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Celebration of freedom from rinderpest during the IAEA 55th General Conference

To Our Readers

Dear Colleagues,

The biggest event in 2011 was the declaration of global freedom from rinderpest by the Food and Agriculture Organization of the United Nations and the World Organisation for Animal Health (OIE). The IAEA celebrated this momentous occasion on the 20th of September 2011, during the IAEA 55thGeneral Conference. The commitment, dedication and hard work of past and present IAEA staff were commended by all participants as the contribution of the IAEA was a critical and essential component of the eradication success. Special recognition needs to go to Jim Dargie, Martyn Jeggo, Roland Geiger, Adama Diallo, Hermann Unger, Mamadou Lelenta, Ali Boussaha and Mokdad Maksoudi. Among the 150 participants were more than 50 Ministers and Ambassadors from the different Member States including dignitaries from FAO, OIE, AU/IBAR, AU/PANVAC and EU. The Director General of the IAEA, Yukiya Amano, the Deputy Director General of the Food and Agricultural Organization, Ann Tutwiler, the Deputy Director of the World Organization for Animal Health, Kazuaki Miyagishima, the Director of the African Union-IBAR, Ahmed El Sawalhy, HE Margaret Kamar, Minister for Higher Education, Science and Technology of Kenya, HE Mr Dinkar Khullar, the Ambassador of India, HE Gianni Ghisi, Ambassador of Italy, made presentations on the achievements and the socio-economic impacts that the absence of rinderpest brought to the world.

IAEA International Atomic Energy Agency

For example, "*The impact of eradication of rinderpest on livestock production in India was colossal -FAO estimates that additional production from 1965 to 1998 was $US289 billion. India is rightly proud of the success of its national rinderpest eradication campaign but today I wish to acknowledge the vital role that the IAEA has played in the global eradication of rinderpest*" (HE Dinkar Khullar from India). "*And congratulate the Agency and the Technical Officers of the Joint FAO/IAEA Division on their dedication in assisting so many MS globally to realize this dream, that has enabled so many poor people to share in the increased prosperity following the disappearance of the disease*" (HE Gianni Ghisi from Italy) and "*Critical to the success of these programs was the need to achieve a high level of vaccine-induced immunity in the national herds and to confirm its effectiveness by appropriate monitoring and surveillance*" (HE Margaret Kamar from Kenya). "*The diagnostic technologies to support this requirement were provided by the IAEA in the form of reagents, kits, equipment, training courses, fellowships and Technical Cooperation projects. Using the various diagnostic tools, countries were able to assemble the data required to confirm that rinderpest was being controlled by vaccination and then undertake an intense period of surveillance to identify any unrecognized remaining foci of infection or virus activity. Such was the success of this approach that by 1998, only a few pockets of disease existed in countries in East Africa and by 2001 the last confirmed case of rinderpest was detected in Kenya. Rinderpest was no longer a threat to the African continent*" (Prof El-Sawalhy from AU/IBAR).

Building on the success of the rinderpest campaign, technology transfer in the field of animal health continued to be a top priority of the Subprogramme during 2011 and this will continue for the future since our next target disease for eradication is peste des petits ruminants (PPR). Member States received support through Technical Cooperation Projects (TCP), projects in control/eradication of African swine fever (Benin), foot-and-mouth disease (Bolivia, Botswana, Bulgaria, Mauritania, Mali, Region of Africa), brucellosis (Bolivia, Eritrea, Kenya), tuberculosis (Bolivia, Eritrea, Mali), rabies (Bolivia), bovine spongiform encephalopathy (Bolivia), highly pathogenic avian influenza (Bolivia, Botswana, Belize, Kenya, European region), contagious bovine pleuropneumonia (CBPP) (Botswana, Kenya, Mauritania, African region), various (multiple) transboundary diseases (Belize, Central African Republic, Cameroon, Eritrea, Madagascar, Mozambique, Sri Lanka, Uganda), Rift Valley fever (Kenya), peste des petits ruminants (Algeria, Angola, Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Cote d'Ivoire, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Gabon, Ghana, Kenya, Malawi, Mali, Mauritania, Morocco, Namibia, Niger, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tunisia, Uganda, United Republic of Tanzania, Zambia, Zimbabwe), tripanosomiasis (Mali), support in implementation of vaccination campaigns and diagnostic kits (Mongolia), fascioliasis (region of Latin America), Newcastle disease (Sierra Leone) and control of drug residues (Uganda).

In most of the tropics, climatic variation, rainfall patterns and droughts reduce plant growth and feed availability and quality leading to extensive livestock losses and reduced productivity. With the assistance of the IAEA, tremendous improvement has been achieved in terms of quantity and quality of the available feed resource base, particularly, in terms of nutritive value, palatability and/or cold and drought tolerance – vital benefits whose effectiveness can be monitored using nuclear technology. For example:

- In **Zambia**, farmers have traditionally kept indigenous animals which they leave to forage for feed and water on their own. However, what is locally available in most pastureland cannot meet the nutritional requirements of the animals. A TCP initiated at the University of Zambia in partnership with the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture is evaluating the nutritional value of the locally available feed resources with potential to provide energy and/or protein supplementation for milking animals. Preliminary results suggest that supplementing the low quality diets with velvet bean (*Mucuna purensis*) in crossbred milking dairy cow diets was comparable to the use of commercial concentrates. Additionally, farmers are beginning to appreciate other benefits that came with improved nutrition – healthy animals are more resistant to diseases, making them less costly to maintain.
- In **Mongolia**, use of alternative animal feed crops and better feeding practices have improved the body conditions of the animals, especially during the harsh winters, thus improving animal survival rates. Use of these improved feeding strategies coupled with improved reproductive efficiency have resulted in great saving for farmers whose input costs have decreased by 67%.
- The **Bangladesh** Agricultural University in Mymensingh developed Community-based Dairy Veterinary Services (CDVS) systems that are operating in three areas (Satkhira, Chittagong and Mymensingh). Milk is delivered to five milk chilling centres set up

by the Bangladesh Rural Advancement Committee (BRAC) Dairy and Food Project, one of the world's largest non-governmental development organizations in the country. This action has resulted in a self-sustaining example to others in the region.

- In **Niger**, the AI centre is mainly working with local breeds such as the Azawak breed, and to a lesser extent with Bororo, Djelli and Goudali breeds. Reproduction management has resulted in an increase of 3 liters per day per cow.
- In **Cameroon**, the AI centre is mainly working with local cross breeds.Reproduction management has resulted in an increase of about 3 liters per day per cow.

Please take a look at our website to follow the latest on software packages that might be of interest. The APH subprogramme has developed a number of software packages: The Web-Based Laboratory Information Management System (LIMS) to facilitate the administration of MS requests by the Animal Production and Health Laboratory (APHL), a Laboratory Information Management System for veterinary diagnostic laboratories (Vet-LIMS) for the MS laboratories, a Genetic Repository Bank (GRB) Database of Genetic Materials and Gene Profiling (GP) for Candidate Gene Information, Development of Genetic Characterization Databases (GC-db) of cattle breeds including an overview of new techniques applied in genome research. All are web based but can also be operated as stand-alone software for an institution. These packages are in English, use open source technology, run under Windows XP and later Windows versions, and are compatible with most of current browsers (e.g. Internet Explorer, Firefox, and Safari). All these modules can be customized for the end-users according to their specific needs. Software and source codes have been distributed to some MS and several scientists from developing countries have been trained on the use of these packages.

Of serious consequence to us all was the Fukushima Daiichi nuclear emergency. As a member of the food monitoring group at the Incident and Emergency Centre (IEC), related to the consequences of the Fukushima Daiichi accident, the Subprogramme has participated in the improvement of software aimed on collection, analysis and decision making in case of nuclear emergency. The software is designed as a referential integrity database, using unique numbers for linking individual parameters in the sampling/reporting process. Thus, the concept can generate numerous user defined reports in a 'real time' manner. Once tested, the database can be installed on-line, for use by authorized users in different Member States. Upon request (authorization), the database will be capable of working in a regional or global mode. All the mentioned software solutions can be used as single or integrated solutions, offering Member States a possibility for systematic data collection, analysis, planning and decision making at the national and regional levels. Thus, they are also expected to facilitate communication and data (experience) exchange between MS, as well as support the management/planning capacities at the national level. Related to nuclear accidents, as a part of the Emergency Preparedness & Response system of the Joint FAO/IAEA Division, the Subprogramme has also developed comprehensive information packages for implementation of remediation measures in agriculture, which are also available on the IAEA website. These packages are 'work in progresses' and are undergoing continuous improvements with up to date, scientifically based information. The aim of these packages is to support Member States in their preparedness towards a possible event and for possible implementation of agricultural countermeasures following a nuclear accident.

Both past and future activities are described in detail in this newsletter and are also accessible at our website (http://www-naweb.iaea.org/nafa/aph/index.html); I thus need not mention them in this section. Please contact us if you have any further ideas, comments, concerns or questions. As discussed in previous newsletters, the Animal Production and Health Subprogramme will continue to move progressively forward and in pace with developments within the livestock field, to optimally serve our Member States.

Concerning news from the Subprogramme, we want to welcome Kathiravan Periasamy from India who joined us in September at the laboratory to support our work on animal genetics and breeding. Before joining the IAEA, he worked as Senior Scientist at the National Bureau of Animal Genetic Resources in Karnal, India, under the aegis of the Indian Council of Agricultural Research. His research interests were in the field of livestock genomics especially buffalo genomics and characterization, conservation and sustainable utilization of indigenous animal genetic resources using molecular tools. His field of expertise include microsatellite based genetic characterization of livestock breeds, molecular phylogeography using mitochondrial DNA variation, candidate gene analysis of economically important traits, SNP detection and genotyping. In addition, we want to welcome Eszter Fesus who joined us as project assistant in July 2011. We hope that both will have a pleasant time with the Subprogramme. Sadly, we also said farewell to two members of our staff, Tony Luckins and Massoud Malek. I want to thank them for their loyalty, dedication and fantastic inputs towards the programmatic activities of the Subprogramme. They will be missed by all – but we plan to keep close contact and will continue to make use of their expertise.

