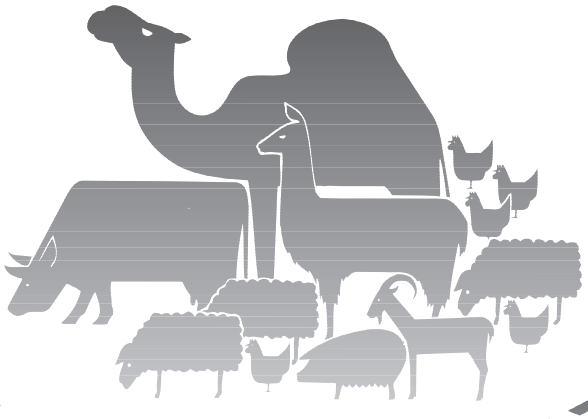
# ANIMAL PRODUCTION AND HEALTH NEWSLETTER



Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf

International Atomic Energy Agency Vienna

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**TO THE READER**

Dear Colleague,

Last month, we held the final Research Co-ordination Meeting of our long-running Co-ordinated Research Project supporting rinderpest eradication and a full report is contained in this Newsletter. During the past 12 months, however, a great deal of discussion has focused on ensuring that the Global Rinderpest Eradication Programme (GREP) can achieve the aim of a verified elimination of the disease and its causative virus by the year 2010. It is opportune to review the progress and determine what must be done to ensure success. Some eight years ago, I published an article arguing that the main impediments to eradication were not technical but political and administrative. I concluded then that we had the technical tools to eliminate rinderpest but that we needed commitment from veterinary services, governments, donors and international organizations if we were to succeed. I believe that we have had that commitment, at least to the extent that can be reasonably expected.

Today, all the national rinderpest vaccination campaigns have been terminated and except for a very few isolated areas where vaccination continues, the effort is now on disease surveillance to demonstrate freedom from rinderpest. Interestingly, as countries move into this surveillance phase, technological problems have again surfaced but in two very different areas.

For the mass vaccination phase, we co-ordinated efforts to develop the cELISA to assist countries monitor national campaigns. This laboratory-based assay proved the ideal tool to enable countries to check that indeed their vaccination efforts were achieving levels of immunity that would ensure that the rinderpest virus could not survive and thus allow them to cease vaccination. Now countries must continue to serologically test cattle, not to show the presence of antibodies from successful vaccination but to demonstrate an absence of antibodies to indicate freedom from infection. Countries also need to be able to rapidly and assuredly confirm a suspect case of rinderpest in cattle, sheep, goats or wildlife. Do they have the tools for this? At the beginning of this year, it appeared not. In February, we held a meeting in Vienna and came to the conclusion that, whilst the cELISA was still suitable for serological surveillance to confirm the absence of infection in a herd, it was not suitable for disease investigation. In fact, it became clear at that meeting that no one assay was suitable and that a number of tests would be required. Fortunately, during the rest of this year a lot of work has gone into evaluating alternative assays, and it appears that the necessary assays are now available but that a more demanding testing procedure will be needed when investigating suspected outbreaks.

The second area for concern was the technical route to verified global freedom. At the FAO GREP meeting in May held in Rome, it was possible to take stock of the global programme. One fact emerged above all others. If countries were to continue down the OIE Rinderpest Pathway as prescribed, many would not reach an OIE international acceptance of freedom from infection by the year 2010. It is important to consider this in context. Firstly, OIE is an organization aiming at facilitating international trade in livestock and livestock products. For many countries trying to rid themselves of rinderpest, international trade is not the primary concern and thus OIE recognition and the level of assurance that this provides to all countries is not the main objective of their endeavours. Secondly, although the OIE Rinderpest Pathway was conceived in 1986, no country has yet completed this Pathway. Some 24 African countries have made the first stage of the OIE Pathway through provisional declarations of rinderpest freedom but none has been able to move to the next part and be recognized by the OIE as free from the disease.

Is the OIE Pathway therefore the right way for GREP? Certainly for countries wishing to trade and where rinderpest is a constraint, then it is the appropriate approach. But GREP is concerned with global eradication. At the meeting in May, it was obvious that the disease is almost eliminated – there are only three remaining foci of infection globally, these are known and strategies are in place to eliminate these. The rest of the world is free of the disease but this needs to be confirmed, as does freedom from the virus. What emerged from this meeting was an alternative technical approach, based on the principles of the OIE Pathway but focused globally not nationally. It was postulated that, if in 2002 vaccination ceases globally, a provisional declaration of global freedom from disease can be made. If in 2004 a global serological and clinical survey is undertaken to demonstrate freedom from disease,

a global recognition of this can be made, and if in 2008 a second global serological and clinical survey is undertaken, a global declaration of freedom from infection can be made. Central to this approach would be the concept of undertaking the surveys based on ecological zones and not national boundaries. It was estimated that this would require only sampling some 200 000 head of cattle – something that could be achieved in a relatively short time frame (2–3 weeks). It was also agreed that such a declaration would be made by all four involved organizations – FAO, IAEA, OIE and WHO. Whilst much has to be done in detailing this approach, it does seem to again offer the realistic opportunity to achieve verified freedom by 2010.

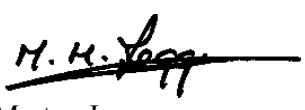
I have taken time to recount to you some of the technical events this year concerning rinderpest for three main reasons. Firstly, to illustrate that through open and frank dialogue it is possible to arrive at technical solutions that take into account the views and concerns of all interested parties. Secondly, to demonstrate the crucial facilitating role that can and should be played by the international organizations in the development of the solutions and thirdly, and most importantly, that global rinderpest eradication is still a realistic and attainable goal by the year 2010. There is little doubt that the achievement of this will be a great tribute to the many developing countries that are involved, demonstrate what can be undertaken with limited resources and provide an enormous incentive for Governments and the donor community to support similar programmes. It does, however, still require considerable focus and energy from all of us, and I ask for your continued support at all levels to make sure that the world rids itself of rinderpest – it is unlikely that we will ever be in a better position to do this.

You will find more details of our support for rinderpest and our other projects in this Newsletter but before concluding I should mention some major staff changes. First the departures: Ron Dwinger and Dierk Rebeski have worked for the past seven years in the Section and the Laboratory Unit, respectively. Both were supported through funds provided by the Government of the Netherlands for a Co-ordinated Research Project (CRP) on trypanosomosis. Ron managed the overall projects in trypanosomosis as well as a CRP dealing with Newcastle Disease and provided technical support to many national IAEA Technical Co-operation projects. His departure is a considerable loss to us, leaving a gap that will be difficult if not impossible to fill. Dierk worked at the Animal Production Unit at the Agency's Laboratories, Seibersdorf, and undertook many studies that underpinned the entire project on trypanosomosis. His research papers will be a valuable reference for many years to come. Andrea Gervelmeyer provided considerable support to our projects in animal health and particularly in rinderpest and CBPP. Andrea was an Associate Professional Officer funded by the German Government. Many of you will know the excellent technical skills she brought to the projects and the very individualistic support she was able to provide. Dan Ezeokoli has completed his one-year sabbatical with us and leaves us with a completed document on rinderpest performance indicators and a well-developed structure on which to build LABINFO. Finally, Mario Garcia, who provided such excellent technical and managerial support to the laboratory Unit during the past eight months. To all of you, I express my sincere gratitude and thanks for jobs so well done. I wish all of you the very best for the future and trust that one way or another you will continue to work with us.

We have two new arrivals. Firstly, we all welcome Adama Diallo who will take over as Head of the Unit at our Seibersdorf Laboratory. Adama has an excellent international reputation for research in both rinderpest and PPR and has considerable expertise in PCR and related biotechnologies. He is the perfect person to provide direction and focus to activities in this Unit and we greatly look forward to working with him in the future. Secondly, Karim Tounkara has joined us for a few months to provide technical support to our projects supporting to the OAU/IBAR PACE programme. We have had many years of partnership with Karim, as a project counterpart, as a Research Contract holder in the rinderpest CRP, as an IAEA expert and as a consultant for many of our Workshops and Training Courses. To both of you, welcome aboard.

Finally, may I again wish you all the very best for the coming year and trust that we continue to provide to you the support that you need and deserve.

With best wishes,



Martyn Jeggo
Head, Animal Production and
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The Animal Production Unit, Seibersdorf, is a collaborating Center for ELISA and molecular technologies in animal disease diagnosis for both the OIE and WHO

## B. FORTHCOMING EVENTS

### RCA Project Review and Planning Meeting on "Improving Animal Productivity and Reproductive Efficiency" (RAS/5/035)

Technical Officers: Oswin Perera and Harinder Makkar.

A project review and planning meeting will be held from 5 to 9 February 2001 in Manila, The Philippines.

The RCA project RAS/5/035, which commenced in 1991, has been extended for a further two years (2001–2002) with new activities aimed at achieving the following objectives:

- Promote the use of integrated management practices based on technologies developed under previous projects, through the establishment of pilot farms;
- Evaluate the suitability of lesser known seed bearing or fodder producing plants as a source of low cost animal feed;
- Establish a regional capability for production and distribution of essential reagents for RIA;
- Develop a database system for livestock service providers to assist farmers.

