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LAMPing in the field – Northern Cameroon

To Our Readers

Dear Colleagues,

The first six months of this year have been a busy time for all personnel in the sub-programme. Apart from our regular Co-ordinated Research Project (CRP) activities and our technical support given to on-going national and regional Technical Co-operation (TC) projects, we were also involved in the initiation (together with TC country officers) of the 2014/15 biennial TC project cycle. In addition to this, when carrying out our 2010/11 end of cycle programmatic performance evaluations, we could identify the areas where good performance was achieved as well as areas where further improvements are needed. It is hoped that our inputs will serve the best interests of our Member States for the present programme cycle 2012-2013.

In response to many requests from our readers, I have decided to give a brief overview of our Subprogramme as background to the upcoming 'Scientific Forum' (Food for the Future: Meeting the Challenges with Nuclear Applications) that will take place during the IAEA General Conference in September 2012. The focus of the Animal production and Health Subprogramme activities is on enhancing food security by supporting sustainable livestock production systems in developing countries. This is to be achieved by strategic and applied research, technology transfer and capacity building. The three principal components of the sub-programme are animal nutrition, animal reproduction and breeding and animal health.

Problems are identified and solutions developed through the use of strategically applied nuclear-based tools, in conjunction with conventional technologies to:

- Characterize and optimally utilize locally available feed and feed resources to enhance maximum energy conversion, whilst minimizing methane and CO₂ emissions;
- Increase animal production through the characterization of livestock genetic make-up to drive the integration of locally adapted animal breeds with trait selected exotic breeds to satisfy the increasing demand for 'more and of better quality' animals and animal products;
- Assess and reduce the risk to livestock by the effective diagnosis and monitoring of transboundary animal diseases and zoonoses and their use in national and international control and eradication programmes.

The above activities are complemented by tools developed for computerized data management in disease diagnosis and animal production; use of geographic information systems in the management of farm resources and diseases; and distance learning through information communication technologies in the related areas.

The aim of the IAEA Scientific Forum on Food Security is to present to Member States the use of nuclear applications for food security in food production, food protection and food safety. Food and agriculture face unprecedented challenges – population increase, degradation of resources, climate change, arable land reduction, water scarcity, urbanization, migration, diet change, and the shift to biofuels, among other things, are affecting local and global food security and putting pressure on productive capacity and ecosystems. By 2050, the world's population will reach 9 billion, 34% higher than today. In order to feed this larger and more urbanized population, food production must increase by more than 70%. Annual cereal production will need to rise to about 3 billion tonnes from 2.1 billion today and annual meat production will need to rise by over 200 million tonnes to reach 470 million tonnes. Never before, on such a scale, has it been more important for the world to generate and use agricul-

tural technologies to reduce hunger and poverty in an equitable, environmentally, socially and economically sustainable manner. We promote the value added use nuclear techniques and related biotechnologies to develop and improve strategies for affordable and sustainable food. Nuclear techniques enable farmers, food processors and government agencies to provide people with more, better and safer food, while conserving soil and water resources and the biodiversity on which these products depend.

To this effect, the Joint FAO/IAEA Division cooperates with approximately 500 research institutions and experimental stations in Member States through a network provided through some 34 Coordinated Research Projects (CRPs). The Joint Division is also responsible for providing scientific and technical support to over 200 national and regional IAEA Technical Co-operation Projects, as well as for inter-regional and regional training courses being organised each year for more than 1000 trainees from developing countries. We will continue to keep all interested parties informed on the proceedings and developments that emanate from this forum. Much of this, and other interesting stories, can be followed on our website (<http://www.iaea.org/programmes/nafa/d3/index.html>).

As discussed in previous newsletters, the Animal Production and Health sub-programme will continue to move progressively forward and in pace with developments within the livestock field so as to optimally serve our Member States. We will therefore continue to encourage project teams to keep abreast of current technological developments and to promote their implementation where feasible. This will allow a better positioning of our Member States with respect to international trade and other livestock-related issues. In turn, it will assure improved quality assurance of animal husbandry and health practices, and lead to greater food autonomy for Member States.

In our news from the sub-programme we would like to take leave of Mr Tesfaye Rufael CHIBSSA, who was at APHL for 4 months (18 January 2012 to 17 May 2012) to learn Capripoxvirus and peste des petits ruminants virus genotyping techniques.