Finally, I wish you all and your families a happy, healthy and safe new year.

Gerrit Viljoen,
Head, Animal Production and Health Section

Staff

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The Animal Production and Health Laboratory, Seibersdorf, is a collaborating Centre for ELISA and molecular technologies in animal disease diagnosis for the OIE.

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Forthcoming Events

Regional project in South East Asia on 'Supporting early warning, response and control of transboundary animal diseases' (RAS/5/060)

Technical Officer: Hermann Unger

This project, accepted to run for the coming 5 years envisages the support of South East Asian Member States to improve and coordinate their fight against transboundary animal diseases (TAD). Major problems discussed are the diagnosis, typing and coordinated vaccination against FMD, HPAI/H5N1, pox viruses and PPR. The aim is to improve the diagnostic capacities to allow proper surveillance activities and preventive measures and to create information links to alert veterinary services in time to allow immediate reaction. For further information please consult the IAEA web site for the regional project RAS/5/060.

Regional training course on 'Major trans boundary and zoonotic animal diseases: early detection, surveillance and epidemiology'

Technical Officer: Adama Diallo

This regional training course aims at building capacity of laboratory staff from the supported laboratories, targeting detection of TADs. The trainees will receive theoretical information on each selected disease combined with practical sessions on the bench. They will also learn application of various tests for each disease and how to interpret and compare results obtained with various tests. This regional training course will address the practical applications of laboratory techniques in early detection and surveillance of important transboundary and zoonotic animal diseases that have high incidence in the Congo basin region in Africa. This training course will be held in Africa in March 2012.

Regional training courses on 'Major transboundary and zoonotic animal diseases in the region: early detection, surveillance and epidemiology'

Technical Officer: Adama Diallo

This training course will address the diagnosis and epidemiology of a selection of regional priority diseases. Trainees will receive theoretical information on each selected disease and also have practical sessions at the bench. They will apply various tests for each disease and will learn how to interpret results obtained with various tests and how to compare them. The aim is to contribute to improving national laboratory staff capacity and competence in the diagnostics of priority diseases in the region, quality assurance of diagnostic results and improving laboratory biosafety. The training course will be held in Asia in June 2012.

Workshop on 'Good laboratory practices for conducting multiple disease diagnosis'

Technical Officer: Adama Diallo

A workshop on good laboratory practices will be held in Vienna during the 3rd quarter of 2012. Experts from well established laboratories (such as FAO/OIE Reference Centres) and regional labs will be invited to discuss their experience on molecular based detection of animal pathogens (viruses, bacteria and parasites). Topics for discussion include: laboratory set-up, workflow, update on new technologies and good laboratory practices for molecular detection of various animal pathogens when only a single laboratory facility exists and has to be shared for multiple activities. The meeting report will be consolidated through teleconferences and email exchanges to produce guidelines for setting up and working in molecular based diagnostics laboratories for animal pathogens detection in limited resources settings. This activity will contribute to build capacity of laboratory staff from the supported laboratories and promote laboratory quality management strategies, targeting diagnostics.

Second RCM of the CRP entitled 'The use of irradiated vaccines in the control of infectious transboundary diseases of livestock' (D32029)

Technical Officers: Adama Diallo and Hermann Unger

This CRP was initiated in 2010 with the overall objectives: (i) to evaluate the effect of radiation on the potency of the irradiated products; (ii) to develop protocols for the attenuation of animal pathogens by irradiation and to define parameters for their use as vaccines against the causative agents of transboundary parasitic and other infectious diseases. The first RCM of the CRP was held in October 2010 in Vienna. The purpose of that meeting was to allow the participants to present their ideas and approaches for developing attenuated animal pathogen vaccines and to discuss with the Research Agreement

holders how they could modify and improve the work programmes for the next two years. The 2nd RCM is planned to be held in Africa in the second quarter of 2012. In that meeting, contract holders will present the results they have obtained so far and the difficulties they have met. Upon discussions with the agreement holders, new work programmes will be developed to take into consideration lessons learnt from the first year project implementation.

Third RCM of the CRP entitled 'The early and sensitive diagnosis and control of peste des petits ruminants'

Technical Officers: Adama Diallo and Hermann Unger

This CRP was initiated in 2007 with the overall objective to develop, validate and transfer to Member States sensitive, specific and rapid tests for the diagnosis of peste des petits ruminants (PPR), certainly the most important transboundary disease of sheep and goats in Africa, Asia and the Middle East. After the first RCM that was held in Vienna, Austria in 2008 and the second one in July of 2010 in Ouagadougou, Burkina Faso, the 3rd and last RCM will be held in September 2012 in Vienna. The purpose of that last meeting is to assess success of test development for PPR control. The participants will present the results that have been obtained during these 5 years of the project implementation and discuss their use in the diagnosis of PPR and eventually its control programs.

Supporting early warning, response and control of transboundary animal diseases (RAS/5/060)

Technical Officer: Ivancho Naletoski

A new regional project on 'Supporting Early Warning, Response and Control of Transboundary Animal Diseases' will be initiated in the Asian region early in 2012. The main focus will be on FMD control, but highly pathogenic Avian Influenza, PPR and poxviruses are also to be targeted. This project will support networking throughout the region to enhance the exchange of specific disease data to facilitate decision making in participating countries and will include technical support and training in rapid disease diagnosis and reporting.
The official invitations to the NLOs are currently being sent out, but interested parties from Southeast Asia are welcome to contact the Technical Officer for further information on RAS/5/060.

Past Events

Superior Achievement Award

The APH subprogramme was awarded the IAEA Superior Achievement Award by the Director General on 4 November 2011 in recognition of the IAEA's contribution to the 'Global Freedom of Rinderpest'. The Joint FAO/IAEA Division and the IAEA's technical cooperation programme were pivotal in ensuring that the relevant technical expertise, training and support in the use of ELISA technologies for the diagnosis of rinderpest were provided to Member States. This long term support was made possible not only through the IAEA's coordinated research and technical cooperation projects, but also in partnership and with financial and technical support from other organizations, including the national governments, the African Union (AU), Swedish International Development Aid, FAO, the World Organisation for Animal Health (OIE), the European Commission/Union, the UK's Institute for Animal Health, and France's Agricultural Research Centre for International Development. More detail about "Global Freedom of Rinderpest" is available in the preface to our readers.

Left to right: E. Winger, R. Reiter, S. Piedra-Cordero, R. Pichler, N. Odongo, C. Lamien (hidden), A. Diallo, M. Lelenta, I. Naletoski, M. Malek and G. Viljoen

Consultants meeting on 'Use of stable isotopes and DNA barcoding in tracing migratory pathways of wild birds, potential carriers of highly pathogenic avian influenza virus'

Technical Officer: Ivancho Naletoski

This consultants meeting was held from 27-28 October 2011 at IAEA headquarters in Vienna. Five experts from Canada, Greece, Republic of Korea, United Kingdom and United States of America, and representatives of the FAO office in Rome were invited to discuss the three topics related to the epidemiology of avian influenza infection i.e. i) the use of stable isotopes as internal markers for determination of migration pathways of wild bird, ii) the use of DNA barcoding to simultaneously determine the bird species and the presence of the virus in the fecal samples and iii) the potential importance of environmental samples (especially natural water reservoirs) in detection of the avian influenza viruses at stop-over points of wild migratory birds. The idea of the meeting was to evaluate the possibility of applying the three technologies in establishing epidemiological linkages between long range migration of wild birds and spread of the virus at different stop-over points of wild migratory birds.

The conclusions of the meeting were that the stable isotope analysis, linked with environmental detection of the virus and bird species may improve the current knowledge of avian influenza epidemiology and ecology. It has been recommended that the Animal Production and Health Section should continue with these activities and include the FAO office in Rome as professional and logistic support via its regional offices throughout the world.

Coordination meeting on the TC regional project 'Supporting early warning and surveillance of avian influenza infection in wild and domestic birds and assessing genetic markers for bird resistance' (RER/5/015)

Technical Officer: Ivancho Naletoski

The coordination meeting was held at IAEA headquarters in Vienna, from 3-4 November 2011. Eleven counterparts from Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, The Former Yugoslav Republic of Macedonia, Montenegro, Serbia, and Turkey were invited to the meeting, as well as the representative of the FAO Sub-Regional Office for Central and Eastern Europe (SEUR) from Budapest, Hungary. The aim of the meeting was to evaluate the outcomes, discuss major constraints and define improvement targets for future collaboration. Areas of activities in the upcoming regional project on 'Supporting coordinated control of transboundary animal diseases with socioeconomic impact and that affect human health' include establishing improved and sustainable regional collaboration.

The participants recommended the following:

- To support and provide funds to carry out activities in the field of nuclear and nuclear related techniques for avian influenza control.

- To facilitate access to relevant analytical facilities to be used for detection of avian influenza, both at national and international level.
- To promote the involvement of young professionals in the project. Additionally, create incentives for young scientists to be involved in applications of nuclear and nuclear-related techniques for avian influenza control.
- To sensitize competent authorities towards providing specialized institutes with dedicated budget lines and programmatic activities.
- To promote in-country multidisciplinary cooperation.
- To promote compliance with international practices and standards.
- To share data within the network of participants and to provide input to OIE and IAEA databases.
- To undertake corrective measures to improve analytical performance and facilities.
- To strengthen management of the project at the national level.
- To provide timely input for regional reports.

Training workshop on 'Classical and molecular veterinary virology'

Technical Officers: Adama Diallo

This training workshop was held from 28 November - 9 December 2011 in Vienna, Austria and was attended by 20 participants from veterinary institutes, diagnostic laboratories and universities from Uganda, Malaysia, Hungary, Philippines, Italy, Turkey, France, Belgium, Kenya, Vietnam, Thailand, United Republic of Tanzania, Indonesia, Lao People's Democratic Republic, Sweden, Serbia, Czech Republic, Sweden, Senegal and Romania.

The purpose of the workshop was to promote the application of classical virology and multiple pathogens detection methods in veterinary diagnostic laboratories of Africa, Asia and Central and Eastern European countries with moderate experience in classical and molecular virology.