The objectives of the project review and planning meeting are to review the results obtained so far in nutritional supplementation and reproductive management and to plan future strategies for the following:

- Establishing pilot farms and introducing integrated management practices;
- Evaluating and incorporating lesser known plants as livestock feeds;
- Furthering regional capability for RIA reagent production;
- Improving AI services and introducing a customized database for routine use.

### First RCM to "Develop, Validate and Standardize Methodologies for the Use of PCR and PCR-ELISA in Diagnosis and Monitoring of Control and Eradication Programmes for Trypanosomosis" (D3.20.21)

Technical Officer: John Crowther

This RCM will be held from 26 to 30 March 2001 in Antwerp, Belgium. The meeting will establish the current state of research in the various laboratories and full work plans will be detailed for the respective participants.

### RCA Task Force Meeting on "Customization of the Artificial Insemination Database Application (AIDA) for Routine Use in AI Services" (RAS/5/035)

Technical Officer: Oswin Perera

This meeting will be held from 2 to 6 April 2001 in Peradeniya, Sri Lanka. Five project counterparts with good experience in the use of AIDA and first-hand knowledge of national AI recording systems will be invited to participate.

### RCA Training Workshop on "*in vitro* Techniques for Feed Evaluation" (RAS/5/035)

Technical Officer: Harinder Makkar

This Training Workshop will be held from 16 to 27 April 2001 in Bogor, Indonesia, in co-operation with the Government of Indonesia and BATAN. The objective of the course is to provide training on modern *in vitro* techniques, in particular the gas method, for evaluation of ruminant feeds. The training

course is open to participants from RCA Member States. Preference will be given to candidates with good knowledge of rumen fermentation and biochemistry of protein and carbohydrate metabolism in ruminants, who have been working for at least two years in a feed evaluation laboratory and have experience in working with the Tilley and Terry and/or the *in sacco* method.

**AFRA Task Force Meeting to Harmonize Procedures for Selection and Management of AI Bulls and Use of Semen Technology in African Countries (RAF/5/046, AFRA III-2)**

Technical Officer: Oswin Perera

This meeting will be held from 7 to 11 May 2001 in Arusha, Tanzania. Five project counterparts with expertise in technical aspects of managing AI bulls and semen processing will be invited to participate.

**Third RCM on "the Monitoring of Contagious Bovine Pleuropneumonia in Africa Using Enzyme Immunoassays" (D3.20.18)**

Technical Officer: Martyn Jeggo

The third RCM of this CRP is planned to take place at the OAU/IBAR PACE Headquarters in Kenya in June 2001. The meeting will focus on developing prevalence studies in countries of the Research Contract holders in conjunction with activities being undertaken through their national PACE projects. There will also be proposals for studies to be carried out to validate a CBPP penside test developed in the UK and a new ELISA based on specific antigens expressed on the surface of M. *mycoides mycoides* SC developed in Switzerland**.**

**Second RCM on the "Use of Nuclear and Related Techniques to Develop Simple Tannin Assays for Predicting and Improving the Safety and Efficiency of Feeding Ruminant on Tanniniferous Tree Foliage" (D3.10.22)**

Technical Officer: Harinder Makkar

This RCM will be held from 16 to 20 July 2001 in São Paulo, Brazil. Six Research Contract holders and four Agreement and Technical Contract holders will be invited to participate in the meeting. The objective of the meeting is to review the work conducted and plan studies for the second phase of the project.

**Third RCM to "Develop and Validate Standardized Methods for Using Polymerase Chain Reaction (PCR) and Related Molecular Technologies for Rapid and Improved Animal Disease Diagnosis" (D3.20.17)**

Technical Officer: John Crowther

This RCM will be held in September/October in South Africa and will concentrate on preparing a set of full working protocols for the differential diagnosis of vesicular diseases of livestock.

**International Symposium on "Application of Gene-Based Technologies for Improving Animal Production and Health in Developing Countries"**

Technical Officer: Martyn Jeggo

First announcement and call for preliminary registration of the FAO/IAEA International Symposium on "Application of gene-based technologies for improving animal production and health in developing countries" to be held in October 2003 in Vienna, Austria.

Genetic engineering is now at the forefront of many biological research efforts whether these are on basic, adaptive and applied or near market research. Manipulation of the gene in order to express a specific protein or product or to produce a characteristic or trait offers exciting possibilities within both the plant and animal kingdom. In terms of improving livestock productivity or reducing losses from disease, the opportunities lie in a number of areas. Some of which are:

1. The expression of a gene product that can be used as a vaccine or as a reagent in a diagnostic assay. Recombinant vaccines and vector virus expressed diagnostic reagents are now a reality and are being increasingly used for a variety of reasons including specificity, safety and cost.
2. Molecular epidemiology is a fast growing discipline that enables characterization of pathogen isolates (virus, bacteria, parasites) by nucleotide sequencing for the tracing of their origin. This is particularly important for epidemic diseases, where the possibility of pinpointing the source of infection can significantly contribute to improved disease control.
3. The production of therapeutic substances through the insertion of specific genes into a variety of living tissues ranging from single cells to complete animals or plants. There are already successes in this area and the potential is considerable.
4. An area that is more complex and involves initially identifying (normally) several genes that control a particularly advantageous genetic productivity trait, and then to identify individuals or specific breeds that have this gene cluster and breed from these for subsequent production. A final, more long-term goal is this area would be to actually insert such advantageous genes into a particular breed or species to perpetuate that trait through genetic modification.
5. The genome for many organisms, including human, will soon be compiled. The genome provides a blueprint and reflects the potential of an organism, but the genome itself does not tell us what actually takes place. All cells contain the complete genome of a given organism, but not all genes are expressed within each cell type. Therefore, it becomes imperative to study the expression of the genes and post-translational modification of proteins coded by genes through transcriptome and proteomics. In context to developing countries, one approach could be control of expression of genes, which confer disease resistance or specific production trait, through simple approaches such as nutrition or environmental triggers.
6. Production of transgenic animals with defined traits and utilization of cloning procedures as a tool for identical multiplication of valuable animals.
7. Global surveys indicate that some 30% of all remaining livestock breeds are at risk of loss, with little conservation effort currently invested. The majority of domestic animal breeds are in developing countries. The use of microsatellites in genetic distancing of breeds will help conserving the livestock breeds through the conservation of genomic DNA, amongst a number of other approaches.
8. Plant biotechnologies to improve the nutritional quality of plant feedstuffs and by-products offer enormous opportunities, potential and benefits for the livestock industry. Tremendous strides have been made in the recent past. The genetic engineering of a golden rice with high levels of beta-carotene and iron is almost a reality, which is likely to have vast implications in developing countries. This has demonstrated that it is now possible not only to transfer a single gene, but the entire genetic pathway for producing a nutritionally advantageous substance in a plant. There are several examples where the composition of oils, proteins and carbohydrate in seeds of corn and soybean, and other crops has been modified to produce grains with enhanced value using plant breeding and molecular technologies. Improving feed quality through genetic manipulation holds great promise, e.g. change of leaf/stem ratio, introduction of ‘stay green’ traits, increase in digestibility of nutrients especially fibre of tropical forages, decrease in fibre content and

increase in cell solubles, increase in soluble carbohydrate in roughages, increase of protein in tropical forages and decrease in degradability of protein in the rumen for temperate forages, increase in sulphur amino acids in leguminous forage, regulation of protein and carbohydrate contents and their degradation to achieve maximum microbial protein synthesis in the rumen, etc.

9. In the longer term, there appear to be good prospects of manipulating the rumen microflora capable of utilizing feeds in ruminant species to degrade fibre and lignin, increase efficiency of nitrogen utilization, and to break down anti-nutritional and toxic factors. The establishment of genetically modified micro-organisms or a 'foreign microbe' in the rumen can be monitored using competitive PCR method and 16S rRNA-targeted oligonucleotide probes which do not require culturing of microbes. Such probes could also be used for getting a better insight into the rumen ecology, and then to use this information to develop an appropriate feeding strategy and also to decrease the emission of environmental polluting gas, in particular methane from ruminants.

10. Genetically engineered silage inoculants, pre- and pro-biotics, feed additives, immunomodulators, etc., are also likely to have considerable impact on enhancing nutrient availability and productivity and health status of farm animals.

It should be noted that in almost all areas of this research, isotopic markers are extensively used and are in most cases essential for achieving levels of sensitivity required for genetic characterization and manipulation. Genetic engineering has the potential to solve problems relating to animal productivity and to animal health but at present the focus is on those that face livestock producers in the developed world. To address the problems facing livestock farmers in developing countries will require characterization and application in these regions if the full benefit of this technology is to be realized globally.

It is intended to discuss the issues under three main headings:

1. Gene-based technologies in animal health
2. Gene-based technologies in animal genetics and breeding
3. Gene-based technologies in animal nutrition

The discussion on the future perspective of biotechnology in animal agriculture would be incomplete without considering issues such as ethical, development policy, ecological risks, environmental impact, intellectual property right, etc., related to gene-based technologies. These aspects will be addressed in each of the three categories.