Gerrit Viljoen,
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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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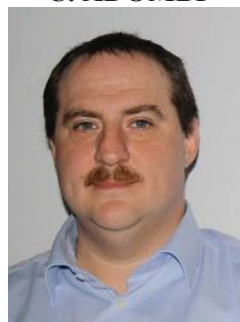
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Forthcoming Events

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

Technical officer: Hermann Unger

This project, accepted to run for the coming 5 years, envisages the support of South East Asian Member States to improve and coordinate their fight against transboundary animal diseases (TAD). Major problems discussed are the diagnosis, typing and coordinated vaccination against FMD, HPAI/H5N1, pox viruses and PPR. The aim is to improve the diagnostic capacities to allow proper surveillance activities and preventive measures and to create information links to alert veterinary services in time to allow immediate reaction. The first coordination meeting is planned for 3–6 July 2012 in Lanzhou, China. Applications to join the project were closed on 25 May 2012. For further information please consult the IAEA web site for the regional project RAS/5/060.

Consultants meeting on ‘Applying good laboratory practices in molecular testing of multiple diseases in veterinary laboratories’

Technical Officer: Adama Diallo

This meeting in Vienna during the last week of September 2012 will allow experts from western laboratories, many with over 20 years of experience in molecular testing, more advanced laboratories from developing countries and IAEA and FAO staff to exchange their respective experience and address molecular testing in veterinary laboratories, common workspace sharing between different disciplines, and common project design for creating sustainable capacity for molecular testing in veterinary laboratories of countries with limited resources.

Regional training course on ‘Artificial insemination in small ruminants’

Technical Officer: Mario Garcia

The training course is part of the activities under TC Project RAS/5/063 ‘Improving the Reproductive and Productive Performance of Local Small Ruminants by Implementing Reliable Artificial Insemination Programmes’. The course is addressed to scientists from ARASIA Member States and has the aim 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. The training course will be held at the Ecole Nationale de Médecine Vétérinaire, Tunis, Tunisia from 1–5 October 2012.

Training course on ‘Sequencing and sequence analysis’

Technical Officer: Adama Diallo

Scientists from the central veterinary laboratories of the following countries are targeted: Botswana, Cameroon, Democratic Republic of Congo, Ethiopia, Kenya, Mali, Nigeria, Senegal, United Republic of Tanzania and Uganda. The training will be conducted in Vienna from 5 to 16 November 2012.

During two weeks, the selected scientists will have lectures and practical on the following aspects of DNA sequencing: the preparation of PCR products for sequencing, DNA sequencing in house and through service providers, post-sequencing analysis of raw data and sequence analysis and specific applications in veterinary microbiology.

2nd RCM of the CRP entitled ‘The use of irradiated vaccines in the control of infectious transboundary diseases of livestock’ (D32029)

Technical Officers: Adama Diallo and Hermann Unger

In 2010, the IAEA launched a Coordinated Research Project (CRP) on the development of irradiated vaccines for the control of animal diseases. The overall objective of this CRP is: (i) to evaluate the effect of radiation on the potency of the irradiated products; (ii) to develop protocols for the attenuation of animal pathogens by irradiation and to define parameters for their use as vaccines against the causative agents of transboundary parasitic and other infectious diseases.

The first RCM of this CRP was held in October 2010 in Vienna. The purpose of that meeting was to allow the participants to present their ideas and approaches for developing attenuated animal pathogen vaccines and to discuss with the Research Agreement holders how they

could modify and improve the work programmes for the next two years. The 2nd RCM is scheduled for 25-29 June, 2012 in Nairobi, Kenya. A full report on the achievements of this CRP and the data presented during this RCM will be presented in the next Newsletter.

3rd RCM of the CRP entitled ‘The early and sensitive diagnosis and control of peste des petits ruminants (PPR)’

Scientific Officers: Adama Diallo and Hermann Unger

The IAEA Coordinated Research Project (CRP) entitled ‘Early and sensitive diagnosis and control of peste des petits ruminants’ has been running since 2007. The overall objective of this CRP is to develop, validate and transfer to Member States sensitive, specific and rapid tests for the diagnosis of peste des petits ruminants (PPR), certainly the most important transboundary dis-

ease of sheep and goats in Africa, Asia and the Middle East.

