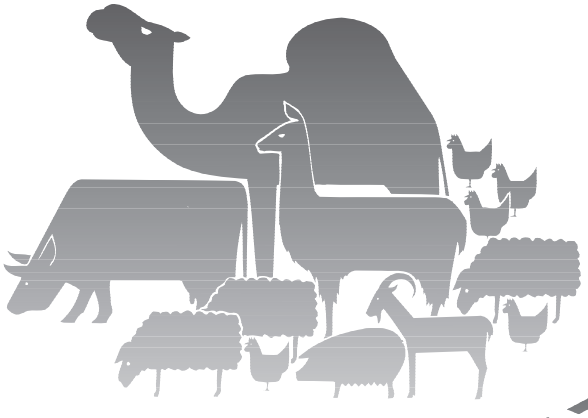
ANIMAL PRODUCTION AND HEALTH NEWSLETTER



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

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TO THE READER

Dear Colleague,

As we enter the final six months of this century, it is perhaps appropriate to look forward and try to envisage what we should be trying to achieve in the medium term. Within the FAO and the IAEA, a great deal of strategic thinking is taking place with every effort being made to maximize available resources to provide the most appropriate support to FAO and IAEA Member States. As you will recall, the Animal Production and Health Sub-programme underwent an external review two years ago and at that time a Medium Term Strategy was conceived. It is not unreasonable to look at this document today and see if the approach is still along the right lines.

The current programme strategy of the Joint FAO/IAEA Division is to promote sustainable food security by assisting Member States to apply nuclear and related biotechnologies to intensify and diversify agricultural production systems and to improve food quality and safety, while ensuring efficient and environmentally sound management of natural resources and external inputs. This is achieved in three ways. Firstly, through provision and facilitation of research to generate strategic technologies and knowledge, secondly, through the provision of scientific and technical services to Member States for planning and delivery of effective technical co-operation and thirdly, through the promotion and dissemination of technical and scientific information to assist decision makers and to provide public understanding of nuclear applications in this area.

The role of the Animal Production and Health Sub-programme is to provide FAO and IAEA Member States with advice and support for improving livestock productivity, through assisting in the identification of constraints and the development of strategies to overcome these using nuclear and related technologies. These strategies must be sustainable, cost–effective and environmentally acceptable. In providing this support, there must be a balance between the normative role of providing guidance and advice to governments (a 'top-down' approach) and the operative role of assisting with technology development and uptake at the field level (a 'bottom-up' approach). Furthermore, it is inherent in the mission statement of the Joint FAO/IAEA Division that any support must have a nuclear technology component. Are we achieving this with our present operational programme?

During the past ten years, the Sub-programme has focused on constraint identification in livestock production, and improving national capabilities for disease diagnosis and surveillance. The emphasis has been on the transfer and reliable utilization of immunoassay technologies (RIA and ELISA) as a 'means to an end'. This has necessitated the development and transfer of standardized reagents and protocols in kit form suitable for use under the often difficult conditions found in developing countries.

Through this support, immunoassay technologies (RIA, ELISA) have been transferred to many research and diagnostic laboratories in developing countries. We are now supporting the **use** of such technologies to **develop intervention procedures** that can, in a practical and sustainable way, improve productivity. These technologies are being used to measure the **success** and **quantify the impact** of changes on productivity. The future approach is clearly **problem-oriented** with continual monitoring and evaluation of impact and success with sustainability and environmental protection as key elements. Given the limited resources and a desire to achieve the most impact, future focus is on peri-urban and mixed crop-livestock farming systems although some advice and support will be applicable to the extensive pastoralist systems.

The focus has changed to one of documenting strategies for overcoming constraints and providing advice on appropriate technologies, how they can be standardized and, where appropriate, nationally validated and on how to quality control the use of such technologies. Through the establishment of data bases on

key components of livestock production and health (e.g. alternative feed resources and their nutritional components, AI management, EMPRES disease surveillance results), Member States have access to a range of critical information essential for policy decision making. Documentation is also being developed on approaches to sustaining intervention strategies and limiting any detrimental environmental impact.

Support is provided for the uptake and use of nuclear technologies (operative activities) to assist Member States resolve problems locally and to monitor and improve intervention strategies. Initially as part of this technology transfer, it had been necessary to develop and provide a RIA kit for progesterone measurement and a variety of ELISA kits for animal disease diagnosis. The supply of such kits through the Sub-programme will be phased out. Support is now focused on assisting the development of regional or national kit or reagent production capabilities based on cost-recovery to ensure sustainability. The emphasis is progressively focusing on utilizing external quality assurance programmes to ensure the quality of these regionally or nationally produced kits and reagents, and the reliability of data generated through their use.

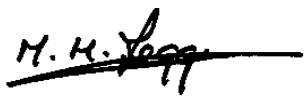
Where appropriate, the concept of introducing newer biotechnologies into the Sub-programme is continuing, (e.g. use of polymerase chain reaction (PCR) for improving identification of disease causing organisms and conducting molecular epidemiological studies). Equally, in new areas where existing technologies can be usefully employed, support is being provided (e.g. use of RIA and ELISA for detecting veterinary drug residues in livestock and livestock products).

I think this brief review of our current activities and direction indicates, that, as we end this century, our direction and focus is on the move and is closely aligned with the overall strategy of the Joint FAO/IAEA Division as it strives to provide the best possible support to Member States and you. In describing the above, I hope I have provided you with an insight into the concepts behind our programme and I would greatly welcome from you any comments, critical or otherwise.

What follows in this Newsletter of course expands and details the outline of the programme I have just given but, before finishing, I would remind you that one of our most important mechanisms of support is through the Technical Co-operation Programme of the IAEA. Requests for support under this programme for the years 2001 and 2002 must be received from your Governments by the end of this year. Whilst many countries have now defined Country Programme Frameworks (CPFs) which are meant to provide a planning process for future support under the Technical Co-operation Programme, these are not exclusive nor complete and I strongly urge you to prepare and submit proposals for support under the Technical Co-operation Programme of the Agency if you are in need of such support! And if you want to see your proposal receive this support, please ensure that appropriate prioritization is given by your Government.

Finally, we all need to give an enormous vote of thanks to Bill Goodger who completed his Sabbatical year with us at the end of December 1998. Bill contributed in so many invaluable ways to the activities of the Sub-programme and he will be sorely missed. Many thanks Bill for all you did.

With best wishes,



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B. FORTHCOMING EVENTS

Regional Workshop on "Self-Coating RIA" (RAS/5/035)

Technical Officer: Oswin Perera

The Workshop will be held from 23 to 27 August 1999 in Mattaram, Indonesia.

The training course is open to 15 qualified participants from national institutes in the Asia/Pacific Region engaged in research and development activities in animal production. Priority will be given to those directly associated with the IAEA/RCA programme on "Better management of feeding and reproduction of cattle" (RAS/5/035). The objective of the course is to develop regional expertise in the routine performance of the new FAO/IAEA Self-Coating RIA (Sc-RIA) for measuring progesterone in milk, and to introduce its field applications under small-holder dairy production systems for the monitoring and improvement of reproductive management and artificial insemination services.

Full information on the course together with requests to submit nominations were sent to the National Co-ordinators of the Regional Co-operative Agreement for East Asia and the Pacific (RCA) in February 1999.

Final RCM on "Use of Immunoassay Methods for Improved Diagnosis of Trypanosomosis and Monitoring of Tsetse and Trypanosomosis Control Programmes in Africa" (D3.20.13)

Technical Officer: Ron Dwinger

The final RCM of the CRP will be organized in Addis Ababa, Ethiopia, from 6 to 10 September 1999.

Second RCM on "The Monitoring of Contagious Bovine Pleuropneumonia in Africa Using Enzyme Immunoassays" (D3.20.18)

Technical Officer: Andrea Gervelmeyer

The second RCM of the CRP will be organized in Lusaka, Zambia, from 27 September to 1 October 1999. The 11 Research Contract holders will be invited to present the results of their field validation of a competitive ELISA to detect antibodies directed against *Mycoplasma mycoides mycoides sc*. Reports should be prepared in electronic form. ELISA results should be brought to the meeting on floppy disk stored as EDI–files together with hard copies of the questionnaires.

Regional Training Course on "The Diagnosis and Control of Foot-and-Mouth Disease" (RAS/5/033)

Technical Officer: John Crowther

The training course will take place from 1 to 26 November 1999 at the Foot-and-Mouth Disease Centre, Pakchong, Nakhonratchasima, Thailand.

The course will be held in English only and is organized by IAEA and FAO in co-operation with the Government of Thailand.

The training course is open to 16 participants from developing Member States of FAO and IAEA in South East Asia.

Deadline for Nominations is 1 August 1999.

Background of the course:
Foot-and-mouth disease (FMD) is a major constraint on livestock in South East Asian countries. The rapid identification of the disease, estimation of immunity levels in herds, vaccination and movement restriction of

livestock are vital to effective control. The major laboratory methods involve both serological and increasingly molecular biological techniques. The serological tests in common practice now focus mainly on enzyme–linked immunosorbent assay (ELISA) and kits for antigen detection and antibody estimation have been supported through Agency activities over a number of years. External quality assurance and internal quality control have also been developed for these kits to allow greater confidence in results from individual laboratories. Recent advances in polymerase chain reaction (PCR) have been exploited in FMD to allow expression of genes as proteins for diagnostic uses and for rapid sequencing and unequivocal identification of FMD virus isolates.