**Objective of the symposium**

To create an interactive environment to discuss the role and future potential of gene-based technologies for improving animal production and health, to identify constraints in the use of this technology in developing countries and how to use this technology in a simple practical way especially for developing countries, to identify specific research needs and prioritize them, to explore the possibility of international co-ordination in the area of biotechnology in animal agriculture, and to examine ethical, technological, policy and environmental issues and the role of nuclear techniques in the further development and application of genetic manipulation in respect of livestock.

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**Preliminary Registration Form**

(The registration can be submitted by mail, fax, e-mail to: H.Makkar@iaea.org or via the registration form on our homepage http://www.iaea.org/programmes/nafa/d3/mtc/symposium2003.html )

Surname:_____ First name:_____ Title:_____

Institution:_____

Address:_____

_____

E-mail:_____

Fax:_____

I intend to present a paper: ☐Yes ☐No ☐Oral presentation ☐Poster presentation

Tentative title of the presentation:

Name and address of a colleague to whom this notice should be sent:

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Further information can be obtained from:

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## C. PAST EVENTS

### RCA Training Workshop on "Production of Iodinated Tracer for Self-coating RIA of Progesterone" (RAS/5/035)

Technical Officer: Oswin Perera

This Training Workshop was held from 8 to 12 May 2000 in Bangkok, Thailand. The objective was to provide training in the preparation of an essential reagent required in the FAO/IAEA Self-coating RIA (Sc-RIA) method, the $^{125}$-I labelled progesterone which is used as a tracer. It was aimed at developing capability in selected laboratories within the Asia/Pacific region to produce and distribute this reagent to other users in the region.

The Workshop included lectures, discussions and hands-on training on the procedures for performing radio-iodination of histamine, coupling the iodo-histamine to activated progesterone-11-alpha-hemisuccinate derivative, purifying the product using HPLC, verifying the purity using electrophoresis, determining specific activity, and comparing assay performance using the locally prepared and commercially available tracer. It was held at the laboratories of the Isotope Production Division of the Office of Atomic Energy for Peace and was attended by eight participants from China, India, Indonesia and Thailand. We wish to thank the Course Director, Ms. Prapaipit Suprarop, her staff and the IAEA expert, Dr. Michael Wheeler of the United Kingdom, for assistance in conducting this training.

### AFRA Training Workshop on "Production of Standards and Internal Quality Control (IQC) Materials for Self-coating RIA of Progesterone" (RAF/5/041; AFRA II-17)

Technical Officer: Oswin Perera

This Training Workshop was held from 22 to 26 May 2000 in Mauritius. The objective of the course was to develop national expertise in the production of standards and internal quality control (IQC) samples and to further develop collaboration and co-ordination within the region to operate a network of RIA laboratories in a self-sustaining manner.

The Workshop was held at the laboratories of the Agricultural Research and Extension Unit of the Ministry of Agriculture, Fisheries and Natural Resources. It was attended by 14 participants from AFRA Member States. We wish to thank the Course Director, Mr. B.D. Hulman, his staff and the IAEA expert, Dr. Mats Forsberg of Sweden, for assistance in conducting this course.

### Meeting to Review Results on AIDA and Plan Future Strategies, IAEA/AFRA Project on "Increasing and Improving Milk and Meat Production" (RAF/5/046; AFRA II-24)

Technical Officer: Oswin Perera

This meeting was held from 12 to 16 June 2000 at the Animal Breeding Centre in Entebbe, Uganda. It reviewed experiences and preliminary results in the eight participating AFRA Member States (MSs) which joined the project in 1999. Their progress in field and laboratory activities was assessed and the Project Co-ordinators (PCs) were provided with instructions and training on the more advanced aspects of AIDA. Concurrently, the current status of AI field services and laboratory facilities was assessed in five MSs joining the project in 2000 and these PCs were provided with the AIDA software, user manual and hands-on training on its installation and use for data entry. Individual country work plans were refined for the former group and developed for the latter. We are grateful to Dr. Daniel Semambo and his staff for making the local arrangements for this meeting. A summary of the main conclusions and recommendations is given below:

***Conclusions***

- 12 AFRA MSs with 13 nominated PCs participate in the project. They are at two stages of participation: *Group I* comprising 8 PCs commencing during 1999, and *Group II* comprising 5 PCs commencing during 2000.
- Information presented at the meeting by *Group I* PCs showed that progress is good in four and satisfactory in the others. Facilities and expertise for the measurement of

progesterone by the Self-coating RIA (Sc-RIA) method are now available to all PCs.

- Presentations made by *Group II* PCs indicated existence of functioning field AI services in these MSs and, despite the late start, there is good potential for envisaged project activities. However, only two PCs have direct access to a functioning RIA laboratory at present. The others can make interim arrangements for collaboration with other institutes, but will require mini-RIA labs to be established, with provision of equipment, training and expert services.
- All *Group I* PCs have installed the AIDA computer application and found it to be a valuable tool for data recording. They benefitted greatly from the advanced knowledge and hands-on training provided during this meeting.
- The meeting permitted *Group II* PCs to be fully briefed and initiated into project activities. Confidence was expressed that they had acquired the knowledge and skills needed to start field activities and use AIDA for data recording.

***Recommendations***

- All participating MSs must complete the initial survey to identify the constraints to AI services and reproductive management by farmers using the three-sample protocol by December 2000 (for *Group I*) and by August 2001 (for *Group II*), and move on to the intervention and improvement phase. Concurrently, the need for and feasibility of establishing N-PD and related services to farmers based on progesterone assay must be evaluated and initiated.
- A decision on the simplification and customisation of AIDA for routine use should be taken when further experience has been gained in its use. The definition of the Minimum Data Set and Individual Cow AI Record should be done at that stage.
- The recommendations and technical protocols formulated during the Task Force meeting, held in South Africa in November 1999, are appropriate and acceptable in principle to all MSs. The application of specific components in their programmes should be decided by each MS.
- Regular contact and exchange of information should be maintained between the PCs and with the PSC and IAEA. Those PCs not having e-mail facilities should endeavour to obtain access through their institutional resources.
- Counterpart institutes should provide adequate infrastructure, manpower, local operative funds and facilities for field transport, sample collection and laboratory analyses. The PCs should also secure other collateral funding to further enhance the activities of this project.
- The immediate inputs required from IAEA for each MS have been identified and include equipment, reagents, Sc-RIA kits and tracer at regular intervals, expert services for establishment of mini-RIA labs and data management, and training in Sc-RIA technology and clinical procedures for improving reproduction.
- The next project review and co-ordination meeting should be held in November 2000 in Tunisia as previously decided. To be eligible for participation, PCs must submit a draft report to IAEA by 10 September and the definitive report by 10 October 2000. For *Group I* this should include full technical and scientific information together with the AIDA database on diskette while for *Group II* it should contain the updated work plans with local arrangements and organization for project activities.

The selection of MSs suitable for upgrading to Model Project status should be done during the meeting in Tunisia, based on the following criteria: functioning project management/steering committee; existence of a viable AI programme; progress in field activities; functioning RIA lab and assays in progress; results obtained; government commitment, local and other collateral support; and potential for successful completion of project activities.

## GREP Workshop on Improving and Harmonizing Rinderpest Diagnosis and Surveillance

Technical Officer: Andrea Gervelmeyer

This FAO GREP Workshop took place from 6 to 14 July 2000 at the Laboratoire Central Vétérinaire in Bamako, Mali.

The Workshop was attended by scientists from Africa (Côte d'Ivoire, Kenya, Mali and Senegal) and Asia (Yemen, Pakistan) under the guidance of two experts from the Institute of Animal Health Pirbright laboratories and CIRAD-EMVT (France) and the Technical Officer from IAEA.

The aim of the Workshop was to familiarize the participants with the indirect ELISA based on the antigen available in the competition ELISA kit, the competitive ELISA based on the N-protein of rinderpest and a peptide based indirect ELISA to be used for the discrimination between negative and rinderpest vaccinated or infected animals. Discussion focused on the issues of the various lineages of rinderpest and how this affected the assessment of samples in the surveillance phase. The strategies for further validation of the reagents were discussed.

It was agreed that the data obtained by the participants in their individual laboratories should be sent to the experts in Pirbright, UK, and CIRAD, France, as well as to the IAEA to allow data analysis and the estimation and agreements of cut-off criteria and that the exercise should be completed as fast as possible preferably by the end of September.

## Second RCM on "Assessment of the Effectiveness of Vaccination Strategies Against Newcastle Disease and Gumboro Disease Using Immunoassay-based Technologies for Increasing Farmyard Poultry Production in Africa" (D3.20.19)

Technical Officer: Martyn Jeggo

The Second Research Co-ordination Meeting on "Assessment of the Effectiveness of Vaccination Strategies Against Newcastle Disease and Gumboro Disease Using Immunoassay-based Technologies for Increasing Farmyard Poultry Production in Africa" was held from 4 to 8 September 2000 at the Sokoine University in Morogoro, United Republic of Tanzania.