The current focus of this project is on isolating PPR virus from clinical cases using a new cell culture system, applying molecular diagnostics for the rapid disease detection and epidemiology and evaluating specific sampling techniques for prevalence and vaccination studies. After the first RCM that was held in Vienna, Austria in 2008 and the second one in July in 2010 in Ouagadougou, Burkina Faso, the 3rd and final RCM will be held in September 2012 in Vienna. The purpose of that last meeting is to assess and summarize the success of test developments for PPR control. The participants will present the results that have been obtained during these 5 years of project implementation and discuss their use in the diagnosis of PPR and eventually its control programmes.

Past Events

Regional (AFRA) training course on molecular epidemiology and bioinformatics in TADs surveillance

Technical officer: Hermann Unger

This training course was held at the Trypanosomosis Centre at KARI, Muguga, with 19 participants from 15 African member states from 16–20 April 2012. The focus was on molecular epidemiology and primer design for experienced molecular diagnosticians.



After a broad review on molecular biology, bioinformatics and functional genomics a general introduction into molecular epidemiology was presented. The different needs for molecular epidemiology versus diagnostics in terms of tools and assay design were discussed. On-line bioinformatics tools and free software were introduced such as BLAST, GenBank, Clusta IX and MEGA. Next day important principles in molecular epidemiology, PCR and DNA sequencing were defined and the concept of phylogenetics introduced. Later the editing of DNA sequences using BioEdit were trained. For aligning, sequence processes applying GenBank and BLAST were depicted and selecting and downloading sequences in the correct format for phylogenetic analysis was trained in practical sessions. Other relevant lectures and exiting exercises during this session were on how to generate multiple alignments (Clustal X/ BioEdit). The following day the generation of phylogenetic trees, how to interpret the phylogenetic results using tools such as MEGA 5 and to build a tree from unknown sequences was worked on. Finally the designing of primers for PCR and probes were presented and trained for PPR with online tools to better understand the difficulties and inherent problems of unsuitable selections and how to test primer sets for a specific setup.

The course was well appreciated and the responses of participants demonstrated the great interest in this subject.

Ring trials for rabies, avian influenza and brucellosis

Technical officer: Ivancho Naletoski

Under TCP BOL/5/019, ring trials were conducted targeting implementation of multiple diagnostic techniques for the five national animal disease control programmes in Bolivia. During the past two years, two workshops covering selected topics of diagnostic procedures and epidemiology were organized. Four additional fellowships have been awarded. The counterparts received equipment and consumables for the diseases covered in the project.

In order to check the implementation of diagnostic techniques, three ring trials were organized: i) a ring trial for rabies (French agency for food, environmental and occupational health safety, Nancy Laboratory for Rabies and Wildlife, courtesy of Dr. Florence Cliquet and Dr. Emmanuelle Robardet); ii) a ring trial for avian influenza (US Department of Agriculture, Agricultural Research Service, courtesy of Dr. Erica Spackman) and iii) a ring trial for brucellosis (Servicio Nacional de Sanidad y Calidad Agroalimentaria-SENASA, Argentina, courtesy of Dr. Ana Nicola). The results of the ring trials will be evaluated between the appropriate local and reference laboratories and (where appropriate) between the three local laboratories. This will enable the counterparts to check their performance, start regular participation in external QC/QA schemes and eventually to evaluate the inter-laboratory performance locally, in order to improve the level of harmonization.

First national coordinators meeting of IAEA-ARASIA TC Project RAS/5/063

Technical Officer: Mario Garcia

The first coordination meeting of the Project on 'Improving the Reproductive and Productive Performance of Local Small Ruminants by Implementing Reliable Artificial Insemination Programmes' (RAS/5/063) was held in Vienna, Austria from 25-27 April 2012.

The purpose of the meeting was to present country experiences on sheep and goat breeding systems and to define country targets for artificial insemination (AI) programmes; to review and update the project work plan;

and to discuss and coordinate implementation of project activities. The meeting was attended by the national coordinators of Iraq, Jordan, Oman, Syrian Arab Republic, and Yemen.



Each National Coordinator presented his country experiences on sheep and goat breeding systems, with emphasis of the status and potential work on artificial insemination in small ruminants. The work plan was discussed and amended to fit the priority needs of participating Member States. Based on that, additional fellowships will be considered and the focus of two out of the four planned training courses was modified.

National coordinators agreed to discuss with their national authorities in order to provide the necessary facilities, funds, and human resources for the implementation of the project in a timely manner, and to encourage bilateral collaboration between participating institutions in the regional project. Also, to encourage germplasm exchange among countries in the region and international organizations for animal genetic research collaboration and genetic improvement of local animal breeds.

The second coordination meeting will take place the first week of December 2013 in Oman.

