

Consultants Meeting to discuss and make recommendations on “Significance, suitability and potential applications of gene-based technologies for improving livestock production in developing countries

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The meeting was held from 27 to 30 November 2001 in Vienna. It was attended by five consultants (John Gibson, Kenya; Allan Murray, New Zealand; Chris McSweeney, Australia; Pierre Cronje, Australia; André Eggen, France) and staff of the Animal Production and Health Sub-programme).

The objectives of the meeting were to:

- Identify the areas which could be addressed by the Animal Production and Health Sub-programme, both in a normative and operational capacity;
- Identify important collaborating institutes and organizations and consider methods of appropriate collaboration and co-ordination;
- Consider and develop modalities for support through FAO/IAEA CRP(s), through the IAEA technical co-operation programme and through other mechanisms e.g. training courses;
- If a CRP is appropriate, describe in detail the objectives of the CRP and the activities that will need to be undertaken to reach these objectives;
- Identify possible areas of activity for undertaking within the Animal Production Unit, Seibersdorf;
- Consider and develop a framework for the FAO/IAEA International Symposium on “Application of gene-based technologies for improving animal production and health in developing countries” to be held from 6 to 10 October 2003 in Vienna.

Conclusions and Recommendations

- 1) The consultants concluded that gene-based technologies had significance, suitability and applications for improving livestock production in developing countries.
- 2) It was recognized that almost all gene-based research is taking place in the developed world. The question of how these technologies can be transferred and applied to solve problems of the developing world is a major issue that needs to be addressed.
- 3) The model in the developed world tends to focus resources in large specialized institutes. An appropriate model needs to be found to harness this technology for developing countries, and should be discussed at the forthcoming FAO/IAEA symposium.
- 4) It was concluded that characterization of the gene pools of livestock, microbes and forages was an important first step. Information generated from these studies would have important applications for future livestock production in developing countries and there is a need to develop appropriate methods, tools and capacity to facilitate this.
- 5) The consultants felt that the Agency could play an important role in both characterization and application through its existing mechanisms using nuclear and related technologies.
- 6) It should be recognized that livestock production in developing countries is always a part of an integrated agricultural system, and therefore, development strategies for gene-based applications should consider the total production system. Collaboration with other disciplines such as plant breeding and food safety should be fostered. The Joint FAO/IAEA division having sections dealing with these subjects is well placed to establish research and development projects with multi-disciplinary focus.
- 7) The consultants reviewed the plans already made for the Symposium to be held in 2003, made recommendations for improvement, and concluded that it would be important for identification of future research and development areas, and for forging collaborative links.
- 8) Specific areas identified for future research were the following:

Development and use of rumen molecular techniques for predicting and enhancing productivity

The overall objective of the project is to improve ruminant performance through a reduction in methane production. The specific objectives are to:

- Reduce the level of methane production by up to 50% in animals fed roughage diets;
- Increase microbial protein and energy supply through reduced methane production using approaches such as inhibitors of methanogens, dietary approaches (e.g., use of polyunsaturated fatty acids or ingredients containing these acids), supplementation strategies, etc.;
- Build in-country capacity to develop and use molecular techniques for studying rumen function;
- Develop molecular probes for quantifying populations of methanogens, fibre degrading bacteria, fungi and protozoa;
- Correlate methane production to methanogen numbers;
- Determine effects of reduced methanogen numbers on fibre degrading bacteria, fungi and protozoa; and
- Identify naturally-occurring plant secondary compounds that inhibit methanogens.

Improvement of animal productivity in developing countries by manipulation of nutrition in utero to alter gene expression

The overall objective of the project is to improve animal productivity in developing countries by manipulation of nutrition *in utero* to alter gene expression. The specific objectives are to:

- Provide proof of the concept: Does plane of nutrition *in utero* alter gene expression of key metabolic hormones and enzymes for a long period after birth in cattle?
- Quantify the relative impact of pre vs. postnatal supplementation strategies in cattle; and
- Build in-country knowledge and capacity in the use of gene-related techniques for measuring gene-expression, physiological genomics and radioimmunoassay.

Gene-based Technologies in Livestock Breeding

a) Characterization of Small Ruminant Genetic Resources in Asia

The overall objective is to generate information and decision support systems for phenotypic and molecular genetic diversity enabling development and implementation of national, regional and global strategies for use and conservation of small ruminants. The specific objectives are to:

- Complete the databases of characteristics and status for a representative set of breeds of sheep and goats of Asia which will complement existing FAO and ILRI data for Africa and Europe;
- Develop capacity within the Asian region to use radio-isotopic microsatellite methods for genotype characterization of ruminants;
- Complete the analyses of regional and global genetic diversity of each species based on molecular data;
- Assess new technologies for diversity assay; and
- Make recommendations on their future application for improving ruminant productivity.

b) Genetic Resistance to Helminths in Sheep

The overall objective is the development of well adapted, productive and disease resistant sheep suitable for small scale market oriented production in the developing world. The specific objectives are to:

- Develop capacity within member states to apply gene-based technologies for improving animal production;
- Demonstrate the principle that phenotypic and molecular data on global livestock is essential for design of national livestock genetic improvement strategies; and
- Produce well adapted, productive and disease resistant sheep suitable for production in several locations in the developing world.

Improvement of tests for African Swine Fever diagnosis and molecular epidemiology analysis of the disease

The overall objective is to improve the effectiveness of national and international ASF control/eradication campaigns through the use of molecular and serological methods. The specific objectives are to:

- Develop and validate diagnostic tests for the detection of ticks (the vector) in the pig sera (surveillance of the vector in the country);
 - Develop and validate PCR test for the detection of the virus in clinical samples and also in the tick vector; and
 - Build up a sequence data bank to ease tracing the evolution of the virus strain.
9. The collaboration of FAO, other international organizations and partners in advanced research laboratories that have the expertise in gene-based technologies will be necessary for effective implementation of the proposed CRPs.
 10. The animal production unit can play an important role in the validation of selected techniques and in training of counterparts from developing countries.