



Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Animal Production & Health Newsletter



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Contents

To Our Readers	1	Past Events	9	Activities of the Animal Production and Health Laboratory	24
Staff	3	Stories	15	Technical Cooperation Projects	28
VETLAB News	5	Coordinated Research Projects	19	Publications	34
Forthcoming Events	7				

To Our Readers

The first six months of this year have been occupied with our projects and regular activities, including our co-ordinated research projects and technical support to national and regional Technical Cooperation projects, as well as with the activities of the Animal Production and Health Laboratory. It is hoped that our inputs will serve the best interests of our Member States. Please look at our website and our most recent Animal Production and Health Newsletter to get familiar with all the activities of the Animal Production and Health Section.

Particular focus was on the current Avian Influenza H7N9, H7N2 and H5N1 outbreaks, the ever expanding threats of peste des petits ruminants (PPR), of foot and mouth disease, of trypanosomosis and of African swine fever, all areas in which we endeavour to give our highest level of support to our counterparts. To this effect, I want to mention the honour also bestowed on the Animal Production and Health Section by the Government of the Republic of Côte d'Ivoire. At the FAO and OIE International Conference for the Control and Eradication of peste des petits ruminants (PPR) held in Abidjan, Côte d'Ivoire, in April this year, Adama Diallo, a staff member of the Joint FAO/IAEA Division and a former Head of the Animal Production and Health Laboratory, was elevated to the grade of Officer of the National Order of the Republic of Côte d'Ivoire. This award recognizes his particular role in creating the PPR vaccine and, in a broader perspective, the work that the Joint FAO/IAEA Division has undertaken in this area over many years and will continue to do in the future. This recognition is particularly pertinent as PPR was reported for the first time in the Republic of Côte d'Ivoire, in 1942. PPR is currently the most important infectious disease of sheep and goat with morbidity and mortality rates that can reach 80% in endemic regions in Africa, the Middle and Near East and Asia.



Adama Diallo is elevated by Prime Minister Daniel Kablan Duncan to the grade of Officer of the National Order of the Republic of Côte d'Ivoire.



Joint FAO/IAEA Division staff member Adama Diallo, OIE Director General Bernard Vallat, Côte d'Ivoire Prime Minister Daniel Kablan Duncan, FAO Director-General José Graziano da Silva, Côte d'Ivoire Minister of Fishery and Animal Resources Kobenan Kouassi Adjoumani.

In February 1985, Adama Diallo started working on a project to develop a PPR homologous vaccine. As studies carried out from 1989 to 1995 proved that the selected attenuated PPRV clone was safe as a PPR vaccine candidate, he began work in 1997 to manufacture the vaccine on a larger scale. From 1988 onwards, the Animal Production and Health Section has contributed to the transfer of the different rinderpest and PPR diagnostic assays to FAO and IAEA Member States. In January 2001, Adama moved from CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) to the Joint FAO/IAEA Division in Vienna, as Head of the Animal Production and Health Laboratory, where he started research activities to develop tools for PPR control and to transfer these to Member States. Since then several training courses have been conducted on PPR diagnosis and PPR proficiency tests in numerous laboratories in Africa and Asia. Today, all the required tools for the implementation of PPR control and eradication programmes are available, and the work of Adama and the Animal Production and Health Section has been duly recognized through this high honour bestowed on Adama. With its longstanding experience and a network of Member State veterinary laboratories, the laboratory and staff of the Animal Production and Health Section will continue to play a vital role in the recently launched global campaign to eradicate PPR by 2030.

Looking back at the activities of the first half of 2015, we have held several workshops, training courses, research co-ordination meetings and consultants meetings. Activities scheduled for the next six months include project review meetings, research coordination meetings, interregional training courses and regional workshops. Both past and future activities are discussed in this newsletter and are accessible also on our website. Let us know if you have any ideas, comments, concerns or questions. If you have any questions, suggestions or just want to say 'hi' please do not hesitate to send us an email (to R.Reiter@iaea.org or

S.Piedra-Cordero@iaea.org). As discussed in previous newsletters, the Animal Production and Health Section aims to continue to move progressively forward and in pace with developments within the livestock field so as to optimally serve our Member States. We therefore encourage project teams and external stakeholders to keep abreast of current technological developments and to promote their implementation where feasible. This will facilitate a better positioning of our Member States with respect to international trade and other livestock-related issues. In turn, it will promote improved quality assurance of animal husbandry and health practices.

Concerning personnel news from the Section and with the PPR achievement mentioned above, it was with particular sadness that we saw Adama Diallo retire from the Animal Production and Health Section in January 2015. We wish him and his family all the best for the future. We nevertheless hope to see Adama actively pushing the control and eradication of PPR forward in the coming years. We also bid farewell to Caroline Adombi as she is moving to Université Péléforo-Gon-Coulibaly (UPGC), Korhogo, Côte d'Ivoire to take up her new assignment of teaching and research. Ms Caroline Adombi significantly contributed to our PPR research, especially in establishing and transferring cell lines for PPRV propagation in Member State laboratories and I take this opportunity to wish her success in her future endeavours. We also bid farewell to Kadidia Tounkara who has moved on to continue her doctoral studies.



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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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VETLAB Network News

1/2015

In this issue:

VETLAB Highlights

VETLAB Capacity Building Initiatives

- Upgrading of laboratory facilities
- Field support missions
- Trainings
- Proficiency testing for the diagnosis of peste des petits ruminants (PPR)

VETLAB Networking Activities

- Technical meeting of directors of veterinary laboratories
- VETLAB laboratories collaborate with APHL in developing and implementing serological and molecular diagnostic tools
- Forthcoming events

To the readers

It is our pleasure to bring to you the first Veterinary Diagnostic Laboratory (VETLAB) Network Newsletter and we hope it will be the first of many in which we showcase the work done by our collaborating veterinary laboratories. The VETLAB Network is made up of veterinary laboratories from IAEA and FAO Member States (MSs) with strong and historic links to the Animal Production and Health Section (APH) of the Joint FAO/IAEA Division. Our focus is to develop, evaluate, validate and implement serological and molecular nuclear, nuclear related and nuclear derived technologies for the control of transboundary animal (TADs) and zoonotic diseases. APH supported veterinary diagnostic laboratories in MSs towards the successful worldwide eradication of Rinderpest through the FAO/IAEA Rinderpest Laboratory Network. Building on this success, APH continues its efforts in maintaining and building diagnostic laboratory capacities to support the control of animal and zoonotic disease threats to MSs in cooperation with the FAO and OIE. In fact, as part of FAO, our laboratory focussed efforts are in full support of FAO's epidemiology and surveillance programmes. The VETLAB Network participants are being supported through IAEA and FAO programmatic activities as well as by South Africa through the African Renaissance Fund (ARF) and USA and Japan Peaceful Uses Initiative (PUI). We bring the VETLAB Network Newsletter in the hope of providing a forum for participating laboratories and other stakeholders to communicate and exchange knowledge/information, to showcase achievements and to share expertise within the VETLAB Network.

VETLAB Highlights

The National Veterinary Institute (NVI), Ethiopia, gets ISO/IEC 17025:2005 accreditation:

NVI was awarded ISO/IEC 17025:2005 accreditation in 2014 for the diagnosis of CCPP and CBPP by cELISA, FMD by 3ABC ELISA and brucellosis by Rose Bengal Plate test.

The National Animal Health Diagnostic and Investigation Center (NAHDIC), Ethiopia, extends its accreditation to include the diagnosis of Newcastle disease and avian influenza by real-time PCR.

The Laboratoire National Vétérinaire (LANAVET), Cameroon, extends diagnostic support and diagnostic confirmatory services to neighbouring countries, Chad (for African swine fever) and Gabon (for Newcastle disease).

The Botswana National Veterinary Laboratory (BNVL) provides external quality assessment (EQA) for contagious bovine pleuropneumonia (CBPP) to the Southern African Development Community (SADC) countries.

Veterinary laboratories in Ethiopia (NVI and NAHDIC), Botswana (BNVL) and Cameroon (LANAVET) showcase their ability to function as centres of excellence by successfully hosting regional animal diagnostic training courses with the support of FAO and IAEA.



1/2015

VETLAB Network News



VETLAB Capacity Building Initiatives

Upgrading of laboratory facilities

Real time PCR for disease diagnosis is now operational in four Laboratories: NVI in Debre Zeit (Ethiopia), LANAVET satellite laboratory in Yaoundé (Cameroon), Laboratoire National d'Elevage (LNE) in Ouagadougou (Burkina Faso) and Laboratoire Central Vétérinaire (LCV) in Kinshasa (Democratic Republic of Congo).

Field support missions

APH staff undertook field support missions to Botswana, Burkina Faso, Cameroon, DRC, Ethiopia, Mozambique, Tanzania, in 2014 for equipment installation, demonstration and training on diagnostic technologies for animal diseases.



Trainings

The Animal Production and Health Laboratory (APHL) of APH, hosted fellows/interns from five MSs (Cameroon, Ethiopia, Mali, Nigeria and South Africa) in 2014 for training on pathogen detection and molecular epidemiology of important TADs like PPR, African swine fever and capripox. Two group training courses were conducted in 2014 in which veterinary scientists from 35 MSs benefitted. The first training course, on "Diagnosis of Transboundary Animal Disease: Pathogen Typing Using Molecular Techniques", took place from 25th

August to 5th September 2014 at the National Veterinary Institute (NVI), Debre Zeit, Ethiopia. The second training course, on "Diagnosis of Transboundary Animal Diseases: Practical Approaches for Introducing New Assays for Routine Use in Veterinary Diagnostics Laboratories", was held from 15-26 September 2014 at the APHL in Seibersdorf, Austria.

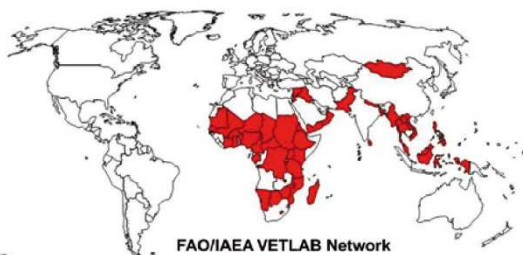
Proficiency testing for the diagnosis of peste des petits ruminants (PPR)

Since 2010, APHL is conducting annual proficiency testing (PT) on the diagnosis of PPR with the participation of African and Asian veterinary laboratories. Initially, the PT exercise included only nucleic acid detection methods but as of 2014, serological detection methods (ELISA) have also been included. The PPR PT 2015 will be announced in the next edition of the VETLAB Network Newsletter.

VETLAB Networking Activities

Technical meeting of directors of veterinary laboratories

Since 2011, APH is receiving support from Japan, South Africa and USA to strengthen animal disease diagnostic capacities in the Sub-Saharan African region. In 2015, the support by Japan and USA is being extended to the Asian region. The first technical meeting with directors of African veterinary laboratories was held from 4-6 February 2014 at IAEA's Headquarters in Vienna, Austria. The first coordination meeting of directors of veterinary laboratories from Asia took place from 23-25 March 2015, also in Vienna. The purpose of these meetings was to discuss the results of past activities, draw on lessons learnt from past experiences, develop future plans and promote the VETLAB Network of veterinary diagnostic laboratories in Africa and Asia.



FAO/IAEA VETLAB Network

VETLAB laboratories collaborate with APHL in developing and implementing serological and molecular diagnostic tools

APHL, with its extensive experience in serological and molecular diagnostic technologies, will continue to be a preferred partner for laboratories in MSs. APHL has a longstanding history and indeed a special position as the only International Organization Laboratory in the development, evaluation and validation of serological and molecular diagnostic assays and molecular characterization tools by cooperating and indeed involving MS laboratories. For example, LANAVET, NAHDIC and NVI are currently involved in the development of diagnostic tools for capripox, PPR and ASF.

Forthcoming events

The second coordination meeting for African veterinary laboratories is planned from 16-18 June 2015 at IAEA, Vienna, Austria.

A training course on "Early Detection of Animal Diseases in Post Flooding Environment, with Emphasis on Water Borne and Vector Borne Diseases", is planned from 15-26 June 2015 at APHL, Seibersdorf, Austria.

A training course on "Transboundary Animal Disease Diagnosis: Sequencing and Bioinformatics Analysis of Animal Pathogen Genomes", is planned from 9-20 November 2015 in Vienna, Austria. Participants will be from laboratories in Asia and Africa funded by the ARF and the PUI initiatives.

Forthcoming Events

Regional (AFRA) Training Course on Rapid Field Diagnostic Detection of Vector Borne Diseases (RAF/5/068)

Technical Officers: Hermann Unger, Charles Lamien

The training course will take place from 29 June to 3 July 2015 in Yaoundé, Cameroon.

The training course is open to 24 participants from the below mentioned IAEA Member States in the region of Africa: Algeria, Cameroon, Ethiopia, Côte d'Ivoire, Lesotho, Libya, Mauritania, Mali, Malawi, Morocco, Namibia, Sierra Leone, Tunisia, United Republic of Tanzania, Zambia, Zimbabwe.

The purpose of the training is to transfer knowledge and techniques of diagnosing vector borne diseases. This course is intended for participants with veterinary or animal science background and with a good knowledge on vector borne diseases, diagnosis and their treatment.

Regional Training Course on Enhancing Capacity of National Monitoring Teams for Diagnosis of Ebola Virus Disease under High Bio-Safety Conditions (RAF/0/042)

Technical Officer: Ivancho Naletoski

The training course will take place from 24 to 28 August 2015 in Yaoundé, Cameroon.