The FAO/IAEA CRP D3.20.19 was established in 1999 to identify ways for improving the health and management of village poultry production in Africa that are appropriate, cost-effective and sustainable. Utilizing nuclear (RIA) and nuclear related technologies (ELISA) for monitoring health status and for evaluating locally available feed resources, it was foreseen that there is great potential for improving productivity in this village-based system. Such an approach could not only improve food security for the rural poor, but also generate income, principally for village women and continue the development of market-driven agricultural production systems between rural and urban areas. From the outset it was recognized that, to achieve any real impact, it would be crucial to establish partnerships with others in this sector and this was initiated during the conception of the programme (with other FAO Divisions, with ILRI, with the International Poultry Network and with Governments supplying bilateral support for poultry development, e.g. UK, Denmark, Australia, The Netherlands).

This meeting was held in conjunction with the Network for Smallholder Poultry Development of the Royal Veterinary and Agricultural University of Denmark, and the Sokoine University of Agriculture, Morogoro, Tanzania. During the opening ceremony, keynote addresses were given by the FAO Resident Representative for Tanzania and by the Acting Dean of the University. The acting Regional Commissioner opened the meeting. This opening ceremony received considerable press coverage both through local and national papers and through national radio and television. This coverage is a reflection of the priority afforded to poultry production in Tanzania.

Individual FAO/IAEA Contract holders (from Tanzania, Zimbabwe, Mauritius, Madagascar, Egypt, Ghana, Côte d'Ivoire, Kenya, Uganda, Cameroon, Sudan and Morocco) presented data on village poultry production in their countries. These data had been collected during the past 18 months using a standardized questionnaire and included all aspects of village poultry production. A problem definition and analysis was included in the report. A number of reports from similar poultry projects supported both internationally and bilaterally were also given (a full list of all

presentations can be obtained from the Animal Production and Health Section). From these reports a series of interventions were developed linked to a standardized productivity evaluation protocol. Invaluable input was provided by the wide range of expertise available at the meeting, which enabled a system, rather than technology-driven approach to be developed.

During one day of the meeting, all Contract holders were trained in the use of the ND ELISA which had been previously developed at the Agency's Laboratories, Seibersdorf. Participants were provided with sufficient biologicals to conduct sero-monitoring of their ND vaccination trials during the coming 18 months.

3. Conclusions and Recommendations

3.1. The data sets collected in the 12 participating countries in this CRP have provided valuable baseline information on family poultry production. These have highlighted priorities for interventions and provided further critical information that relates to this farming system. The inter-country comparison through collation and analysis of all the data has provided additional critical decision support information. It is clear that Newcastle Disease (ND) is a constraining factor in all countries and it is recommended that each Contract holder initiate a serologically monitored ND vaccination programme on the 24 flocks in their study. Over and above this, specific interventions of a local priority should be undertaken. Four flocks should be vaccinated only, to provide a baseline control for the vaccination component of the trial.

Each Research Contract holder developed a logical framework and work plan for these interventions that is based on a standardized data set, which will be collected monthly from each national study site. The final activity of this second phase will be a repeat of the initial baseline questionnaire to determine the overall impact at the village level of the specific interventions.

A full account of the papers presented at this meeting should be published and this publication should include the results presented from the Network for Small Holder Poultry Development supported by the Government of Denmark.

3.2. The ELISA to detect antibodies to Newcastle Diseases (an essential element for subsequent sero-monitoring of vaccination programmes against this disease) proved robust under tropical conditions during the training given to the Contract holders at the RCM. Vaccination monitoring and the diagnosis of ND and other diseases affecting village poultry will require a range of nuclear-based technologies (ELISA, PCR, RIA). It is recommended that, at present, sera collected as part of the monitoring of ND vaccination be submitted to Dr. Frans Davelaar at the Fort Doge Animal Health Laboratory (a high security laboratory in Europe that can receive samples from Africa) for testing. Subsequently, assays and the capability to use these will need to be developed in Africa and this should include regionalization of the production and supply of diagnostic reagents and kits for the key poultry diseases. It is recommended that this be completed for ND under the auspices of the OAU/IBAR PACE project through the regional IAEA TC project in animal health.

3.3. The complex issues surrounding family poultry production and the need for an integrated and holistic solution demands the involvement of experts in various fields. Some of these issues are outside the objectives of this CRP but must be included if effective and sustainable strategies for productivity improvements at the village level poultry are to be developed. This meeting included groups and experts from Denmark, UK, Australia and USA as well as from within the region. Socio-economic as well as technical issues were widely discussed in order to provide a co-ordinated and co-operative approach both to the meeting and to the subsequent interventions.

It is essential that this co-operative and co-ordinated process continues to ensure that a sustainable change is induced in village poultry production in Africa.

3.4. It is proposed that the next Research Co-ordination Meeting of this programme will take place in May 2002 in Mauritius.

## FAO/IAEA Consultants Meeting/Workshop on Developing Standardized Training Material to Assist Member States to Establish Quality Systems for Veterinary Diagnostic Laboratories

Technical Officer: Axel Colling

The Consultants meeting/Workshop took place from 4 to 8 September 2000 in Vienna, Austria.

The purpose was to bring together a group of scientists with expertise in quality systems, accreditation procedures and experience in

veterinary diagnostic laboratories in developing countries to prepare generic documents in accordance with the new OIE Standard from which laboratory quality assurance co-ordinators can develop their own material, and to start with the production of training material to be used by the 'IAEA trainers' while guiding and monitoring the establishing of quality systems in veterinary diagnostic laboratories in the different regions.

Six Workshop participants (two each from Africa, Asia, and Latin America) from leading laboratories participated in the meeting and became acquainted on the reasons, purpose, relevance and technical details of the material under preparation while strengthening their knowledge of managing quality control and quality assurance and documentation issues. They assisted in the development of the training material and used their expertise to adjust this training material to their own regional needs and conditions.

At a later stage, it is foreseen to extend these activities through regional Workshops in which the quality assurance co-ordinators will discuss the adaptation and dissemination of the training material within their laboratories, the status of implementation and the constraints encountered. Based on their experiences other laboratories in each region will be identified to implement quality systems on a larger scale.

The understanding and dissemination of this information is crucial for the implementation of adequate laboratory quality systems. The Department of Technical Co-operation and the Animal Production and Health Sub-programme have designed a multi-regional project to facilitate the implementation of a Quality System, which finally may lead to accreditation of veterinary diagnostic laboratories in developing countries through the participation of trainers (QA co-ordinators with relevant expertise and proper training tools) within the regions.

## Final RCM on "Rinderpest Sero-monitoring and Surveillance in Africa Using Immunoassay Technologies' (D3.20.16) in Conjunction with an FAO/IAEA Consultants Meeting

Technical Officer: Andrea Gervelmeyer

The final Research Co-ordination Meeting of the FAO/IAEA Co-ordinated Research Project (CRP) on the "Rinderpest Sero-monitoring and Surveillance in Africa using Immunoassay Technologies" was held from 16 to 20 October 2000 in Vienna Austria. The meeting was attended by 18 of the 20 Research Contract holders and the two Research Agreement holders. The meeting was attended also by the representative of the Infectious Diseases Group of the FAO Animal Production and Health Division, two representatives of the OUA/IBAR/PACE Co-ordination Unit and six scientists who are working on the development of new assays to be used in the surveillance of rinderpest.

During the meeting, the activities carried out in 2000 by the Contract holders in the field of rinderpest surveillance were discussed. The results obtained in the development of rinderpest assays with special emphasis on the problem of the detection of rinderpest lineage II were presented and discussed.

One day was spent on quality assurance, especially on the management of internal quality control data and the future of the FAO/IAEA External Quality Programme.

The participants received the latest information on PACE and GREP strategies.

The forum was used to present the existing surveillance software TADinfo and the concept of development of a specific data management software for the laboratories (Labinfo). Also, a presentation was given on the use of performance indicators for the surveillance of rinderpest.

The overall conclusion is that there is a need to continue to support the laboratory network of PACE through the proposed IAEA Regional TC Project RAF/5/053.

**Recommendations**

Rinderpest Surveillance

1. It is apparent that national PACE project documents do not allocate sufficient funds for laboratory support. The meeting strongly recommends that if PACE is to be successful, the PACE Co-ordination Unit (IBAR) and the regional and national PACE Co-ordinators must ensure that sufficient funds are allocated from the national PACE projects for the national laboratories.
2. The meeting highlighted the impact of waning maternally derived rinderpest antibodies on the interpretation of results from cattle sera tested as part of rinderpest surveillance. It is

recommended that only sera from cattle of a minimum of two years old based on the possession of two permanent incisors be tested for surveillance.

3. Those countries still carrying out vaccination should make every effort to mark all vaccinated animals either by ear notching or branding or to use alternative vaccines which allow the differentiation of vaccinated from infected animals. An expert consultation should be convened to evaluate the available alternative vaccines.

4. International and regional support for all countries at risk is vital as part of the rinderpest eradication effort and to ensure the sustainable success of the PACE project.