This course comprises lectures, practicals and demonstrations to cover all aspects of diagnostic methods involved in the detection and differentiation of FMD virus and measurement of antibodies against the virus. These will focus on the use of ELISA emphasizing the benefits of the test but comparing results to other 'conventional' methods. Use of the PCR technologies and sequencing will also be demonstrated. The fundamentals of vaccination and control of FMD will be examined as well as epidemiological aspects of the disease from a South East Asian and world-wide perspective. Good laboratory practice (GLP), external quality assurance (EQA) and internal quality control (IQC) will also be examined. The course is intended to provide an overall view of FMD both from the applied and on-going research areas.

Participants' qualifications:
Experienced scientists and veterinarians directly involved in control of FMD. Participants must have basic training and experience in the laboratory.

General Information for Training Courses/Workshops

Application procedure:
Nominations may be submitted on the standard IAEA application form for training courses. Completed forms should be endorsed by and returned through the official channels established (the Ministry of Foreign Affairs, the National Atomic Energy Authority or the Office of the United Nations Development Programme). They must be received by the International Atomic Energy Agency, P.O. Box 100, A–1400 Vienna, Austria, not later than the deadline given for each training course. Nominations received after this date or applications which have not been routed through one of the aforementioned channels cannot be considered.

Advanced nominations by facsimile (+43-1-26007), or e-mail (Official.Mail@iaea.org) are welcomed. The facsimile/e-mail should contain the following basic information about the candidate: name, age, academic qualifications, present position including exact nature of duties carried out, proficiency in the language of the course and full working address including telephone/facsimile numbers.

Language certificate:
In the case of countries in which the language of the course is not an official or customary language, nominations must be accompanied by a separate certificate of the candidate's proficiency in the language of the course. This certificate must be issued by a language school or cultural institution, or an embassy of a country in which the language of the course is spoken.

Administrative and financial arrangements:
Nominating Governments will be informed in due course of the names of the candidates who have been selected and will at that time be given full details on the procedures to be followed with regard to administrative and financial matters.

During their attendance at the course, participants from countries, eligible to receive technical assistance, will be provided with a stipend sufficient to cover accommodation, food and minor incidental expenses. The IAEA will also bear the full cost of their round-trip air ticket, economy class, from their home countries to the place of the training course and return. Shipment of accumulated

course materials to the participants' home countries is not the responsibility of the IAEA.

The organizers of the course do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the course, and it is clearly understood that each Government, in nominating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

C. PAST EVENTS

FAO/IAEA/OAU Workshop on "Emergency Preparedness Against Rinderpest and Other Transboundary Animal Diseases in Southern Africa" (RAF/5/043)

The Workshop took place from 23 to 26 November 1998 in Harare, Zimbabwe.

This Workshop jointly organized between FAO, IAEA, OAU and SADC focused on concepts for emergency preparedness for transboundary animal diseases. The Workshop was attended by 30 participants from 11 countries from southern Africa. The majority of countries were represented by the Director of Veterinary Services and by the Director of Laboratory Services. The recommendations of the Workshop are listed below.

Considering that livestock production is a major contributor to rural livelihoods, food security and economic viability in SADC countries; recognizing that livestock production in SADC countries will need to increase progressively to match the additional animal protein needs of the forecast population growth; recognizing that transboundary animal diseases are a major constraint to trade in livestock and livestock products within and from the SADC region; understanding that regional co-ordination is an essential pre-requisite for the management of transboundary animal diseases and their progressive control; the Workshop recommends:

1. With regard to animal disease emergency preparedness:

- The control of outbreaks of transboundary animal diseases should be regarded as primarily a public good and Governments should be committed to use state funds to bring them under control.
- SADC Member Countries should increase stakeholder participation in emergency preparedness and disease control initiatives and develop broadly-based funding methods involving them.
- The SADC animal health programme should establish regional emergency preparedness planning for transboundary animal diseases with contingency funding for responding to disease emergencies and facilitate strengthening of national emergency planning through assistance to national authorities in establishing national animal disease emergency plans, where necessary with external assistance. Country needs should be documented and submitted to the Livestock Sector Co-ordinator by 28 February 1999.
- In preparing national animal disease emergency plans, countries should include an analysis of the likely economic impact of the diseases and their impact on the potential for growth of the livestock sub-sector.
- In organizational management of veterinary services, SADC Member Countries should pay due attention to the need for a short and direct chain of command in managing transboundary animal disease emergencies.

2. A sub-regional commission for the control of FMD should be established for SADC countries with the long-term objective of eradication of FMD viruses to promote animal production and trade:

- Dr. Gavin Thomson is mandated to prepare a proposal for presentation to the

next meeting of the SADC Livestock Sector Technical Committee.

3. With respect to standardization, harmonization and co-ordination of information management surveillance and diagnostic systems, and disease control:

- SADC countries adopt and implement surveillance and diagnostic systems for transboundary animal diseases (CBPP, rinderpest, Newcastle disease, FMD and trypanosomosis) in accordance with OIE guidelines and using performance indicators to assess their efficiency.
- Standardization and independent external quality assurance of diagnostic tests should be undertaken by the Diagnostic Sub-committee of the SADC Livestock Sector Technical Committee which should designate regional centres of excellence (reference centres).
- The SADC Livestock Sector Technical Co-ordinator should facilitate the implementation of donor-funded regional programmes for strategic control of transboundary animal diseases as a regional priority.
- The SADC Livestock Sector Co-ordinator, in consultation with the Livestock Sector Technical Committee and SACCAR, should plan, prioritize and monitor regional research on transboundary animal diseases and ensure communication of results to Member Countries.
- SADC Livestock Sector co-ordination should be strengthened by provision of an epidemiologist to assist with risk analysis and control of priority diseases.
- SADC Member Countries should establish or strengthen national epidemiology and economics units as an aid to developing socio-economic justifications for expenditure by national authorities and donors on the progressive control of transboundary animal diseases.
- SADC Member Countries should strengthen cross–border harmonization to deal with specific transboundary problems, for example, the Angola/Namibia/Zambia CBPP focus.
- SADC Member Countries should improve their ability to trace animals.
- Collaboration, co-ordination and communication between SADC Livestock Sector and OAU/IBAR should be strengthened.
- The SADC Livestock Sector Technical Committee should make representation to OAU/IBAR of the needs of SADC Member Countries with respect to the new PACE programme.

Task Force Meeting on "Strategies for Future Sustainability of the Applications of Progesterone RIA for Improving Livestock Production in Developing Member States" (RAF/5/041)

Technical Officer: Oswin Perera

This meeting was organized under the framework of the Regional Technical Co-operation Project RAF/5/041 (AFRA II-17) in order to discuss possibilities and modalities for future sustainability in the use of radioimmunoassay (RIA) technology for progesterone measurement in support of improvements in livestock production, and to make appropriate recommendations for consideration and implementation by IAEA and Member States (MSs) under the Regional Co-operative Agreement for Africa (AFRA) as well as in other regions.

The meeting was held from 7 to 10 December 1998 at the Vienna International Centre, Austria, and was attended by five consultants (Prof. Ibrahim Issa Ibrahim, Egypt; Dr. Al-Monim M. Hassan, Sudan; Dr. Mario Garcia, Peru; Dr. Rienzil Piyasena, Sri Lanka; Dr. Mats Forsberg, Sweden) and staff of the Joint FAO/IAEA Division from the Animal Production and Health Section, the Animal Production Unit of the Agency's Laboratories at Seibersdorf and the AFRA Projects Co-ordinator from the Department of Technical Co-operation.

The full report is available from the Animal Production and Health Section and the Office of the AFRA Projects Co-ordinator,

Department of Technical Co-operation. A summary of the main conclusions and recommendations is given below:

Conclusions:

- The solid-phase based RIA method using ^{125}I tracer is preferred to alternative modalities using ^{3}H tracer from the point of view of convenience, robustness and cost.
- Counterpart laboratories in some 60 Member States now have the infrastructure (trained personnel and equipment) for performing progesterone RIA using the DPC kits based on ^{125}I. With regard to the more recently developed FAO/IAEA Self-Coating RIA (Sc-RIA), approximately 10 laboratories in Latin America, 8 laboratories in Africa and 2 laboratories in Asia now have the capability to use the technique effectively.
- There is a clear need to develop a regional capability for the production of the primary reagents for progesterone RIA and the experience gained in a similar project in the field of medical applications, based on the production and supply of bulk-reagents for a range of assays, provides good justification for the use of this approach in the field of livestock production as well.
- The most appropriate strategy will depend on the region concerned, and will involve the selection and upgrading of several regional centres to serve as sources of primary reagents, training locations and focal points for external quality assurance programmes (EQAPs).
- These regional centres will need to be closely linked to national laboratories, which will in turn service decentralized or peripheral laboratories within each country.