As Ebola virus disease has struck western African nations. IAEA, upon request of the Member States, has developed two TC projects on Strengthening Africa's Regional Capacity for Diagnosis of Emerging or Re-emerging Zoonotic Diseases, including Ebola Virus Disease (EVD), and Establishing Early Warning Systems, RAF/0/042 for EVD-related activity; RAF/5/073 for Emerging Zoonotic Diseases.

In order to address the most important issues and pressing needs, an expert meeting was organized in Entebbe, Uganda, from 23 to 27 February 2015 (under RAF/0/042) to discuss, fine-tune and agree on the terms of reference and a work plan for the projects.

Based on the understanding of the underlying factors that led to EVD outbreaks in West Africa, the need for capacity building related to rapid and early detection of this emerging infectious disease (EID) was seen as priority.

Strengthening early detection and control of EIDs through surveillance in livestock and wildlife was seen as the next important corner stone to prevent an outbreak of such dimension. Further needs identified by the experts were harmonizing diagnostic procedures, the establishment of one health initiatives to foster cooperation between veterinary and medical staff and, of course, the simple preparedness through availability of protective gear and means of transport to visit sites with suspicious disease reports.

It was decided to support the affected region with training in biosafety in field sampling situations, biosafety in the laboratory from handling of samples to diagnosis, diagnostic procedures for the identification and confirmation of emerging infectious diseases and finally, the collection of wildlife samples for risk analysis. In parallel, training material will be produced to help in local training events. The required diagnostic tools will be evaluated and missing items supplied to the MS laboratories.

The goal is to support establishing a sensibly acting 'one health initiative' in each country that is equipped to address investigations into an alleged outbreak without delay and can come up with results within one day. In parallel, epidemiological surveillance for zoonotic diseases will be carried out and the chances for a potential prediction evaluated. Communication and reporting will be the last pillar of the project.

In conclusion of this meeting, it was decided that the first training course on 'Biosafety in the Field' will be held from 24 to 28 August 2015 in Yaoundé, Cameroon, covering the collection of samples under bio security conditions.

Final Research Coordination Meeting on Genomic Analysis to Characterize Resistance to Parasites

Technical Officers: Mohammed Shamsuddin, Kathiravan Periasamy

The final research coordination meeting on genomic analysis to characterize resistance to parasites (D31026-CR-3) will take place from 28 September to 3 October 2015 at the Vienna International Centre, Vienna, Austria.

The objective of the meeting is to discuss results and prepare a final report on the accomplishment of the project objectives. The meeting will also focus on lessons learnt and future research needs to identify markers with economic, environmental, animal health and welfare importance.

Consultants Meeting on Applications of Nuclear Tools for Improving Ruminant Nutrition while Addressing Greenhouse Gas Emission

Technical Officer: Mohammed Shamsuddin

The consultants meeting is planned to take place in October 2015.

The purpose of the consultants meeting is to discuss the applications of nuclear techniques in the assessment of animal nutrition, especially the digestion of feed, greenhouse gas (GHG) emission and an understanding of methane production potentials of various feeds whose management in animal feeding could enhance productivity and reduce GHG emission. It is expected that the results of the meeting will be the basis for the implementation of a new coordinated research project in the near future.

Ruminants convert fibrous feeds and forages to meat and milk. However, they also produce methane, which is a GHG and has remained as a rising concern in enhancing animal production to feed never ending increasing human population on one side and the mitigation of climate change effects on the other side. Increased forage digestibility can increase animal production and decrease GHG emissions. Improved digestibility in ruminants depends on diet balancing, which leads to improved fermentation process in the rumen by microorganisms that produce volatile fatty acids (acetic acid, butyric acid, propionic acid) and thus provides nutrients to ruminants. An additional product of this process is the growth of a microbial mass, which meets a portion of protein needs by the host ruminants.

The application of nuclear and related techniques for analysing animal feeds will allow use of diets with higher digestibility and determination of GHG production potentials of feedstuffs. This will improve feed conversion into meat, milk and other value added products while reducing energy leakage and GHG to the environment. It will provide a better understanding of rumen physiology, strengthen research capacity among animal scientists in developing countries and support networking among animal scientists from developed and developing countries.

Final Research Coordination Meeting on Evaluating the Use of Enzymes to Improve Fibrous Feeds

Technical Officers: Mohammed Shamsuddin, Gerrit Viljoen

The final RCM on evaluating the use of enzymes to improve fibrous feeds (D3.10.27) is scheduled from 9 to 13 November 2015 in Piracicaba, Sao Paulo, Brazil.

The objective of the meeting is to discuss results and prepare a final report on the accomplishment of the project objectives and lessons learnt. The meeting will also focus on ways forward and the identification of future research needs to enhance livestock productivity while mitigating greenhouse gas emission by improving feeds and feeding practices.

Training course on Transboundary Animal Diseases Diagnosis: Sequencing and Bioinformatics Analysis of Animal Pathogen Genomes

Technical Officer: Charles Lamien

The training course will be held from 9 to 20 November 2015 at Seibersdorf Laboratories, Austria.

The purpose of this training is to promote the application of gene based identification and classification of pathogens in Member States veterinary laboratories. This training will reinforce the participants' knowledge on sample preparation and submission for sequencing and the subsequent analysis of sequencing data to better characterize animal pathogens. All raw data from the sequencing machine needs to be verified, assembled, and edited using appropriate software. Once cleaned data are obtained, the subsequent analyses depend on the objective, but also on the pathogen being studied. Comparative studies always involved the selection of appropriate reference sequences from public databases and comparative studies with the user generated sequences. This training will demonstrate the practical steps in searching similar sequences, performing multiple sequence alignments, and inferring phylogenetic trees and interpretation of the results in biological terms. Additionally, the trainees will be encouraged to share their sequences with the scientific community, by introducing them to the procedure of submitting their sequences to public databases.

The training is designed for veterinary scientists with moderate experience in molecular diagnostics. Well-recognized experts will deliver lectures and demonstrate the principles and practical applications on genetic

analysis of animal pathogens in their field of specialization. Practical training on sequencing and sequence analysis will be provided covering capripoxvirus, peste des petits ruminants virus, African swine fever virus, foot and mouth disease virus, Newcastle disease virus and highly pathogenic avian influenza viruses.

The course is open to veterinary diagnostic laboratory scientists from sub-Saharan African and Asian countries, members of the veterinary laboratory network supported by the IAEA Peaceful Uses Initiative (PUI) and African Renaissance Fund (ARF) projects. Good background knowledge and laboratory skills in molecular biology are required.

Past Events

National training course on Operation and Utilization of NIRS for Feed Analysis (ERI/5/009)

Technical Officer: Mohammed Shamsuddin

The training course took place from 1 to 5 December 2014 in Asmara, Eritrea.

The objective of the course was to provide on-site, hands-on training to Animal Nutrition Laboratory personnel in the field of spectroscopy techniques applied to analysis of animal feeds and agro-food products.



Participants before practical sessions.

The training course was organized by Eritrea's Veterinary Services Division of the Animal Resources Department of the Ministry of Agriculture in Asmara as part of activities of IAEA TC ERI/5/009 project.

The International Atomic Energy Agency appointed an external lecturer, Mr Bernard Lecler, Walloon Agricultural

Research Centre, Belgium. The local organizer was Mr Tzeggai Tesfai Bekele, Veterinary Services Division, Ministry of Agriculture, Asmara, Eritrea.

The course was attended by eight laboratory technicians and animal nutritionists from the Ministry of Agriculture, Eritrea and was conducted at the laboratory of Veterinary Services Division.

The course has been designed to reflect the interest in the use of molecular vibrational spectroscopy techniques for addressing emerging food safety issues at both the industry and laboratory levels.

The course summarized the use of molecular vibrational spectroscopy to assess the quality and safety of agro-food products and to control food processing at the laboratory, industry and field levels. In particular, it described the theory and application of rapid methods based on near infrared (NIR) spectroscopy in the food, feed and non-food sectors. The properties of the electromagnetic radiation characteristic of molecular vibrational spectroscopy, the measurement mode, the spectra acquisition procedure and the interest of spectral fingerprinting approach have been briefly explained. Instrumentation for laboratory and in situ analysis has been outlined and sample NIR presentation techniques have been discussed. An important part of the course focused on spectral data treatment and interpretation. An overview has also been given on the chemometric tools for multivariate calibration, pattern recognition, classification and discrimination analysis for both quantitative and qualitative analysis.

Recent applications of NIR spectroscopy to tackle food problems, focusing on the main outputs and most promising trends that should lead to the development of a new methodology were explained and demonstrated. The information presented relates to the routine application of molecular vibrational techniques for quality control at the laboratory level and for process control of various food products.

The following modules were included in the course:

- Module I: presentation of CRA-W and of the Food and Feed Quality Unit
- Module II: Vibrational spectroscopy - theory I (General & NIR)
- Module III: CHEMOMETRICS - challenges
- Module IV: CHEMOMETRICS - introduction
- Module V: CHEMOMETRICS - pattern recognition
- Module VI: CHEMOMETRICS - regression
- Module VII: applications to seed and kernels (cereals, oil seeds, etc.)
- Module VIII: application to feed (compound feeds, forage, PAP, etc.)

- Module IX: application to animal products (meat, milk, cheese, etc.).

A practical session also included how to use the TQ Analyst software of Antaris Thermo-Fisher.

A comprehensive training manual was provided to the participants on the first day of the programme, including a hard copy manual, electronic copies of all PowerPoint presentations and additional references.

The outputs of the training were regarded very well by the participants. The involvement of the participants was considered excellent. The quality of the technical staff and the reception was highly appreciated by the lecturer.

Future training could be foreseen once the team taken in hand the instrument in order to assure the implementation of the technical procedures and to discuss the setup of additional methods.

National training course on Artificial Insemination in Small Ruminants (BKF/5/014)

Technical Officer: Mohammed Shamsuddin

The training course was held from 26 January to 6 February 2015 in Ouagadougou, Burkina Faso.

Objectives of the course were to provide on-site hands-on training to students, technicians and researchers of University of Ouagadougou on (1) the science of male and female reproductive physiology and the practices of artificial insemination (AI) in small ruminants, (2) the development of working skills in participants on collection, evaluation and preservation of semen and practice of AI in small ruminants and (3) the application of AI for improving the productivity of sheep and goats.



The training course was organized jointly by INERA - Centre National de la Recherche Scientifique et Technologique (CNRST) and Université d'Ouagadougou, Laboratoire de Physiologie Animale, Ouagadougou, Burkina Faso. The training was officially opened and

addressed by authorities of Université de Ouagadougou and INERA.

The International Atomic Energy Agency appointed an external lecturer, Dr Naceur Slimane, École nationale de médecine vétérinaire (ENMV), Sidi Thabet, Tunisia. Dr Moussa Zongo from the Laboratoire de physiologie Animale, Université de Ouagadougou was an internal lecturer. The local organizer was Dr Adama Kabore from INERA.

The course was attended by 15 participants from INERA, Université de Ouagadougou, private veterinarians and ministry. Theoretical lectures, practical demonstration and hands-on practices were conducted at the research animals and laboratory facilities of the Université d'Ouagadougou.

The theoretical part of the artificial insemination (AI) in small ruminants included male and female sections. The male section covered anatomy and physiology of the reproductive system of rams and bucks, spermatogenesis, sexual function, collection, evaluation and processing of semen. The female part included anatomy of the reproductive tract of ewes and does, physiology and control of sexual cycle, infectious diseases, especially those, which cause abortions, anoestrus, techniques for the diagnosis of early pregnancy (progesterone RIA and ELISA, ultrasonography) and biotechnologies applied to the reproduction of small ruminants. The course also included fertility and fecundity of small ruminants and use of computer applications for the management of AI and animal reproductions (AIDA, Sperm, LIMA).



Seven practical sessions were conducted to holistically cover the techniques of AI in small ruminants. Details of practical exercises/demonstrations were as follows:

- Rams and bucks were examined for general health and sexual health, especially scrotum, testes, penis and urethra.
- Ewes and does were examined also for general health and reproductive health involving pelvic girdle, vulva, vagina and part of cervixes that could be visualized through vaginal speculum.
- Several excised male and female genital tracts of small ruminants were used to demonstrate and allow participants to practice on, not only to make them familiar with the internal genital organs of sheep and

goats but also to develop skills for doing AI in a real world situation.

- The participants practiced AI in ewes and does. Lectures and demonstrations were also done for oestrus synchronization and AI in sheep and goats.
- The use of ultrasonography for the assessment of sexual cycles in sheep and goats and for early pregnancy diagnosis was discussed and demonstrated.

A comprehensive training manual was provided to the participants on the first day of the programme, including a hard copy manual and electronic copies of all PowerPoint presentations. They also received additional references. Participants were given certificates.

The outputs of the training were regarded very well by the participants. Participants showed great interest in the topics covered in the course. The quality of the technical staff and the reception was highly appreciated by the lecturer.

Future training could be foreseen on cryopreservation of semen from small ruminants and application of artificial insemination in ewes and does by using frozen semen.

Enhancing Capacity for Diagnosis of Ebolavirus Disease (EVD) under High Bio-Safety Conditions (RAF/0/042)

Technical Officers: Ivancho Naletoski, Hermann Unger

The expert meeting took place from 23 to 27 February 2015 in Entebbe, Uganda. Nineteen experts from IAEA, China, Côte d'Ivoire, Germany, Ghana, Italy, Japan, Kenya, Niger, Nigeria, South Africa, Senegal, Sierra Leone, Spain, Togo and Uganda attended the meeting.