Regional training course on epidemiology and early and rapid diagnosis of classical and African swine fever, TC project RER/5/016

Technical officers: Adama Diallo and Ivancho Naletoski

The tendency of spread of the African swine fever (ASF) in the South and the North Caucasian Federal regions of the Russian Federation (Figure 1), as well as the recent outbreaks in the northern-eastern parts of the country (Figure 2) has generated serious considerations in the international veterinary community, especially in European countries where ASF has not been reported. Classical swine fever (CSF), on the other hand, is endemic in most of the EU member states in south-eastern Europe

and has similar clinical signs with CSF. Therefore, the capacity of early and rapid diagnosis of ASF, as well as the differential diagnosis between ASF and CSF is of utmost importance for the veterinary authorities in Member States.



Figure 1. Spatial and temporal risk for spread of ASF in the Russian Federation. Source: <http://www.fsvps.ru/fsvps/iac>

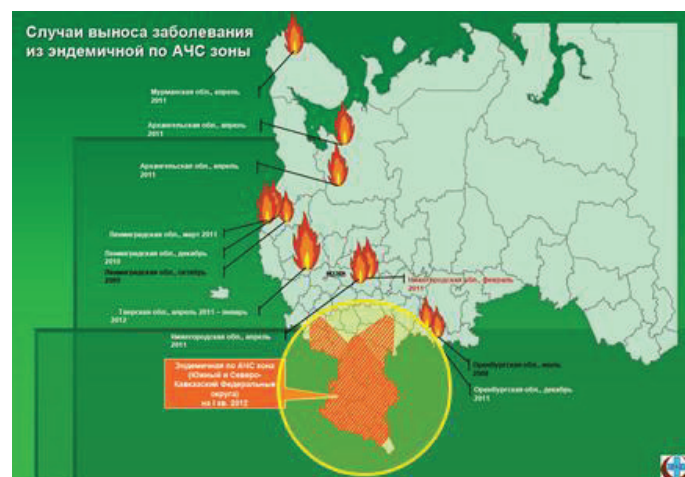


Figure 2. Outbreaks of ASF in Russian Federation between 2010-2012 north of the Caucasian region. Source: <http://www.fsvps.ru/fsvps/iac>

In order to improve the existing diagnostic capacities and (where appropriate) establish new capacities for the two important diseases, the TC department and the APHS organized a training course on epidemiology and early and rapid diagnosis of CSF and ASF at the Seibersdorf laboratories between 21 and 25 May 2012.



Sixteen participants from Albania, Azerbaijan, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kyrgyzstan, Montenegro, Tajikistan, The former Yug. Rep. of Macedonia, and Turkey attended this course. The training course consisted of theoretical and practical sessions and discussions on the epidemiology, diagnosis and differential diagnosis of CSF and ASF. Participants also received validated SOPs for the two diseases and video materials on simulation exercises organized to checkup the whole system of early detection of the diseases, response, detection of gaps and definition of improvement targets.



Figure 3. Group photo of the trainees, lecturers and the staff from the Seibersdorf laboratory.

The lectures and practical sessions were led by Prof. Dr. José Manuel Sánchez-Vizcaíno and Dr. Lina Mur Gil from the OIE reference laboratory for ASF in Madrid, Spain [Centro de Vigilancia Sanitaria Veterinaria (VISAVET), Facultad de Veterinaria].

New fellowships awarded for the project ZIM/5/016

Technical officer: Ivancho Naletoski

The project 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’ has been approved for financing at the beginning of 2012. The main counterpart is the Veterinary Laboratory and Research Branch (VLRB) in Harare, Zimbabwe. The project is comprised of two distinctive components i) upgrade of the residuals/drugs analysis laboratory, scheduled in the workplan for 2012 and ii) upgrade of the animal health laboratory, scheduled in the workplan for 2013. The project will also support establishment of an IT network in order to install the hardware of the laboratory information system for regulating the data flow and reporting of the obtained testing results.

The laboratory for residuals/drugs analyses within VLRB is currently well equipped; however, it is continuous lack of staff. Four fellowships have been awarded for the younger scientists of VLRB in the field of residuals/drugs analysis, in order to fill this gap. The fellowships will be organized as on-the-spot training for targeted quantitative parameters at the FAO/IAEA Laboratories in Seibersdorf (tentative dates 1-30 September 2012). The fellowships will include techniques for extraction, separation and detection of the targeted substances, technical characteristics of the methods used (analytical sensitivity, measurement range, cross reactive substances, etc.) and QA/QC topics. Consumables and accessories required for implementation of the methods upon finalization of the fellowships are in the process of purchasing. The upgrade of the residuals/drugs analysis laboratory will significantly contribute to the improved detection of steroids, antibiotics, antihelmintics and other substances included in the official testing of food products of animal origin in Zimbabwe.