The meeting recommended that the technical aspects of the project should involve the following inter-related activities, some of which have already been achieved, or are being implemented, in some MSs:

- Introduction of the bulk reagent based Sc-RIA methodology;
- Establishment of good RIA practices;
- Establishment of EQAP;
- Production of primary reagents in selected regional laboratories;
- Distribution of such reagents to national laboratories; and
- Transfer of technology by means of training activities.

The meeting formulated detailed recommendations on the modalities to be adopted and developed work plans for the activities to be undertaken for achieving these objectives.

Review and Planning Workshop for the Asia/Pacific Region on "Feed Supplementation Strategies and Reproductive Management of Cattle" (RAS/5/030 and RAS/5/035)

Technical Officer: Oswin Perera

This Workshop was held from 11 to 15 January 1999 in Yangon, Myanmar, in order to review the progress made in a previous Regional Technical Co-operation Project (RAS/5/030) and to plan future activities under a follow-up project (RAS/5/035) which is being implemented under the framework of the Regional Co-operative Agreement for the Asia and Pacific Region (RCA). The new project has the dual objectives of (a) further extending the field applications of feed supplementation strategies; and (b) monitoring and improving reproductive management and artificial insemination (AI) services in Member States.

The Workshop was attended by 16 of the 17 nominated participants from 10 RCA Member States (P.R. China, Indonesia, R.O. Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam). It was supported by two IAEA experts (Dr. M. Garcia, Peru, and Dr. A. S. Nanda, India) and the Technical Officer from the Joint FAO/IAEA Division.

Following the presentation of country reports, the participants convened in two separate groups. Group 1 discussed and summarized the achievements made so far in feed supplementation strategies and formulated work plans for further extension of these activities to wider groups of farmer communities. Group 2 discussed the current status of AI programmes and reproductive performance of dairy cattle in the region and developed methodologies to be used for monitoring and improvement. The participants then re-convened in plenary sessions to discuss and finalize the conclusions and recommendations.

All participants were provided with instructions on the use of the computer database AIDA (Artificial Insemination Database Application) which has been developed by the Animal Production and Health Sub-programme. The counterparts for the reproduction component were also provided hands-on training in the use of the database.

The full report is available from the Animal Production and Health Section and the Office of the RCA Projects Co-ordinator, Department of Technical Co-operation. A summary of the main conclusions and recommendations relating to scientific aspects is given below:

1. The previous IAEA Regional TC Project RAS/5/030 has resulted in significant achievements in the utilization of locally available feedstuffs for formulating, testing and using feed supplementation strategies for dairy and beef cattle, buffaloes and goats. The main formulation currently being used is the Urea-Molasses-Multinutrient-Block (UMMB), which has been shown to result in increased lactation yield, reduction of feeding costs, increased growth rate and reduced calf mortality. These responses have resulted in proven technical and economic benefits to farmers.

2. Modalities have been developed for extension of this technology to larger groups of farming communities. These need to be further enhanced, consolidated and extended.

3. In several countries good contacts have been established between the ministries concerned, co-operative organizations and other livestock agencies. Further development of these linkages through collaborative activities such as training, field trials and production of farmer information materials should be fostered.

4. The information presented confirmed the need for improved reproductive management through more efficient AI and other breeding services in the participating countries.

5. The RIA technique has been successfully used to monitor reproductive performance in supplemented and control animals and has, therefore, been a valuable tool to quantify the benefits of supplementary feeding. The solid-phase DPC RIA kit has been successfully used in all laboratories previously associated with IAEA programmes. In order to ensure sustainability and to reduce operating costs, the recently developed FAO/IAEA Self-Coating RIA (Sc-RIA) method should be introduced in all participating laboratories. Subsequently, the possibility of producing certain primary reagents required for this assay such as radiolabelled tracer, standards and quality assurance (QA) samples in selected laboratories in the region should be pursued.

The inputs to be provided from IAEA were determined, including expert services, training workshops, supply of small items of equipment and progesterone RIA kits. It was recommended that a Review and Co-ordination Workshop be held in January/February 2000. Submission of complete technical information on project activities and achievements (including AIDA database for AI counterparts) would be a pre-requisite for participation at this Workshop.

First Research Co-ordination Meeting (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: Ron Dwinger

The RCM took place from 8 to 12 February 1999 in Rabat, Morocco.

Nine Research Contract holders (RCHs), five Research Agreement holders (RAHs) and three observers were able to attend the RCM in Rabat. Each RCH presented the situation of family poultry production in his/her country. The RAH and observers gave lectures on various aspects of family poultry production, serological and vaccination techniques.

The advantages and disadvantages of inactivated, live thermo-stable and recombinant vaccines against Newcastle disease were discussed. Similarly, the various diagnostic and serological techniques to monitor Newcastle control campaigns were assessed. The most suitable vaccine for protecting birds against Newcastle disease was discussed at length. It was decided that the RCHs should come to the next meeting with a recommendation as to which vaccine should be used or tested in his/her country to protect the birds against Newcastle disease. If production is feasible locally, the use of a thermo-stable vaccine, ^{2}I as an eye-drop application, should certainly be considered. In addition, the most appropriate way for serological and diagnostic monitoring of immunity was discussed.

A practical session of one day duration was organized to demonstrate *post mortem* techniques and practice blood sampling in adult chickens. A field trip was arranged to visit a semi-intensive poultry farm and a family poultry farm near Rabat.

An existing detailed questionnaire for collecting base-line data on family poultry production was discussed. The questionnaire was considerably revised during the meeting with the assistance of comments from field workers in Zimbabwe who had tested the form extensively.

Guidelines for the field work were designed to assist the RCH in the research activities during the first year.

It was decided that during the first year base-line data will be collected from 24 different family poultry farms by each RCH (2 different ecological zones; 3 villages in each zone; 4 farmers in each village). The farms will be sampled twice (once during the rainy season and once during the dry season). It was advised to translate the survey in the local language and test the survey in the field before use. In addition, the RCHs were strongly advised to explain the various steps of the research project (survey, sampling, interventions, training) to the village elders/chief before entering individual farms. Two different surveys will be conducted by the RCH: a base-line survey in 24 farms (twice) and a disease survey (continuous). Completed questionnaires will be entered in a standardized EXCEL data input sheet and will be analysed for factors constraining family poultry productivity in each ecological zone. The spreadsheet will assist uniformity in data collection and facilitate data analysis.

Furthermore, serum samples should be collected as part of the continuous survey from at least 6 adult animals on each farm. Filter paper disks can be used under those circumstances where farmers object to blood sampling. Sick or dead chicken should be purchased/collected for *post mortem* examinations. Collection will be facilitated by employing a veterinary assistant stationed in the village.

During the second year of the CRP, interventions will be initiated on the selected farms in order to improve productivity as measured by number of eggs produced, number of chicks reaching adulthood and number of animals sold. Interventions will consist of providing one or more of the following measures depending on local conditions and the factors limiting production: vaccination, disease prevention, supplementary feeding and simple housing structures.

The first data set should be sent to Vienna by the end of June 1999. The second data set (of the alternate season) should be sent to Vienna

by the end of November 1999. The next RCM is likely to be organized in Port Louis, Mauritius, in May 2000.

Project Co-ordination Meeting and Mid-Term Review of AFRA Project II–17 – "Development and Field Evaluation of Animal Feed Supplementation Packages" (RAF/5/041)

Technical Officer: Oswin Perera

This meeting was held from 8 to 12 February 1999 in Antananarivo, Madagascar, under the framework of the Regional Technical Co-operation Project RAF/5/041 (AFRA II-17). The objectives were to: (a) review the achievements in formulating and field testing feed supplementation strategies in AFRA Member States (MSs); (b) assess the current status of establishment of the Self-Coating RIA (Sc-RIA); (c) consider the report of the Task Force meeting on "Strategies for Future Sustainability of the Applications of Progesterone RIA for Improving Livestock Production in Developing Member States"; and (d) develop future work plans for both components of the project.

The meeting was attended by 13 of the 16 nominated Project Co-ordinators (PCs) from 13 AFRA MSs (Cameroon, D.R. Congo, Côte d'Ivoire, Egypt, Ghana, Kenya, Madagascar, Mauritius, Namibia, Niger, Nigeria, U.R. Tanzania and Zambia). Three nominated PCs did not attend (Algeria, Morocco and Libya), while in the case of two MSs either no suitable nomination (Tunisia), or no nomination (Sudan), was received. The meeting was supported by an IAEA expert (Dr. N. Jayasuriya, Sri Lanka), the Project Scientific Consultant (PSC), who is also PC for Egypt and the IAEA Technical Officer.

The opening of the meeting was held concurrently with that of a National Meeting and Symposium organized jointly by the Ministry of Research and Scientific Affairs and the Ministry of Higher Education of Madagascar to mark the tenth anniversary of AFRA. This was addressed by H.E. the President of the National Assembly of the Republic of Madagascar; H.E. the Vice Prime Minister (as representative of the President of the Republic of Madagascar); the Hon. Ministers for Higher Education, Foreign Affairs, Livestock, Scientific Research, and Industries; the Malagasy National Co-ordinator for IAEA and AFRA; and the Technical Officer from the Joint FAO/IAEA Division.