Rinderpest Laboratory Diagnosis

5. The present developments in assays, particularly their validation in counterpart laboratories, should be continued as fast as possible with support from all parties involved in GREP. A meeting should be arranged by IAEA to technically evaluate all currently available data and to set up lines of communication and assign responsibilities for the acceleration of future development and assay validation activities. This meeting should also determine when and how rinderpest diagnostic and surveillance reagents and kits will be available regionally. A manual on assays available for rinderpest surveillance and disease investigation should be made available to all laboratories.

6. The network of laboratories established through this CRP should be involved in validation of assays. Such validation should emphasize predictive value characteristics of assays and these determined from a wide variety of sera (see 12).

7. Use of the developed pen side test for rinderpest detection should be encouraged and final validation for use in rinderpest surveillance should be completed as soon as possible.

8. The data generated to show the efficacy and safety of the rinderpest recombinant vaccinia virus vaccine should be made available immediately. The vaccine should be evaluated in terms of cost/benefit analysis for strategic use in the final stages of rinderpest eradication. The evaluation should include a number of agro-ecological regions.

9. The proposed FAO/IAEA CRP on using PCR technology for the differential diagnosis of rinderpest should focus on undertaking studies and extending PCR technology into national laboratories involved in rinderpest surveillance.

10. Full working protocols and standards (including quality control procedures) for establishing and using PCR technologies for disease diagnosis should be prepared as soon as possible.

11. Current assay development should focus on the measurement of antibodies against all possible lineages of rinderpest in livestock and game sera and the differentiation of infected and conventionally vaccinated livestock.

12. There is an urgent need to evaluate assays against each other using both field and experimental sera and to measure both analytical and diagnostic predictive values sensitivity and specificity. Agreement as to how this process of harmonization and equivalence of tests can be achieved in the most efficient and cost-effective manner should be sought.

13. The sustainable supply of quality-controlled reagents to all GREP laboratories is a high priority to ensure the current undertaking of surveillance activities.

14. Every effort should be made by donor communities and international organizations to financially support and strengthen the OAU/IBAR PANVAC laboratory to enable it to continue as an African institute for the quality control of vaccines, and to develop a future capability to include veterinary drugs, to produce and distribute diagnostic kits and to enhance technology transfer through effective training of scientists in OUA/IBAR Member Countries.

PACE and GREP

15. Priority should be given to using Contract holders from Africa in the current FAO/IAEA CRP on PCR as experts to train other scientists from the region and elsewhere.

16. Appreciating that a number of species of wildlife are highly susceptible to rinderpest virus independent of the pathogenicity of a particular strain in cattle, it is vital that they are used as sentinel animals to detect the presence of rinderpest in a country and to assist in the verification of rinderpest freedom.

17. The rinderpest buffer zones, where vaccination against rinderpest is still on-going, could be used to evaluate the rinderpest recombinant vaccinia virus vaccine, particularly since it is possible to use this vaccine to distinguish between vaccination and field infection antibodies.

18. There is no evidence that the RBOK vaccine has ever reverted to virulence, yet monitoring the possibility is one of the reasons why all viruses associated with rinderpest disease should be submitted to reference laboratories for molecular characterization.

19. Regional reference laboratories should be directly supported through the research funds of PACE. Submission of diagnostic samples from national laboratories to regional reference laboratories for further clarification should be supported through national PACE funds.

EQA and IQC

20. IAEA should continue the proficiency testing of laboratories participating in PACE through the use of EQA panels as well as IQC monitoring.

## AFRA Project Co-ordination and Mid-term Review Meeting on "Improving and Increasing Milk and Meat Production" (RAF/5/046, AFRA III-2)

Technical Officer: Oswin Perera

This meeting was held from 30 October to 3 November 2000 at the École Nationale de Médecine Vétérinaire, Sidi Thabet, Tunisia. It was a follow-up to the one held in June in Uganda (see above) and was attended by 9 Project Co-ordinators (PCs) from AFRA Member States (MSs), an IAEA consultant (Dr. David Galloway of Australia) and the Technical Officer.

Based on assessments made at the Uganda meeting and subsequent nominations, PCs participating at this meeting were categorized in to three groups as follows: *Group I (Morocco, Tanzania, Tunisia, Uganda, and Zambia)* – country work plans established, field and laboratory activities well advanced; *Group II (Kenya, Senegal and Sudan)* – country work plans being developed, field and laboratory work being initiated; and *Group III (Ethiopia)* – new nominee, project activities still to be initiated. The objectives of the meeting were therefore adapted to the requirements of these three groups as follows: (a) review progress in organization of national activities, field and laboratory work and use of AIDA for data management in *Group I*; (b) review progress in initiating project activities in *Group II*; (c) assess the potential for project activities and provide training on the installation and use of AIDA in *Group III*; (d) develop and/or update country work plans and identify the inputs required for all participants; and (e) finalize the group activities and overall regional work plan for 2001–2002.

The full meeting report (including the proceedings, conclusions, recommendations, list of participants, individual country work plans and the regional work plan) are available in the Animal Production and Health Section and the AFRA Projects Co-ordinator's Office, TCPA. A summary of the conclusions and recommendations is given below.

**Conclusions**

- *Group I:* Field sampling, laboratory work and data processing have been initiated in all MSs and are well advanced in some. Training of AI technicians and laboratory technicians, and sensitization of farmers have been conducted. Equipment and supplies have been received and utilized by all. AIDA has proved to be useful and user-friendly. The main problems identified were in field data recording, collection of second and third samples, and delivery of forms and samples to laboratories. Farmers have shown good interest, particularly in the early diagnosis of non-pregnancy as a management tool, but this requires quick and regular feedback. The results obtained so far have provided

preliminary information on interval from calving to first service and on conception rate to first service in several countries. Further data are required to reliably establish these fertility indices and to interpret the progesterone results in relation to clinical findings.

- *Group II:* Subsequent to the Uganda meeting, all PCs have obtained some baseline information on the status of AI in their countries and have established the necessary links for project activities. Some sensitization of field staff and farmers has been done. Equipment and materials have been received by those who have made requests. Some have initiated sampling, field data collection and progesterone assays, and have also installed and operated AIDA on a trial basis.
- *Group III:* Information presented by the recently nominated PC indicated good potential for participating in project activities. The arrangements for RIA need to be finalized with a collaborating institute.
- There have been few problems in the supply of kits and Self-coating bulk materials from Seibersdorf. However, many PCs have experienced problems with supply of progesterone tracer from the manufacturers in the UK, relating to deficiencies in communications and delays in shipments and clearance procedures.

**Recommendations**

- The time frames for completing the initial survey to identify the constraints to AI services and reproductive management by farmers using the three-sample protocol was revised as follows: *Group I – April 2001; Group II – December 2001; Group III–- June 2002.* Concurrently, the need for and feasibility of establishing N-PD and related services to farmers based on progesterone assay must be evaluated and initiated.
- A decision on the simplification and customization of AIDA for routine use should be taken during the project review meeting in March 2002. Definition of the Minimum Data Set, Individual Cow AI Record, inclusion of milk records, and the format for a customized AIDA should be addressed at a Task Force meeting in May 2002.
- The immediate inputs required from IAEA for each MS were identified and include the following: equipment and reagents (single-well gamma counters, pipettes and accessories for mini-RIA laboratories, tubes and preservative for field sampling, centrifuges and fridge/freezers, and Sc-RIA kits and tracer at regular intervals); expert services (for establishment of mini-RIA labs, data management and interpretation, and field services to farmers); training (Sc-RIA technology and clinical procedures in improving reproduction).
- Countries joining the project recently should arrange in-country training for technicians in laboratories already conducting RIA. Expert services should be provided as required to new participants.
- Sustainability and cost recovery for services must be established under each individual country situation, under the present supply system and after decentralized reagent production. Benefits of the technology to the farmer have to be determined.
- Each PC should make contact with appropriate in-country staff who can advise on impact assessment, in the context of the farming systems in their countries, and include the selected methodology in the report for the PCs meeting in March 2002.
- In order to overcome problems encountered in supply of progesterone tracer, a detailed procedure to be followed was developed and incorporated in the meeting report.
- The regional production of tracer should be followed up by IAEA with the laboratories in the selected MSs which attended the training course in Cairo in October 1999.
- Standards and IQC should be prepared and validated in each MS. The required materials and protocol should be provided by IAEA.
- PCs should look for potential laboratories capable of producing monoclonal antibodies to progesterone from an established cell line, and inform IAEA. One or two suitable laboratories in the AFRA MSs should be selected and provided with the cell line.

**Final Review Meeting of the AFRA Project on "Development and Field Evaluation of Animal Feed Supplementation Packages" (RAF/5/041, AFRA II-17)**

Technical Officer: Harinder Makkar

The meeting was held from 25 to 29 November 2000 in Cairo, Egypt.

The objectives of the meeting were to evaluate the progress of the work conducted and to formulate recommendations and conclusions.

A full report will be provided in the next Newsletter.

## D. STATUS OF EXISTING CO-ORDINATED RESEARCH PROJECTS

**Use of Nuclear and Colorimetric Techniques for Measuring Microbial Protein Supply from Local Feed Resources in Ruminant Animals (D3.10.21)**

Technical Officer: Harinder Makkar

This CRP is now in its second Phase. It has a total of nine Research Contracts and six Research Agreement holders. It is aimed at developing a simple method, which can readily be used by extension workers or farmer advisors to identify major problems of nutrition that result in a grossly inefficient rumen digestion of feed and a low level of microbial supply to the host animal. This CRP will conclude in 2002.