Stories

The application of a mobile laboratory based LAMP-PCR technique to investigate transboundary animal disease outbreaks in the field: A case study of PPR outbreak in northern Cameroon

Peste des petits ruminants (PPR) is enzootic in many sub-Saharan African countries including Cameroon. The highly contagious virus disease is affecting small ruminants (especially goats and sheep) and after a short clinical episode with pulmonary and enteral affections a high percentage of animals die. First identified in West Africa in the 1940s, PPR can now be detected all over sub-Saharan Africa and some other parts of the world, hence its status as a reportable transboundary animal disease (TAD). The PPR causal virus is an RNA virus, which needs reverse transcription for its nucleic acid amplification. Although many scientists have developed several more robust methods of diagnosing this disease, they are all time consuming, expensive and not well adapted to African reality. The rapid diagnosis of a disease causing pathogen during investigation not only helps to ascertain the cause of clinical symptoms, it also allows for fast decision making for the application of correct and quick preventive and/or control measures to minimize its rapid spread.

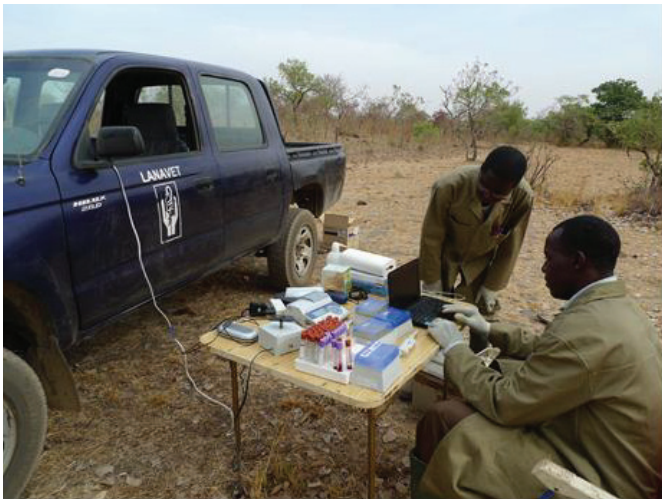


Figure 3. LANA-VET mobile team running LAMP PCR in the field during a PPR outbreak in Mayo-Danai division (Far-North region of Cameroon).

The development of a new molecular technique, the loop-mediated isothermal amplification (LAMP), a novel method for nucleic acid amplification in which the target nucleic acid is amplified in real-time by a single enzyme at a constant temperature, has attracted substantial scientific interest in its diagnostic value for adoption for Africa conditions. The technique uses four

primers that recognize six regions on the target nucleic acid, implying that specificity is extremely high. The method is also highly efficient and allows for the synthesis of large amounts of DNA in a relatively short time (less than an hour, including sampling, and results obtainable 30-40 minutes after amplification). Additionally, this real-time method requires no fluorescence probe and it reverse transcribes and amplifies RNA in a single closed tube. LAMP is therefore suitable for field diagnosis as a real-time pen-side test because of these great advantages over other techniques that require DNA or RNA extraction and it can be performed as a mobile laboratory connected to a 12-volt battery adapted for all (no need of high skill). Furthermore, this LAMP method is suitable for developing genetic point-of-care or point-of-use testing systems.

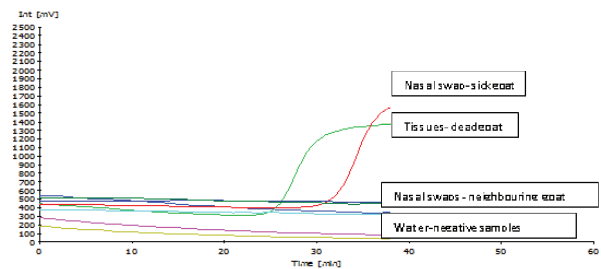


Figure 4. PPR LAMP PCR results for outbreak in Vele: the 2 curves up are positive as mentioned on the graphs. Negative samples are linear lines water (negative control and swaps from neighbouring goats).