Following the presentation of country reports, a critical analysis of achievements in each MS was done and a SWOT analysis of the overall project was conducted.

The major achievements were summarized as: (a) development of feed supplementation packages and their testing on-station by over 90% of participating MSs, completion of on-farm testing by over 75% and large-scale testing and extension among farmers by three MSs; (b) the holding of four regional training workshops as programmed and the conduct of national workshops by 80% of MSs; (c) the compilation of a training manual on "Guidelines for Development of Feed Supplementation Packages" and individual country databases on "Feed Resources and Reproductive Parameters of Livestock"; and (d) the upgrading of RIA facilities in all MSs, establishment of the Sc-RIA technique in ten MSs and successful participation in the EQA programme by most MSs.

The major weaknesses were considered to be: (a) inadequate financial and logistical support from some National Governments for project activities; (b) lack of recognition and support for the role of the PSC; (c) problems associated with shipment and customs clearance for project materials; and (d) problems in nominations by MSs as well as late notice to selected participants of training courses and workshops.

The meeting made detailed recommendations specific to Project Co-ordinators, AFRA National Co-ordinators, AFRA Field Management, AFRA Governments and IAEA for more effective implementation of the scientific, technical and administrative aspects of the project.

The meeting also accepted in principle the report and recommendations of the Task Force Meeting on "Strategies for Future Sustainability of the Applications of

Progesterone RIA for Improving Livestock Production in Developing Member States" and made further specific recommendations on the technical and logistic aspects of this initiative. Potential locations were identified for the regional laboratories which will be responsible for the production and distribution of bulk reagents, for the EQA programme and for hosting the planned training workshops.

It was recommended that a final review meeting for both components (feed supplementation and Sc-RIA) be held in December 2000. All PCs were requested to prepare a scientific paper which contains all data obtained under the project, with statistical and cost–benefit analyses, and forward this to the PSC and IAEA by 30 October 2000. The publication of these papers in the form of a TECDOC was recommended.

The full report is available from the Animal Production and Health Section and the Office of the AFRA Projects Co-ordinator, Department of Technical Co-operation.

Final RCM on "Use of Immunoassay Technologies for the Diagnosis and Control of Foot-and-Mouth Disease in South East Asia" (D3.20.14)

Technical Officer: Martyn Jeggo

Final Research Co-ordination Meeting (RCM) of the FAO/IAEA Co-ordinated Research Project entitled "Improved Diagnosis and Control of Foot-and-Mouth Disease in South East Asia using ELISA-based Technologies", Phnom Penh, Cambodia, from 22 to 26 February 1999.

This final RCM was held in conjunction with the fifth meeting of the OIE Sub-commission dealing with the control and eradication of foot-and-mouth disease (FMD) from 7 countries (Malaysia, Philippines, Thailand, Vietnam, Laos, Cambodia and Myanmar) in this region. This programme aims at eradicating FMD from these countries where this disease causes enormous losses through reduced livestock production, through loss of draught power and through loss of export opportunities. Throughout the implementation of this CRP (from 1993 to 1999), there has always been a strong link with this OIE initiative to ensure that the support provided through the CRP is targeted towards the eradication process through building an FMD diagnostic capability and conducting appropriate research. It should be noted that the eradication programme is divided into three Phases. Phase 1 is concerned with planning and capacity building linked to socio-economic studies and enabling research. Phase 2 is the implementation control phase. Phase 3 is concerned with eradication and verification. Phase 1 is due to run from 1993 to 1999 and the operation of an FAO/IAEA CRP in conjunction with this Phase is highly appropriate.

The objectives of this CRP were:

1. To establish ELISA-based diagnosis and surveillance capabilities for FMD in S.E. Asia.

2. To conduct specific research studies on FMD to meet national needs (e.g. effectiveness of FMD vaccination programme).

3. To introduce elements of internal and external laboratory quality assurance.

At this final RCM, papers were given by the 10 Research Contract holders (from Malaysia, Philippines, Thailand, Vietnam, Laos, Cambodia, Myanmar, Sri Lanka, Bangladesh and Hong Kong China) on the work conducted under their Contracts during the past five years. These papers will be published as an IAEA-TECDOC. During the meeting, presentations were closely linked with national and technical reports on the OIE eradication programme. The achievements of this CRP were universally acclaimed by the representatives of countries attending this meeting and experts/representatives from the various international (FAO, ILRI, APHCA) and donor (ACIAR, JICA, EU) organizations supporting the OIE programme and attending this meeting.

Conclusions and Recommendations

3.1. National laboratories supported under this CRP can now diagnose FMD virus (to the type

level), detect antibodies to the virus and conduct sero-epidemiological surveys.

3.2. A quality assurance system is operational and has confirmed the validity of results so far published.

3.3. Further training is required in laboratory EQA and IQC procedures.

3.4. All seven national veterinary diagnostic laboratories in the OIE Programme can now provide the necessary diagnostic support to national FMD control and eradication programmes.

3.5. A number of enabling research studies have been undertaken to assist national FMD control and eradication programmes, e.g. evaluation of the vaccination efforts programme in the Philippines and molecular tracing of causative viruses in Thailand.

3.6. To maintain this present situation it will be necessary to continue to provide external support for further training, for the supply of ELISA kits and reagents and for the continued operation of the FMD EQAP. Eventually, most of the above activities will become functions of the newly-established OIE FMD Regional Reference Laboratory in Thailand.

3.7. A strong FMD diagnostic and research capability has been established in the region and a significant amount of enabling research undertaken through this CRP. During Phase 2 of the OIE FMD eradication programme, maintenance of a diagnostic and surveillance capability utilising ELISA-based technologies will be critical to the success. There are significant opportunities for the technical co-operation programme of the Agency to assist in this area, to capitalize on what has already been achieved and to contribute towards the overall aim of improving livestock productivity as part of creating food security and poverty alleviation in the region.

A full account of the overall conclusions and recommendations will be published in the next Newsletter after completion of the TECDOC. We would like to take this opportunity to thank all those involved in this CRP for their inputs and enthusiasm that has resulted in the success that the CRP has certainly been. We would particularly like to thank the three Agreement holders (Dr. Alex Donaldson, UK, Dr. Laurie Gleeson, Australia, and Dr. Roger Morris, New Zealand), for all their help and guidance during the implementation of the CRP.

Regional Workshop on African Swine Fever (RAF/0/011))

Technical Officer: John Crowther

The workshop was organized jointly with FAO from 22 to 26 February 1999 in Dakar, Senegal, to bring together scientists involved in African Swine Fever (ASF) diagnosis and control from Senegal, Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Madagascar, Nigeria and South Africa.

ASF is now regarded as a Pan African disease. Confirmation of its recent effects can be seen in Madagascar where 500,000 pigs (60% of total population) have died since October 1998. It is clear that rapid diagnosis, linked with movement control, is a major factor in limiting the disease and the consequences of failure (as in Madagascar) are devastating. Continued surveillance is also imperative to monitor any outbreaks and to assess the virus in the environment. The FAO has spent the last two years in raising the profile of the disease, particularly in West Africa. The methods used for diagnosis were demonstrated and participants had limited time to perform the techniques. Advantages and relevance of the methods were stressed. A great deal of discussion focused on the emerging disease and the control strategies examined for individual countries. Reports from countries were given. Diagnostic reagents were distributed to selected laboratories. The workshop was extremely timely on focusing on the acute needs for ASF diagnosis and control and to highlight the poor understanding of the disease situation in Africa.

General recommendations

1. Urgent support is still needed for the establishment of standardized kits for antibody and antigen detection.

2. Provision for differential diagnosis should be made in laboratories world wide to identify ASF, in particular in the face of complications caused by classical swine fever.
3. There is a need for countries to assess their capacity to perform the indirect and direct fluorescent techniques (IIF and DIF), as well as ELISA, as the first line of diagnostic surveillance as strongly recommended by the experts.
4. There is an urgent need to alert all national authorities in Africa of the epidemiological implications of ASF, particularly the likely chronic form of the disease. The experts concluded that there was a tremendous threat from ASF to countries both inside Africa and world wide (particularly in S.E. Asia).
5. An intensive training course should be organized dealing with standardized ELISA and IF methods for diagnosing ASF, epidemiological considerations including estimation of disease status of countries, analysis of vectors (arthropod) and wild animal reservoirs; control methods; and cost benefit scenarios for control. Such a course should include all African countries and deal not only with diagnosticians but people involved with epidemiology and those responsible for national disease control. Such a course should be run as soon as the standardized methods and kits are available.
6. Specific work to identify possible vectors of ASF, and examine these for the maintenance of ASF, should be made in all countries which have suffered ASF and also those under threat.

First RCM on "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 meeting was held from 8 to 12 March 1999 in Vienna. It was attended by six Research Contract holders, three Research Agreement holders, one Consultant, one observer, and staff of the Animal Production and Health Sub-programme of the Joint FAO/IAEA Division.