**Use of Nuclear and Related Techniques to Develop Simple Tannin Assays for Predicting and Improving the Safety and Efficiency of Feeding Ruminants on Tanniniferous Tree Foliage (D3.10.22)**

Technical Officer: Harinder Makkar

This CRP has six Research Contracts, one Technical Contract and three Research Agreements. It is presently in its first Phase. The main objective of this Phase of the CRP is to identify a tannin assay or a battery of tannin assays which could predict the biological effects of tannin-containing tree or shrub leaves on ruminants.

The second RCM will take place in São Paulo, Brazil, from 16 to 20 July 2001 to evaluate the progress of the work conducted and to formulate work plans for the second Phase of the CRP. Three to four new Research Contracts could be awarded in the second Phase of the CRP. Interested groups are suggested to contact the Technical Officer.

**Standardized Methods for Using Polymerase Chain Reaction (PCR) and Related Molecular Technologies for Rapid and Improved Animal Disease Diagnosis (D3.20.17)**

Technical Officer: John Crowther

The CRP has now five Research Contract holders from Mali, Côte d'Ivoire, Ethiopia, Kenya and Korea. The protocols for differential diagnosis of rinderpest and rinderpest-like diseases are now established. The next RCM (to be arranged for 2001) will provide a working document dealing with all facets of the use of PCR in differential diagnosis to be available to workers involved in the last stages of eradication programmes. The final phases of this CRP will involve increasing the number of Contract holders to include workers with good PCR facilities to involve them in use of PCR for differential diagnosis of rinderpest.

**The Monitoring of Contagious Bovine Pleuropneumonia in Africa Using Enzyme Immunoassays (D3.20.18)**

Technical Officer: Martyn Jeggo

This CRP has eleven Research Contracts and three Research Agreements. The main objective of the CRP is to validate, standardize and utilize the competitive ELISA for the detection of antibodies to contagious bovine pleuropneumonia

(CBPP) through field studies in different African countries.

The second RCM of this CRP took place in Lusaka, Zambia, early this year (see the Past Events of the previous edition of this Newsletter). The next RCM will take place in Kenya in June 2001.

## Assessment of the Effectiveness of Vaccination Strategies against Newcastle Disease and Gumboro Disease using Immunoassay-based Technologies for Increasing Farmyard Poultry Production in Africa (D3.20.19)

Technical Officer: Martyn Jeggo

The Second Research Co-ordination Meeting on "Assessment of the Effectiveness of Vaccination Strategies Against Newcastle Disease and Gumboro Disease Using Immunoassay-based Technologies for Increasing Farmyard Poultry Production in Africa" took place at the Sokoine University at Morogoro, United Republic of Tanzania, from 4 to 8 September 2000. (see past events for a detailed report) and the results will be published early next year. There are currently twelve Research Contract and five Agreement holders. The next RCM will take place in 2002 in Mauritius.

## The Use of Non-structural Protein of Foot-and-Mouth Disease Virus (FMDV) to Differentiate between Vaccinated and Infected Animals (D3.20.20)

Technical Officer: John Crowther

The CRP has fifteen Research Contract holders and six Research Agreement holders. The CRP is examining three assays involving indirect and competitive ELISAs to allow discrimination of antibodies produced in livestock after vaccination or infection with FMD virus. Results using the three kits supplied are now available. Relative analytical sensitivity and specificity studies have been received from several laboratories and reveal some differences in the assays with respect to detection of antibodies from pig, cattle, sheep and goats. The diagnostic potential of the assays is similar and the relative sensitivities affect assessment of very early (up to 10 days post infection) and very late (200 plus days following infection).

There is a need to fully standardize assays available worldwide but there is reluctance by suppliers to fully validate methods and provide effective IQC and QA follow-up, as well as to identify suitable world standard reference sera for all species. There are also foreseen problems with the costs of such kits and sustainable supply for mass use. In this light, it is concluded that it is worth developing a single competitive system based on 3 ABC expressed protein using directly conjugated detecting serum, with adequate relevant controls for cattle, sheep, pigs and cattle. To this end, selected laboratories will perform the necessary development of such an assay which will then be compared and harmonized with existing tests by the whole CRP network. Reference sera will be evaluated for use in all tests as well as for use in those to be developed.

## Developing, Validating and Standardizing Methodologies for the Use of PCR and PCR-ELISA in the Diagnosis and Monitoring of Control and Eradication Programmes for Trypanosomosis (D3.20.21)

Technical Officer: John Crowther

A new Co-ordinated Research Project on "Developing, validating and standardizing methodologies for the use of PCR and PCR-ELISA in the diagnosis and monitoring of control and eradication programmes for trypanosomosis" has been approved**.** Ten Research Contract holders have been identified and the first Research Co-ordination Meeting will be held in Antwerp in March 2001.

**Background of CRP**

Traditionally, trypanosomosis in animals has been diagnosed by laborious microscopic examination of individual blood samples, initially thin and thick Giemsa stained smears, later wet films. Concentration methods were developed in the

seventies using a haematocrit centrifuge. As a result, the diagnosis of the disease was improved and more animals were detected to be infected with trypanosomes. These techniques, the Woo method and the buffy coat technique (BCT), had as an additional advantage that the anaemia of the animal could be assessed simultaneously by measuring the packed red cell volume percentage. However, although the specificity of the techniques was good (very few false positives were encountered), the sensitivity was insufficient. The lower detection limit of the most sensitive technique (the BCT) was reported to be between 100 and 1000 trypanosomes/ml blood. This proved to be insufficient since trypanosomosis in cattle is often encountered under field conditions as a chronic disease with low levels of circulating parasites in the blood.

The discovery of monoclonal antibodies and the use of ELISA technology provided an additional diagnostic tool for testing large numbers of samples with a reasonable accuracy of detecting infected animals. Although initial results using the antigen-detection ELISA were promising, it soon became apparent that many infections were missed (false negatives) and that even false positive results were not uncommon. Moreover, under experimental conditions, it was found that the antigen-detection ELISA was not any better in diagnosing infected animals than the BCT. In other words, the test not only failed to detect animals with a low amount of circulating antigen during the initial (subacute) phase of infection, but also was not able to detect parasites during later stages of the disease due to the formation of immune complexes masking the antigenic determinants recognized by the monoclonal antibodies used in the test.

**Rationale**

Consequently, it became necessary to develop a new set of test reagents and a new format of testing. A combination of ELISA and novel molecular techniques such as the polymerase chain reaction (PCR) might be the answer to the need for a reliable and accurate diagnosis of the disease.

The PCR is known to be a very sensitive test. For trypanosomosis in particular, this test would be ideally suited as the "gold standard". It would have to verify doubtful samples which have been detected positive by ELISA, but have not been found positive parasitologically in order to distinguish the true from the false positives. At the same time, it would be useful if the PCR technique could be employed to detect infected animals that have tested negative in the ELISA and BCT due to insufficient sensitivity of these latter two tests (in other words, to detect the false negatives). However, it should be noted that the PCR technique will show false positives if insufficient controls are being used during the sampling and testing procedures.

Consequently, a test combining the properties of PCR and ELISA and including sufficient controls might provide the correct diagnostic results. The proposed CRP intends to develop and validate a PCR in combination with an ELISA format. The practical significance of such a test would be in disease eradication programmes. In such cases, it is of great importance to detect remaining foci of infection (to detect the false negatives). It is equally important to unmask the false positives which would assist in indicating when to stop eradication efforts.

**Overall objective**

To improve livestock production through effective control/eradication of livestock diseases.

**Specific objective**

To introduce a molecular biological technique (PCR–ELISA) for more effective diagnosis and surveillance of trypanosomes in cattle.

**Expected research outputs**

Development of a PCR–ELISA to detect trypanosomal DNA.

Modification of the technique to an easy-to-use format which can handle large numbers of samples (PCR–ELISA).

Application of a more sensitive diagnostic technique with the result that a larger number of animals can be identified as infected and, subsequently, can be treated with trypanocidal drugs.

Improved monitoring of control of eradication programmes using more sensitive detection techniques for a correct identification of animals no longer infected with parasites.

## E. NEW CO-ORDINATED RESEARCH PROJECTS

### Integrated Approach for Improving Small Scale Market Oriented Dairy Systems

Technical Officer: Oswin Perera

The background to and objectives of a proposed new CRP entitled "Methodologies for Demonstrating Increases in the Productivity of Peri-Urban Dairy Cattle Using an Integrated Approach to Improving Nutrition, Reproductive Management and Disease Control" were described in the December 1999 Newsletter. A large number of inquiries were received from scientists in all regions of the world, requesting further information and expressing interest in participating in this project.