The purpose of the expert meeting was to review, update, amend, and agree on the terms of reference of the PUI-funded activity, Enhancing capacity for diagnosis of EVD under high bio-safety conditions under the TC project RAF/0/042. This PUI activity aims at enhancing the efficient diagnosis of emerging zoonotic diseases in the Africa region. It aims at helping African countries to prevent or mitigate future zoonotic disease outbreaks, by enabling earlier disease detection and faster responses. The activity will also contribute to integrate the information generated, to facilitate data sharing and information exchange and to enhance disease control in the region.

Specific objectives of the meeting were: (i) to present, discuss and evaluate the project work plan; (ii) to fine tune the 2015 action plan, including training programme; (iii) to agree on the terms of reference of the training and procurement components; (iv) to evaluate the nominations of candidates for training; and (v) to revise, discuss and agree on IAEA inputs for the project implementation in 2015.

National training course on Serological and Molecular Techniques for the Diagnosis of Transboundary Animal Diseases (ERI/5/009)

Technical Officer: Mohammed Shamsuddin

The training course took place from 9 to 20 March 2015 in Asmara, Eritrea.

The national training aimed at an in-depth understanding of standard diagnostic methods and enhanced networking between the laboratory and the veterinarians practicing in the field. Specific objectives of the course were to update/refresh participants knowledge and skills on the theories and practices of molecular and serological methods used for the diagnosis of animal diseases in everyday laboratory workings, introduce participants to a distinct workflow involving activities in the laboratory, in the field and sampling, with emphasis on protocols and operating procedures.

The training comprised of lecturing, practical lessons and protocol development specifically adapted for the staff of the national diagnostic laboratory supported by the Ministry of Agriculture.

The training course was organized by the National Laboratory for Molecular Diagnostics, Ministry of Agriculture, Asmara, Eritrea.



Hands-on training on animal disease diagnosis in the laboratory.

The International Atomic Energy Agency appointed two external lecturers; (1) Dr Georg Mair, Veterinärmedizinische Universität Wien, Austria and (2) Professor Md. Rafiqul Islam, Faculty of Veterinary Science; Bangladesh Agricultural University, Mymensingh. The local organizer was Tzeggai Tesfai Bekele from the Animal Resources Department of the Ministry of Agriculture, Asmara, Eritrea.

The course was attended by 15 participants from the Animal Resources Department, Ministry of Agriculture, Eritrea. Theoretical lectures, practical demonstration and hands-on practices were conducted at the National Laboratory for Molecular Diagnostics.



Laboratory staff at the National Laboratory for Molecular Diagnostics, Animal Resources Department, Asmara, Eritrea.

The two-week training was divided into one week of lecturing followed by a week for practical demonstration and hands-on training. The lectures comprised of standard methods for animal disease diagnosis and introductions of participants to organizing and harmonizing laboratory activities and sample collection. Equipment of each laboratory was tested and an inventory was done for all chemicals, kits and consumables to allow for optimal conditions in the second week. Laboratory protocols were discussed and necessary modifications were adapted. The new protocols were specifically tailored for the supplied kits and the given equipment. Instead of separate PCR protocols for each pathogen assay, one standard protocol was defined to only change the primer sets. For the serology laboratory, a new ELISA reader and a new computer were installed. The old ELISA reader was cleaned and kept as a backup. Besides universal software, the 'titri' tool was introduced for acquisition of ELISA readouts from the reader in the absence of specific software of the reader.



Communal grazing lands pose high risks to disease transmission.

During the second week, the participants were assigned to either the molecular or the serology group according to their actual field of work. The training was thus specifically optimized for the daily work of the personnel and students. Before starting practical sessions, an introduction was given on the principle and usage of

different ELISA kits, and calculation and interpretation of ELISA results using Microsoft Excel spreadsheet. ELISA kits with different protocols for the detection of antibodies to FMDV, Brucella and IBDV were used for the training. Training of the PCR group included nucleic acid extraction, PCR, gel electrophoresis and LAMP by using the newly installed ESE Tube Scanner instrument. Assays comprised of NCD, FMD and PPR. Instead of gel electrophoresis after each PCR run, which increases the risk of lab contamination, the ESE Melt software was used in combination with the Tube Scanner to analyse PCR amplification by melting curve analysis. To do so, a dsDNA binding dye was added to the PCR master mix prior to the reaction. This allowed for fast and clean quality analysis.

A comprehensive training manual was provided to the participants on the first day of the programme, including a hard copy manual and electronic copies of all PowerPoint presentations. They also received additional references.

The two-week training in the national molecular laboratories of Eritrea was highly efficient. All laboratories were clean and the equipment was in a very good condition and optimally available to run the training. The host institute made special efforts to ensure consistent power supply and serviced any equipment on the spot if necessary. All participants remained present during lectures and hands-on exercises. Participants gave an impression of absolute understanding of the lectures and exercises.

Development of a Plan for a Vaccination Trial for Brucellosis Using Irradiated Rev-1 Vaccine in Sheep and Goats (SUD/5/036)

Technical Officer: Ivancho Naletoski

The expert mission took place from 16 to 20 March 2015 at Jordan Bio Industries Center (JOVAC), Jordan.

A meeting between two counterparts of the SUD/5/036 project, an invited international expert on irradiated vaccines and the hosts from JOVAC, a vaccine production company in Jordan was organized. The team discussed the possibility of initiating a vaccine trial using irradiated, metabolically active and non-replicating Rev-1 strain of *Brucella melitensis*.

The participants concluded that the development of such a trial is possible and realistic through preparation of the vaccines (appropriate irradiation protocol) in the facility of JOVAC in Jordan, and performing the trial at the Central Veterinary Research Laboratory in Soba, Khartoum, Sudan.

Upon the recommendation of the expert, the trial should include 8 groups of 12 sheep each, vaccinated under a

predefined regime (including negative control) and checked for the immune response. The development of the immune response will be monitored in weekly intervals using classical serological assays (RBT, SAT, CFT and ELISA), as well as the gamma interferon assay, as an indicator of the T-cell response.

Currently, the project team and the counterparts are evaluating the needs of staff training and equipment required for successful implementation of the workplan. The initial plan is to start the trial during the early spring of 2016.

Technical meeting with Directors of Veterinary Laboratories Participating in the Project to Strengthen Animal Disease Diagnostic Capacities in Selected Asian Countries supported by PUI

Technical Officers: Charles Lamien, William Dundon

The first coordination meeting took place from 23 to 25 March 2015 in Vienna, Austria.

This meeting was supported by the Peaceful Uses Initiatives (PUI-VETLAB) project to strengthen animal disease diagnostic capacities in six selected Asian countries. Partner laboratories from Bangladesh (Central Disease Investigation Laboratory, Dhaka), Lao PDR (National Animal Health Laboratory, Vientiane), Mongolia (State Central Veterinary Laboratory, Ulaanbaatar), Myanmar (Ministry of Livestock, Fisheries and Rural Development, Yangon Insein) and Nepal (Central Veterinary Laboratory, Kathmandu) participated in the meeting.

The three-day meeting consisted of presentations by the project coordinators explaining the background and aims of the PUI-VETLAB project. The activities under the PUI-ARF (African Renaissance Fund) project with African veterinarian laboratories was discussed and used as an example for the successful implementation of a similar project. In addition, each partner presented their specific needs for capacity building within their own countries based on the present state of transboundary animal diseases (TADs) and their diagnostic capabilities. Together with guidance from the project coordinators, each partner developed a work plan for 2015/2016 and presented a list of specific requirements (e.g. reagents, equipment and training) necessary to achieve their goals.

It was clear from the input of the partners that there is high of interest in the PUI-VETLAB project. Many of the partners share the same TAD issues and have similar training needs. The main TADs for all countries included, foot and mouth disease (FMD), highly pathogenic avian

influenza (HPAI), Newcastle disease (NDV), peste des petits ruminants (PPR) and other small ruminant's diseases such as capripox, parapox, pasteurella and blue tongue. Most of the laboratories have the minimum capability required to diagnose FMD, HPAI and NDV, although they need to strengthen their capacity for the typing and characterization of pathogens causing HPAI and FMD (including vaccine matching). In contrast, little or no capacity is present in the participant countries for the diagnosis and characterization of PPR and other small ruminant diseases.



Directors of veterinary laboratories in Asia visit the Animal Production and Health Laboratory.

Consultants meeting on Application of Nuclear and Genetic Tools for Animal Selection to Improve Productivity

Technical Officer: Mohammed Shamsuddin

The consultants meeting took place from 14 to 17 April 2015 in Vienna, Austria.

The consultants meeting aimed at updating the current status of scientific information in relation to animal selection and breeding involving conventional and genomic techniques. With the recent advances in livestock genomics, nuclear and nuclear derived molecular technologies play an important role in animal selection for improving livestock productivity. During the meeting, those techniques, which are appropriate and relevant to developing country situations, were identified. It was considered a timely and realistic initiative by the APH to implement a coordinated research project (CRP) for the development, adaptation and validation of tools, techniques and protocols for animal identification, performance recording, genetic analysis and investigation of cross breeding under the prevailing conditions of artificial insemination services in dairy production systems (including cattle, buffalo and camel).

The meeting identified across many developing countries a low level of human capacities and infrastructure for the

analyses of data relevant to genetic improvement programmes. Therefore, it was agreed to have trainings on performance data collection and analyses adjunct to the research coordination meetings (RCM) of the proposed CRP to facilitate hands-on experiences. The meeting strongly recommended seeking additional funding opportunities to provide training for improving bioinformatics data analysis skills of researchers and scientists in developing countries.

A detailed work plan, including some of the technical procedures, for the implementation of the CRP was prepared. Minimum requirements of technical staff, infrastructure, laboratory equipment, institutional relationship with artificial insemination services and farmers were identified and recommended to ensure better scientific results.

The proposed CRP, based on the planned activities and existing knowledge can substantially contribute to sound scientific outputs on the validation and field application of genomic techniques for sire selection, which will enhance breeding programmes for improving livestock production in developing countries.

The meeting was attended by seven consultants, one FAO staff, four IAEA staff and five observers.



Meeting participants, observers, FAO and IAEA staff.

Participation at the Annual Meeting of the European National Reference Laboratories for Rabies

Technical Officer: Ivancho Naletoski

The annual meeting of the European National Reference Laboratories for rabies was held in Zagreb, Croatia, from 28 to 29 May 2015.

The meeting was organized by the European Reference Laboratory (EURL) for Rabies, ANSES, Nancy Laboratory for Rabies and Wildlife, France, and hosted by the Croatian Veterinary Institute. Fifty two participants from 31 countries attended the meeting. Representatives of

international organizations, such as the European Commission, Global Alliance for Rabies Control (<http://rabiesalliance.org/>), and the World Health Organization (WHO) were also present.

The participants discussed the current situations with rabies at national levels, as well as the progress of the implementation of harmonized strategies for control of the disease, relying mainly on vaccination of domestic and/or wild carnivores. Special attention was given to the harmonization of the diagnostic techniques used to detect rabies virus, as well as to the methods used to estimate the post vaccination immune responses (success of the vaccination).

The technical officer gave a presentation on the requirements for the IAEA TC project application that are meant to facilitate the capacity building and technology transfer of nuclear and nuclear related methods used for disease control. Part of the presentation was dedicated to the integration of the IAEA TC project in the on-going disease control plans in Member States, including the control plans for rabies.

More information on the event available at the EURL at following link:

<https://eurl-rabies.anses.fr/en/minisite/rabies/workshop-rabies-2015-0>



Meeting participants.

Early Detection of Animal Diseases in Post Flooding Environment with Emphasis on Water Borne and Vector Borne Diseases (RAS/5/069)

Technical Officers: Ivancho Naletoski, Charles Lamien

The training course took place from 15 to 26 June 2015 at the Seibersdorf Laboratories, Austria.

Three international experts gave their lectures and supported the practical classes on the animal and zoonotic aspects of leptospirosis, clostridial infections and vector borne diseases, using West Nile virus and bluetongue virus

as models. The participants received training in the use of early and rapid techniques for detection of the above mentioned diseases, quality assurance and quality control of the assays, as well as interpretation and epidemiological importance of the test results.

A fourth expert gave a lecture on the use of disease data recording platforms, as well as in the real-time geo visualization of disease events in the field. Practical classes on basic data visualization were also included.

Nineteen participants from 12 Member States (Bangladesh, China, Indonesia, Cambodia, Lao P.D.R., Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam) attended the course.

Technical meeting with Directors of Veterinary Laboratories Participating in the Project to Strengthen Animal Disease Diagnostic capacities in selected sub-Saharan Countries Supported by ARF and PUI

Technical Officers: Gerrit Viljoen, Charles Lamien

The second coordination meeting took place from 16 to 18 June 2015 at the VIC, Vienna, Austria.

The objective of this second coordination meeting for African veterinary laboratories supported by IAEA through the South African Renaissance Fund (ARF) and the USA and Japan supported-PUI projects was to discuss results of the 2014 activities, draw lessons learned from past experiences and advise on future plans. A detailed report will be given in the next newsletter.

Regional training course on Artificial Insemination in Sheep and Goats (RAS/5/063)

Technical Officer: Mario Garcia

The course took place from 22 to 26 June 2015 in Sassari, Sardinia, Italy.

The one-week training course on artificial insemination is focused on sheep and goats to provide knowledge and know-how on animal reproductive physiology, oestrous cycle, heat detection, semen collection and processing, techniques and procedures for artificial insemination, male selection, male management, and data recording for assessing reproductive performance. The main objective is to transfer knowledge and develop skills that can be used to improve livestock production through applying

reproductive management and selective breeding strategies.

This course will be the last technical activity of the ARASIA TC Project RAS/5/063. Seven scientists from the Arab-Asia Member States were selected to participate. The course took place at the Agricultural Research Agency of Sardinia (AGRI Sardegna) in Sardinia, Italy.