Background

Tanniniferous trees and shrubs are of importance in animal production because they can provide significant protein supplements but, unfortunately, the amounts of tannins that they contain vary widely and unpredictably. Their effects on animals range from beneficial to toxic including death. The toxic or antinutritional effects may be exacerbated in times of stress when a very large proportion of the diet is tanniniferous. With a better understanding of tannin properties, mechanism of tannin action and proper management of the forages, browses could become an invaluable source of protein for strategic supplementation. As the demand for food rises, tanniniferous plants must play an increasingly important part in the diet of animals, in particular for ruminants in small-holder subsistence farming in developing countries. It is therefore critical that techniques be developed to *measure* and *manage* the anti-nutritional components that they contain.

Keeping the above in mind, a Joint FAO/IAEA Co-ordinated Research Project (CRP) on "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" has been initiated. In order to provide a sound basis for this CRP, an FAO/IAEA Consultants Meeting was held in August 1997 in Vienna, which defined the tanniniferous plants to be studied, analytical methods, test animals and the animal response evaluation techniques.

Objectives of the Meeting

To discuss the rationale behind the tannin assays and evaluate protocols recommended at the consultants meeting in August 1997, and to define:

- protocols for collection, storage, drying and grinding of plant material; extraction of tannins; and quantification of tannins;
- standards for use in the tannin assays;
- animal experimental protocols, work plans, logical framework and milestones;
- strategies for networking the CRP-related activities of Contract and Agreement holders and the IAEA.

Conclusions and Recommendations

1. The Research Co-ordination Meeting (RCM) re-affirmed the conclusions of the FAO/IAEA Consultants Meeting held in Vienna in August 1997, that the project should be carried out in 2 phases. During Phase I, for a duration of 2 to 3 years, existing laboratory techniques should be refined, standardized and validated to seek correlation with animal performance indicators. During Phase 2, validated techniques and indicators should be used to exploit the potential benefits of tanniniferous plants as animal feed supplements and as strategic feed in situations of fluctuating nutrient supply.

2. In view of the scarcity of existing background information and uniqueness of this CRP (the complexity and difficulty of obtaining and correlating information from the analytical, *in vitro* and *in vivo* experiments), a further two renewals of the first phase of this CRP (July 1999, July 2000) are needed.

3. In order to ensure smooth and timely progress of the CRP, it was stressed that Agreement holders and the Project Officer should visit CRP sites to assess progress and provide continuous advice on analytical techniques and execution of the experimental work plans and protocols.

4. A training course in analytical techniques for a duration of at least five weeks must be organized as early as possible in the CRP and all Contract holders must attend in order to ensure that reproducible, standardized and meaningful data are obtained during the CRP. Contract holders will set up the analytical procedures in advance of attending the training course to ensure maximum benefit from the course. The tentative dates for the course are the last week of August, and September 1999.

5. Participants will use representative tanniniferous fodder samples in order to learn the analytical techniques. The same samples or mixtures will then be exchanged amongst Contract holders to be used as quality assurance standards.

6. In order to ensure reproducible results, IAEA should provide the Dacron bags for the rumen studies, ^{125}I-labelled BSA, and standards for the rumen bag and *in vitro* gas techniques.

7. The following techniques should be further developed to allow their use on a routine basis in counterpart laboratories. These are the radioisotope assay (based on ^{125}I-labelled protein) and a screening assay for hydrolyzable tannins (ellagi- and gallo-tannins). In addition, inexpensive and stable reference materials need to be developed for condensed tannins as none are available at present. It is suggested that immobilized tannins and a colouring agent (in relation to cyanidin chloride) should be developed for use as standards.

8. These methods and a protocol for screening of tannins by TLC methods should be added to the FAO/IAEA working manual on tannin assays and should be published by the Agency as a TECDOC.

9. Details of all methods to be used (e.g. proximate analyses, tannin analyses, purine analyses) and protocols for animal trials (e.g. feeding trials, collection of samples) must be followed closely and details recorded by all Contract holders.

10. Contract holders need to keep samples of all basal, concentrate and tanniniferous materials, faecal and urine samples for future analysis if required. (A protocol will be provided for collection, fixing and storage of organ and tissue samples. It was considered desirable but optional.)

11. Statistical advice must be obtained immediately from a biometrician/statistician for the short-term *in vivo* studies (adaptation periods and strategies between treatments and number of animals per treatment) before the start of the feeding trials.

12. Frequent e-mail contact between Contract, Agreement holders and the Joint Division

within this CRP is necessary. It was agreed that all participants will provide regular reports in the first week of February, June and October every year by e-mail which will be distributed to all participants in the CRP for comments and suggestions. A future tannin network on the internet, organized and moderated by the Joint Division through its home page should be developed for the interchange of information within and outside the group.

13. The final RCM for Phase 1 will be held in Brazil or Turkey in April/May 2001, and Phase 2 of the CRP should follow immediately with another training workshop in a developing country for the new Contract holders.

14. The analysis and discussion of all results (across countries and species) will be done at the RCM in April/May 2001. A biometrician/statistician should attend the next RCM. All Contract holders will submit the final report, including spreadsheets containing all the data by Feb 2001. The results of the work are intended to be published as a TECDOC.

Second RCM on "Rinderpest Sero-monitoring and Surveillance in Africa Using Imunoassay Technologies" (D3.20.16)

Technical Officer: Andrea Gervelmeyer

Second RCM of the FAO/IAEA/PARC CRP on "The surveillance of rinderpest in Africa using enzyme immunoassays", Machakos, Kenya, 26-30 April 1999.

The second RCM marked the end of the EU-funded PARC-project, which will be continued under the new EU Pan African Project for Control of Epizootics PACE. Research Contract holders from 20 African countries reviewed the progress made in rinderpest surveillance in their respective countries during the last year and discussed laboratory diagnosis issues pertinent to the complete eradication of rinderpest from Africa. The meeting made the following conclusions and recommendations:

The laboratory results are an essential component in the surveillance of rinderpest and it must be ensured that the results are considered adequately in the planning of veterinary activities. Where necessary, the serological results must be followed up rapidly through epidemiological field investigation. The surveillance network recognizes the need to adhere to performance indicators with particular emphasis on the rapid follow-up responses and resolution of sero-positive results in herds expected to be negative.

The meeting recognized that National, Regional and World Reference Laboratories are essential to the success of PACE. The National and Regional Laboratories being the first "line of defence" require regular funding for consumables, diagnostics, equipment, training and to facilitate linkages with other countries, laboratories and PACE projects. Funding for the World Reference Laboratory must be increased to maintain the free diagnostic service and increasing molecular epidemiological studies.

Recognizing the contribution of the laboratory network to the eradication of rinderpest, which is based on the proficiency of the Research Contract holders and the support of SIDA, FAO/IAEA and PARC, the meeting recommends that the sero-monitoring network is expanded into a network of laboratories in charge of diagnosis and surveillance of rinderpest and other priority diseases.

Recognizing the experience of the Joint FAO/IAEA Division in the transfer of the technology which is the basis of the sero-monitoring network the meeting recommends that the Joint FAO/IAEA Division continues to co-ordinate the activities of the network of laboratories in charge of diagnosis of rinderpest and other priority diseases. The activities should be funded by PACE.

Considering the importance for the exchange of the experiences in the surveillance, the meeting recommends to continue the annual meetings of the Research Contract holders from the laboratory network and that these meetings are held jointly with those

responsible for the surveillance networks. The participation of those responsible for surveillance networks should be funded by the national PACE project.

Considering the need to harmonize all activities of PACE, it is recommended that two delegates of the laboratory network attend regional PACE co-ordinators meetings. Participation should be funded by the Regional PACE Units.

Considering that information exchange is essential for the operation of an efficient surveillance network the meeting recommends that support is provided for the installation and recurrent costs of e-mail to facilitate the communication within the network and between neighbouring countries.

Although the practical bench work related to the diagnosis and surveillance of rinderpest is now delegated to technicians the project holders must still ensure that a high standard is maintained. To assist with this process it is recommended that a multinational technician training course should be organized.

Recognizing that all countries supported through FAO/IAEA can purchase the rinderpest ELISA kits at a reduced price it is recommended that the national PARC and PACE projects ensure that the supplier is informed accordingly when the kits are ordered. At the national level it is essential that efficient systems for the clearance of reagents and equipment are put in place.

Recognizing the importance of reliable laboratory results in the diagnosis of the main epizootics and considering the increasing importance that these results are verified as part of trade regulations it is recommended:

- That the established system of external quality assurance (EQA) for the diagnosis of rinderpest consisting of a panel of quality control sera, a laboratory questionnaire and the control of the internal quality controls continues under PACE and that adequate funds are identified under PACE.
- That the EQA is expanded to other priority diseases in particular FMD, PPR and CBPP.
- That in the operation of the EQA, FAO/IAEA should collaborate with PANVAC and that PANVAC's capacity for the operation of EQA should be strengthened.