A Consultants Meeting was therefore held at IAEA, Vienna, from 21-24 August 2000 in order to develop this project further. It was attended by five consultants with expertise in specific aspects of research and development in dairy production, three external resource persons who were funded from their own institutes, a staff member of FAO's Animal Production Service, a representative of the IAEA's Department of Technical Co-operation and staff members of the Joint FAO/IAEA Division's Sub-programme on Animal Production and Health. The specific objectives of the meeting were to:

- Review the current research thrusts that are relevant to the objectives of the project, recommend areas that should be included and determine the most appropriate modalities for supporting these activities;
- Define the scientific scope of the project and recommend appropriate technologies and methods that should be applied in field and laboratory studies for obtaining the necessary information;
- Review the background document which has been prepared and make appropriate improvements and modifications; and
- Develop work plans, time scales, schedule of Research Co-ordination Meetings (RCMs) and the project framework matrix.
- The conclusions and recommendations arising from the meeting (which included a change in the title of the CRP) were as follows:

**Conclusions**

- The Consultancy, having reviewed the Sub-programme's past activities and medium-term strategy, fully supports the need for the CRP on "Integrated Approach for Improving Small Scale Market Oriented Dairy Systems".
- This CRP intends to build upon the human and institutional resources already developed in FAO/IAEA Member States through previous and on-going projects.
- It will utilize nuclear and related techniques that have been developed through the Sub-programme to bring solutions to problems of dairy farmers in an integrated manner, and will also explore the potential of new nuclear techniques to evaluate nutritional status and reproductive potential of ruminants.
- There is substantial comparative advantage of the Joint FAO/IAEA Programme in undertaking this integrated research project, but will need other collateral support and partnerships, for example with the Animal Production and Health Department of FAO, and with ILRI and IFS.
- The CRP, if successful, will greatly improve the uptake and adoption by farmers of technologies arising from research.
- It will enhance team building in interdisciplinary research and problem solving skills of NARS.

**Recommendations**

- Recognizing the availability of potentially important technologies developed previously through the Sub-programme, the Consultancy strongly recommends the implementation of a CRP to demonstrate the integrated application of these to resource-poor dairy farmers, extension agencies and others.
- The CRP should be initiated and conducted according to the project document developed during this Consultants Meeting.
- An interdisciplinary team is an essential pre-requisite for participation in the project and should be strictly applied in order to ensure success.
- The existence of a national programme in dairy development should be considered essential for participation. The CRP should be linked as far as possible to projects funded by

national programmes and external donor agencies.

- This CRP should target the small scale market oriented dairy production system which has been identified as having the potential for improvement.
- The CRP should be for a duration of five years.
- In view of the multidisciplinary nature of the research, involving a team of investigators, Research Contracts are likely to require a minimum of US$ 10 000 per year per holder.
- Considering the different disciplines and regions to be covered, it is likely to require a minimum of five Agreement holders.
- FAO should look for sources of funds to supplement support available from IAEA.
- The first RCM should be held as soon as possible after the award of Research Contracts and Agreements and should include training on PRA and related survey methodology together with reinforcement of team management skills.
- Isotope techniques to be used in the CRP include the following:
- $^{15}N$ and $^{125}I$ labelled BSA based tannin assays for studies on feeds and forages.
- $^{125}I$ for RIA of progesterone and relevant metabolic hormones (IGF-I, Insulin, Leptin).
- ELISA and PCR-based technologies for differential disease diagnosis.

**Proposals**
Scientists working in countries in Africa, Asia and Latin America who have been actively engaged in research and development in small scale market oriented dairy systems, and where these are an important component of the agricultural economy, are encouraged to submit Research Contract proposals. Those who have already expressed interest will be sent the Project Document and the appropriate forms for preparing a proposal. Others can obtain these by contacting Oswin Perera.

It should be noted that selection of projects for award of Contracts will be done during late 2001, the project will become operational in 2002 when the first RCM will also be held.

## The Development of Strategies for the Effective Monitoring of Veterinary Drug Residues in Livestock and Livestock Products in Developing Countries

Technical Officer: Martyn Jeggo

This commencement of this CRP has been postponed until the appointment of a new staff member who will be responsible for technically supporting the projects in veterinary drug residue monitoring. The Vacancy Notice was issued last September and the closing date was in December. It is foreseen that this appointment will take place within the first couple of months of 2001. A re-evaluation of all Contract proposals will then take place prior to the commencement of this CRP.

## General information applicable to all Co-ordinated Research Projects

**Submission of Proposals**
Research Contract proposal forms can be obtained from IAEA, National Atomic Energy Commissions and UNDP offices. Such proposals need to be countersigned by the Head of the Institution and sent directly to the IAEA. They do not need to be routed through other official channels unless local regulations require otherwise.

**Complementary FAO/IAEA Support**
IAEA has a programme of support through national IAEA Technical Co-operation Projects (TCP). These are concerned with aspects of animal production and diagnosis of animal diseases. Through such projects, additional support may be provided for the activities planned under the individual Research Contracts. This would provide further equipment, specialized training through IAEA training fellowships and the provision of technical backstopping through visits by IAEA experts for periods of up to 1 month. Such support is available to IAEA Member States.

## F. TECHNICAL CO-OPERATION PROJECTS

**Operational Projects in 2001/2002**
*(Number, Title, Technical Officer)*

**ARG/5/010**, IMPROVING TUBERCULOSIS DIAGNOSIS IN RUMINANTS USING PCR, John Crowther

**BGD/5/023**, DEVELOPMENT OF AGROFORESTRY-BASED LIVESTOCK PRODUCTION SYSTEMS, Harinder Makkar

**BKF/5/002**, DEVELOPMENT OF A VETERINARY MEDICINE TO CONBAT THE FOWL POX IN POULTRY FARMING, Martyn Jeggo

**BOL/5/014**, DIFFERENTIAL DIAGNOSIS OF FOOT-AND-MOUTH DISEASE, John Crowther

**CMR/5/009**, NUCLEAR TECHNIQUES FOR IMPROVING LOCAL RUMINANT PRODUCTIVITY, Harinder Makkar

**COL/5/020**, USE OF PROTEIN BANKS FOR IMPROVING PORK PRODUCTION, Harinder Makkar

**CPR/5/014**, INCREASING PRODUCTIVITY OF CROP-LIVESTOCK PRODUCTION SYSTEMS, Harinder Makkar (Associate Staff)

**CYP/5/019**, ACCREDITATION OF LABORATORY FOR CONTROL OF FOODS OF ANIMAL ORIGIN, Martyn Jeggo

**ETH/5/012**, INTEGRATING SIT FOR TSETSE ERADICATION, Martyn Jeggo

**ELS/5/009**, IMPROVING CATTLE PRODUCTION AND QC FOR MONITORING OF ANIMAL DISEASES, Oswin Perera, Axel Colling

**INS/5/029**, SUPPLEMENTARY FEEDING AND REPRODUCTIVE MANAGEMENT OF CATTLE, Oswin Perera, Harinder Makkar

**INS/5/032**, IMPROVING BEEF AND DAIRY CATTLE PRODUCITON IN YOGYAKARTA, Oswin Perera

**MAL/5/025**, FOOD SAFETY MONITORING PROGRAMME FOR LIVESTOCK PRODUCTS, Martyn Jeggo

**MAT/5/003**, SURVEILLANCE OF PROGRAMMES FOR CONTAMINANTS IN FOODS OF ANIMAL ORIGIN, Martyn Jeggo

**MEX/5/036**, IMPROVING THE REPRODUCTIVE PERFORMANCE OF PELIBUEY SHEEP IN TROPICAL MEXICO USING LOCAL FEED RESOURCES, Harinder Makkar

**MON/5/011**, INTEGRATED APPROACH FOR FIELD MANAGEMENT OF ANIMAL PRODUCTION AND HEALTH, John Crowther, Harinder Makkar

**MOR/5/027**, MONITORING OF VETERINARY DRUG RESIDUES, Martyn Jeggo

**MYA/5/011**, DEVELOPMENT OF SUPPLEMENTARY FEEDING STRATEGIES BASED ON LOCAL FEED SOURCES, Harinder Makkar

**MYA/5/012**, DIAGNOSIS AND CONTROL OF SWINE VESICULAR DISEASE AND SWINE BRUCELLOSIS, John Crowther

**NAM/5/006**, MONITORING OF VETERINARY DRUG RESIDUES IN LIVESTOCK, Martyn Jeggo

**PAK/5/041**, SETTING UP IMMUNOASSAY AND MOLECULAR-BASED METHODS TO MONITOR AND SURVEY RINDERPEST DISEASE, John Crowther

**POL/5/010**, INCREASING PIG PRODUCTIVITY THROUGH RADIOIMMUNOASSAY TO DETERMINE METHODS FOR ADVANCING PUBERTY IN GILTS, Oswin Perera

**RAF/5/046**, INCREASING AND IMPROVING MILK AND MEAT PRODUCTION, Oswin Perera

**RAF/5/053**, ASSISTANCE TO OAU/IBAR PACE PROGRAMME FOR THE CONTROL AND ERADICATION OF MAJOR DISEASES AFFECTING LIVESTOCK, Martyn Jeggo, Mamadou Lelenta

**RAS/5/035**, BETTER MANAGEMENT OF FEEDING & REPRODUCTION OF CATTLE (RCA), Oswin Perera, Harinder Makkar

**RLA/5/046**, SUSTAINABLE ANIMAL PRODUCTION ON LANDSCAPES OF VENEZUELAN-COLOMBIAN ORINOQUIA, Harinder Makkar

**SUD/5/025**, IMPROVING PRODUCTIVITY OF GOATS IN SUDAN, Oswin Perera

**SRL/5/035**, MONITORING AND CONTROL OF RESIDUES IN LIVESTOCK PRODUCTS, Martyn Jeggo

**URT/5/021**, LIVESTOCK DEVELOPMENT IN ZANZIBAR AFTER TSETSE ERADICATION, Oswin Perera, Harinder Makkar

**URU/5/023,** IMPROVEMENT OF ARTIFICIAL INSEMINATION SERVICES USING RIA, Oswin Perera

**VEN/5/021**, SUSTAINABLE ANIMAL PRODUCTION, Harinder Makkar

**YEM/5/004**, IMRPOVING THE DIAGNOSIS OF ANIMAL DISEASES, John Crowther

## G. QUALITY ASSURANCE PROGRAMMES

BRA99a: "The external quality assurance programme for use with the FAO/IAEA indirect Brucellosis ELISA, Interim Report EQA/BRA/1999a".