The first week was dedicated to molecular virology-multiple viral pathogens detection and was held at the Animal Production and Health Laboratory in Seibersdorf and the second week covered classical virology and was held at the Department of Clinical Virology, University of Veterinary Medicine in Vienna, Austria. This training course was supported by the US-AID tripartite Identify project.

Regional training course on 'Transboundary and zoonotic animal diseases: Early detection, surveillance and epidemiology'

Technical Officer: Charles Lamien

This regional training course (RTC) was held at the National Animal Disease Diagnostics and Epidemiology Centre, Ministry of Agriculture, Animal Industry and Fisheries, Entebbe, Uganda from 20 June to 1 July 2011. For this 'one health' concept training, one week was dedicated to transboundary animal diseases (CBPP and PPR) and a second to zoonotic diseases (RVF and rabies). The aim of this RTC was to enhance knowledge and practical application of early detection and surveillance techniques of important transboundary and zoonotic animal diseases that have high incidence in the Congo basin in Africa as part of the USAID supported 'Identify Project', whose aim is to strengthen capacities in both veterinary and public health laboratories to enable rapid identification of these diseases in the targeted countries. Fifteen participants from Uganda, Democratic Republic of Congo, Cameroon, Republic of Congo, United Republic of Tanzania, Gabon, Equatorial Guinea, Rwanda, Central African Republic, Kenya and Ethiopia attended the training course.

The training course included both theoretical and practical elements that were driven by internationally recognized experts in the field of diagnostics and epidemiology of PPR, CBPP, RVF and rabies – APHL staff, the National Institute for Communicable Diseases, South Africa, the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France. Laboratory practical sessions were also provided on well established procedures that have been harmonized for sensitive and rapid detection and also for surveillance of these diseases.

Regional training course on 'Advanced bioinformatics and laboratory data management for enhanced quality assurance and quality control'

Technical Officer: Adama Diallo

This RTC in support of TCP RER/5/015 on 'Supporting early warning and surveillance of avian influenza infection in wild and domestic birds and assessing genetic markers for bird resistance' and the USAID-supported

'Identify project' was held from 11 to 22 July 2011 in Vienna, Austria.

The aim of the training course was to enhance knowledge and practical application of advanced bioinformatics and laboratory data management to improve quality assurance (QA) and quality control (QC) through good laboratory practices in analysing, storing and retrieving genomic information and to managing biobank resources.

The two week training course covered both theoretical and practical aspects and consisted of lectures and exercises. The first week of the course provided training on nuclear and nuclear related platforms related to the diagnosis and monitoring of transboundary animal diseases:

1. Retrieving, formatting and generating sequences
2. Comparing and analysing nucleic acid and protein sequences;
3. Using of web based databases for influenza viruses
4. Applying phylogenetic reconstruction to classify and identify reassortant and recombinant viruses;
5. Using the Animal Production and Health Subprogramme Web based tool for Applied Bioinformatics.

The second week provided training on:

6. Quality system in veterinary diagnostic laboratory.
7. The web based Laboratory Information Management System (LIMS);
8. Laboratory Information Management System for veterinary diagnostic laboratories (Vet-LIMS);
9. An interactive research and management platform (RaMP);
10. Genetic Repository Bank (GRB) database of genetic materials and Gene Profiling (GP) for candidate gene information;
11. Development of Real-Time Databases (RT-db) for genetic information on small ruminants;
12. Development of Genetic Characterization Databases (GC-db) of cattle breeds.

Nineteen scientists from Albania, Armenia, Bulgaria, Croatia, Greece, Hungary, The Former Yugoslav Republic of Macedonia, Moldova, Poland, Romania, Turkey, Cameroon, Ethiopia, Indonesia, Kenya, Malaysia and Uganda attended the training course. In addition to APHL staff, lectures were given by a colleague from FAO and scientists from the Swiss Institute of Bioinformatics.

Regional (AFRA) training course on 'PPR and CBPP diagnosis and epidemiology' (RAF 5057)

Technical Officer: Hermann Unger

This regional training course on epidemiological surveillance targeting PPR and CBPP under the AFRA project 'Control of Transboundary Animal Diseases' was held in Lusaka, Zambia from 11-15 July 2011. Twenty four participants from 20 Member States were trained on the application and evaluation of the respective ELISAs, qPCR methods and isothermal molecular diagnostics. After a day of introduction, discussion on fitness for purpose of the different tests and their optimal use, the competition ELISA's for CBPP and PPR were run with field samples and titrations were carried out to demonstrate the sensitivity of the test. In order to allow for easy quality control, excel templates were generated presenting the relevant data. The next day qPCRs were run for both diseases applying extracted sample material. These tests, based on an intercalating dye reading, displayed good correlation to the history of the samples, and the QC procedures showed perfect performance of the tests. Nevertheless, it was clear that such testing would only make sense for selected samples due to the time consuming procedures.

Finally, the loop-mediated isothermal Amplification (LAMP) technique was carried out. As no sample preparation is necessary for this test, a number of field samples (affected lungs, pleural fluids and sera) were run directly with this procedure. All samples displayed the expected results (pathology diagnosis) and the melting curve analysis for QC of LAMP was presented and discussed. On Friday a summing up of the topics again presented a pathway for decision making for the different scenarios of outbreaks in small versus large ruminants and serology versus pathogen detection. Finally reagents were distributed so that the participants could immediately implement these techniques in their own laboratories.

Mid-term coordination meeting of the AFRA project 'Control of Transboundary Animal Diseases' (RAF 5057)

Technical Officer: Hermann Unger

The mid-term coordination meeting of the AFRA project on 'Control of Transboundary Animal Diseases' RAF5057 was held from 10 to 14th October 2011 in Entebbe, Uganda. Focus was on the achievements reached so far, room for improvements and the work plan for the coming 2 years.

After an introductory presentation reviewing the objectives and expected outputs of the project the participants gave their presentations on the work done so far. The majority reported on their national surveillance and control activities addressing outbreaks of FMD, CBPP, PPR and NCD. Specifically, the lack of a typing test for FMD to match vaccines; the low protection level of CBPP vaccine and the resulting consequences for control campaigns; the population dynamics as a problem to counteract PPR; and the lack of NCD vaccine (and their local production) were seen as major impediments for the efficient control of TADs. Increasing numbers of ASF outbreaks were reported from most participants and a need for better diagnostics for virus detection highlighted. The diagnostic capacity has generally improved despite a low staffing level and specifically the diagnostic training courses were very much appreciated by the participants.

The scientific coordinator of the project, Edy Baipoledi then presented his experience of compiling the annual reports. The list of countries that had submitted their annual reports was presented to the participants. The consultant indicated that the reports for the period 2009 were generally poor but had subsequently improved for the year 2010. The reporting format was discussed in order to improve the reporting. The project members were asked to respect the time lines for submission, in order to allow for orderly reporting.

Technical aspects of the project were presented. A key technology for early and rapid diagnosis being introduced through this project is loop mediated isothermal amplification (LAMP); detailed presentations of the underlying principles were given and the fitness for purpose of this diagnostic tool discussed. The feedback from participants already using this technology was very positive. In order to demonstrate this technology, Thursday afternoon was devoted to visiting the central veterinary laboratory in Entebbe and a performance of LAMP testing was conducted.

The future activities regarding the veterinary Laboratory Information Management System (LIMS) were discussed. The urgent need for such a tool was again expressed. A number of participating laboratories from SADC were already involved in activities supported by the Italian government (SILAB) and Namibia has the system up and running. The currently developing APH software vetLIMS is running in Botswana. The differences in the technological approach were discussed and the majority of participants favoured a local solution due to low internet coverage. It was decided to convene a meeting preferably at CVL Namibia to see both systems working and agree upon the use of one of these solutions. It was recommended to hold a training course for the management of the software to be selected in support of its dissemination.

A major task for the coming biennium is to establish the capacities to carry out socio-economic studies on disease events or effects of intervention. Specifically CBPP and PPR, but also ASF and NCD present challenges for the livestock industry and the resulting damage is not well documented. Such studies should be carried out in the coming 2 years by institutions that already have an existing link to an economic study project. It was agreed that a focal point will be installed for the support and supervision of these studies and towards the end of this project a publication should be edited to present and summarize all data gathered.

As AFRA projects focus on networking and sharing information, participants requested the support to establish such an internet based tool. After discussing details required for this tool, the technical officer recommended using ‘sparklix’ software, which can perform the tasks. This was installed with access restricted to the participants of this network and experts were invited for discussion.

As participants reported very different disease priorities and approaches, a long session on new tools and techniques regarding all the diseases in question was conducted. Mediated by the TO, participants presented their new tests and approaches and potential implication to disease control were discussed. Specifically the use of plant derived vaccines was seen as a potential tool to control TAD’s in small ruminants and poultry.

Regarding the training, participants indicated that they were very satisfied with the quality of training that has been organized so far by the project. One participant requested that more specific details of the training should be sent to the participants in advance. It was also suggested that the annual reports should indicate how the training has changed or improved the way the participant works.

Further training needs were seen in the field of molecular diagnostics and bio informatics and a training course covering these topics was recommended. As modern information technology will inevitably change the management of laboratories, a training course for computer specialists to set up and maintain the local infrastructure was equally seen as crucial.

The final coordination meeting will take place in October 2013 and the participants voted to have this take place in Vienna.

Biosafety workshop

Technical Officer: Hermann Unger

The post rinderpest biosafety workshop brought together scientists working or having worked with rinderpest virus and experts in biosafety and pathogen sequestration. As

rinderpest is the first animal pathogen eradicated from the globe (only for human small pox virus has this been achieved before), a number of open questions for the institutions still maintaining virus or vaccine stock were obvious. This meeting attempted to summarize these questions and to present them in a document which should be the basis of the envisioned virus sequestration process in the coming years. Finally, it is hoped that only a small number of laboratories will maintain some virus sequences and that these will not be capable of inducing infection again. As the research community requested being allowed to keep a well defined stock at least for the coming years to help virologists in discriminating mechanisms of PPR from RP virus, it is clear that some certainly well restricted research will be carried out. Soon less than 20 countries will possess any rinderpest virus and in Ethiopia a central storage for RPV has been constructed and awaits approval as a Bio security Level III building, to finally collect all important samples left on the continent. Despite a number of legal and documentation issues experienced during the small pox virus sequestration and foreseeable for this exercise as well, only a small number of laboratories envisage the storage or use of RPV in the long term. Similarly the storage of vaccine certainly has an expiration date as well.

