Environmental Studies Swedish University of Agricultural Sciences, Umeå, Sweden

Newsletter – December 2012

GB-Net
The First RGB-Net Meeting was held at the Faculty of Agriculture of the University of Bologna (Bologna, Italy) on the 28-30 March 2012, and was attended by 60 people from 18 countries. The programme was very dense. It included 38 plenary presentations, divided in 6 sections, 4 parallel Working Group (WG1-4) meetings, and the Management Committee meeting (and a social dinner 😊)
“A Network within the Network”

The First RGB-Net Meeting that was held in Bologna was preceded by an on-line survey based on 115 preselected keywords among all Working Group participants. This activity had a twofold aim: 1) managing purpose of the Action and possibilities to address in appropriate ways possible interactions and complementarities though the different WGs; 2) establish a first level (upper level) of systems biology network through the Action.

The approach took advantage from a Systems biology vision considering experts as nodes to be linked. The on-line survey results provided a first overview of the expertises and interdisciplinarity already included in the Action.

Among the 115 preselected keywords, 108 were checked. Then, these terms were combined into general terms of systems biology including 8 main categories. Phenomics was the category with the highest weight, that means many experts work in this area or related fields. It is worth to mention that this category include many different scientific fields (i.e. from immunology to meat quality). Results obtained from the on-line survey represented a new way to combine and explore interactions and expertises within COST Actions.
In 2012, a total of ten early stage researchers and scientists participated in STSMs funded by RGB-Net: five were from Hungary, two from Spain and France and one from Portugal. Hosting institutions were in Slovenia (5), Italy (3), Sweden and Hungary.

STSMs lasted from 1 week to 2 months and included lab works, data analysis and seminars within the hosting labs.

Common publications and joint applications to research programmes are expected as outcomes.
An STSM story: Yann Tapponnier

Grant applicant: **Yann Tapponnier** (PhD student)
Grant number: COST-STSM-TD1101-10740
Related work package: WG3
Applicant institution: INSERM U846, Stem Cell and Brain Research Institute, France.
Host: Bosze Zsuzsanna, Agricultural Biotechnology Center, Hungary.
Period: 18/06/2012 - 02/07/2012.

**Production of rabbit embryonic chimaeras by aggregation with iPSCs**

One key issue in the generation of transgenic rabbits, and the subsequent creation of models of human diseases and bioreactors, is the availability of pluripotent stem cells capable of colonizing the preimplantation embryo to generate germline chimaeras. We engineered in Lyon, rabbit induced Pluripotent Stem Cells (iPSCs) lines and one of the challenge we are facing, is the evaluation of the capacity of rabbit iPSCs to colonize the rabbit preimplantation embryo and, thereby, to contribute to foetus development. To this aim we are engaged in collaboration with Dr. Bősze, a well known expert in rabbit transgenesis.

**Dr Elen Gócza in the institute directed by Dr Bősze** has developed the technique of morula aggregation in the rabbit. This technique will be extremely useful to assess the capacity of iPSCs, to contribute to blastocyst formation. During the mission, with Dr. Elen Gocza, we, first of all, adapted this embryo-embryo technique to embryo-iPSCs. Secondly we repeated the experiment with a high number of embryos and succeed to obtain 9 (over 82) chimeric embryos, showing an iPSCs colonization.

Results obtained in the STSM period provide evidence that rabbit iPSCs are capable of colonizing the pre-implantation embryo and participate in the formation of inner cell mass (ICM) the founder tissue of the foetus.
STSM stories: Genomic selection in rabbit breeding?

Genomic selection simulation in Slovenia
The use of genomic information in rabbit breeding has a huge potential that still needs to be explored. In addition, exploitation of genomic selection in this species could represent a model for application in larger livestock species. As a first step, simulation studies should be carried out.

A small ad-hoc Team has been created within the WG2 that is working on this matter via close on-line exchange of information and STSMs. Several people of this team (Arpad Bokor, Eduardo Manfredi, Miriam Piles, Juan Pablo Sánchez Serrano, Ino Curik, Ivana Kovac and Istvan Nagy) gathered together through STSMs at the University of Ljubljana (Slovenia) hosted by Gregor Gorjanc.

The Team set out four tasks for future work in this area:
T1 Genomic-selection for the improvement of lines (within line selection);
T2 Use of imputation to make genomic selection cost effective;
T3 Genomic-selection for the improvement of whole rabbit breeding programme (purebreeds and crossbreeds);
T4 Dominance and inbreeding.