For over two decades now, LANA-VET (the National Veterinary Laboratory in Cameroon) has been enjoying scientific collaborations with the International Atomic Energy Agency (IAEA) especially on diagnosis and surveillance of major animal diseases through some TCPs and CRPs. The LAMP technique was transferred to LANA-VET among other laboratories and the LAMP machine, LAMP kits and reagents for the diagnosis of various TADs provided. The technique was well received in LANA-VET, so much so, that a mobile laboratory was set up for this real-time diagnostic method to be used in all cases of outbreak on the field in addition to sample collection for further analysis.

So far, two outbreaks of PPR were confirmed in the field by the mobile LAMP PCR laboratory team of LANA-VET. The first case was reported on January 30, 2012 after the death of a goat and clinical signs observed on few others in a small ruminant herd in Vele sub-division, Mayo-Danai division in the Far-North region of Cameroon. The MINEPIA delegate called LANA-VET a few minutes after the death of the first animal in the afternoon of 29 January 2012. The mobile team arrived the following morning at 11:00 am after

about a 325 km drive. After clinical examination of the herd it was concluded, that PPR could be the cause of disease and mortality and samples were taken to verify the diagnosis. On site, nasal swab and lymph node samples were subjected to LAMP PCR carried out in a tube scanner and positive results were obtained after 30 minutes, allowing the team to alert the veterinary services before afternoon the same day. The second outbreak was in Gabarey Waka (about 25 km from the first outbreak site) in the far-north region of Cameroon, which is only a few kilometers to the Chad republic along the Logon river and less than a kilometer to Koumi village in Rigaza-Bongor locality, Chad. This second case was reported to the same LANAVET team in the same manner as the previous one and was also diagnosed using LAMP PCR two days later in the presence of IAEA experts from Vienna. In the first incident, all 20 goats diagnosed died (100% mortality) while in the second, 15 or 30% of the goats had already died in less than 2 weeks at the time of our visit.

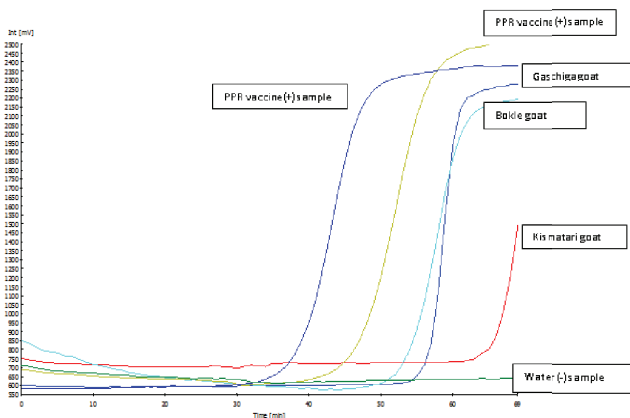


Figure 5. PPRV detection using LAMP-PCR at LANAVET (Cameroon): here 3 PPR outbreaks were confirmed in Gashiga, Kismatari and Bokle localities of the Benoue division in the North region of Cameroon.

LAMP PCR has induced a revolution in diagnostic methods used in disease surveillance and investigation. Because of its beneficial advantages, this technique should be emphasized world-wide as its vulgarization in Africa and in the world as a whole will improve in disease reporting for a potential and fast eradication policy if well coupled with vaccination and stamping out.

Ethnoveterinary Medicine Gains Momentum

Domesticated livestock are susceptible to infection with many different pathogens including parasites, fungi, bacteria and viruses as well as infestations with external pests such as ticks. In order to maintain healthy, disease-free livestock, it is often necessary to utilize extensive treatment with antibiotics or antiparasitic drugs in addition to the application of pesticides. Difficulties in monitoring the usage and quality of the com-

pounds used have led to the development of resistance to both antibiotics and antiparasitic drugs. In addition, since animal products are an integral part of the human food chain, the increasing use of synthetic drugs and antibiotics, and their persistence in livestock products such as meat, milk or eggs, can present a significant problem in human medicine as for instance the implication in the development of resistance to antibiotics.

Medicinal plants have been used for many centuries to treat diseases in both animals and humans. According to the WHO, more than 80% of the populations in the developing world are using herbs and plant extracts to treat diseases. In addition, many diseases and ailments that are without treatment, and therefore the importance of 'ethnoveterinary medicine'. In the past few years, there has been an increased interest in medicinal foods, or bioactive foods, such as garlic, honey, green tea, wine, pomegranate, etc., because of their potential role in the prevention of some transmissible and non-communicable diseases.