Stories

Rinderpest eradication

Countries suffering from the ravages of rinderpest, a highly contagious viral disease of cattle, buffalo, yak and several wildlife species, were officially recognised as disease free by the World Organisation for Animal Health (OIE) in May 2011 and the Food and Agriculture Organization of the United Nations (FAO) in June 2011 when they declared that rinderpest was eradicated world-wide. The IAEA, together with FAO and the OIE, has made significant technical contributions to this achievement through the development, evaluation, validation and distribution of immunological and molecular nuclear and nuclear related technologies for the diagnosis and control of rinderpest.

Motivated by the IAEA's contribution towards the eradication of Rinderpest, a 'Rinderpest Freedom Celebration' was held on 20 September 2011, during the IAEA 55th General Conference in Vienna. More than 200 observers attended the event and representatives of different international organizations (the Director General of the IAEA, Yukiya Amano; the Deputy Director General of the Food and Agricultural Organization, Ann Tutwiler; the Deputy Director of the World Organization for Animal Health, Kazuaki Miyagishima; the Director of the African Union-IBAR, Ahmed El Sawalhy), as well as the Ambassadors of Kenya, Italy and India, gave plenary talks of appreciation to the critical role that the IAEA played during the campaign.

The Animal Production and Health Subprogramme of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and the Technical Cooperation Department have developed, evaluated, validated, transferred and maintained nuclear and nuclear related diagnostic technologies in FAO and IAEA Member States. The IAEA worldwide diagnostic laboratory network was one of the critical cogs in the drive to control and eliminate rinderpest. This diagnostic laboratory network that was established to fight rinderpest now forms the basis of our campaign to control other transboundary animal diseases such as peste des petits ruminants.

Rinderpest, also known as cattle plague, has been responsible for immense livestock losses throughout history. First described in Europe in 1712, it reached Africa in 1850, where it killed millions of cattle and wild animals, and caused widespread starvation. Initially controlled through a policy of 'stamping out' (slaughter of all infected or exposed animals), it was later brought under control by vaccination, which has been key to its eradication in Africa, the Middle East and Asia. This required the development and deployment of diagnostic tests to determine where the disease was, where it was spreading to, which animals were infected and/or at risk and, most importantly, to monitor the efficiency of the vaccination campaigns. The continent-wide implementation of immunoassay technology provided the technological platform to monitor national vaccination programmes of the Pan African Rinderpest Eradication Campaign (PARC) to save animals from the disease and has led to an annual economic benefit to the region estimated at US $920 million.

To address the field diagnosis and control of livestock from this deadly disease, the Enzyme Linked Immunosorbent Assay (ELISA) platform was developed in the early 1980s mainly through IAEA support. This ELISA technology evolved from a radioisotope immuno assay research tool into an affordable nuclear related diagnostic laboratory technology. The rinderpest ELISA was developed in stages. Initially an indirect test (i-ELISA) was used to detect antibodies to rinderpest in infected or vaccinated cattle. Later, with the development of monoclonal antibodies, a highly specific competitive ELISA (c-ELISA) for detecting antibodies was deployed. This had advantages over the indirect test in terms of standardization, applicability to different livestock and wildlife species, as well as increased reliability and quality assurance parameters. Finally, an immunocapture ELISA was developed that could be used to detect viral antigen in pathological samples or exudates from affected animals. This assay was able to distinguish between rinderpest and another virus, peste des petits ruminants, enabling unequivocal identification of rinderpest infection.

Easy to use ELISA kits were provided with control reagents and a protocol containing a list of the essential equipment required to conduct the assay. These kits were specifically designed for use in laboratories in countries participating in the PARC which covered 34 countries. A strict bench protocol ensured a standard level of assay performance within and between laboratories. The protocol also described reagent preparation, handling and use, as well as details of data management and interpretation.

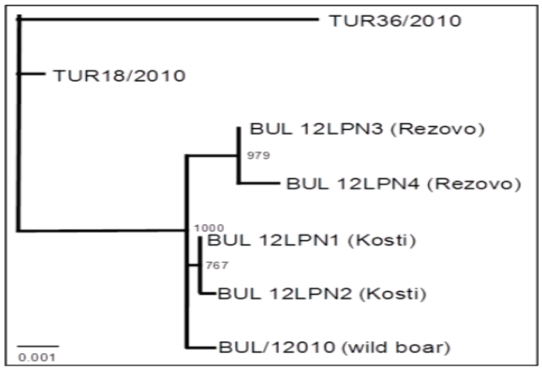
For the sero-monitoring strategy to work, institutional linkages were essential. Through its technical cooperation programme, the IAEA trained national veterinary staff across Africa in the use of ELISA as a monitoring tool, and supported the establishment of a feedback system. Software programmes, specifically written for the Joint FAO/IAEA Division in support of the rinder-

pest sero-monitoring facilitated data acquisition, processing, management, interpretation and reporting, as well as quality assurance. In addition, an external quality assurance programme with check sample panels facilitated international certification of laboratory performance using the ELISA kit or its equivalent. Today, most technical support for sero-monitoring in Africa is provided by national staff trained by the IAEA. These tools and techniques developed for PARC were also used in the West Asian and South Asian Rinderpest Eradication Campaigns as well as in FAO's field implementation activities of the Global Rinderpest Eradication Programme (GREP).

As a result of the collaborative work on international standardization of the rinderpest c-ELISA and the immuno-capture ELISA, these tests have been included in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals as the internationally agreed diagnostic tests for rinderpest and PPR, thereby contributing to assurance of the sanitary safety of animals in international trade. In 1992, the Laboratory at Seibersdorf was designated as the FAO/IAEA Centre for ELISA and Molecular Techniques in Animal Disease Diagnosis and as the OIE Collaborating Centre for Application of ELISA and Molecular Techniques to Animal Diagnostic.

Supporting the control of foot and mouth disease (FMD) in Bulgaria (BUL/5/012)

Since 2009, the subprogramme has supported TCP BUL/5/012 entitled 'Developing and Validating Molecular Nuclear Technologies for Rapid Diagnostics of Foot and Mouth Disease and Genotyping of Indigenous Cattle Breeds'. The researchers at the Department for Emergent and Exotic diseases of the National Diagnostic and Research Veterinary Medical Institute, under the leadership of Prof. Dr. Georgi Georgiev, have received training in advanced molecular methods for detection of the foot and mouth virus (FMDV) and epidemiological evaluation of genetic sequence data in two EU National Reference Laboratories, i.e. Lindholm in Denmark and Riems in Germany.



Initial results of the sequence comparison data obtained in the Bulgarian laboratory

Foot and mouth disease was accidentally detected in shot wild boar in the south-east of Bulgaria, 2 km from the Turkish border and 7 km from the first populated place in Bulgaria. The wild boar was shot on 29 January 2010, samples were submitted on 3 January 2011 and the diagnosis was established on 4 January 2011. As of March 2011, eleven outbreak cases have been detected in 2 municipalities (Tsarevo and Sredets).

Serologically positive buffaloes but showing no clinical symptoms of FMD

The counterparts of the BUL/5/012 project were able to quickly detect the presence of the FMDV in the country (within 24 hours), as well as to determine its genotype. It has been shown that the virus type belongs to the O Panasia FVDV, sublineage 2, which was later confirmed by the World Reference Laboratory in Pirbright, United Kingdom. The virus had the greatest similarity to the Turkish isolates, detected in Anatolia, Turkey, circulating in the country during 2010.

The early and rapid response by the Bulgarian laboratory has brought great benefit to the competent authority in the country, enabling rapid enforcement of control measures; it was also evidence of the successful achievement of the outcomes of the BUL/5/012 project.

Providing IAEA Member States with access to genetic knowledge of local and indigenous livestock

Sheep HapMap

HapMap (short for haplotype mapping) studies, in which a large number of members of a given species are genotyped for a large number of single nucleotide polymorphisms (SNPs), have produced a great deal of genetic information. Using the information from the HapMap, researchers are able to find genes that affect health, disease and individual responses to medications and environmental factors.

A HapMap project on small ruminants (sheep and goats) is extremely important for developing countries to enhance the ability of scientists to use genomics for

improving productivity and other characteristics influenced by genetics, including adaptability and disease resistance. For this reason, a Sheep HapMap project has recently been proposed by the International Sheep Genomics Consortium, Australia, aimed at improving: productivity and product quality for wool fibre and meat; reproduction; and host resistance to parasites.

It is expected that at least 50 breeds from all continents will be included in the study. The Animal Production and Health Section had particular interest in the inclusion of the African Dorper breed in the HapMap study because (i) the breed is well adapted to tropical and subtropical regions and is also being used in cross-breeding programmes to improve the productivity of local sheep in many Member States, and (ii) this breed is one of the constituents of the reference population of animals upon which the ongoing IAEA collaborative study on helminth resistance is based. The IAEA, in collaboration with the International Livestock Research Institute (ILRI), awarded a contract to CSIRO Livestock Industries to perform genotyping of selected breeds from Africa using 60 000 SNP arrays.

Identification of genetic markers for resistance to parasites is a major aim of the project

ILRI provided the International Sheep Genomics Consortium with samples of sheep DNA from the African Dorper breed and data from three generations of pedigrees. These sets of samples included three sets of family trios (i.e. father, mother, and offspring), as it is important for the pedigree status of the animals to be known to ensure the animals are not closely related, except the trios.

A total of 108 purified DNA samples derived from whole blood have been shipped from ILRI to CSIRO in Australia, representing three diverse breeds of African animals. Each sample was entered into the International Sheep Genomics Consortium DNA repository and its associated sample management system. The 108 samples were arrayed into 96 well plates and an electronic manifest was prepared describing the concentration, sample identifier and origin of breed of each animal. The 108 DNA samples received as part of a contract from the IAEA were added to other breed samples to form the International Sheep Genomics Consortium 'HapMap and Breed Diversity Experiment' making the IAEA a formalized participant in the HapMap experiment.