Stories

IAEA supports Belize to strengthen their animal health diagnoses and control capacities

Agriculture in Belize plays a significant role in the country's economic stability and growth in terms of foreign exchange earnings, income generation, employment, nutrition, and food security. The Agricultural sector represented 13% of Belize's Gross Domestic Product (GDP) in 2014, a 2.0% increase over the previous year. Aquaculture, a well-defined arm of the agricultural sector, has seen significant growth over the years. From its modest beginning in the early 1980's with the development of ten acres of experimental ponds by a private company, the industry has developed rapidly with almost 8000 production acres and export earnings recorded at \$132 million Belize dollars (nearly 66.5 million Euro) in 2014.

Aquaculture has been prioritized by the Government of Belize as a tool to evaluate alternative sources of protein, and ultimately provide a cheaper protein source option for Belizeans. This led to the establishment of a Government run fish hatchery to provide seed stock to small scale



Project staff working with IAEA provided PCR equipment in the Animal Health Molecular Diagnostic Laboratory in Belize City.

farmers to improve their market share alongside that of shrimp farming. The 14 shrimp farms currently operational have seen tremendous growth and export earnings over the last couple of years and have benefited from better international market access, and better management practices. However, all have faced the challenges of viral and bacterial diseases

threatening their livelihoods. The impact of diseases, especially the current impact of bacterial pathogens affecting the region, has yet to determine what the future growth of the shrimp industry will be.



Collecting and processing shrimp specimens for disease control.

In light of this, the IAEA has been assisting Belize in developing nuclear and molecular diagnostic and control techniques and strengthening capacities in animal health management through several initiatives, including the development of the Animal Health Molecular Diagnostic Laboratory. This project was initiated in 2010 with the training of three staff in molecular diagnostics of shrimp diseases, avian diseases and bovine diseases respectively. In addition, equipment and consumables and reagents and on the ground expert services were provided. Shrimp disease diagnostics was the first established in support of the shrimp industry in testing for diseases of OIE importance as well as those of economic importance. The BAHA Belize City PCR laboratory started PCR testing of aquatic animal samples in 2010 and in February 2012 participated in its first inter laboratory proficiency test (Ring test) offered by the OIE Reference lab in Arizona for shrimp diseases. The lab successfully tested ten



View of the construction site of the new BSL2 PCR laboratory in Belize.

unknown samples for five shrimp diseases: white spot disease (WSD), Taura syndrome (TS), infectious hypodermal and hematopoietic necrosis (IHHN), yellow head disease (YHD) and infectious myonecrosis (IMN). By the end of 2012, the BAHA Belize City PCR laboratory tested more than 500 samples. All farm

sampling and testing were done on a cost recovery basis. This continues to be the practice.



Field work for the control and monitoring of avian diseases (e.g. avian influenza).

In 2013, the shrimp industry increased to 9 farms, and the testing capacity of the laboratory also increased to 6 diseases, with necrotising hepatopancreatitis (NHP) being added to the list. Then, by the end of 2014, 8 of the 14 operational shrimp farms were sampled and tested for these OIE listed diseases. Despite the setbacks that were experienced along the way, the molecular diagnostic capacity in aquatic animal diseases was realized and showed tremendous potential for further growth and strengthening. The growth in the shrimp industry, though met with production setbacks caused by diseases, still shows the significant investment potential of this sector and further requests for the development of a Government facilitated genetic program in country that can help farmers identify better family lines that are more tolerant or resistant to diseases.

From 2012 to present, the IAEA assisted in the further strengthening of diagnostic capacity by training part of the technical personnel at the OIE shrimp disease reference laboratory in real time PCR techniques, as well as assisting the laboratory's participation in the inter-laboratory proficiency (calibration) testing program, which is offered semi-annually by the shrimp disease reference laboratory in Arizona, USA. By this, the Aquatic Animal Health Services has been able to use its laboratory testing capabilities along with the continued aquaculture farm/enterprise inspections and sample testing to provide a full certification program for exports of live aquatic animals and products of aquatic animal origin. The commitment to continue funding this initiative and others like it will ensure that the Belize aquaculture sector sees improved aquatic animal health and productivity, and ultimately, a sustainable food producing industry in the country.

The Government of Belize, through additional assistance of the Inter-American Development Bank (IDB), proposed to construct a new BSL2 level molecular laboratory at BAHA, Central Farm, Cayo. The new facility started operation in April 2015 and houses both aquatic and

terrestrial disease diagnostic laboratory services. The IAEA funded BZE/5/007 project to establish and strengthen molecular diagnostic techniques for avian diseases is well underway. The commitment to continue funding these initiatives will ensure that the Belizean agricultural sector sees improved animal productivity and health, ultimately enhancing sustainable food security in the country.

Research results disseminated through farmers outreach programmes improve livestock productivity in Burkina Faso

Burkina Faso is a West African country with 17.3 million people in 274 200 sq km land area. Country's economy heavily rely on agriculture, which is mostly livestock rearing, 32% of its GDP that accommodates 80% of the working population.

Livestock keepers in Burkina Faso are challenged by a long dry season (from October to April) and tsetse fly (vector for trypanosomes, protozoa that kills animals) infestation of the Savana in the middle and southern part of the country that provides grazing/browsing opportunities. Therefore, important research and development issues for effective feed supplements for the dry season and breeding for trypanosome resistant livestock.



Burkina-livestock market.

Capacities of the Institut national d'études et de recherches agricoles (INERA) have been strengthened on animal production and health research and farmers' outreach activities through continued supports from several IAEA TC projects since 2007 (BKF/5/006, BKF/5/008, BKF/5/011, BKF/5/014). Four laboratories have been equipped and staff have been trained to enable the analysis of local feed resources, genetic characterization of indigenous animal breeds, identification and application of medicinal plants for the control of helminth infections, and

dissemination of better genetics through artificial insemination (AI).

The enhanced capacities enabled the animal nutrition laboratory to analyse local feed resources for feed formulations and thus improving animal nutrition and productivity. The team has developed and disseminated among farmers multi-nutrient mineral block (MMB) technologies, whose adaptation has allowed farmers to maintain good condition of their animals during the dry period with very limited access to forage. In total, 108 farmers, half of them females, have benefitted from the MMB supplementation. These farmers belong to four cooperatives, which are (1) Association Wend Raabo de Toéhin, (2) Coopérative pour la promotion de l'élevage dans le Soum, (3) Groupement d'éleveurs d'Azawak Kossam Bpdedji de Dori and (4) Association Wend Konta de Ziniaré (éleveurs des zebu Azawak). Sheep fed on MMB are in better condition than those without any supplementation.



Multi-nutrient mineral block is an effective supplement to fatten sheep.

Strengthened capacity of the Molecular Biology Laboratory has enabled characterization of sheep and goat breeds in Burkina Faso. Djalonke, Sahelian and Mossi are three breeds of sheep and goats. In total 6439 sheep and 10 137 goats from the three breeds were phenotypically characterized, of which 123 sheep and 133 goats were genotyped. These data are now being used to train farmers on the identification of animals with appropriate level of Sahelian blood, which are more tolerant to trypanosomes and produce more meat. It is known that Djalonke sheep and goats are trypanosome tolerant but smaller in size and produce little meat and milk, which is hardly enough for lambs and kids. Sahelian sheep and goats are bigger than Djalonke, produce more meat and can be milked for human consumption but are susceptible to trypanosomes. Crossbreds with around 50% Sahelian blood show moderate trypanosome tolerance and also produce more milk and meat than Djalonke. Genotypic analyses revealed that Mossi is in fact a crossbred between Djalonke and Sahelian.

To excel breeding for dissemination of desired genetics (for example, resistance to parasite, tolerance to harsh environmental conditions, high feed conversion ability and survival on poor quality forages) the capacity of the AI

laboratory in the University of Ouagadougou is being strengthened to implement AI in small ruminants.

A private dairy farm at Zaghtouly village in the suburb of Ouagadougou has proven that good genetics with improved feeding and health care enable running a profit making dairying even in harsh environmental conditions. This farm has in total 60 animals, 29 lactating cows which yield 360 L milk per day. Milk is sold with good demand at a price of US\$58/100 L. Animals are crossbred with Holstein, Montbéliarde and Brown Swiss. On top of milk sales, 20–25 animals are sold in a good year. The farmer programmes breeding, using oestrus synchronizations, to be able to sell milk at a time of the year when the price is high.

IAEA support to Burkina Faso will continue to strengthen the national breeding programmes where genetically characterized studs with known traits of economic importance will be utilized through effective artificial insemination field services and improved feeding and health care.

Activities of National Animal Health Diagnostic and Investigation Center (NAHDIC)

The National Animal Health Diagnostic and Investigation Center of Ethiopia is both a national and east Africa's center of excellence for diagnosis of transboundary and zoonotic animal pathogens. Its national mandates include: disease investigation, surveillance, health certification, research, training and consultation activities. As a support laboratory, NAHDIC provides reference services for national laboratories of twelve countries in East Africa. In view of delivering quality service, the center is implementing ISO 17025:2005 international quality management system in its molecular and serology laboratories and 14 test methods were accredited.



New microbiology building and some of its facilities supported by IAEA.

With the support of the Ethiopian government, a newly constructed microbiology building has recently opened and construction of a new training hall is also under way.



In addition to the government's commitment, NAHDIC has a strong collaboration with international organizations working on animal health research and FAO reference laboratories. Specifically, the IAEA has played a leading role in capacity building of NAHDIC through its Joint FAO/IAEA Division. The project provided the necessary equipment, reagents and consumables, as well as short and long term trainings. Staff of the laboratories were trained in the early and rapid diagnoses and control of transboundary animal diseases (such as Newcastle disease, peste des petits ruminants, avian influenza, Rift Valley fever, capripox virus disease, and African swine fever) using molecular diagnostic technologies. Moreover, IAEA staff undertook expert and training missions to molecular laboratories to facilitate on-site training and the transfer of appropriate technologies in 2013.

As the major outcome of the support provided by the project, NAHDIC has efficiently delivered two short term trainings on molecular and serological diagnosis of zoonotic and transboundary animal pathogens for African scientists who came from different African countries at different times.

Taken together, NAHDIC is striving forward to continue its national and regional leading roles under the continued support of the Ethiopian government, IAEA's Animal Production and Health Laboratory and other development partners.

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

Project Number	Ongoing CRPs	Scientific Secretary
D3.10.26	Genetic variation on the control of resistance to infectious diseases in small ruminants for improving animal productivity	Mohammed Shamsuddin
D3.10.27	The use of enzymes and nuclear technologies to improve the utilization of fibrous feeds and reduce greenhouse gas emissions from livestock	Mohammed Shamsuddin
D3.20.28	The control of foot and mouth disease (FMD)	Gerrit Viljoen
D3.20.29	The use of irradiated vaccines in the control of infectious transboundary diseases of livestock	Hermann Unger
D3.20.30	Use of stable isotopes to trace bird migrations and molecular nuclear techniques to investigate the epidemiology and ecology of the highly pathogenic avian influenza	Ivancho Naletoski
D3.20.31	Early and rapid diagnosis and control of TADs – second phase- African swine fever	Hermann Unger

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

Technical Officer: Mohammed Shamsuddin

A coordinated research project (CRP) referred to above (D3.10.26) has been running since 2010. The CRP was designed to characterize phenotypes of sheep and goats related to resistance to gastrointestinal (GI) parasites and identify genes responsible for variations in phenotypes. The project has been implemented in 14 countries as research contract holders (RCH). Two major research trials (i.e. artificial challenge and field trial) were designed for recording phenotypic data focusing on parasite burden and sampling blood for DNA analysis during the first RCM (Vienna, 21–25 February 2011). RCHs of Argentina, Brazil, Eritrea, Ethiopia, Indonesia and the Islamic Republic of Iran have been working with sheep breeds. RCHs of Bangladesh, Burkina Faso, China, Mexico, Nigeria and Sri Lanka have been working with goat breeds and TCH of Pakistan has been studying both sheep and goat breeds.

All RCHs have completed the artificial challenge trial and presented the data during the Second RCM held in Bogor, Indonesia (11–15 February 2013). Based on preliminary results, there are clear indications of genetic variations in resistance to parasites in sheep and goats, however, advanced and detailed statistical analysis involving bioinformatics data are still being processed. This will lead to the submission of at least one manuscript per RCH for publication in a peer reviewed journal by the end of 2014.

The research team in Argentina has already initiated a breeding programme where rams have been selected for parasite resistance. On the other hand, two RCs were terminated based on poor results. In addition to the research trials, a Radiation Hybrid panel for goats (*Capra hircus*) was constructed as a resource for rapid and large-scale physical mapping of the goat genome to 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. Later in a second step, the whole-genome Radiation Hybrid Map (RH Map) was developed. This is used during the second phase of the CRP for the genetic characterization of goat breeds, for conducting comparative genomics that are necessary to utilize the genotype-phenotype associations, for evaluating candidate genes for the identification of genetic markers associated to infectious disease resistance and for the development of analytical tools for molecular diagnostics and assisted breeding.