Recommendations regarding the diagnosis of rinderpest and research/development:

The meeting was concerned by the failure to detect antibody in some lineage 2 virus infected cattle. As a matter of urgency, studies must be carried out to establish if this is due to poor test sensitivity for this lineage or due to a low humoral antibody response. The following must be carried out as soon as possible:

1. Determination of VNT titres of post-infected sera;
2. Determination of optimal time taking post infection for detection of antigen and eye swabs;
3. Determination of the duration for antigen detection in tissues of infected animals;
4. Evaluation of further Mabs in the cELISA to increase sensitivity for lineage 2;
5. Evaluate changes in test protocol to increase test sensitivity;
6. Evaluate any other technology currently available which may assist in detection of lineage 2 virus.

As soon as progress has been made in improving the detection of lineage 2, the results should be transmitted to the whole network.

The meeting realizes that the current cut-off value for the cELISA was designed for sero-monitoring and correlates with protection. A lower cut-off value will increase test sensitivity, assist in detection of antibody to lineage 2 virus and speed up detection of foci of infection. The meeting feels that rather than change the cut-off value (which is stated in the O.I.E. manual of standards) values between 40 to 50% must be considered as suspect and field staff must be alerted to undertake an investigation and, where appropriate, to re-sample. Thus any values greater than 40% must initiate a field investigation.

The meeting felt it is imperative that constant monitoring of the geographical delineation of

lineage 1 and 2 viruses is maintained so that national veterinary field services can be warned of possible changes in clinical syndromes due to the emerging of new lineages in different geographical areas.

Funding should be set aside for PACE-related research as and when required.

Considering that the serological results of the rinderpest ELISA need correct interpretation, it is recommended that the sero-surveillance and sero-monitoring results are analyzed at regular intervals through frequency distribution analysis and software to accomplish this should be included in any ELISA reading software supplied by IAEA.

Considering the importance of peste-des-petits ruminants in the eradication of rinderpest from Africa and considering the constraints of the currently established serological tests, it is recommended that further research to improve the current diagnostic tests continues and is funded through PACE.

The meeting felt that once validated, pen-side diagnostic devices for the detection of rinderpest antigens should be made available to all laboratories carrying out active surveillance.

Recognizing the need for the establishment of efficient surveillance systems for CBPP, it is recommended that adequate guidelines be developed and distributed.

While offering our condolences to the family of the Terra Nova employee recently killed in Somalia, the meeting wishes to offer every support and encouragement to the NGO field staff currently working in Southern Sudan, Southern Somalia and North-east Uganda. Organizations such as Terra Nova and UNICEF OLS, Sudan, should continue to receive financial support through PACE. The meeting appreciates that without the courageous activities there is no hope for the disease eradication.

Final RCM on "Use of RIA and Related Techniques to Identify Ways of Improving Artificial Insemination Programmes for Cattle Reared Under Tropical and Sub-tropical Conditions" (D3.10.20)

Technical Officer: Oswin Perera

The final RCM of this CRP took place from 10 to 14 May 1999 at the Swedish University of Agricultural Sciences, Uppsala, Sweden. It was attended by 13 Research Contract holders, 4 Agreement holders, one Technical Contract holder and the FAO/IAEA Technical Officer.

The objectives of this RCM were to present the results obtained by all participants over the five year period of the CRP, to discuss the relevance and potential applications of the findings for future improvements to dairy production in developing countries, and to edit and prepare the scientific papers for publication by IAEA. The main conclusions and recommendations were as follows:

1. Conclusions

1.1. The standardized methodology and uniform approach to data recording and analysis has resulted in the generation of a unique international data set on the current status of artificial insemination (AI) in cattle in 14 developing countries of Asia and Latin America.

1.2. Measurement of progesterone by radioimmunoassay (RIA) in milk samples collected at specific times in relation to AI, combined with the use of the computer database AIDA (Artificial Insemination Database Application), has proved to be a powerful tool for calculating reproductive indices and identifying factors which affect them. The Guide to AI Data Analysis (GAIDA) system was a useful adjunct to facilitate data analysis.

1.3. The methodology and approach have provided a better understanding of the complex factors influencing AI programmes and, in many countries, have resulted in the first reliable assessment of the success rate of AI and the efficiency of reproductive management by small-scale dairy farmers.

1.4. The CRP has been a good learning experience for the participants. It has provided an opportunity to work directly with AI

personnel and farmers, strengthened capability for project planning, organization and management, lead to interchange of experiences at international level and exposure to the range of problems existing in different countries, and shifted the research emphasis of participants to a more problem solving approach.

1.5. The results, based on over 11,000 services in 7,990 cows on 1,735 farms, have permitted a clear understanding of the major constraints and factors contributing to inefficiency of AI services. They have highlighted the need for closer monitoring of field results by AI service providers and for better education of AI technicians and farmers.

1.6. The conception rate to first service ranged from 15% to 62% in the study areas of the 14 countries, with an overall mean of 41%. The overall mean intervals from calving to first service and to conception were 122 and 138 days, respectively.

1.7. The main causes of low fertility were heat detection failure, inseminations at inappropriate time, poor semen quality, embryo mortality, seasonal influences and factors related to management on individual farms.

1.8. Overall, 17.3% of cows were inseminated at an inappropriate time (range 2-55% among countries). Of this, 7% (1.5-18%) were during the luteal phase or pregnancy and 10% (1-48%) were during anoestrus.

1.9. Of the services performed at an appropriate time, 24.7% did not result in a pregnancy as diagnosed by progesterone measurement at 22-24 days (due to non-fertilization or early embryonic death). A high proportion of these cows were not submitted for further services until rectal palpation 2-3 months later, highlighting the failure of farmers to detect subsequent returns to oestrus.

1.10. Of the animals diagnosed as possibly pregnant by progesterone assay, 12% were found to be non-pregnant at rectal palpation (due to late embryo mortality or persistence of luteal function).

1.11. The efficiency of non-pregnancy diagnosis based on progesterone assay at 22-24 days after AI was greater than 95%.

1.12. Interventions aimed at improving fertility were undertaken by several contract holders. These included improved nutrition, management of suckling by calves, restricting breeding to favourable seasons, education of AI technicians, synchronization and/or induction of oestrus using hormonal treatment and conduct of field fertility clinics. Adoption of some of these practices by AI services and farmers resulted in beneficial impact on reproductive performance.

1.13. The CRP has clearly demonstrated the value of accurately identifying the management problems as a basis for implementing interventions. It has already assisted in improving the performance of AI technicians and has been instrumental in initiating programmes aimed at improving the dairy industry in some countries.

1.14. The results clearly demonstrate the potential value of the progesterone RIA in providing diagnostic and related services to farmers in developing countries. Of the participants, 92% confirmed the feasibility of establishing a non-pregnancy diagnosis service, provided that some financial support and assay reagents were available during the initial phase to demonstrate cost-effectiveness.

2. Recommendations

2.1. The future sustainability of the methodology used in this CRP will rely heavily on the continuous availability of cost-effective reagents required for progesterone assay in developing countries. This should be ensured through appropriate regional strategies for the production and distribution of essential reagents.

2.2. The AIDA database has great potential for application in national AI programmes and farmer-oriented services. Its further development and customization for specific needs should be supported.

2.3. The survey methodology developed under this CRP should be used for monitoring and improving AI services in other areas of participating countries and also extended to other countries.

2.4. There is a need to focus on aspects related to male reproduction in AI services and to adopt standard procedures for identifying inefficiencies in the production, handling, transport, evaluation and utilization of semen.

2.5. Based on the findings of the current CRP, participants should continue to test and introduce appropriate interventions for further improvements in reproductive efficiency.

2.6. The links established between scientists, AI services, farming communities and extension systems must be further strengthened and developed. This should include regular monitoring, analysis and utilization of data collected in AI programmes, regular communication and interchange of information between researchers, extension staff and farmers.

2.7. It is strongly recommended that routine services to dairy farmers, including diagnosis of non-pregnancy and infertility based on progesterone RIA, be established.

Second 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

The meeting was held from 17 to 21 May 1999 in Pretoria, South Africa.

The meeting reviewed the work of the Research Contract holders. The individual reports highlighted key areas in the problems of technology transfer of molecular techniques, in particular for the establishment of validated polymerase chain reaction (PCR) methods.

Major areas discussed

1. Training. It was stressed that both intensive training in basic molecular biology as well as specific applications, is essential. Personnel are lost to commercial companies who can offer much larger salaries, and this is highly disruptive. Better methods for training should be examined. This includes group training for adequate periods of time with certification that candidates have good basic knowledge of molecular techniques.

2. Good laboratory design. This is absolutely essential before PCR is attempted.

3. Contamination problems. These are common and greater precautions are needed to identify and avoid them.

4. Protocols. It was concluded that an 'agreed' protocol using the PCR for rinderpest, PPR, and related viruses, can be produced. This does not indicate that other protocols are invalid, but will provide a known working standard, incorporating developments in PCR technologies over the past two years, e.g. 'Hot start', and 'wax bead' methodologies, as well as the use of more stable enzymes. This protocol will be prepared by Agreement holders and field tested in the Research Contract holders' laboratories in the near future. There was recognition that account must be taken of the available equipment (e.g. thermocyclers), in the agreed protocol.