The DNA samples were shipped from the DNA repository to the Illumina 'fast track' facility in California, in the United States of America, to facilitate genotyping of each sample using the Ovine SNP50 BeadChip. This is a high density genotyping platform which generates genetic data from approximately 50 000 SNP markers located across the sheep genome from high quality data. For each breed, the average call rate was exceptionally high, indicating that the experiment was a success. For example, only 19 SNP markers out of a total of 49 034 SNPs attempted failed for the African Dorper DNA samples (i.e. 99.96% of SNP markers tested returned high quality data). The success rate for other breeds was similar.

The full set of genotypic data obtained under this contract was released for public analysis in March 2009 via the International Sheep Genomics Consortium web site (www.sheepmap.org). The full dataset contains information from over 2800 animals, thus it is a large dataset and consists of more than 140 million genotypic data points. To allow researchers worldwide access, the data were formatted and released as .PED and .MAP files that can be analysed using the PLINK program (http://pngu.mgh.harvard.edu/~purcell/plink/index.shtml), which is designed specifically for large SNP datasets and is freely available.

Construction of a goat whole genome radiation hybrid panel

The goat (Capra hircus) is an important agricultural species worldwide, with centuries of phenotypic observations, trait selection and breed differentiation. However, our understanding of the goat at the genomic level lags behind that of many other livestock species. To improve our understanding of the genetic components of traits related to goat health, production and biology, there is an urgent need to develop a detailed goat genome map.

Radiation hybrid (RH) mapping is a method for producing high resolution maps that can be used for integrating linkage maps and can serve as a link across species for comparative mapping. Therefore, it is important to construct a RH panel providing a resource for rapid and large scale physical mapping of the goat genome. This will facilitate the resolution of the genetic and physical distances prior to designing strategies for positional candidate cloning of the gene(s) that are involved in economically important traits.

The aims are to (1) develop and characterize a whole genome RH panel in the goat; (2) develop an initial RH map for the goat using SNP markers; (3) develop a goat RH mapping server allowing the user to map goat markers relative to a framework of previously mapped markers; (4) provide a unique tool for the study of goat genomics and for identifying genes of important economic traits that can be used in genetic improvement programmes; and (5) train researchers, graduate students and technicians to conduct genetic research in the goat.

Indigenous goat and her kid in Myanmar

The C. hircus RH panel was constructed based on the following protocol: skin biopsies were obtained from two adult Boer males, from which fibroblasts were cultured and karyotypic analyses were performed. Both goats had normal 2N=60 karyotypes, and the male named JEW105 was selected as a donor because its fibroblasts grew slightly faster than the others. The Boer was selected due to its extensive utilization in many countries.

Approximately 108 cells were irradiated with a cobalt-60 source for a total dose of 5000 rad. One fusion of the donor goat fibroblast cells with the recipient Chinese hamster TK cells (A23) generated 130 RH colonies. One hundred and twenty one of these 130 colonies were grown to confluent 2 cultures in two 900 cm roller bottles to produce the final harvest for DNA extraction for each colony. The DNA extractions from cell pellets by phenol/chloroform/isoamyl alcohol protocol produced an average of 84 mg of DNA for each RH colony, sufficient for an estimated 168 000 PCR reactions, assuming 50 ng per reaction.

The RH map project is designed to develop a fundamental tool for genomic research in the goat. Additionally, this tool will be useful for the entire research community through comparative genomic analyses with other species. The development of a RH map for the goat will allow researchers that discover a phenotype of interest, to use it as a model for comparative analysis and gene discovery.

These stories as well as other articles are also available under ‘Highlights’ on our Homepage
http://www-naweb.iaea.org/nafa/aph/index.html

Coordinated Research Projects

The control of foot and mouth disease (FMD)

Technical Officer: Gerrit Viljoen

The FMD CRP investigates vaccine matching procedures, vaccine potency testing methods and guidelines, and procedures by which an FMD vaccine's ability to induce production of protective antibodies in cattle, without the need for animal challenge experiments, can be evaluated.

The first Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on 'The control of Foot and Mouth Disease', FAO, Rome, Italy, 10-14 January 2011, was held in collaboration with FAO and EU-FMD. It was attended by all but one research contract holders and agreement holders as well as several observers from EU-FMD, FAO and foot and mouth vaccine and diagnostic manufacturers and producers. Discussions were focused on (1) the status of FMD in the participating counterpart's respective countries (e.g. FMD free vs. FMD free zone with or without vaccination vs. FMD endemic) with respect to the risks and threats; (2) what is currently being done in terms of vaccine matching; (3) which criteria are being used to choose FMD vaccines and how they are being applied; (4) how vaccine potency is being determined and utilized; (5) how post-vaccination monitoring and surveillance are being performed; and (6) the status of counterpart's vaccine laboratory quality assurance and FMD laboratory analysis and diagnoses (i.e. their analysis and/or diagnostic laboratory proficiencies and capacities both for routine testing and research, laboratory infrastructure and procedures). The work plans of all research contract holders and agreement holders (AH) were developed and discussed and all the agreement holders will supervise (based on their respective expertise) identified aspects of the work plans.
Foot and mouth disease is one of the most important livestock diseases known to man due to its high infection rate (ease of spread) and its effect on the limitation of livestock movement and trade. An outbreak of FMD will have a devastating effect on a country's food security with direct impact on national and international trade. The confirmatory diagnosis of FMD and its effective control through prophylactic, quarantine or slaughter-out procedures are therefore of paramount importance as it has financial and trade implications. Vaccination with inactivated FMD virus is undertaken to control FMD in endemic countries or countries at risk. Vaccines, whilst widely available, should match (i.e. should be of homologous serotype and strain isolate) the virulent FMD viruses circulating in the region of vaccine use. Often, however, vaccines are of variable quality, not from the homologous outbreak serotype/strain isolate, and are stored under inadequate temperature conditions and therefore might not be as effective in the field as determined in animal experiments. Due to insufficient knowledge of vaccine strength and antigenic match (antigenic cartography) between vaccine strain and outbreak virus, it is often not possible to pinpoint the weakness of the vaccination strategy and to take action on this weakness. Vaccine effectiveness can be determined by animal challenge, but this is both costly and difficult. In-vitro systems have been developed in different countries since the 1980s, but these are not standardized for international use. Many countries now produce FMD vaccines but often without due consideration of their effectiveness.

In many developing countries, vaccination will continue to be an essential component for the progressive control of FMD. Maximizing the effectiveness of current vaccines and supporting research to improve the effectiveness and quality of those and of new vaccines will be critical. Countries using locally produced vaccines need to assure trade partners that they are using quality assured vaccines in order to overcome the restrictive effects of endemic FMD. The provision of internationally accepted guidelines for quality assurance and alternatives to the present need for animal challenge vaccine trials would be a significant step forward. It is likely that control and eventual eradication in endemic areas with a low level resource base (much of Africa, parts of Asia and Latin America) will require the use of quality assured vaccine preparations, correct vaccine formulations (i.e. homologous strain or isolate vaccine) to protect against outbreak, new generation vaccines with a broader protection base (i.e. cross protection between different strains and isolates) or alternative formulations of existing vaccines.
All the counterparts developed their work plans such that, individually and/or collectively, they work towards generating solutions set by the objectives of the FMD CRP:

- Establish methods and develop internationally agreed protocols for measuring the potency of FMD vaccines using in vitro methods.
- Establish guidelines for optimum population vaccination intervals based on in vitro measurements of potency and duration of the antibody response to structural proteins, after vaccination of cattle and small ruminants with commercially available FMD vaccines, including evaluation of reduced dose op-

tions such as intradermal administration of FMD vaccine;
- Establish protocols and guidelines for application and interpretation of vaccine matching methods (antigenic cartography) to identify the extent of expected cross-protection to type A or SAT viruses;
- Provide further global co-ordination of current research into FMD vaccines for use in endemic settings and to cooperate with other FMD institutions such as EU-FMD and PANAFTOSA;
- To evaluate and standardize (i) virus neutralization (VN) tests, (ii) early and rapid lateral flow and dipsite technologies and their application and use and (iii) antigenic cartography (at IAH and OVI) in relation to VN tests.

The next RCM will take place in 2012.

The use of enzymes and nuclear technologies to improve the utilization of fibrous feeds and reduce greenhouse gas emissions from livestock

Technical Officer: Nicholas Odongo

The world's poorest people, some one billion, depend on livestock for their day-to-day livelihood: food, fibre, manure, draught power, transport, ready source of cash, etc. However, livestock production in many developing countries is constrained because of poor nutrition. Because of climatic conditions, animal feeds are in short supply and what is available is of poor quality. The problem is particularly critical during the dry season when farmers may suffer great animal losses. Furthermore, there is a lack of and/or limited use of commercial concentrate feeds, e.g. soybean, cottonseed and groundnut meals, etc. because the resource poor farmers cannot afford them. The problem is also being exacerbated by the decreasing availability of arable land because of the rapidly increasing human population, soil/land degradation, urbanization and effects of global warming.

Furthermore, methane production from ruminants fed poor quality diets such as straw and stover is higher than those from animals fed better quality forages. The increased concentration of greenhouse gases (e.g. methane) in the troposphere has been implicated in climate change and global warming. Methane production is negatively correlated with energy utilization and can range from two to 12% of the gross energy intake; thus, reduction of methane production through the use of enzymes and rechanneling the hydrogen to short chain fatty acids and microbial mass is desirable. Reducing methane emission from ruminant animals has implications not only for global environmental protection but also for efficient animal production.

Recent research shows that supplementing livestock diets with fibre degrading enzymes can improve the efficiency of feed utilization, resulting in improved animal performance and a reduction of methane emissions. For sustainable development of the livestock sector it is essential to secure sufficient supply of balanced feeds from resources that do not compete with human food − production of grain in developing countries is mostly for human consumption. Novel approaches through the utilization of tree leaves, agro-industrial by-products, feed additives and aquatic sources are required to bridge the gap between supply and demand of feeds.