RCHs have already started or nearly completed the field trial that involves studying sheep and goat breeds for resistance to natural infections with GI parasites. DNA has been extracted from blood samples and most of the RCHs have sent an aliquot to the IAEA's Animal Production and Health Laboratory (APHL) in Seibersdorf for genotyping. Single Nucleotide Polymorphism based DNA markers were discovered in different candidate genes at Seibersdorf laboratory. Part of the DNA samples collected from resistant/susceptible sheep and goat breeds by the RCHs during artificial challenge trials were genotyped. Several RCH have already published their data. The project is progressing according to the work plan. The CRP will end in 2015. The final research coordination meeting on genomic analysis to characterize resistance to parasites

(D31026-CR-3) will take place from 28 September to 3 October 2015 at the Vienna International Centre, Vienna, Austria

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

Technical Officers: Mohammed Shamsuddin, Gerrit Viljoen

The CRP referred to above has been implemented since 2010 and involved 11 RCHs. The CRP aims at improving efficiency of utilizing locally available feed resources including tree and shrub leaves, agro-industrial by-products and other lesser-known and/or new plants adapted to the harsh conditions or capable of growing in poor, marginal and degraded soils. The first RCM was held in Lethbridge, Alberta, Canada, from 7 to 11 February 2011 and work plans were finalized to conduct the research work in two phases.

Most of the RCHs published data generated during the first phase of the CRP. The first phase had three major activities. In the first activity, commercial fibrolytic enzymes were screened in vitro to identify 2 to 4 best-bet candidates and their optimal dosages for further evaluation in animal trials. All enzyme candidates were assayed locally by each RCH for enzyme activity using standardized methodology before starting the in vitro research which focused on batch culture incubations of the forage substrates in buffered rumen fluid plus enzymes to determine effects on 24 and 48 h dry matter (DM) and neutral detergent fibre (NDF) degradation. Additionally, the teams surveyed for and collected samples of fibrous feed materials available and/or used on smallholder farms for chemical compositional analysis of feed ingredients. The second activity was the evaluation of fibrolytic enzyme activity using the different fibrous feed materials available in the region, including endoglucanase, exoglucanase, cellulase and xylanase activity. The third activity was to conduct initial in vitro batch cultures to identify enzyme candidates and optimum dose rates for the forages of interest using DM and NDF degradation followed by more detailed in vitro batch cultures or continuous culture incubations to measure other variables of interest such as digestibility, kinetics of digestion, methane production, microbial protein synthesis, rate of gas production including methane, volatile fatty acid production and concentrations, microbial ecology of the rumen, etc.

The activities of the second phase were planned during the second RCM in Vienna, from 13 to 17 May 2013. The activities focused on in vivo evaluation of best-bet

candidate fibrolytic enzymes to determine effects on animal productivity, the critical enzymatic activities, optimal enzyme application method and to establish possible mode of action. In vivo trials with the best-bet candidate fibrolytic enzymes are in progress to determine effects on animal productivity including effects of enzyme on methane production. The project is progressing according to the work-plan. The CRP will end in 2015. The final RCM will take place in from 9 to 13 November 2015 in Piracicaba, Sao Paulo, Brazil

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, from 10 to 14 January 2011, was held in collaboration with FAO and EU-FMD. It was attended by all but one research contract holder and agreement holders, as well as several observers from EU-FMD and FAO and foot and mouth disease (FMD) 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) what criteria are being used to choose FMD vaccines and how they are being applied, (4) how is vaccine potency being determined and utilized, (5) how are post-vaccination monitoring and surveillance being performed, (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 the research contract holders (RCH) and the 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 can 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 procedures are therefore of paramount importance as they have financial and trade implications. Vaccination with inactivated FMD virus is undertaken to control FMD in endemic countries or countries at risk. Vaccines, while widely available but which should match (i.e. should be of homologous serotype and strain isolate) with virulent FMD viruses circulating in the region of vaccine use, are of variable quality, not from the homologous outbreak serotype/strain isolate, and are often stored under inadequate temperature conditions and therefore might be not as effective in the field as determined in animal experiments. Due to insufficient knowledge on 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 proper 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 or 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 worked towards creating solutions set by the objectives of the FMD CRP.

It is important to:

- 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 the vaccination of cattle and small ruminants with commercially available FMD vaccines, and including

the evaluation of reduced dose options 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 of type A or SAT viruses;
- provide further global coordination of current research into FMD vaccines for use in endemic settings and to cooperate with other FMD institutions such as EU-FMD and PANAFTOSA;
- evaluate and standardize:
 - Virus neutralization (VN) tests
 - Early and rapid lateral flow and dip-site technologies and their application and use
 - Antigenic cartography (at IAH and OVI) in relation to virus neutralization tests (VN).

The second RCM took place from 8 to 12 April 2013 at FAO Headquarters in Rome, Italy. The final RCM will take place from 6 to 10 July 2015.

The use of irradiated vaccines in the control of infectious transboundary diseases of livestock

Technical Officer: Hermann Unger

Vaccination has been one of the greatest achievements of mankind in enabling the eradication of serious, life-threatening diseases of man and his domesticated livestock. Many of the vaccines used today rely on technologies developed over 100 years ago involving some form of attenuation, i.e. the use of an alternative or mutant strain of a pathogenic organism that has reduced virulence whilst maintaining immunogenicity, or inactivation, where chemical or physical methods are used to kill virulent pathogenic strains. In general, attenuated vaccines are more efficient than killed vaccines which might be denatured in their immunogenic sites and displaying a different recognition system of the immune system. Irradiation of pathogens may be an alternative to chemical inactivation of the pathogen for developing efficient vaccines.

This CRP which now ends evaluated the irradiation doses for different pathogens to suppress amplification but keeping the pathogen metabolically active. This strategy allows for safety, i.e. the pathogen cannot multiply and thus not affect the host. Due to its low metabolic activity it is still recognized by the host immune system as a live organism, which for instance does invade cells. This mechanism activates the cellular immune system, recognizing 'infected' cells and leading to a memory effect which extends the time of immunity to often several years.

In the first phase of the project the most efficient dose of irradiation was evaluated. In the second phase the metabolic activity was determined. In the last phase the

immunogenicity was evaluated in animals. Good results have been obtained with some cases such as, *Thelazia annulata*, brucellosis and *Fasciola gigantica*. In those cases the evaluation in the natural host remains to be carried out. This test was already carried out in the case of the fish parasite *Ichthyophthirius multifiliis* and the ruminant gastrointestinal parasite *Haemonchus contortus*. The results obtained so far are very promising and should lead to an understanding of the technical requirements facilitating the use of irradiation in a novel vaccine production.

It is foreseen to start with a new CRP on irradiated vaccine technologies in 2016.

Use of stable isotopes to trace bird migrations and molecular nuclear techniques to investigate the epidemiology and ecology of the highly pathogenic avian influenza

Technical Officer: Ivancho Naletoski

Among several important issues in the epidemiology of highly pathogenic avian influenza (HPAI) that needs attention is the role that wild water fowl (WWF) populations might play in the dissemination of infection. Tracing the movements of WWF in relation to where they originated as well as their stopover points during their migration between breeding and non-breeding grounds is a particularly challenging task.

It is necessary to utilize methods that can be used on a larger scale and not biased to initial capture location if we are to fully comprehend the role of migratory birds in the spread of avian influenza. A suitable technique that has already been used to trace migrants is based on the stable isotope (SI) signatures of the tissues of birds, especially those in feathers. Of most interest are deuterium (δD) ratios in tissues that reflect those in surface (lakes, rivers, oceans) and ground waters. Since hydrogen isotope composition of environmental water varies spatially across the globe in a predictable manner, and its presence relayed to feathers, δD analyses of feathers provide a way of linking SI data on water isoscapes with those in the feathers.

Faecal samples will be used for the detection of AI viruses with extraction and analysis of somatic DNA to detect the bird species. These two techniques will be used to link the AI carrier status and the carrier species without even capturing the birds, and may thus be used as a non-invasive platform to generate important epidemiological information on migration pathways (obtained by SIA) and the transmission of the virus to a certain geographical area. Faecal samples should be collected randomly at the same sites where feathers are collected. Samples will undergo two test procedures:

(a) DNA barcoding (species identification) was adapted at the Avian Disease Laboratory, College of Veterinary Medicine, Konkuk University, South Korea. The technique is based on detection of a short gene sequence from a standardized region of the genome as a diagnostic 'biomarker' for species. The target sequence has been the 648-bp region of the mitochondrial gene, cytochrome C oxidase I (COI), already optimized as a DNA barcode for the identification of bird species. The optimization of a DNA barcoding technique for faecal samples has been performed by comparing DNA from the faecal samples with the DNA from tissue samples (muscle, feather, and blood) from already known bird species (domestic poultry and WWF), collected from live bird markets, the Conservation Genome Resource Bank for Korean Wildlife and from the Seoul Grand Park Zoo. The results of bird species identification, using COI gene sequences from tissues matched the faecal samples of the same individuals.

(b) Detection of AIV in the faecal samples using optimized protocol in five phases: i) detection of M gene to detect the presence of influenza A viruses using PCR technique (positive samples should be inoculated in SPF eggs for virus isolation), ii) positive samples should be tested using H5 or H7 protocol by PCR, iii) H5 and H7 positive samples should undergo molecular pathotyping (cleavage site sequencing), iv) M gene positive, H5 and H7 negative, should be further typed in order to differentiate the subtype using conventional (HI-test) and/or molecular methods, v) positive samples and a portion of negatives will be tested using loop mediated isothermal amplification (LAMP) protocol.

The main pathway of AIV transmission is faecal contamination. Natural water reservoirs are the media where WWF faeces are excreted in the water, contaminating it randomly. However, the survival of the AIV in natural water reservoirs depends on numerous environmental, physical and chemical influences, as well as on the period between excretion by an infected and infection of a healthy WWF. Testing of natural water reservoirs will generate information on the level of (eventual) contamination and the risk of AIV transmission via these media at different geographical and environmental conditions. Water samples should be collected from different points of each selected area, in an amount of approximately 500 ml per sample. Each sample should be tested for the presence of AIV, using PCR with previous concentration of the virus. Using a standardized protocol it is possible to quantitatively evaluate the level of contamination based on a comparison with a known titrated virus isolate.

Of great epidemiological interest would be the potential application of the same technology to trace short-range migration in wildlife carriers, in order to determine their role in transmission of animal and/or human pathogens.

Seven research contract holders from Bulgaria, China, Egypt, Nepal, Russian Federation, Tajikistan and Turkey, two agreement holders from Germany, and three technical contract holders from Canada, Republic of Korea and the UK are currently participating in the CRP.

The first RCM was held at the IAEA from 31 October to 2 November 2012. The second RCM was held from 5 to 9 May 2014 in Izmir, Turkey.

The early and rapid diagnosis and control of TADs – second phase – African swine fever (AFS)

Technical Officers: Herman Unger, Charles Lamien

This CRP started in 2014 and focuses on evaluating technologies which could help to control ASF worldwide.

African swine fever is a contagious viral disease of pigs transmitted by ticks or through contact. In domesticated pigs, it leads to acute disease with high mortality and survivors are chronically infected serving as the reservoir for further transmission. Wild boars are the natural reservoir in Africa. Endemic in wide parts of sub-Saharan Africa it has spread in the last 10 years to the Northern Caucasus and keeps expanding primarily to the West and

North. The disease creates severe economic hardship for pig farmers and due to lack of a vaccine, culling and quarantine measures are the only tools available to control disease. As pig production is in many cases a small scale business, farmers do often lack the means and education how to fend off disease. Similarly the diagnostic tools so far available have their limitations and a number of issues regarding its epidemiology or virology are not understood.

The CRP will focus on performing a validation trial of the serological and molecular diagnostic tools to define the fitness of purpose for each and every tests available. In parallel, samples from infected pigs, wild or domestic, will be collected for virus isolation. These isolates should be characterized and some of them sequenced in order to create an understanding of the genetic diversity on a spatial scale. This knowledge together with information regarding the pathology of each strain should allow some insight into the underlying patho-mechanisms and might help identify epitopes of interest for a candidate vaccine. Finally, a number of control measures will be initiated to see how efficient they are in the context of small scale commercial production.

The first research coordination meeting took place from 7 to 11 July 2014 in Vienna, Austria.

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/>.

Activities of the Animal Production and Health Laboratory

Animal Genetics

Genetic variation on the control of resistance to internal parasites in small ruminants for improving animal productivity

Field testing of DNA markers for parasite resistance in goats

Parasitic infections in sheep and goats cause severe economic losses to the tune of \$10 billion every year across the world. In continuation of its efforts in identifying DNA markers for parasite resistance, specifically *Haemonchus contortus*, the Animal Production and Health Laboratory (APHL) developed genotyping assays for 170 novel SNP (single nucleotide polymorphism) markers identified in several candidate genes related to immune pathways in goats. All the newly identified SNP markers are currently genotyped for association with parasite resistance in goats. Genotyping of 1175 goats belonging to 14 indigenous breeds that are part of the field trial in five countries (Bangladesh, China, Nigeria, Pakistan and Sri Lanka) is currently under progress. The field trial involved recording of phenotypes related to parasite resistance (faecal egg count, packed cell volume and body weight change) under natural infections in the above mentioned countries.

*Development of a real time PCR based assay to differentiate sympatric *Haemonchus* species infecting ruminants*

Identification of different species/variants of *Haemonchus* parasites, as well as knowledge regarding the epidemiology and genetic characterization of the principal circulating species/variants, is essential for the establishment of sustainable control strategies. APHL initiated the development of a real time PCR (polymerase chain reaction) based assay to differentiate the three major *Haemonchus* species infecting ruminants in Asia. A novel snapback PCR assay coupled with melting curve analysis was developed. APHL continued validation of the assay with additional field samples from Nigeria, Argentina and Austria. The specificity and sensitivity of the assay were also conducted to rule cross reaction with other gastro-intestinal parasites and to establish the limit of detection respectively. The results showed the assay being highly

sensitive and robust in detecting different species of *Haemonchus* (*H. contortus*, *H. placei* and *H. longistipes*).