5. Differential diagnosis. Sets of primers to investigate samples for virus genomes will be standardized. These will examine rinderpest, PPR, IBR, BVD and MCF. This should allow scientists not only to indicate whether a sample is negative for one disease, but also to possibly identify a positive signal against another disease. There is increasing pressure from administrations asking the question "Well if it is not rinderpest, then what is it?". The development of differential diagnostic tests using PCR will assume increasing importance under GREP.

6. Role of PCR. All the participants stressed that PCR technologies must be used in conjunction with serological techniques, and that PCR alone was a dangerous route to take. It was acknowledged that there is often political pressure for this route, which should be resisted. Discussions as to the feasibility and use of sequencing PCR products were made. These included use of automatic and manual sequencing and commercial sequencing services. The role of PCR in

studying diseases where serological techniques were unsuitable, is also made.

7. Help desk. The need to have a source of expertise on PCR was emphasized. The role of the Joint Division in providing a "help desk" facility was discussed. It was strongly emphasized that a priority for efficient technology transfer and sustainability must be the establishment of e-mail in all laboratories.

Research Contract holders prepared logical frameworks outlining their next year's research schedule. Individual needs for equipment were discussed.

There was consensus that the RCM was extremely useful and timely in emphasizing the problems of technology transfer of the PCR in Africa.

D. STATUS OF EXISTING CO-ORDINATED RESEARCH PROJECTS

Use of RIA and Related Techniques to Identify Ways of Improving Artificial Insemination Programmes for Cattle Reared Under Tropical and Sub-tropical Conditions (D3.10.20)

Technical Officer: Oswin Perera

The Final RCM was held in May 1999 (see Past Events for a detailed report) and a full account of the results will be published by the end of this. The CRP is therefore completed.

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 now in its Phase II, has six new Research Contracts and two Research Agreements making in all nine Research Contract holders and six Research Agreement holders. The CRP is aimed at developing a method which can readily be used by farmer advisors or extension workers 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. The next RCM will be held in March 2000 to assess the progress of the work conducted and to develop procedure(s) to assess the impact of the techniques developed.

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. The first RCM was held in Vienna, Austria, from 8 to 12 March 1999 (see Past Events for conclusions and recommendations). The Contract holders will be provided training on tannin assays at the Institute for Animal Production in the Tropics and Sub-tropics, University of Hohenheim, Stuttgart, Germany, from 23 August to 24 September 1999.

To Improve the Effectiveness of Monitoring Trypanosomosis and Tsetse Control Programmes in Africa Using Immunoassay and Parasitological Techniques (D3.20.13)

Technical Officer: Ron Dwinger

The CRP is aimed at using an immunoassay technique (ELISA) for improved diagnosis of

trypanosomosis and at applying this serological technique together with standard parasitological techniques, such as the buffy coat technique (BCT) for monitoring the effectiveness of tsetse and trypanosomosis control programmes.

All Research Contract holders (RCH) have received consumables which will enable the validation of two indirect ELISAs designed for detecting antibodies directed against *Trypanosoma congolense* and *T. vivax*.

The RCH have been requested to send preliminary results, being raw optical density data and PP values of the serum samples tested (with a complete background history of the samples) not later than mid-March, 1999. The results will enable an overall analysis for validation of the antibody-detection ELISA.

Moreover, a full and detailed report of the investigations should be submitted to Vienna by August, 1999. Thus, it will be possible for the Research Agreement holders to examine the results and discuss the reports during the final RCM, which is planned for 6 to 10 September 1999, at the ILRI site in Addis Ababa, Ethiopia.

Use of Immunoassay Technologies for the Diagnosis and Control of Foot-and-Mouth Disease in South East Asia (D3.20.14)

Technical Officer: Martyn Jeggo

The final RCM took place in Phnom Penh, Cambodia, from 22 to 26 February 1999 (see Past Events for a detailed report) and the results will be published as an IAEA TECDOC later this year. This CRP is now completed.

Rinderpest Sero-monitoring and Surveillance in Africa Using Immunoassay Technologies (D3.20.16)

Technical Officer: Andrea Gervelmeyer

This CRP has 20 Research Contracts and two Research Agreements. The research focuses on the use of the FAO/IAEA rinderpest ELISA for the surveillance of rinderpest through surveys and active disease research.

The third RCM is planned to be held in Garoua, Cameroon, in March 2000.

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 CRP has seven Research Contract holders involving investigations on rinderpest, peste-des-petits ruminant (PPR), contagious bovine and caprine pleuropneumonia (CBPP and CPBB). The third RCM will tentatively be held in Namibia in January 2001.

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

Technical Officer: Andrea Gervelmeyer

This CRP has 11 Research Contracts and three Research Agreements. The research carried out under this project is aiming at the validation of the competitive CBPP ELISA for the diagnosis of antibodies against *Mycoplasma mycoides mycoides sc.* The second RCM will be held from 27 September to 1 October 1999 in Lusaka, Zambia (see also under Forthcoming Events).

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: Ron Dwinger

A description on the first RCM held in Rabat, Marokko from 8 to 12 March 1999 is available on page 10 of this Newsletter.

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

This CRP has 13 Research Contracts six Research Agreement holders. The CRP started in January 1999.

The first RCM will be held in March 2000 in Rio de Janeiro, Brazil.

E. NEW CO-ORDINATED RESEARCH PROJECTS

Application of PCR-ELISA for the Diagnosis and Control of Animal Trypanosomosis

Technical Officer: Ron Dwinger

Introduction

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 individuals. 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 (sub-acute) 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 be used 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 individuals that have tested negatives 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 a more effective diagnosis and surveillance of trypanosomes.

Expected outputs

- Development of a standardized PCR test to detect trypanosomal DNA in blood samples. The ideal golden standard test would consist of a unique reaction using one couple of primers amplifying the DNA of all pathogenic trypanosomes of mammals. Since this test is not readily available, in the first phase the PCR will consist of a species-specific test, applied with primers already available that have been shown to properly amplify the DNA of: *T. vivax*
  T. brucei sensu lato
  T. congolense (savannah type)
- Modification of the technique to an easy-to-use, more sensitive, standardized format, which can handle larger numbers of samples (PCR-ELISA).
- Development of a 'pan-tryp' test that will amplify the DNA of all pathogenic trypanosomes of mammals. The test can be applied in specified geographical regions to assess trypanosomosis prevalence and assist decision makers in focusing and implementing appropriate disease control programmes.
- Evaluation of the PCR-ELISA for the identification of sleeping sickness using human blood samples.
- Application of a more sensitive technique to evaluate the importance and identify the presence of animal reservoirs of human trypanosomosis.
- Improved monitoring of control and/or eradication programmes with a more sensitive diagnostic technique with the result that a larger number of animals can be identified as infected and subsequently treated, and that animals no longer infected with parasites will be correctly identified.
- Improvement of knowledge and technical skills of Research Contract holder's in the use of molecular tools for diagnostic and epidemiological studies through training activities. Workshops will be organised during the Research Co-ordination Meeting's dealing with aspects of disease diagnosis, analysis of data and application of results for rapid risk assessment or appropriate orientation and implementation of disease control programmes. Short-term training fellowships will be awarded for selected scientists in collaboration with partner institutes possibly leading to higher degrees.

Proposals

Scientists working in countries in Africa, Latin America and Asia, where trypanosomosis is a serious problem for the livestock industry and for human health and where control programmes are in operation, are requested to submit research proposals using the appropriate forms ("Research Contract Proposal").

Only those institutes with already sufficient laboratory equipment and capability in the

areas of ELISA and PCR technology present should apply for participation in the new CRP. The number of participants will be between eight and ten.

Proposals should describe the experimental design (for example number of samples, number of animals, geographical area, parameters, sampling techniques, experimental animals, etc.) of the validation and application of the PCR-ELISA. In addition, the expected output and benefits (for the laboratory, the farmers and the country) should be indicated.

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

Technical Officer: Martyn Jeggo

It has been decided to carefully review the activities to be undertaken under this CRP to ensure that it is in line with the rapidly changing needs and opportunities in this area of food quality monitoring. All those submitting proposals have been informed accordingly and a re-evaluation of submitted proposals will be undertaken in the coming months.

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 back-stopping through visits by IAEA experts for periods of up to 1 month. Such support would be available to IAEA Member States.

F. QUALITY ASSURANCE PROGRAMMES

EQA Highlights

Since the last Newsletter, data from 4 EQA rounds with FAO/IAEA ELISAs were analyzed: two rounds with the indirect brucellosis ELISA (BRA97a and BRA98a), one round with the competitive Rinderpest ELISA (RP98a) and one round with the FMD LPBE (FMD98a). Detailed interim reports, including a list of 'recognized' laboratories, were produced and distributed to the participants and interested institutions, e.g. FAO, OIE.

Overall, results show that the majority of participating laboratories have a good proficiency in conducting the FAO/IAEA ELISA test. However, several laboratories still need to improve their IQC practices; i.e. they must concentrate on the monitoring and analyses of the IQC data and should regularly check the calibration of their ELISA equipment. To improve this situation, a number of steps have been undertaken:

- Guidelines for the auto-monitoring of internal quality controls have been produced. A document entitled: "Internal

Quality Control (IQC) of Competitive Enzyme-Linked Immunosorbent Assay (C-ELISA) for the Measurement of Antibodies against Rinderpest and Peste des Petits Ruminants (PPR) Viruses Using Charting Methods" describes the proper way of producing and analysing IQC charts. The document also includes troubleshooting procedures based on the most common problems in assay performance. Similar documents are being prepared for other FAO/IAEA ELISAs.