Overall, the CRP will:

a) Determine the effects of supplementing livestock diets with enzymes on (i) fibre degradation *in vitro*, in situ and *in vivo*, (ii) feed intake and digestibility, (iii) ruminal fermentation and microbial protein synthesis and (iv) milk production and composition and/or growth performance.
b) Determine the mode of action, the critical enzymic activities and application method and rates needed to elicit the desired response.
c) Determine the effects of supplementing livestock diets with enzymes on animal performance, enteric methane production and cost-benefit analysis.
d) Build capacity in developing countries on the use of nuclear and related technologies to improve livestock productivity and to create opportunities for research collaboration internationally.

The first RCM of the CRP was held from 7-11 February 2011 in Lethbridge, Alberta, Canada and the report can be found under Past Events in this newsletter. In this phase, the Research Contract holders will:

- Determine the chemical composition of at least two locally available straws and/or stover.
- Determine the major enzymic activities of candidate exogenous fibrolytic products (xylanase PLUS and cellulase PLUS).
- Evaluate at none, low, medium, high dose rates of 2 types of enzymes (xylanase PLUS and cellulase PLUS) using local substrate in vitro and in situ.
- Use batch culture incubations for in vitro screening of candidate exogenous fibrolytic products (xylanase PLUS and cellulase PLUS) in buffered rumen fluid to determine effects of 24 and 48 h NDF degradation.

Genetic variation on the control of resistance to infectious diseases in small ruminants for improving animal productivity

Technical Officer: Mario García Podestá

Farmers in developing countries, due to the pressure for higher animal output and to the 'advantages' of small numbers of highly specialized exotic breeds from the developed world, have been replacing or crossbreeding

their local breeds with exotic animals for many years. The genetic improvement has been quite successful in many places; however, neglecting or upgrading indigenous animals with exotic breeds is leading to deterioration in genetic diversity.

Much of the genetic biodiversity controls advantageous traits influencing adaptability to harsh environments, productivity, or disease resistance. However, these indigenous animals are underutilized in conventional breeding programmes due to a lack of knowledge and failure to identify breeds and animals carrying the most advantageous traits. There are indigenous breeds with some degree of enhanced resistance, as compared to exotic ones reared in the same environment, especially for gastrointestinal nematode infections. Therefore, the present CRP is aiming, through genomic studies using radiolabeled nucleotides in DNA hybridization, DNA characterization, and hybrid mapping procedures, to identify molecular markers of economic interest that will open possibilities in the future to select and breed animals for enhanced resistance to diseases. The CRP also aims to develop capacity in developing countries in the use of molecular and related technologies and create opportunities for international research collaboration.

The overall objective of the project is to improve productivity in smallholder livestock systems using gene based and related technologies. The specific objectives are:

- To develop capacity in developing countries in the use of molecular and related technologies and create opportunities for international research collaboration.
- To establish or improve programmes for animal identification and data recording for small ruminants in developing countries, allowing for the monitoring of production, reproduction and health traits and generating populations suitable for molecular genetic studies.
- To collect phenotypic data and DNA samples from goat and sheep breeds or populations within breeds with a history of infectious disease resistance.
- To develop expertise on the use and development of bioinformatic tools for the analysis of large datasets of genomic data related to parasite resistance in various breeds.
- To provide valid data for the identification of genetic markers associated with infectious disease resistance and to initiate the development of tools for molecular diagnostics and assisted breeding.

The first research coordination meeting was held in Vienna, Austria, from 21 to 25 February 2011. Research Contract holders are collecting samples from sheep and goat breeds according to agreed protocols. DNA will be extracted and in most cases DNA subsamples will be sent to our laboratory in Seibersdorf to evaluate DNA quality and to be part of the Gene Repository Bank.

Khatiravan Periasamy, who joined the Animal Production and Health Subprogramme in early September 2011, will play an active role in technically supporting CRP participants.

General information applicable to all Coordinated Research Projects

Submission of Proposals

Research Contract proposal forms can be obtained from the IAEA, the National Atomic Energy Commissions, UNDP offices or by contacting the Technical Officer. The form can also be downloaded from the URL http://www-crp.iaea.org/html/forms.html

Such proposals need to be countersigned by the Head of the Institutions 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 Technical Cooperation (TC) Projects. Such support is available to IAEA Member States and can include additional support such as equipment, specialized training through IAEA training fellowships and the provision of technical assistance through visits by IAEA experts for periods of up to one month. Full details of the TC Programme and information on how to prepare a project proposal are available at the URL http://pcmf.iaea.org/

For further information please contact: Svetlana Piedra-Cordero (s.piedra-cordero@iaea.org)

Activities of the Animal Production and Health Laboratory

Genetic variation on the control of resistance to infectious diseases in small ruminants for improving animal productivity

Through two Coordinated Research Projects (CRP), (CRP D3.10.26 - Genetic Variation on the Control of Resistance to Infectious Diseases in Small Ruminants for Improving Animal Productivity and CRP D3.10.25 – Gene Based Technologies in Livestock Breeding: Characterization of Small Ruminant Genetic Resources in Asia) the IAEA embarked on the promotion of the study related to helminth resistance in small ruminants. In the Animal Production and Health Laboratory (APHL), at the IAEA Laboratories, Seibersdorf, initiatives have been taken to develop genotyping tools for single nucleotide polymorphisms (SNPs) already identified in the project. The SNP typing tests will be validated and tested on DNA samples from unrelated individuals of sheep/goat breeds from across the world.

Subsequent to validation and testing, the SNPs will be tested on DNA samples from experimentally challenged sheep/goat from participating Member States to estimate the frequency distribution of alleles at different loci. These SNP typing techniques will be transferred to the research contract holders for testing and validation on sheep/goat DNA samples from field trials. An end point genotyping system with the FRET (fluorescent resonance energy transfer) based KASP (KBiosciences competitive allele specific PCR) system is being used to develop assays for different SNPs. Initially, development of assays for 45 selected SNPs is under way and assays for 36 SNPs have passed the initial validation process. The second round of validation for these 36 SNPs will be started shortly followed by testing in unrelated sheep/goat DNA samples.

Supporting early warning and surveillance of avian influenza infection in wild and domestic birds and assessing genetic markers for bird resistance (Technical Cooperation Regional project TCP RER5015)

This European regional TCP was implemented from 2009 to 2011 and aimed at establishing early bird flu diagnosis and assessment of genetic markers for avian influenza resistance with nuclear molecular methods in the region to prevent spread of avian influenza for better animal health and economic benefits.

One of the objectives of the genetic component of this project was to screen indigenous chicken breeds/strains from different European countries for the distribution of alleles at different candidate gene loci, such as myxovirus resistance (Mx), major histocompatibility complex (MHC), toll like receptors (TLR) and certain microsatellite loci linked to disease resistance in poultry. The myxovirus resistance gene (Mx/resistance) is one of the important candidate genes with respect to genetic resistance to avian influenza. The amino acid variation of Asn (allele A) at position 631 has been found to be specific to positive antiviral Mx/resistance, while that of Ser (allele G) is specific to negative Mx/susceptible.

In this project, initial screening of indigenous and commercial chicken strains from European and Asian poultries is under way to estimate the distribution of susceptible and resistant Mx allele variants. Indigenous chicken breeds, like Shoumenska from Bulgaria, Autohtonous from Macedonia, Aseel and Kadaknath from India, Bangka, Kampang, Gaok from Indonesia and local populations from Poland, Belgium and Croatia, will be screened. An endpoint genotyping based KASP assay will also be developed to type the resistant and susceptible Mx alleles in poultry. Screening of other candidate genes like MHC and TLR will be performed subsequently to detect novel SNP variants related to resistance to avian influenza.

Development of an ELISA test for capripox disease

Serological tools such as ELISA represent a mean for surveillance of diseases. Unfortunately, for capripox, no commercial kit is available and the currently described ELISAs are based on the use of crude viral antigen. The drawback of using crude viral antigens is the difficulty of having a well optimized method for laboratories, and also the fact that certain countries are still reluctant to use killed viruses because of the biosafety risk it can represent if the viruses are not efficiently inactivated. A good alternative to crude viral antigens are recombinant proteins, which can be used to produce well optimized ELISAs and do not present any biosafety concern.

Since 2007, APHL is working on the development of tools for the control of capripox, including diagnostic tests. In particular, research was conducted to identify genes that encode suitable immunogenic proteins for the

development of a capripox ELISA based on recombinant protein. In 2010, five capripox viral genes were identified and cloned for expression. The obtained clones were used to express recombinant capripox viral proteins. Among those proteins, two seems to be promising for use as antigens in the development of an ELISA. Indeed by western blot analysis, those recombinant proteins react very well with sera collected from experimental and natural capripox virus infected small ruminants. Investigation is under way for the development of the test.

finalising software to allow an easy handling of this method by animal disease diagnosticians and scientists.

Training Courses

1. A regional training course on 'Major Transboundary and Zoonotic Animal Diseases: Early Detection, Surveillance and Epidemiology' was organized by the APHL in the framework of the US-AID tripartite FAO/OIE/WHO Identify project at the National Animal Disease Diagnostics and Epidemiology Centre, Ministry of Agriculture, Animal Industry and Fisheries in Entebbe, Uganda from 20 June to 01 July, 2011; the report can be found under Past Events in this newsletter.

2. A training course on 'Advanced Bioinformatics and Laboratory Data Management for Enhanced Quality Assurance and Quality Control' was held at the APHL at Seibersdorf from 11 to 22 July 2011. The training course consisted of theoretical and practical sessions in the application of advanced bioinformatics tools for viral genome sequence analysis (databases, sequence retrieval, sequences comparison and phylogeny), animal genomic data handling (animal genetic resources databases) and laboratory information management systems (LIMS, VetLIMS). This training was jointly funded by the IAEA TCP RER/5/015 and the US-AID tripartite FAO/OIE/WHO Identify project. The report for the training course can be found under Past Events in this newsletter.