The IAEA has already promoted several projects dealing with the better usage of local feed resources in developing countries such as the Asia Regional Technical cooperation (TC) project RAS/5/035. Through this project, a number of plants were evaluated for their ability to protect against internal parasites in ruminants, with promising results. For example, in Bangladesh, *Azadirachta indica* (neem) leaves and *Ananas comosus* (pineapple) leaves were used in experimental studies to complement urea molasses multi-nutrient block. Using this approach, they were found to be efficient in controlling gastrointestinal nematodes (GIN), with the pineapple leaves being as effective as albendazole when applied for three weeks.

The most important aspect of ethnoveterinary medicine is that the knowledge base resides in the local population and has been acquired over many years based on their experience in the treatment of livestock diseases using plant products found in the regions in which they live. In order to enable a rational, scientific approach to the use of medicinal plants it is necessary to carry out a comprehensive analysis of the therapeutic efficacies of the various plants or plant extracts that are used by local people to treat various animal diseases. An example of the IAEA's assistance to ethnoveterinary medicine is the IAEA TC project BKF/5/002 in Burkina Faso to investigate a local treatment to combat fowl pox infections of poultry based on the use of the medicinal plant *Guiera senegalensis*. The results of in vitro antiviral investigations showed that an aqueous acetone extract from the galls of this plant could inhibit fowl pox virus growth with a selectivity index of 30 (the ratio of the 50% cytotoxic concentration to the concentration that reduces the viral titre by 50%).



Guiera senegalensis

Another example is the use of *Aloe secundiflora* which is used by locals in the United Republic of Tanzania for the treatment of fowl typhoid. Treatment with *A. secundiflora* resulted in delayed clinical signs and a reduced severity of the symptoms. The mortality decreased from 43% in the infected and non-treated to 14% in the treated group. Recently, a research team from Japan has isolated anti-trypanosomal molecules from *Brucea javanica*, a medicinal plant that is widely used in Indonesia as an antiprotozoal agent. Some of these molecules, e.g., the bruceine A (IC₅₀ = 2.9 nM), were three times more efficient than diminazene aceturate (IC₅₀ = 8.8 nM), which is the standard trypanocidal drug. However, further studies are needed to estimate the toxicity of these molecules.

Of interest is the immunomodulatory activity of saponins through cytokine induction. Saponins are a group of immunostimulatory adjuvants, derived from the bark of a Chilean tree, *Quillaja saponaria* (Quil A). These

molecules have been widely used as adjuvants for many years and have been included in several veterinary vaccines, such as bluetongue, foot and mouth disease, and influenza A.

A number of ethnoveterinary surveys have been made worldwide and they confirm the importance and widespread usage of plants in animal production and health. In Pakistan, a recent study has shown that more than 49 traditional recipes with 41 plant species are used for the treatment of helminthoses in animals. In central Kenya, 40 plant species were recorded as useful for traditional management of various diseases in cattle alone. These plants are used against ectoparasitism, endoparasitism, and also others diseases such as East Coast fever, diarrhoea, anaplasmosis, and respiratory diseases. In the Iberian peninsula, 36 plant species were recorded for use in dermatological, respiratory, or digestion problems. Interestingly, in the same study, all 36 species were also found to be used for humans. In central Italy, almost 100 plant species were recorded in 2001 for the treatment of animal ailments. Although for many conditions, plant medicines have been replaced by the use of defined 'Western medicines' such as vaccines and pharmaceutically produced compounds, ethnoveterinary practices are still used for curing minor ailments that afflict small farm animals such as gastrointestinal disorders and mycosis.

Finally, it seems evident that supporting developing countries in building up their capacity in ethnoveterinary medicine represents a good approach for helping them to use local knowledge and resources while building their scientific capacity. It will also encourage decision makers and the indigenous population in protecting these resources and their environment.