A simulation program was developed for applications within T1 considering real rabbit breeding programs. The Team will continue working on genomic selection simulations in 2013.
At Fall: a successful Training School on Rabbit and Pig Genomics and Bioinformatics

A training school on Rabbit and Pig genomics and bioinformatics was jointly organized by RGB-Net and the COST Action “European Network for Understanding and Combating Porcine Reproductive and Respiratory Syndrome in Europe (EuroPRRS.Net) for five days (October 22-26, 2012) at The Genome Analysis Centre (TGAC, Norwich, http://www.tgac.ac.uk/). The organizers were Claire Rogel Gaillard (RGB-Net WG1 leader), Nizar Drou (RGB-Net Local organizer), Tahar Ait-Ali (EuroPRRS.Net Chair), and Luca Fontanesi (RGB-Net Chair).

The aims of the training school were: (i) to disseminate knowledge on rabbit and pig genome and genomic resources; (ii) to provide a practical training on bioinformatics methods available to carry out research at genome and transcriptome levels.

The courses were delivered by researchers from the TGAC-UK (Nizar Drou, Kirsten Mclay, Bernardo Clavijo), INRA-France (Véronique Duranthon, Andrea Rau, Jordi Estellé), the Broad Institute-USA (Federica di Palma), University of Bologna-Italy (Pier Luigi Martelli), The Roslin Institute-UK (Tom Freeman). The lessons included an overview of databases for genome analyses, a primer of programming (Linux, R, PERL), transcriptome studies using microarrays, and next generation sequencing for transcriptome studies and genome variation studies.

A total of 21 PhD students and postdocs (12 from RGB-Net and 9 from EuroPRRS.Net) from 12 countries (Bulgaria, Croatia, France, Germany, Greece, Hungary, Italy, Macedonia, Portugal, Slovakia, Spain, and United Kingdom) attended the course.
Workshops
1) RGB-Net organized a Workshop at the 4th World Lagomorph Congress that was held in Vienna on July 23-27, 2012. At this “RGB-Net: Lagomorph Genomics workshop” that was held on the 23rd of July 2012 six speakers presented research programmes and results in wild lagomorph genomics. A round table followed the presentations.

2) Another workshop was organized at the 27th European Show for Poultry, Pigeons, Rabbits, Cavies and Birds in Leipzig on December 9, 2012 in which the Chair met several rabbit breeder organizations and presented RGB-Net activities.

Other activities
RGB-Net funded two early stage researchers to attend the Proteomics Summer Course organized by COST Action Farm Animal Proteomics on the 18-21 June 2012 in Porto (Portugal)

Presentation of RGB-Net at international congresses
1) The Vice Chair presented a RGB-Net poster at the Congress of the International Society for Animal Genetics, ISAG2012, in Cairns, Australia, July, 15-20 2012
2) An oral communication presenting RGB-Net was given by the Vice Chair at the 10th World Rabbit Congress, held in Sharm El-Sheikh (Egypt) 3-6 September, 2012

Networking activities
1) The Chair was invited by COST Action FA1002 (Farm Animal Proteomics) at the meeting that was held at Tivoli Hotel, Vilamoura, Portugal (12-13 April 2012). At this meeting the Chair presented RGB-Net
2) The Chair attended the Annual Progress Conference of Biomedicine and Molecular Biosciences (BMBS) COST Actions - 29-30 May 2012, Zagreb, Croatia
3) The Chair presented RGB-Net at the AllBio-TRANS COST Action meeting organized by COST Action SeqAhead in Amsterdam on the 29-30 November 2012
2013 Activities

RGB-Net activity Programme in 2013

1) The plenary RGB-Net meeting will be held in Uppsala (Sweden), 9-10 April 2013. Then, on the 11th of April a Seminar on "Rabbit genome biology in science and industry" will follow.

2) WG1 and WG4 are organizing in Bologna (Italy), 18-19 February 2013, a Lagomorph Genomics Meeting in collaboration with the World Lagomorph Society. The meeting aim will be the "Constitution of an International Sequencing Consortium for all Lagomorph Genomes”

3) WG2 is organizing a meeting on “Genomic Selection in Rabbit Breeding”, Barcelona (Spain). Date: February 2013

4) WG3 is organizing a meeting entitled "Rabbit ES and iPS cells as basic biology model and rabbit models of diseases” in Godollo (Hungary), 26-27 March 2013

5) WG2 is organizing a Training School on rabbit breeding and genetics at the Polytechnic University of Valencia, Valencia, Spain. Date: June 2013.

6) All WGs will be involved in the organization of the Rabbit Genetic Disease Resistance meeting, that will be held in Porto (Portugal). Date: to be confirmed

7) Members of WG3 will be involved in the organization of the 5th International Meeting on Rabbit Biotechnology, Shanghai (China), June 6-8, 2013

8) RGB-Net will be presented at the 20th ASPA Congress of the Animal Science and Production Association, Bologna 11-13 June

9) The Genetics and Genomics of the Rabbit – RGB-Net has contracted the production of this book with CABI by the end of 2013

Other activities will be planned in 2013, including STSMs
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http://www.cost.esf.org/domains_actions/bmbs/Actions/TD1101

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