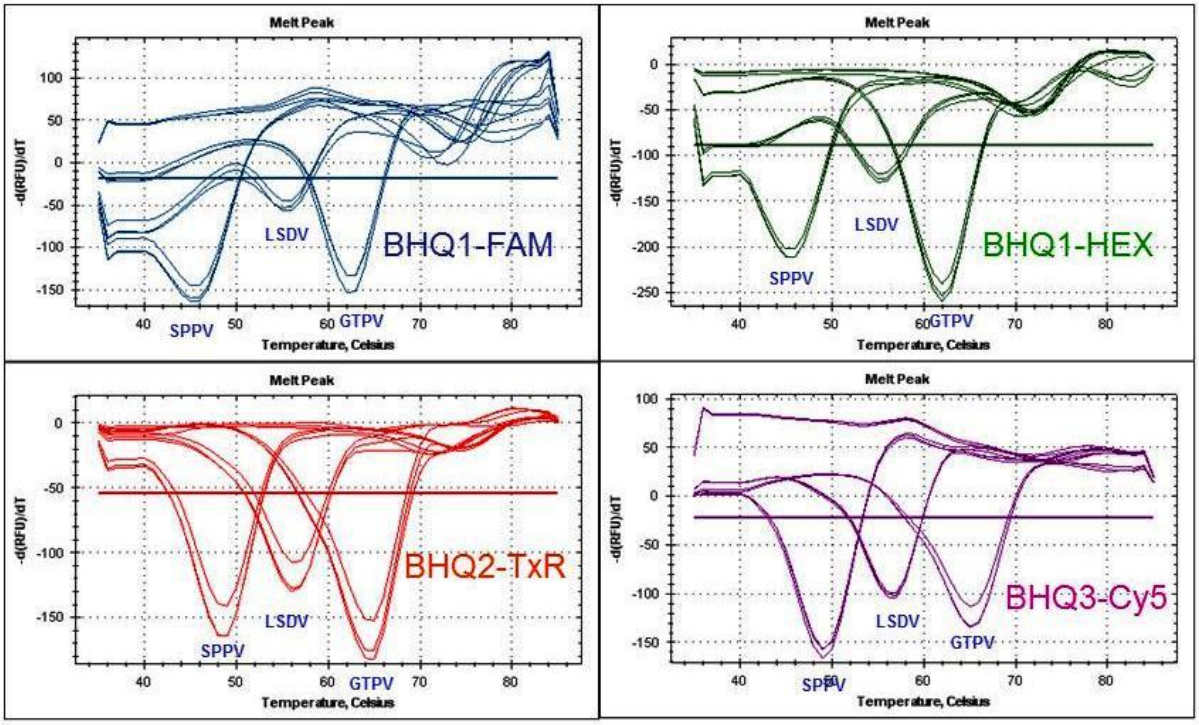


Figure 1. Evaluation of different channels of the BioRad CFX real time PCR system for capripox virus genotyping using the quencher induced fluorescence shut down PCR method: different quencher/flourophore combinations were evaluated (BHQ1-FAM, BHQ1-HEX, BHQ2-Texas Red and BHQ3-Cy5).

Differentiation of capripox viruses by real time PCR

Since 2009, APHL is working on a real time PCR method to be used as an alternative to the classical FRET using dual hybridization probes (see APH Newsletter June 2011 and article published in J. Virol. Methods, 2011, 171: 134-140). The major concern of the classical FRET method is that it requires the use of specialized types of real time PCR machines which possess FRET channels. To overcome this limitation, the new alternative to this method was designed based on quencher-induced fluorescence shut down, that can be performed on any real time machine using the known standard channels of real time PCR machines (Figure 1). The final validation of the method to assess its analytical performances was undertaken in 2011 and the method was transferred to PANVAC in August 2011. It was successfully used to genotype different capripox virus vaccine seeds available in the PANVAC repository and vaccine samples that were received from various manufacturers in Africa for quality control. APHL is currently working at

3. A workshop on 'Classical and Molecular Veterinary Virology' was organized in Vienna from 28 November to 09 December 2011. This course was jointly organized by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and the FAO Animal Health Service (FAO-AGAH), the University of Veterinary Medicine Vienna, the European Society for Veterinary Virology (ESVV), the European Union 'Epizone' project FP6-2004-Food-3-A, the Network of Excellence for Epizootic Disease Diagnosis and Control (EPIZONE), the European Union 'ConFluTech' project FP6-2005-SSP-5B-INFLUENZA and the European Union-funded 'AniBioThreat' project (a project for developing and improving the EU's bio-preparedness for risks in the livestock sector and linked to the new EU action plan for hazardous materials).

The report for the training course can be found under Past Events in this newsletter.

Fellowships and interns

Daniela Horvatek from the Faculty of Veterinary Medicine, University of Zagreb, Croatia was attached to the APHL for 3 weeks (5 to 23 of September 2011) to work on animal pathogen genotyping techniques.

Waqas Ashraf, from the National Institute for Biotechnology and Genetic Engineering, Faisalabad, Pakistan spent a 6 month internship at APHL from 4 July 2011 to study the diagnosis and molecular epidemiology of peste des petits ruminants.

Technical Cooperation Projects

TC Project	Description	Technical Officer(s)
BEN/5/006	Improving Animal Health and Productivity **Objective**: To strengthen, diagnose, and control African swine fever, and increase animal productivity.	Unger / Diallo
BKF/5/008	Strengthening the Development of Small Ruminant Production **Objective**: To combat poverty in the rural environment in Burkina Faso by improving production by evaluating the productivity of different genetic types of small ruminants, improving productivity and reproduction performance of local small ruminants through improved feeding and management practises, and evaluating the impact of gastrointestinal and reproductive diseases in small ruminants and the effectiveness of the medicinal plants commonly used by breeders.	Garcia Podesta / Unger
BOL/5/019	Implementing Molecular Techniques to Upgrade the Diagnostic Facilities of National Animal Health Programmes **Objective**: To strengthen the diagnostic capacity of the animal health laboratories supporting programmes for the control and eradication of animal diseases in Bolivia through the use of molecular diagnostic techniques and training of staff in the use of the techniques; to provide rapid and precise diagnosis of animal diseases to allow better control of economically important diseases of livestock.	Luckins / Naletoski
BOT/5/005	Improving Diagnosis of Animal Diseases **Objective**: To employ nuclear molecular diagnostic techniques for improved diagnosis of trans-boundary animal diseases, such as foot and mouth disease, contagious bovine pleuropneumonia, and avian influenza.	Viljoen
BUL/5/012	Developing and Validating Molecular Nuclear Technologies for Rapid Diagnostics of Foot and Mouth Disease and Genotyping of Indigenous Cattle Breeds **Objective**: To improve livestock by rapid diagnosis and effective control of foot and mouth disease, and genotyping of indigenous cattle breeds through development and validation of molecular nuclear methodologies.	Naletoski / Viljoen
BZE/5/004	Strengthening the Veterinary Diagnostic Laboratory with Capacities in Polymerase Chain Reaction Diagnosis (Not funded) **Objective**: To ensure food security through early detection of H5/H7 avian influenza, and other exotic diseases, and to ensure the capacity for quick response to disease outbreaks with epidemiological surveillance.	Viljoen
CAF/5/004	Improving Livestock Production Through Disease Control and Artificial Insemination **Objective**: To improve animal production in the Central African Republic through livestock disease control and improved breeding by use of artificial insemination.	Naletoski / Garcia Podesta
CMR/5/017	Improving Animal Productivity and Health **Objective**: To strengthen capacity and outreach regarding artificial insemination in ruminants, and to control livestock diseases impeding reproduction and productivity.	Unger / Garcia Podesta
ERI/5/006	Controlling Major Epizootic Diseases and Other Mycoplasma Infections of Livestock **Objective**: To improve the control of transboundary animal diseases, and continue the eradication of tuberculosis and brucellosis.	Unger / Naletoski
HON/5/005	Improving the Nutrition and Health Conditions of Livestock in Order to Increase Productivity and Reproductivity (Phase II) **Objective:** To strengthen and improve livestock production in Honduras.	Garcia Podesta / Odongo / Viljoen
IVC/5/030	Assessing the Genetic Profile for Improved Livestock Production **Objective**: To assess the genetic profile of livestock for the effective revival of stockbreeding in Côte d'Ivoire.	Garcia Podesta / Unger

TC Project	Description	Technical Officer(s)
KEN/5/027	Assessment of Local Feed Resources for Enhancing Fertility and Productivity of Smallholder Dairy Cattle **Objective**: To assess the potential of local feed resources for enhancing the fertility and productivity of smallholder dairy cattle in the Nakuru District of Kenya.	Odongo / Garcia Podesta
KEN/5/028	Applying Nuclear Based Techniques to Control Animal diseases **Objective**: To improve the capacity to diagnose and carry out surveillance of Contagious Bovine Pleuro-Pneumonia (CBPP), Brucellosis, Rift Valley Fever (RVF), Peste Des Petits Ruminantes (PPR) and Highly Pathogenic Avian Influenza (HPAI) using nuclear and related technologies.	Unger
MAG/5/016	Applying Nuclear Techniques to Optimize Animal Production **Objective:** To increase animal production through the improvement of animal health and control reproduction in the Amoron'i Mania region.	Garcia Podesta / Odongo / Naletoski
MAU/5/003	Improving the National Capacity in Diagnostics for Animal Diseases (Infection and Parasitic Diseases) **Objective**: To strengthen the diagnostic capacity of the Centre National D'Elevage et de Recherches Veterinaires (CNERV) to monitor and control trans-boundary animal diseases, particularly foot and mouth disease and contagious bovine pleuropneumonia.	Unger / Naletoski
MLI/5/023	Improving National Capabilities for Characterization of Serotypes of Major Animal Diseases Using Molecular Biology Techniques **Objective**: To identify various serotypes present in Mali in order to improve animal health and increase productivity in milk and meat through increased capabilities for diagnosis and control of foot and mouth disease, trypanosomes and tuberculosis.	Unger / Naletoski / Viljoen
MON/5/017	Supporting the Sustainable Production and Supply of Vaccines and Diagnostic Kits for Transboundary Animal Diseases **Objective**: To produce vaccines and diagnostic kits for transboundary animal diseases.	Viljoen / Luckins
MOZ/5/002	Promoting sustainable Animal Health, Reproduction and Productivity Through the Use of Nuclear and Related Techniques **Objective**: To obtain sustainable improvement in animal reproduction and breeding and animal health through the use of nuclear and nuclear related technologies.	Viljoen
MYA/5/018	Enhancing the Lifetime Health and Performance of Offspring and Improving the Profitability of Livestock Production Systems Through Selective Breeding and Management of the Maternal Environment **Objective**: To improve livestock production and thereby increase profitability through improved management of the maternal environment and health care programmes; b) To train technicians in advanced technologies in the field of research and development, breeding, reproduction, dairy production, nutrition and waste management and train technical staff in livestock data analysis and data processing.	Garcia Podesta / Diallo / Unger
NER/5/013	An Integrated Approach for Improvement of Livestock Productivity **Objective**: To increase the productivity of livestock through implementation of an integrated programme dealing with nutrition and reproduction.	Odongo / Garcia Podesta / Diallo
RAF/5/057	Strengthening Capacities for the Diagnosis and Control of Transboundary Animal Diseases in Africa (AFRA) **Objective**: To strengthen the diagnostic capacity of national veterinary services to monitor and control major transboundary animal diseases, particularly foot and mouth disease, peste des petits ruminants and contagious bovine pleuropneumonia.	Unger / Diallo