Genetic characterization of indigenous sheep of Sri Lanka

Small ruminants (sheep and goat) form an important component of livestock production system in Sri Lanka. Sheep and goat are mostly reared for meat in Sri Lanka and crossbreeding has been applied to improve the production performance of local animals. This resulted in genetic dilution of indigenous breeds/populations although little or no information on their genetic characteristics is available. The Joint FAO/IAEA Division supported Sri Lanka's effort on genetic characterization of indigenous goat populations of Sri Lanka through a coordinated research project. In continuation of this, APHL currently supports the genetic evaluation of Jaffna Local sheep, the only indigenous sheep breed of Sri Lanka. DNA samples collected from various flocks of Jaffna local sheep were genotyped using short tandem repeat DNA markers, single nucleotide polymorphic markers and mitochondrial DNA markers. Genotype and sequence data of Jaffna local sheep will be compared with South Indian sheep to assess genetic relationship particularly, Madras Red, the sheep breed recommended for crossbreeding to improve mutton production. Information generated by this work is expected to help formulating strategies for breeding, improvement and conservation of indigenous sheep in Sri Lanka.

Genetics Laboratory Information and Data Management System (GLIDMaS)

Development and transfer of bioinformatics tools to animal genetics laboratories worldwide continues to be an important strategy to support FAO/IAEA Member States in managing their livestock biodiversity and improving productivity of local animal breeds. Development of a Genetics Laboratory Information and Data Management System (GLIDMaS) was initiated that will allow users to manage genetic repository, genetic and genomic resources. The system will have different modules including Genetic repository, DNA Markers-Microsatellite, DNA Markers-SNPs, DNA Sequence, Oligos, Radiation Hybrid Panels and laboratory inventory (Figure 1). The system will have the facility to manually enter and edit data, import multiple datasets from spreadsheets, search different modules, export search and found items and create reports. GLIDMaS platform will be a standalone application and will not need special software on user computers. Development of five modules have been completed so far for which the testing and validation of the system is currently under progress.

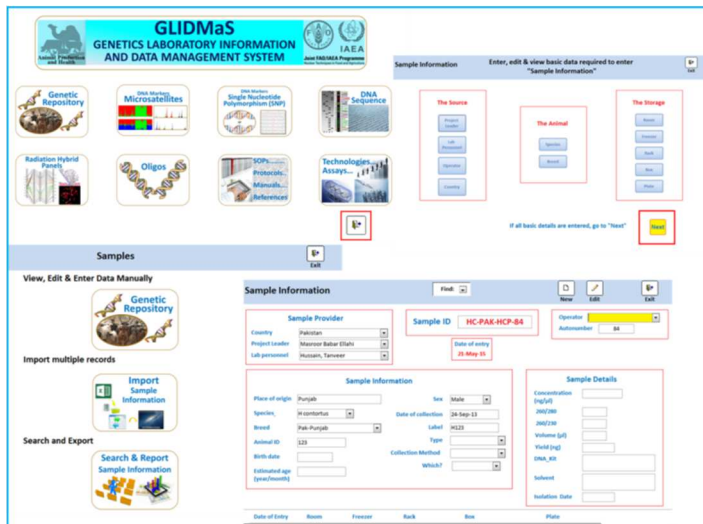


Figure 1. Genetics Laboratory Information and Data Management System.

Animal Health

Using irradiation technology to develop a potential trypanosome vaccine

Trypanosomosis, a parasite disease in mammals, remains a big hindrance to the development of livestock resources in Africa with more than one third of Africa infested by tsetse flies, the major insect vector of the parasite in the continent. The disease puts a large number of cattle at risk with annual losses estimated to be as high as US\$5 billion. A vaccine would provide the most effective means of managing the disease in Africa and other endemic areas. At the Joint FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf, experiments have been carried out to characterize the effects of using low level irradiation doses on trypanosomes. Previous studies have shown that parasites subjected to low level irradiation doses are not able to cause an infection in mice. In addition, using low dose irradiated parasites induces a stronger immune response when compared to using high dose irradiated parasites with cytokine levels as a marker of immunity. In order to further study the effect of low dose irradiation on protozoan parasites, an expression micro-array platform that covers the genomes of three trypanosome species, *T. brucei*, *T. evansi* and *T. congolense* has been designed by APHL. Such a multi-species genomic tool targeting Tsetse as well as non-Tsetse transmitted trypanosomes is expected to be used by researchers across different laboratories for studies on gene expression. In addition, this platform will lead to the identification of trypanosome genes across different species that are affected by low dose irradiation and are important during infection.

Orf virus infections in sheep and goats in Ethiopia

Orf is an acute, contagious, debilitating and economically important zoonotic viral skin disease of sheep, goats and wild ruminants caused by orf virus (ORFV). Owing to the existence of several diseases which can potentially develop similar lesions on the mouth and related symptoms (Figure 2) such as sheep pox, goat pox, peste des petits ruminants, dermatophytosis and foot and mouth disease, a good laboratory diagnostic is needed for outbreak confirmation.

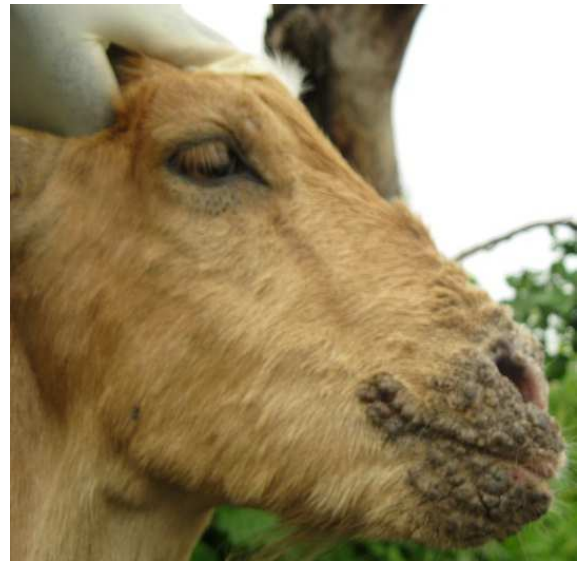


Figure 2. Crusted wart-like multiple lesions on the oral commissures, lips and nostril area in a goat infected by Orf

With the view of developing a panpoxvirus assay for detection of pathogens causing pox-like lesions in ruminants and camels, APHL has completed a comprehensive study of ORFV infections in sheep and goats in Ethiopia that occurred between 2008 and 2013. Six Orf suspected outbreaks were investigated in different geographical locations of the country and DNA samples were taken to APHL for molecular characterization. The results have provided the first laboratory confirmation of ORFV infections in Ethiopia where disease diagnosis was based only on clinical observations. Additionally, multiple variants of ORFV were characterized, highlighting at least two separate evolutionary pathways for ORFV in the country (Figure 3). Although, no human cases were recorded during these investigations, the current results will serve as basis to formulate recommendations for ORFV management in the country. Additionally, these investigations have confirmed the need for developing a panpoxvirus detection method for the accurate identification of pathogens causing pox-like lesions in ruminants and camels, and APHL is currently working on it. Indeed, ORFV were characterized in skin samples with lesions suspected of capripoxvirus infections.

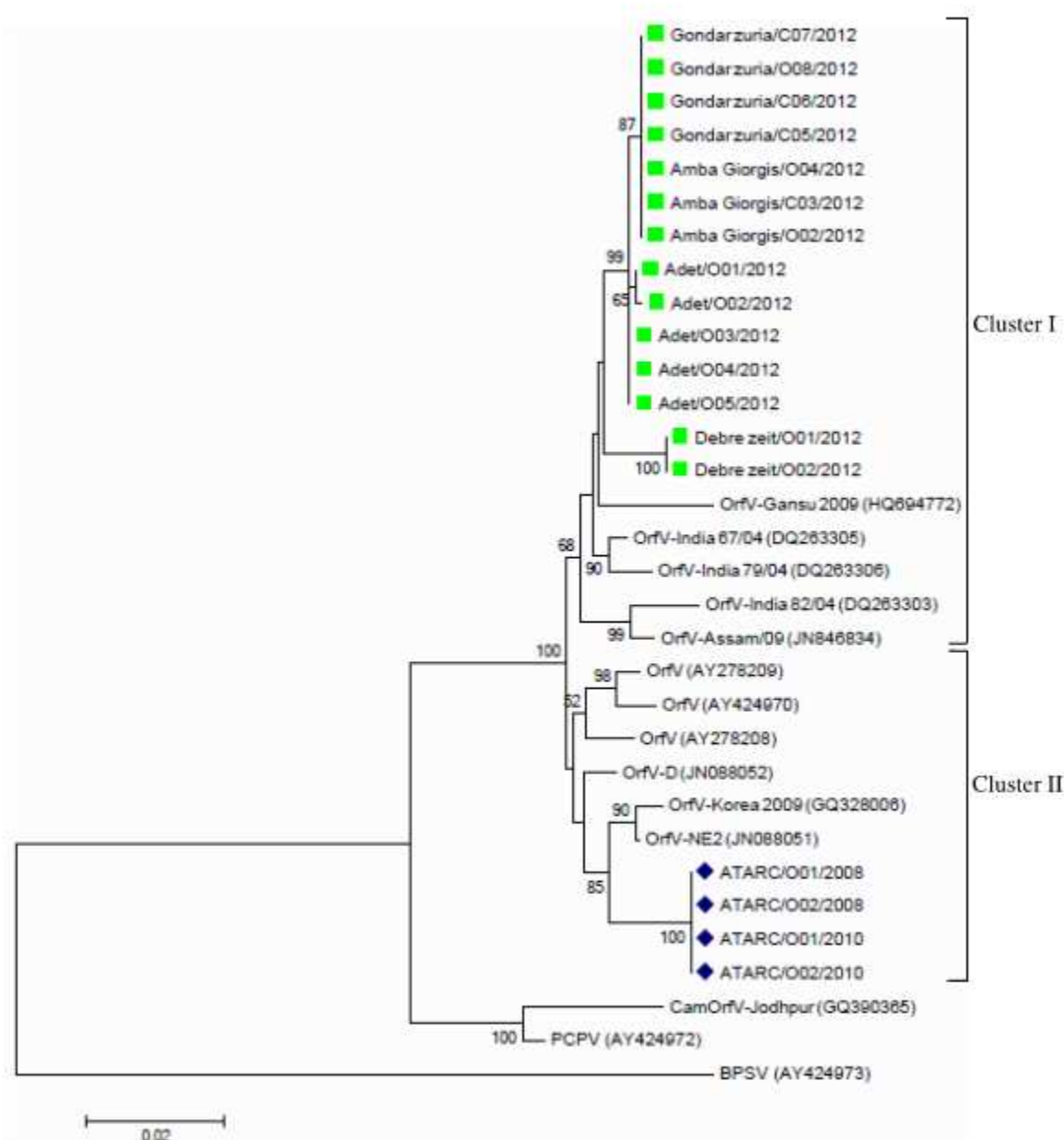


Figure 3. Phylogenetic analysis of ORFV based on the full-length B2L gene nucleotide sequences. The Ethiopian ORFV isolates (highlighted) grouped into two clusters together with other strains.

African swine fever

African swine fever (ASF) is one of the most devastating transboundary animal diseases for the swine industry, both in Africa and the Balkan region. The disease also represents a serious threat to Europe with the recent detection of ASF in wild boar in several countries (including Russia, Belarus, Lithuania and Poland), showing the continued movement of virus westward.

APHL is currently collaborating with Member States to assess the epidemiology of ASF virus (ASFV) and study the viral genome through IAEA technical cooperation projects, coordinated research projects (CRP D3.20.31-

Early and Rapid Diagnosis and Control of Transboundary Animal Diseases — Phase II: African Swine Fever) and extra budgetary projects (Peaceful Uses Initiative). Due to the lack of information about currently circulating genotypes and subtypes of ASFV, several MS requested APHL to molecularly characterize their local strains. In 2014, isolates from Burkina Faso, Chad, Côte d'Ivoire, Nigeria and Senegal were characterized. The results are consistent with previous virus isolates from Western and Central Africa showing the dominant presence of genotype I based on characterization of the p72 gene sequence.

Fellows/interns/consultants

Ms Pann Pwint Phyu from Livestock Breeding and Veterinary Department, Yangon, Myanmar was trained on genetic characterization, population structure and phylogeography of indigenous goat breeds from Myanmar at APHL for three months (25 June to 21 September 2014) under TC fellowship (MYA/13013).

Ms Maheshika Kurukulasuriya from University of Peradeniya, Peradeniya, Sri Lanka, was trained on genetic diversity analysis of Sri Lankan sheep using nuclear and extra-nuclear DNA markers at APHL for three months (16 March to 8 June 2015) as part of CRP D3.10.26.

Ms Katja Silbermayr from Institute of Parasitology, Veterinary Medical University, Vienna, Austria, worked on a novel real time PCR based snapback assay to differentiate sympatric species of *Haemonchus* to complete her internship for a period of one month from 9 April to 8 May 2015.

Mr Edgar Kayesa from Central Veterinary Research Institute, Zambia, was trained at APHL on Laboratory diagnosis of transboundary animal diseases using molecular techniques (from 2 March to 30 April 2015) under IAEA/TC project ZAM/5/028.

Ms Keitumetse Gladys Mangate from the Botswana National Veterinary Laboratory was trained at APHL on laboratory diagnosis of transboundary animal diseases using molecular techniques for three months from 20 January to 17 April 2015 under IAEA/TC Project BOT/5/011.

Mr Charles Mayenga Ngassa from the Veterinary Laboratory Agency, United Republic of Tanzania, was trained on Molecular diagnosis and molecular epidemiology of PPRV at APHL for three months from 16 February to 11 May 2015.