The sixth round (EQAP/BRA1999A) started in late summer 1999. Out of 32 laboratories, which participated in this round, 27 laboratories confirmed receipt of the panel. Twenty-three laboratories sent information concerning the questionnaire, 19 sent IQC results and 22 laboratories sent results concerning the EQC test panel.

With regard to the EQC test panel, 100% agreement was achieved for samples 2, 3, 4 and 5 and 90% of agreement for sample 1 when the common cut-off (15%) was applied resulting in an overall agreement of 98%. When individual cut-offs were applied, an overall agreement of 99% was obtained after exclusion of sample 1 (53% of agreement). Based on the results of the proficiency testing of the last 2 consecutive EQAP indirect brucellosis rounds, 4 laboratories qualified as "provisionally recognized" and 7 laboratories qualified as "recognized".

BRA99b: Report: "The external quality assurance programme for use with the FAO/IAEA indirect Brucellosis ELISA, Interim Report EQA/BRA/1999b".

The seventh round (EQAP/BRA1999B) started in late 1999. Out of 29 laboratories, which participated in this round, 20 laboratories confirmed receipt of the panel. Sixteen laboratories sent information concerning the questionnaire, 12 sent IQC results and 16 laboratories sent results concerning the EQCl test panel. With regard to the EQC test panel 100%, of agreement was achieved for samples 2, 3 and 4, 93% of agreement for sample 5 and 80% of agreement for sample 1 when the common cut-off (15%) was applied. This results in an overall agreement of 95%. When individual cut-offs were applied, an overall agreement of 98% was obtained after exclusion of sample 1 (less than 80% of agreement).

An increasing number of laboratories analyze and monitor their IQC results sending Excel spreadsheets and charts to the EQA co-ordinator. Also the calibration and checks of ELISA equipment is being done on a more regular basis. It is hoped that this valuable effort will continue and that the remaining laboratories will start to implement these essential QC/QA activities soon.

Based on the results of the proficiency testing of the last two consecutive EQAP indirect brucellosis rounds, four laboratories qualified as "provisionally recognized" and seven laboratories qualified as "recognized".

## H. COMPUTER SOFTWARE PROGRAMS

### LABInfo

A contract has been issued to two commercial companies to develop a prototype version of LABINFO based on open source software. This will be completed by the end of this year. There has been considerable interest from many groups both nationally and internationally on the concepts behind LABINFO of using open source software as the basis for building the overall product. It is anticipated that a commercial consortium will be established in the early part of 2001 to further develop LABINFO as a generic package that can be used by a variety of groups for laboratory management. From this a specialized version dealing with the activities and needs of veterinary laboratories will be developed and linked with TADINFO.

## I. GEOGRAPHICAL INFORMATION SYSTEMS

The GIS model to identify priority areas for tsetse control in Ethiopia has been analysed and the results have been published in "Animal Trypanosomosis: Diagnosis and Epidemiology. Results of a FAO/IAEA CRP on the use of immunoassay methods for improved diagnosis of trypanosomes and monitoring tsetse and trypanosomosis control programmes". The model looked at two areas: (a) where trypanosomosis has a negative effect on (agricultural) development and (b) those areas where control measures will have the highest impact/economical benefit. A training set of different factors of the Didessa Valley has been used to identify the priority areas for Ethiopia. The unique altitude related dynamic tsetse situation in Ethiopia makes wider extrapolation, using the same training-set, unpredictable. Validation of the model will take place early in 2001.

A new study, co-ordinated jointly by AGAH, Rome, and the Joint FAO/IAEA Division, Vienna, "to develop a data driven area bound strategy decision model for tsetse eradication" has been identified to support the OAU Heads of State and Governments decision (July 2000, Lomé, Togo) towards tsetse eradication in Africa. A desk study, using real data from so-called shadow projects (hypothetical tsetse control projects), will be undertaken by an agro-economist to explore the possibilities for tsetse eradication projects in West Africa at three different geographical scales. The study will be GIS-driven and supported by (West African) experts of different relevant disciplines. Two Workshops, one in November 2000 in Geneva and one in December 2000 in Vienna, were organized and four shadow-projects and co-ordinators in Benin, Nigeria, Mali and Burkina Faso have been identified to assist the study. Additionally, the agro-economist made a one-week visit to the GIS-Unit at APH, Joint FAO/IAEA Division, Vienna in November and to AGAH, FAO, Rome, for 1½ weeks in December to work jointly with the relevant staff members.

To support the GREP pathway to globally eradicate Rinderpest by 2010, an initial GIS decision tool set-up will be developed in close co-operation with AGAH, Rome, and PACE, Nairobi. In November 2000 a visit to AGAH, FAO Rome was made to explore data availability and to discuss the GIS approach.

The report "GIS at APH, Joint FAO/IAEA Division, Vienna 2000/2001" will be finished by the end of February 2001. The report will include GIS benefits & goals for APH, system architecture, GIS standards, information management and nomenclature, projects, capacity building, documentation, future GIS at the Joint FAO/IAEA Division (a vision) and conclusions and recommendations. Two more training manuals will be ready by August 2001.

Basic GIS techniques for disease mapping using ArcView, Idrisi and Cartalinx.

Advanced GIS techniques and modelling in Animal Health, a case study.

New soft- and hardware have been ordered to support the GIS Unit at the Joint FAO/IAEA Division. New software packages include the ArcViews' Model builder, 3D Analyst, Image Analyst, Tracking Analyst and ArcPress. An update of IDRISI version 2 to IDRISI32 has been ordered. Hardware includes a large format color scanner (ScanPlus III, model 810c) and a large format color printer (HP DesignJet 5000, model 42).

## J. PUBLICATIONS

**Published:**

Proceedings of the Final RCM of the Co-ordinated Research Project on "Improved Diagnosis and Control of Foot-and-Mouth Disease in South East Asia Using ELISA-based Technologies" held in Phnom Penh, Cambodia, 22–26 February 1999, IAEA-TECDOC-1150.

Guidelines for the use of performance indicators in rinderpest surveillance programmes, IAEA-TECDOC-1161.

Proceedings of the Second RCM of the Co-ordinated Research Project "The monitoring of contagious bovine pleuropneumonia in Africa using enzyme immunoassay" held in Lusaka, Zambia, 27 September – 1 October 1999, Working Material, Limited Distribution.

International Atomic Energy Agency, Animal Trypanosomosis: Diagnosis and Epidemiology, Results of a FAO/IAEA Co-ordinated Research Project on the use of immunoassay methods for improved diagnosis of trypanosomosis and monitoring tsetse and trypanosomosis control programmes, Backhuys Publishers, Leiden (2000).

The external quality assurance programme for use with the FAO/IAEA indirect Brucellosis ELISA, Interim Report EQA/BRA/1999a.

The external quality assurance programme for use with the FAO/IAEA indirect Brucellosis ELISA, Interim Report EQA/BRA/1999b.

**In Press:**

Proceedings of the Final RCM of the Co-ordinated Research Project on "Use of RIA and Related Techniques to Identify Ways of Improving Artificial Insemination Programmes for Cattle Reared under Tropical and Sub-tropical Conditions", held in Uppsala, Sweden, 10–14 May 1999.

**In Preparation:**

Performance indicators for rinderpest surveillance.

The FAO/IAEA Guidelines to Establish a Quality System in Veterinary Testing Laboratories in Developing Countries.

Proceedings of the third RCM of the Co-ordinated Research Project on the Rinderpest Sero-monitoring and Surveillance in Africa using Immunoassay Technologies held from 16 to 20 October 2000 in Vienna Austria.

Proceedings of the second RCM of the Co-ordianted Research Project on the assessment of the effectiveness of vaccination strategies against Newcastle disease and Gumboro disease using immunoassay based technologies for increasing farmyard poultry production in Africa held from 4 to 8 September 2000 in Morogoro, Tanzania.

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