TC Project	Description	Technical Officer(s)
RER/5/015	Supporting Early Warning and Surveillance of Avian Influenza Infection in Wild and Domestic Birds and Assessing Genetic Markers for Bird Resistance **Objective**: To establish early bird flu diagnosis and assessment of genetic markers for AI resistance with nuclear molecular methods in the region of Bosnia and Herzegovina, Bulgaria, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Uzbekistan, Kyrgyzstan and the Russian Federation.	Naletoski / Diallo
RLA/5/049	Integrated Control of Fascioliasis in Latin America (in support of National Programmes	Viljoen / Naletoski
SIL/5/011	Controlling Economically Important Livestock Diseases **Objective**: To design epidemiological surveys and adopt appropriate rapid laboratory techniques for the diagnosis of PPR and NCD in small ruminants and local chickens.	Unger / Naletoski
SRL/5/041	Maximizing Productivity on Goat Farms through Cost-Cutting and DNA-Based Technology in Selection for Breeding **Objective**: To improve the productivity of goats of smallholder farmers in Sri Lanka, by introducing new strategies such as supplementary feeding, improved management practices and disease control and by transferring genetic technologies to assist in proper selection of superior breeding animals.	Garcia Podesta / Odongo / Viljoen
SRL/5/042	Applying Molecular Diagnostics to Zoonotic Diseases **Objective**: To enhance the long-term epidemic preparedness by developing competence in molecular diagnosis and surveillance of zoonotic infections.	Kashyap (NAHU) / Unger
UGA/5/030	Improving the Diagnostic Capacity in Animal Diseases (Phase II) **Objective**: To strengthen the diagnostic capacity of the National Animal Diseases Diagnostics and Epidemiology Laboratory in the detection of animal disease and food-borne pathogens including drug residues.	Unger / Luckins / Naletoski
URU/5/026	Increasing the Profitability of Dairy Producers by Improving Reproduction Efficiency, Rational Sustainable Use of Genetic Resources **Objective**: To implement integrated management strategies to improve the profitability of medium size grazing dairy farms by means of (a) integrated nutritional strategies; (b) strategic reproductive interventions; and (c) marker-assisted selection.	Garcia Podesta / Odongo

Publications

Relationship between rumen methanogens and methane production in dairy cows fed diets supplemented with a feed enzyme additive

Zhou M., Chung Y.H., Beauchemin K.A., Holtshausen L., Oba M., McAllister T.A. and Guan L.L.

J. Appl. Microbiol. 111(5):1148-1158 (2011) doi: 10.1111/j.1365-2672.2011.05126.x.

Aims: To investigate the relationship between ruminal methanogen community and host enteric methane (CH_4) production in lactating dairy cows fed diets supplemented with an exogenous fibrolytic enzyme additive.
Methods and results: Ecology of ruminal methanogens from dairy cows fed with or without exogenous fibrolytic enzymes was examined using PCR-denaturing gradient gel electrophoresis (PCR-DGGE) analyses and quantitative real time PCR (qRT-PCR). The density of methanogens was not affected by the enzyme additive or sampling times, and no relationship was observed between the total methanogen population and CH_4 yield (as g per head per day or g kg^{-1} DMI). The PCR-DGGE profiles consisted of 26 distinctive bands, with two bands similar to methanogenic archaeon CH1270 negatively correlated, and one band similar to *Methanobrevibacter gottschalkii* strain HO positively correlated, with CH_4 yield. Three bands similar to Methanogenic archaeon CH1270 or *Methanobrevibacter smithii* ATCC 35061 appeared after enzyme was added.
Conclusions: Supplementing a dairy cow diet with an exogenous fibrolytic enzyme additive increased CH_4 yield and altered the composition of the rumen methanogen community, but not the overall density of methanogens.
Significance and impact of the study: This is the first study to identify the correlation between methanogen ecology and host CH_4 yield from lactating dairy cows.

Monkey CV1 cell line expressing the sheep-goat SLAM protein: a highly sensitive cell line for the isolation of peste des petits ruminants virus from pathological specimens

Adombi C.M., Lelenta M., Lamien C.E., Shamaki D., Koffi YM., Traoré A., Silber R., Couacy-Hymann E., Bodjo S.C., Djaman J.A., Luckins A.G. and Diallo A.

J Virol Methods 173(2): 306-313 (2011).

Peste des petits ruminants (PPR) is an important economically transboundary disease of sheep and goats caused by a virus which belongs to the genus Morbillivirus. This genus, in the family Paramyxoviridae, also includes the measles virus (MV), canine distemper virus (CDV), rinderpest virus (RPV), and marine mammal viruses. One of the main features of these viruses is the severe transient lymphopaenia and immunosuppression they induce in their respective hosts, thereby favouring secondary bacterial and parasitic infections. This lymphopaenia is probably accounted for by the fact that lymphoid cells are the main targets of the morbilliviruses. In early 2000, it was demonstrated that a transmembrane glycoprotein of the immunoglobulin superfamily which is present on the surface of lymphoid cells, the signalling lymphocyte activation molecule (SLAM), is used as cellular receptor by MV, CDV and RPV. Wild-type strains of these viruses can be isolated and propagated efficiently in non-lymphoid cells expressing this protein. The present study has demonstrated that monkey CV1 cells expressing goat SLAM are also highly efficient for isolating PPRV from pathological samples. This finding suggests that SLAM, as is in the case for MV, CDV and RPV, is also a receptor for PPRV.

Asian lineage of peste des petits ruminants virus, Africa

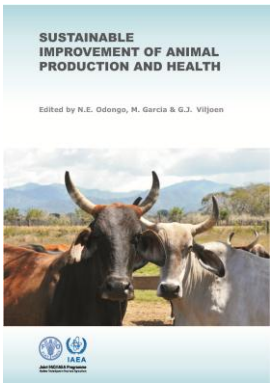
Kwiatek O., Ali Y.H., Saeed I.K., Khalafalla A.I., Mohamed O.I., Obeida A.A., Abdelrahman M.B., Osman H.M., Taha K.M., Abbas Z., El Harrak M., Lhor Y., Diallo A., Lancelot R., Albina E. and Libeau G.

Emerg Infec Dis 17(7):1223-31 (2011)

Interest in peste des petits ruminants virus (PPRV) has been stimulated by recent changes in its host and geographic distribution. For this study, biological specimens were collected from camels, sheep, and goats clinically suspected of having PPRV infection in Sudan during 2000-2009 and from sheep soon after the first reported outbreaks in Morocco in 2008. Reverse transcription PCR analysis confirmed the wide distribution of PPRV throughout Sudan and spread of the virus in Morocco. Molecular typing of 32 samples positive for PPRV provided strong evidence of the introduction and broad spread of Asian lineage IV. This lineage was defined further by 2 subclusters; one consisted of camel and goat isolates and some of the sheep isolates, while the other contained only sheep isolates, a finding with suggests a genetic bias according to the host. This study provides evidence of the recent spread of PPRV lineage IV in Africa.

Recently Published

Sustainable improvement of animal production and health



The growing world population is vulnerable to limitations in the production of agricultural products and to any change, be it climatic realities and/or variations or civil strife, that upset the delicate balance of providing affordable food for all. It is alarming that the world's poorest people, some one billion living mostly in Africa and Asia, depend on livestock for their day to day livelihood. To reduce poverty, fight hunger and ensure global food security, there is an urgent need to increase livestock production in sustainable ways. An international symposium on 'Sustainable Improvement of Animal Production and Health' was organized by the APH subprogramme of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in cooperation with the Animal Production and Health Division of the Food and Agriculture Organization of the United Nations in 2009 to address the animal husbandry and public health issues that threaten global food security and safety.

http://www-naweb.iaea.org/nafa/aph/public/aph-sustainable-improvement.html

Freedom from rinderpest

Rinderpest (also known as cattle plague), a highly contagious viral disease of cattle, buffalo, yak and several wildlife species, is no more. Countries that had suffered from the ravages of rinderpest were officially recognized as disease free by the World Organisation for Animal Health (OIE) in May 2011 and by the Food and Agriculture Organization of the United Nations (FAO) in June 2011, when those organizations declared that rinderpest had been eradicated worldwide. The IAEA (together with FAO, OIE and AU) made significant technical contributions over a period of almost 20 years through the development, evaluation, validation and distribution of immunological and molecular nuclear and nuclear related technologies for the diagnosis and control of rinderpest. This EMPRES special issue on 'rinderpest' highlights the contribution of the different organizations to its eradication.

http://www.fao.org/docrep/014/i2259e/i2259e00.pdf

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CD-ROMs

A CD-ROM is available dealing with training material for the diagnosis of rinderpest and for the preparation for the OIE pathway. It was produced under an IAEA Technical Cooperation project RAF/0/013 ICT based training to strengthen LDC capacity. Contact Gerrit Viljoen at g.j.viljoen@iaea.org for further information.
A new batch of CDs with a training package to help artificial insemination (AI) technicians to improve the performance of AI and field services provided to farmers was produced for users with a slow internet connection and is now available through the APHS. It is also accessible from the APHS website:
http://www-naweb.iaea.org/nafa/aph/index.html

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Impressum

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