- Additionally, an Excel spreadsheet has been produced to assist a laboratory to produce its own IQC charts. The advantage of the use of the spreadsheet is its easy use and uniform approach. ELISA data can be imported/converted from different programmes (e.g. EDI, Procomm) and then are automatically displayed as graphs showing intra- and interassay variation. The same data can be sent via e-mail attachment or on diskette to the Technical Officer/EQA Co-ordinator for further analysis.
- To improve the calibration and maintenance procedures, a document entitled: "The Laboratory Wizard – A practical loose-leaf edition guide for all who want to share and update ordinary information reported from technical staff of diagnostic laboratories world-wide" is being distributed and continuously updated.

It is hoped that these measures help colleagues who directly work with the ELISA assisting them to identify early stages of problems in assay performance.

Future EQA rounds and perspective for recognition

The definition for 'Recognition' requires that "a laboratory must have successfully fulfilled all of the requirements of the EQA for the designated assay including the most recent proficiency tests."

Based on the results supplied during earlier rounds, some countries have accumulated good data for the different EQA components, e.g. correct identification of EQC samples, but no submission of IQC results or no questionnaire information. Provided that results from all EQA components are received and evaluated as acceptable, the following laboratories (expressed in code numbers) are earmarked for 'Recognition' for the next EQA round. See Table 1 below.

Résumé of EQA rounds with the RIA for the determination of progesterone in milk and serum/plasma samples

RIA EQA

Recently the analyses of the 21st External Quality Control (EQC) exercise has been concluded. EQC samples were distributed to 23 laboratories for milk determination and to 12 laboratories for serum/plasma determination as part of the FAO/IAEA External Quality Assurance Programme (EQAP). The report has been prepared from the results returned by 13 laboratories that processed the milk EQC samples (59% response rate) and six laboratories that processed the serum/plasma sample (50% response rate). Within the milk EQC (X and Y samples) there was only one outlayer for each category. The serum/plasma results were all within limits. It is concluded that results obtained during this round were better than results from earlier rounds.

The 22nd EQC round for milk and plasma/serum is scheduled for June 1999.

Table 1

Rinderpest:	**Brucellosis**
1 (need to supply more IQC data)	1
2	2
5	5
8	6
9	12 (IQC data outside)
10	13 (IQC data outside)
11	17 (IQC and quest. missing)
12 (need to supply more IQC data)	28(IQC data outside)
13 (need to supply Questionnaire and IQC data)	30
14	37
15	38 (IQC data outside)
Rinderpest:	**Brucellosis**
16	39
22 (IQC data not OK in earlier rounds, OD for Cm too low)	
23	
24	
26 (need to supply IQC data)	
29 (EQC results were wrong in last round, PI results too low)	
30	
31	

G. COMPUTER SOFTWARE PROGRAMS

1. SID

SID 3.1 has now been supplied to most of those using a previous version of SID. It provides a computerized basis for linking field data with laboratory test results.

2. TADInfo

Under the FAO EMPRES programme a new software program called TADInfo is being developed for use at the national, regional or global level. This program will be designed to allow those making decisions on disease control or eradication to be better informed through a systematic collection and multiple manipulation of reports on disease occurrence. It is foreseen that such reports will be geo-referenced (either at the point of collection or subsequently centrally) to allow the full use of GIS (geographical information system) in analysing these reports. A link within this approach is a software program (LABInfo) for tracking laboratory samples from their collection point, to the laboratory for testing and the submission of a final test report (see below).

Driving the TADInfo initiative from FAO Headquarters in Rome is Roger Paskins and he will work closely with us.

3. LABInfo

The Joint FAO/IAEA Division and EMPRES, FAO have commenced the development of a system to assist laboratories in recording, analysing, interpreting and presenting their

data for tracking and managerial purposes. The main objectives of this product, LABInfo, is to assist in daily management of submissions, sample tracking and facilitation of reporting.

LABInfo is intended to be distributed to national laboratories, as a counterpart of the national animal disease information system, TADInfo, that is currently being developed by FAO and field tested in pilot countries.

H. GEOGRAPHICAL INFORMATION SYSTEMS — UPDATE

Two visits have been made to the TALA (Trypanosomiasis And Land-use in Africa) Research Group and ERGO Ltd. (Environmental Research Group Oxford) at the Department of Zoology, University of Oxford, in December 1998 and February 1999.

The aim of the first visit was to get familiar with the set-up, the updated version and future developments of the DAVID (Disease and Vector Integrated Database) program for future training purposes and disease mapping exercises. A debugged version has been received and the first updated version is on its way.

In addition, some initial discussions focused on the best approach to "determine priority areas for tsetse control in Africa" using a GIS.

The purpose of the second visit was to collect satellite images and digital maps and data for the GIS-exercise "determination of priority areas for tsetse control in Africa" for the study-areas (Ghibe Valley, Didessa Valley and south-west Ethiopia). This was done through importing and resampling of 239 satellite images, digital maps and data of different subjects (for example climate, vegetation, population) into latlong projection (deg) in a *defined* window for south-west Ethiopia.

Preliminary research to determine availability of data sources and data quality for the GIS-exercise "determination of priority areas for tsetse control in Africa" is undertaken at the moment. At a later stage, a final database design and data organization (data dictionary) structure will be produced. Thereafter, the methods of analyses will be determined. A limiting factor for this exercise could be the lack of reliable field data, particularly tsetse distribution and disease data.

New GIS software has been ordered. *Cartalinx* is a spatial Data Builder, a digital development tool that serves as a companion to a variety of GIS and desktop mapping software products. *Cartalinx* will be mainly used as a digitising tool. An update version of *ArcView (3.1)* with a new S*patial Analyst* application will be used to produce and analyse the (final) products for GIS-training of two Sudanese fellows (envisaged in June 1999) and the GIS-exercise mentioned above.

The *Spatial Analyst* is a new application for spatial modelling and analysis features to create, query, map and analyse cell-based raster data and to perform integrated vector raster analysis.

I. GUIDELINES FOR THE USE OF PERFORMANCE INDICATORS

Performance indicators have been conceived in response to needs of countries to have access to a management tool to monitor their surveillance systems efficiently and are a product of expert missions, detailed discussions, workshops and field testing. More specifically, performance indicators would provide a method of objectively measuring and assessing surveillance systems and their ability to detect rinderpest disease or virus if these were present in the country.

Additionally, countries may use the concept of performance indicators to provide documentation to the OIE for official

international recognition of 'freedom from rinderpest' in order to benefit from increased access to international export markets for livestock and livestock products.

Guidelines for the use of performance indicators, as a part of rinderpest surveillance for the Global Rinderpest Eradication Programme (GREP) have been prepared and will be published as an IAEA–TECDOC. It will be distributed to Chief Veterinary Officers, Directors of Veterinary Services, rinderpest control co-ordinators, sero-surveillance co-ordinators and laboratory directors at national level. The document aims to guide readers through a comprehensive indicator system capable of assisting routine monitoring of a national surveillance programme and identifying any deficiencies the programme may possess to prompt remedial action.

J. PUBLICATIONS

Published:

1. TECDOC entitled "Diagnosis and Epidemiology of Animal Diseases in Latin America": Proceedings of the Final RCMs of an FAO/IAEA/SIDA Co-ordinated Research Programme entitled "Immunoassay Methods for the Diagnosis and Epidemiology of Animal Disease in Latin America" held in Guadeloupe, Lesser Antilles, 13–17 June 1994, and "The use of ELISA for Epidemiology and Control of Foot-and-Mouth Disease and Bovine Brucellosis in Latin America" held in Vienna, Austria, 14–18 April 1997. — IAEA–TECDOC–1055, Vienna, IAEA, 1998.
2. A special edition of the Journal of Preventive Veterinary Medicine. This publication contains most of the reports of the Final RCM of the FAO/IAEA Co-ordinated Research Project on Development of Supplementation Strategies for Milk-producing Animals in Tropical and Sub-tropical Environments held in Malang, Indonesia, 24–28 March 1997, PREVET January 1999, Volume 38, issues 1–2.

In Press:

1. Proceedings of the Final RCM of the Co-ordinated Research Project on "Development of Feed Supplementation Strategies for Improving the Productivity of Dairy Cattle on Smallholder Farms in Africa" held at the Agency's Headquarters in Vienna, Austria, 7–11 September 1998.
2. Proceedings of the Final RCM of the Co-ordinated Research Project on "Development, Standardization and Validation of Nuclear-based Technologies for Measuring Microbial Protein Supply in Ruminant Livestock for Improving Productivity" held at the Agency's Headquarters in Vienna, Austria, 24–28 August 1998.

   These proceedings will be published in 1999 as IAEA–TECDOCs.

In Preparation:

1. 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.

   These proceedings will be published in 1999 as IAEA–TECDOC.
2. Surveillance of Rinderpest in Africa — Reports 1998.

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