Technical Cooperation Projects

TC Project	Description	Technical Officer(s)
ALG/5/027	<p>Strengthening Animal Health and Livestock Production to Improve Diagnostic and Reproductive Capacities in Animal Breeding and Support Expertise for the Feasibility Study of a Biosafety Laboratory, Level 3 (BSL3)</p> <p>Objective: To contribute to the improvement of animal health and livestock production by using nuclear and nuclear related technologies to strengthen reproductive and diagnostic capacities in animal breeding, to support expertise for the feasibility study of a biosafety laboratory.</p>	M. Shamsuddin I. Naletoski C. Lamien
ANG/5/011	<p>Monitoring Soil Fertility in Pasture Areas for Their Improvement and Maintenance</p> <p>Objective: The objective of the work is monitoring of soils in pasture areas for their improvement and maintenance.</p>	M. Shamsuddin
BDI/0/001	<p>Supporting Human Resource Development and Nuclear Technology Support including Radiation Safety</p> <p>Objective: To upgrade and strengthen the skills and capabilities of human resources and to provide general support within the broad spectrum of the application of nuclear science and technology, including radiation safety. To support unforeseen relevant needs of Member States.</p>	I. Naletoski
BEN/5/007	<p>Soil, Crop and Livestock Integration for Sustainable Agriculture Development Through the Establishment of a National Laboratory Network</p> <p>Objective: An interdisciplinary project that aims at a sustainable intensification of peri-urban agricultural production through the integration of cropping-livestock systems was developed.</p>	M. Shamsuddin H. Unger
BKF/5/011	<p>Improving the Health and Productivity of Small Ruminants through Efficient Animal Feeding, Identification of Genetic Markers for Breeding Programmes and Better Health and Reproductive Management</p> <p>Objective: To improve small ruminants productivity through efficient use of local plant resources in animal feeding and health, identification of genetic markers for use in breeding programmes and better health and reproductive management.</p>	M. Shamsuddin K. Periasamy
BKF/5/014	<p>Improving the Productivity of Small Ruminants through Diet, Health and Identification of Genetic Markers for Selection and Breeding Management</p> <p>Objective: To contribute to improving the productivity and profitability of small ruminant farms in Burkina Faso by applying genetic characterization and artificial insemination for breeding and utilizing local feed resources to improve nutrition and medicinal plants to control parasites</p>	M. Garcia Podesta M. Shamsuddin K. Periasamy
BOT/5/008	<p>Using Nuclear and Molecular Diagnostic Techniques for Improved Diagnosis of Animal Diseases</p> <p>Objective: To employ nuclear and molecular diagnostic techniques to improve diagnosis of animal diseases.</p>	G. Viljoen C. Lamien
BOT/5/011	<p>Using Nuclear and Molecular Techniques for Early and Rapid Diagnosis and Control of Transboundary Animal Diseases</p> <p>Objective: To employ nuclear molecular diagnostic techniques to improve diagnosis of transboundary animal diseases, such as foot and mouth disease, contagious bovine pleuropneumonia, avian influenza, Rift Valley fever, tuberculosis, PPR (peste des petits ruminants) and rabies.</p>	G. Viljoen C. Lamien

TC Project	Description	Technical Officer(s)
BZE/5/007	Supporting Sustainable Capacity Building through Distance Learning for Laboratory Personnel of the National Agricultural Health Authority Objective: To increase and sustain the level of trained qualified staff in the laboratory, and thus the sustainability of the laboratory as a whole by providing an avenue for technical laboratory staff to pursue educational advancement while retaining their services.	G. Viljoen
CAF/5/005	Enhancing Livestock Productivity through the Improvement of Selection and Use of Artificial Insemination for Increased Meat and Milk Production Objective: Improve cattle productivity by implementing a reliable artificial insemination (AI) programme in the country.	M. Shamsuddin
CHD/5/004	Improving Cattle Productivity through Genetic Improvement, Including Artificial Insemination, to Contribute to Reducing Poverty and Combating Food Insecurity Objective: Improve the productivity of local cattle breeds by means of artificial insemination.	M. Shamsuddin
CMR/5/018	Improving Productivity of Indigenous Breeds and Animal Health Objective: Improved productivity of indigenous breeds and animal health.	H. Unger K. Periasamy M. Garcia Podesta
CMR/5/019	Using Nuclear Techniques to Improve Milk Production Objective: To improve breeding and disease control in cattle for increased milk production in Cameroon by utilising nuclear techniques.	M. Garcia Podesta M. Shamsuddin H. Unger K. Periasamy
ELS/5/011	Enhancing Livestock Productivity and Decreasing Environmental Pollution through Balanced Feeding and Proper Manure Management Objective: Enhance livestock productivity and decrease environment pollution through balanced feeding and proper manure management.	M. Shamsuddin H. Unger
ERI/5/009	Enhancing Small Scale Market Oriented Dairy Production and Safety for Dairy Products through Improved Feeding and Cattle Management, Higher Conception Rates and Lower Calf Mortality Objective: To increase dairy production through improved feeding and cattle management and higher conception rate and lower calf mortality, and improve farmers' livelihood in Eritrea.	M. Shamsuddin
ETH/5/017	Improving Livestock Productivity through Advances in Animal Health and Production Objective: Improvement of livestock productivity through advances in animal health and production.	G. Viljoen
IVC/5/032	Establishing Epidemiological Surveillance of Peste des s Ruminants (PPR) and Studying Its Socio-Economic Impact on Rural Populations by Developing Diagnostic Tools and Providing Economic Data to Veterinary Services Objective: To develop diagnostic tools and provide economic data to assist veterinary services in developing a proper strategy to control peste des petits ruminants in Côte d'Ivoire.	H. Unger G. Viljoen
IVC/5/034	Monitoring Epidemiology of Transboundary Animal Diseases Objective: To contribute to the fight against peste des petits ruminants (PPR). To allow for a systematic study and characterization of the viral strains present in Côte d'Ivoire. To help improve the economic situation of small-scale farmers, who have suffered in the crisis. The results from the epidemiological study planned under the project, and of the economic study to be conducted, will be key tools in this post-crisis phase.	H. Unger

TC Project	Description	Technical Officer(s)
KAM/5/002	Using Nuclear and Molecular Techniques to Improve Animal Productivity and Control Transboundary Animal Diseases Objective: To improve livestock productivity for food security by integrated management of animal nutrition, reproduction and health which includes: early pregnancy diagnosis for better reproductive management, metabolic profiles in livestock for assessing nutrition.	G. Viljoen M. Garcia Podesta M. Shamsuddin
KEN/5/033	Using an Integrated Approach towards Sustainable Livestock Health and Nutrition to Improve Their Production and Productivity for Enhanced Economic Development Objective: To use an integrated approach to manage both livestock health and nutrition in order to improve their production and productivity for enhanced economic development.	M. Shamsuddin
LES/5/002	Using Nuclear and Molecular Techniques for Improving Animal Productivity and Control of Transboundary Animal Diseases to Enhance Livestock Production and Health Objective: To improve livestock production and health.	G. Viljoen
LES/5/003	Using Nuclear and Molecular Techniques for Improving Animal Productivity Objective: To improve livestock production.	G. Viljoen
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.	M. Shamsuddin I. Naletoski
MAG/5/020	Improving Stockbreeding Productivity Through the Application of Nuclear and Related Techniques for Reducing Rural Poverty Objective: To contribute to reducing rural poverty by improving the productivity of stockbreeding.	M. Shamsuddin I. Naletoski
MAR/5/021	Improving Smallholder Dairy Productivity through Better Nutrition by Using Locally Available Forage and Browse Species Objective: To contribute to the improvement of smallholder dairy productivity through better nutrition using locally available forage and browse species.	M. Shamsuddin
MAU/5/004	Supporting Genetic Improvement of Local Cattle Breeds and Strengthening the Control of Cross-Border Diseases Objective: To increase livestock productivity by reducing disease events and improving breeding programmes and genetic resources for food security.	H. Unger M. Shamsuddin
MLI/5/025	Improving National Capacities to Characterize Serotypes of Major Animal Diseases Using Molecular Biology Techniques for the Development of a National Disease Control Strategy Objective: The main objective is identification of the various serotypes of the foot and mouth disease virus. The project would help the elaboration of a national strategy for control of the disease by formulating vaccines which are currently imported from Botswana.	I. Naletoski C. Lamien
MLI/5/026	Improving the Diagnosis of Livestock Diseases Objective: To improve animal health by implementing a control programme to tackle the major prevalent animal diseases in Mali.	I. Naletoski C. Lamien
MLW/5/001	Strengthening the Essential Animal Health and Veterinary Infrastructure for Disease Control and Management Services in Urban and Rural Areas Objective: To develop capacity and strengthen infrastructure for animal disease control and management services in urban and rural areas of Malawi.	H. Unger

TC Project	Description	Technical Officer(s)
MON/5/020	<p>Improving the Health Status of Livestock by Developing a Technology to Produce the Vaccine and Diagnostic Kit for Transboundary Animal Diseases</p> <p>Objective: To improve the health status of livestock by developing a technology to produce the vaccine and diagnostic kit of transboundary animal diseases.</p>	H. Unger G. Viljoen
MON/5/021	<p>Improving the Productivity and Sustainability of Farms Using Nuclear Techniques in Combination with Molecular Marker Technology</p> <p>Objective: To improve the productivity and sustainability of livestock and crop integrated farms through utilization of high yield, disease resistant new wheat varieties and other cereal varieties developed by the combined application of nuclear and molecular marker.</p>	M. Shamsuddin
MOR/5/034	<p>Improving Veterinary Drug Residue Detection and Animal Disease Diagnosis with Nuclear and Molecular Techniques</p> <p>Objective: To establish technical expertise using nuclear and complimentary non-nuclear techniques for screening and confirmatory analysis of veterinary drug residues and related chemical contaminants in food for human consumption and diagnosis of animal diseases by molecular biology.</p>	I. Naletoski
MOZ/5/005	<p>Strengthening the Sustainability of the Institution to Address Animal Diseases, Prevention, Food Safety and Animal Production Problems through Nuclear and Related Techniques</p> <p>Objective: To improve the productivity and sustainability of livestock and crop integrated farms through utilization of high yield, disease resistant new wheat varieties and other cereal varieties developed by the combined application of nuclear and molecular marker.</p>	G. Viljoen
MYA/5/022	<p>Improving Animal Productivity through the Use of DNA-Based Technology and Artificial Insemination</p> <p>Objective: To improve livestock productivity through the selection of superior breeding stock and to improve capacity in the use of molecular and related technologies for raising the genetic quality of local and adapted livestock breeds.</p>	M. Shamsuddin K. Periasamy
MYA/5/024	<p>Supporting the National Foot and Mouth Disease Control Programme</p> <p>Objective: To increase productivity of the livestock sector by implementing sustainable strategies to control and eradicate Foot and Mouth Disease.</p>	G. Viljoen
NAM/5/011	<p>Establishing Research and Diagnostic Capacity for the Effective Control of Animal Diseases in the Northern Communal Areas and Improving Vet. Public Health Services</p> <p>Objective: To control transboundary and parasite-borne animal diseases in the Central and Northern Communal Areas (NCA) and to improve veterinary-public health.</p>	H. Unger G. Viljoen
NEP/5/002	<p>Improving Animal Productivity and Control of Transboundary Animal Diseases Using Nuclear and Molecular Techniques</p> <p>Objective: To improve livestock productivity for food security by integrated management of animal nutrition, reproduction and health.</p>	G. Viljoen I. Naletoski
NER/5/016	<p>Strengthening the Capacities of the Epidemiological Surveillance Network for Transboundary Animal Diseases of Livestock</p> <p>Objective: To contribute to ensuring food security and to reducing poverty by improving livestock productivity through mitigation of health constraints.</p>	I. Naletoski
RAF/0/042	<p>Promoting the Sustainability and Networking of National Nuclear Institutions for Development</p> <p>Objective: To enhance the self-reliance and sustainability of national nuclear institutions and other end users of nuclear techniques in African Member States through the rationalization of scientific programmes and managerial practices.</p>	I. Naletoski

TC Project	Description	Technical Officer(s)
RAF/5/068	<p>Improving Livestock Productivity through Strengthened Transboundary Animal Disease Control using Nuclear Technologies to Promote Food Security (AFRA)</p> <p>Objective: To integrate livestock disease control in support of increased livestock productivity to enhance food security. To use an integrated approach while deploying available appropriate technologies to bring about sustainable improvement of livestock production among AFRA Member States. This will contribute to food security and poverty reduction, especially among small-holder farmers.</p>	H. Unger C. Lamien
RAF/5/073	<p>Strengthening Africa's Regional Capacity for Diagnosis of Emerging or Re-emerging Zoonotic Diseases, including Ebola Virus Disease (EVD), and Establishing Early Warning Systems.</p> <p>Objective: To enhance control of emerging zoonotic diseases in the African region, through safe and accurate early detection of pathogens in wildlife and livestock.</p>	H. Unger I. Naletoski
RAS/5/060	<p>Supporting Early Warning, Response and Control of Transboundary Animal Diseases</p> <p>Objective: To establish a regional/national network of laboratories and training centres on early diagnosis, response and control of transboundary animal diseases and eradication programmes for zoonotic diseases.</p>	H. Unger
RAS/5/063	<p>Improving the Reproductive and Productive Performance of Local Small Ruminants by Implementing Reliable Artificial Insemination Programmes</p> <p>Objective: To improve small ruminants productivity by implementing reliable artificial insemination programmes.</p>	M. Shamsuddin / M. Garcia K Periasamy
RAS/5/069	<p>Complementing Conventional Approaches with Nuclear Techniques towards Flood Risk Mitigation and Post-Flood Rehabilitation Efforts in Asia</p> <p>Objective: To improve the capacity to develop resilience/adaptation of agricultural production systems to flooding events by (i) generating flood-tolerant crops using nuclear techniques, (ii) improving soil-water-nutrient management practices by isotopic techniques for flood adaptation-rehabilitation approach, (iii) optimizing use of local feed resources while protecting the environment, animal production and locally adapted animal breeds, and early and rapid diagnosis/control of trans-boundary animal/zoonotic diseases, (iv) flood management by use of isotope hydrology, comprehensive water resources assessment, including river basin and groundwater systems, for forecasting occurrence and potential extent of floods, and (v) developing strategies to exploit the potential of floodplains to absorb floodwater to the extent possible and to fulfil additional needs of drinking and irrigation through use of groundwater from floodplains.</p>	G. Viljoen / I. Naletoski C. Lamien
RER/5/016	<p>Supporting Coordinated Control of Transboundary Animal Diseases with Socioeconomic Impact and that Affect Human Health</p> <p>Objective: To reduce transboundary disease incidence in livestock and livestock products in the Euro-Asian region.</p>	I. Naletoski C. Lamien
SEY/5/008	<p>Building Capacity for Diagnosis of Animal Diseases using Nuclear and related Techniques (Phase I)</p> <p>Objective: To enhance local production of livestock in order to improve local food and nutrition security by reducing the country's dependence on importation of animal and animal products.</p>	H. Unger G. Viljoen
SIL/5/013	<p>Establishing a Dual-Purpose Cattle Development Project for the Sustainable Contribution to Food Security, Poverty Alleviation and Improved Livelihoods of Communities Raising Cattle</p> <p>Objective: Sustainable contribution to food security, poverty alleviation and improved livelihoods of communities raising cattle.</p>	M. Shamsuddin H. Unger

TC Project	Description	Technical Officer(s)
SIL/5/015	Enhancing Ebola Diagnostic Capacity using nuclear-derived technique at WHO/NICD EVD Lakka Laboratory, Freetown, Sierra Leone Objective: To support the national efforts and international response to combat Ebola outbreak in Sierra Leone.	I. Naletoski H. Unger G. 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.	H. Unger C. Lamien
SRL/5/045	Establishing a National Centre for Nuclear Agriculture Objective: To develop and implement programmes on the use of nuclear technology applications in the field of agricultural soil, water and plant nutrient studies, crop variety improvement and associated management technologies.	H. Unger C. Lamien
SUD/5/036	Improving Livestock Production for Enhanced Food Security through Genetic Improvement of Indigenous Animal Breeds Using Artificial Insemination, Improved Nutrition and Adequate Animal Disease Control Measures Objective: To attain food security by improving livestock productivity.	N. Naletoski M. Garcia Podesta
THA/5/053	Enhancing Productivity and Control of Reproductive Diseases of Dairy Cattle and Buffaloes by Application of Nuclear-Based and Molecular Techniques Objective: To enhance productivity of dairy cattle and buffaloes in Thailand in order to obtain food security, poverty reduction and a good quality of life for farmers according to the national development programme for food and agriculture, with a focus on animal productivity and disease control.	G. Viljoen M Shamsuddin
TUN/5/028	Supporting Watering Strategies to Help Livestock Raised in Semiarid and Arid Regions Coping with Climate Change Objective: To characterize, analyse and to adjust watering strategies for livestock adopted in different production systems in the main agroecological areas of Tunisia. To enhance livestock performance, secure the sustainability of livestock-based production systems and contribute to the empowerment of livelihoods of rural communities.	M. Garcia Podesta I. Naletoski
UGA/5/032	Improving Animal Production and Productivity through Advanced Animal Disease Control and Animal Production Measures Objective: To improve animal production and productivity through advanced animal disease control and animal production measures.	H. Unger C. Lamien
UGA/5/035	Improving Food Safety through Surveillance of Fish Diseases Objective: To avail credible information about trace metals and aflatoxins in fish.	H. Unger C. Lamien
URT/5/027	Improving Livestock Production and Productivity through Sustainable Application of Nuclear and Related Techniques Objective: The broad objective of this project is to improve livestock production and productivity in the United Republic of Tanzania through sustainable application of various nuclear and nuclear related techniques.	M. Shamsuddin M. Garcia Podesta
YEM/5/012	Improving Diagnostic and Analytical Capabilities of the Central Veterinary Laboratory Including Residue Testing of Animal Products Objective: To enhance livestock productivity and quality by reducing the incidence of livestock diseases.	H. Unger

TC Project	Description	Technical Officer(s)
ZAI/5/021	Upgrading Laboratory Services for the Diagnosis of Animal Diseases and Building Capacity in Vaccine Production to Support the Sustainability of Food Security and Poverty Alleviation Objective: To support the sustainability of food security and poverty alleviation through animal diseases diagnosis and immunization.	H. Unger
ZAI/5/023	Upgrading Laboratory Services for Capacity Building in Fish and Aquaculture Diseases as a Contribution to Sustainable Poverty Alleviation and Sanitary Security of Food Objective: To enhance advanced skills in the diagnosis and investigation of fish and aquaculture diseases as a contribution to sustainable poverty alleviation and sanitary security of food.	H. Unger
ZAM/5/028	Improving Productivity of Dairy Animals Maintained on Smallholder Farms through Selected Breeding and Effective Disease Diagnosis and Control Using Isotopic and Nuclear Techniques Objective: To improve productivity of dairy animals maintained on smallholder farms in rural areas through selected breeding, effective disease diagnosis and control, improved supply of quality feeds and application of assisted animal reproduction techn.	I. Naletoski M. Garcia
ZIM/5/016	Strengthening Food Security and Safety by Advancing Technologies for the Rapid Diagnosis of Diseases of Major Economic and Zoonotic Importance and for Residue/Pesticide Control in Animals and Animal Products Objective: Strengthening the existing technology and capacity to rapidly diagnose diseases of major economic and zoonotic importance and enable proper and timely response to disease outbreaks.	I. Naletoski

Publications

Capripox disease in Ethiopia: Genetic differences between field isolates and vaccine strain, and implications for vaccination failure

Gelaye, E., Belay, A., Melesse A.G., Jenberie, S., Yami, M., Loitsch, A., Tuppurainen, E., Grabherr, R., **Diallo, A., Lamien, C.E.**

Antiviral Research, Volume 119, July 2015, Pages 28–35; doi:10.1016/j.antiviral.2015.04.008

Sheeppox virus (SPPV), goatpox virus (GTPV) and lumpy skin disease virus (LSDV) of the genus Capripoxvirus (CaPV) cause capripox disease in sheep, goats and cattle, respectively. These viruses are not strictly host-specific and their geographical distribution is complex. In Ethiopia, where sheep, goats and cattle are all affected, a live attenuated vaccine strain (KS1-O180) is used for

immunization of both small ruminants and cattle. Although occurrences of the disease in vaccinated cattle are frequently reported, information on the circulating isolates and their relation to the vaccine strain in use are still missing. The present study addressed the parameters associated with vaccination failure in Ethiopia. Retrospective outbreak data were compiled and isolates collected from thirteen outbreaks in small ruminants and cattle at various geographical locations and years were analysed and compared to the vaccine strain. Isolates of GTPV and LSDV genotypes were responsible for the capripox outbreaks in small ruminants and cattle, respectively, while SPPV was absent. Pathogenic isolates collected from vaccinated cattle were identical to those from the non-vaccinated ones. The vaccine strain, genetically distinct from the outbreak isolates, was not responsible for these outbreaks. This study shows capripox to be highly significant in Ethiopia due to low performance of the local vaccine and insufficient vaccination coverage. The development of new, more efficient vaccine strains, a GTPV strain for small ruminants and a LSDV for cattle, is needed to promote the acceptance by farmers, thus contribute to better control of CaPVs in Ethiopia.

Complete genome sequence of a lineage I Peste des Petits Ruminants Virus isolated in 1969 in West Africa

Dundon W.G., Daojin, Y., Loitsch A., Diallo A.

Genome Announcements 2015 May 7 : 3(3). pii: e00381-15. doi: 10.1128/genomeA.00381-15

In March 2013 a lyophilized specimen was shipped by the Laboratoire de Virologie ISRA/LNERV, Dakar, Sénégal to the Animal Production and Health Laboratory, Vienna for further characterization. The specimen dates back to 1969 and, although the original sample from which the specimen was derived is believed to have been collected in Senegal, the sample's exact origin is unclear. What is known, however, is that five goats were experimentally infected in June 1969 using the original sample. All of the animals died following classical PPR symptoms i.e. depression, diarrhoea, respiratory difficulties, serous and mucopurulent nasal discharges. The lungs of the dead animals were ground and passaged three times in lamb kidney cells. Aliquots (1ml) of the infected cultures were then lyophilized on the 3-9-1969. On arrival in Vienna, the lyophilized specimen used to infect CHS-20 cells). A cytopathic effect was observed after 5 days. RNA was extracted and subjected to full genome sequencing. The organization of the PPRV E32/1969 genome (15,948 bp) was identical to that seen for other PPRVs with a 107 nt genome promoter region at the 3' end followed by the transcription units for the N, P, M, F, H and L proteins and the antigenome promoter at the 5' end. The genome has the highest nucleotide sequence identity (97.1%) with the lineage I virus ICV89 (EU267273) and the lowest identity (89.3%) with the lineage III virus KN5/2011 (KM463083). This is the earliest PPRV genome sequenced to date and only the second lineage I virus available in public databases. The sequence provides important information to those working on the molecular evolution of this important transboundary disease.

Detection and genome analysis of a Lineage III peste des petits ruminants virus in Kenya in 2011

Dundon, W.G., Kihu S, Gitao, G.C., Bebora, L.C., John N.M., Oyugi, J.O., Loitsch, A., Diallo, A.

Transboundary and Emerging Disease (In press) doi: 10.1111/tbed.12374

In May 2011 in Turkana county northwestern Kenya tissue samples were collected from goats suspected of having died of peste des petits ruminant (PPR) disease, an acute viral disease of small ruminants. The samples were processed and tested by reverse-transcriptase PCR for the presence of PPR viral RNA. The positive samples were

sequenced and identified as belonging to PPRV Lineage III. Full genome analysis of one of the positive samples revealed that the virus causing disease in Kenya in 2011 was 95.7% identical to the full genome of a virus isolated in Uganda in 2012 and that a segment of the viral fusion gene was 100% identical to that of a virus circulating in the United Republic of Tanzania in 2013. These data strongly indicate transboundary movement of Lineage III viruses between Eastern Africa countries and has significant implications for surveillance and control of this important disease as it moves southwards in Africa.

Environmental factors and dam characteristics associated with insulin sensitivity and insulin secretion in newborn Holstein calves

Kamal, M.M., Van Eetvelde, M., Bogaert, H., Hostens, M., Vandaele, L., Shamsuddin, M., Opsomer, G.

Animal. 2015. doi:10.1017/S1751731115000701

The objective of the present retrospective cohort study was to evaluate potential associations between environmental factors and dam characteristics, including level of milk production during gestation, and insulin traits in newborn Holstein calves. Pre- and post-natal physiological data were recorded. A blood sample was collected from all calves at least 5 h after a milk meal on day 3 of life to measure basal glucose and insulin levels. In addition, an intravenous glucose-stimulated insulin secretion test was performed in a subset of the calves (n=316). After descriptive analysis, generalized linear mixed models were used to identify factors that were significantly associated with the major insulin traits (Insb, basal insulin level; QUICKI, quantitative insulin sensitivity check index; AIR, acute insulin response; DI, disposition index) of the newborn calves. The insulin traits were significantly associated with gender and season of birth when data of all calves were analysed. In addition, the insulin traits in calves born to cows were significantly associated with MGEST, DP and LL. The Insb was estimated to be higher in calves born to the cows having passed a higher MGEST (P=0.076) and longer DP (P=0.034). The QUICKI was estimated to be lower in calves born to the cows having passed a higher MGEST (P=0.030) and longer DP (P=0.058). Moreover, the AIR (P=0.009) and DI (P=0.049) were estimated to be lower in male compared with female calves. Furthermore, the AIR (P=0.036) and DI (P=0.039) were estimated to be lower in calves born to cows having passed a longer LL. The decisive effects of MGEST, DP and LL in cows on the insulin traits of their calves may provide a basis for developing managerial interventions to improve metabolic health of the offspring.

VETLAB Network

The Animal Production and Health Section (APH) supported veterinary diagnostic laboratories in Member States (MSs) towards the successful worldwide eradication of Rinderpest through the FAO/IAEA Rinderpest Laboratory Network. Building on this success, APH continues its efforts in maintaining and building diagnostic laboratory capacities to support the control of animal and zoonotic disease threats to MSs in cooperation with the FAO and OIE. The VETLAB Network participants are being supported through IAEA and FAO programmatic activities as well as by South Africa through the African Renaissance Fund (ARF) and USA and Japan Peaceful Uses Initiative (PUI).

APH is now taking an additional step in introducing the VETLAB Network Newsletter in the hope of providing a forum for participating laboratories and other stakeholders to communicate and exchange knowledge/information, to showcase achievements and to share expertise within the VETLAB Network.

Initially, the newsletter will be distributed every three months through our web site, via e-mail and in a printed version. We strongly encourage participants of the VETLAB Network to contribute to the success of this initiative with contributions in relation to your laboratory activities.

Impressum

Animal Production and Health Newsletter No. 62

The APH Newsletter is prepared twice per year by the Animal Production and Health Section, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and FAO/IAEA Agriculture & Biotechnology Laboratory, Seibersdorf.

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