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	Mario García
D3.10.27	The use of enzymes and nuclear technologies to improve the utilization of fibrous feeds and reduce greenhouse gas emissions from livestock	Nicholas Odongo
D3.20.26	The early and sensitive diagnosis and control of peste des petits ruminants (PPR)	Adama Diallo
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	Adama Diallo
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

The control of foot and mouth disease (FMD)

Technical Officer: Gerrit Viljoen

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

The first Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on “*The control of Foot-and-Mouth Disease*”, FAO, Rome, Italy, 10-14 January 2011, was held in collaboration with FAO and EU-FMD. It was attended by all, but one, research contract holders and agreement holders as well as several observers from EU-FMD and FAO and Foot-and-Mouth (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 are 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 are 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 hold-

ers (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 (FMD) is one of the most important livestock diseases known to man due to its high infection rate (ease of spread) and its effect on the limitation of livestock movement and trade. An outbreak of FMD will have a devastating effect on a country's food security with direct impact on national and international trade. The confirmatory diagnosis of FMD and its effective control through prophylactic, quarantine or slaughter-out procedures are therefore of paramount importance as they have financial and trade implications. Vaccination with inactivated FMD virus is undertaken to control FMD in endemic countries or countries at risk. Vaccines, whilst widely available 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 effective 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 work towards generating 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 vaccination of cattle and small ruminants with commercially available FMD vaccines, including 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 co-ordination of current research into FMD vaccines for use in endemic settings and to cooperate with other FMD institutions such as EU-FMD and PANAFTOSA;
- To evaluate and standardize:
 - 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 next RCM will take place in 2013.

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

Technical Officer: Nicholas Odongo

Implemented under the IAEA project 2.1.2.1 titled 'Integrated management of animal nutrition, reproduction and health', this CRP has the overall objective to improve the efficiency of using locally available fibrous feed resources to improve livestock productivity while protecting the environment. The CRP was initiated in September 2010 with the award of eleven Research Contracts, three Research Agreements and one Technical Contract. The First RCM of the CRP was held 7-11 February 2011 in Lethbridge, Alberta, Canada and it was attended by all 15 Contract and Research Agreement Holders and one observer.

The first activity of the CRP was for all research contract holders to conduct baseline surveys to characterize the various fibrous feed resources available in the project area, e.g. rice and wheat straw, maize stover, tropical grass, bagasse and sugarcane tops etc. and to establish how much of these were available and how they are currently being used. During the survey, samples of the available feed resources were collected for chemical compositional analysis in the laboratory and sub-samples stored for later *in-vitro* and *in sacco* evaluations. Most contract holder have completed the compositional analysis and are currently evaluating enzymic activities of candidate enzymes. All research contracts were renewed for the 2012/2013 fiscal year.

In the current phase, contract holders will be (i) finalizing the chemical compositional analysis of various fibrous feed resources collected during the survey, (ii) determining the major enzymic activities of candidate exogenous fibrolytic products (xylanase PLUS and cellulase PLUS), (iii) evaluating the two enzymes (xylanase PLUS and cellulase PLUS) *in vitro* and *in situ* using locally available substrates at none, low, medium, high dose rates and (iv) using batch culture incubations for *in vitro* screening of candidate exogenous fibrolytic products in buffered rumen fluid to determine their effects on 24 and 48 h NDF degradation.

Publications to date:

- Salem, A.Z.M., A.A. Hassan, M.S. Khalil, H.M. Gado, H. Alersy and J. Simbaya (2012). Effects of sun-drying and exogenous enzymes on nutrients intake, digestibility and nitrogen utilization in sheep fed *Atriplex halimus* foliages. *Animal Feed Science and Technology*, 171: 128-135.
- Holtshausen L., Chung Y.H., Gerardo-Cuervo H., Oba M. and Beauchemin K.A. (2011). Improved milk production efficiency in early lactation dairy cattle with

dietary addition of a developmental fibrolytic enzyme additive. *J. Dairy Sci.*, 94:899-907.

- Arriola K.G., Kim S.C., Staples C.R. and Adesogan A.T. (2011). Effect of fibrolytic enzyme application to low- and high-concentrate diets on the performance of lactating dairy cattle. *J. Dairy Sci.*, 94:832-841.
- Gado, H.M., Salem A.Z.M., Odongo N.E. and B.E. Borhami. (2011). Influence of exogenous enzymes ensiled with orange pulp on digestion and growth performance in lambs. *Animal Feed Science and Technology*, 165: 131–136.
- Zhou, M., Chung Y.H., Beauchemin K.A., Holtshausen L., Oba M., McAllister T.A. and Guan L.L. (2011). Relationship between rumen methanogens and methane production in dairy cows fed diets supplemented with a feed enzyme additive. *J. Appl. Microbiol.*, 111:1148–1158.
- Gado, H.M., Salem A.Z.M., Borhami B.E. and N.E. Odongo (2012). Effect of enzyme preparation matrix on fiber digestibility of rice straw and DDGS in sheep. Submitted to *Animal Feed Science and Technology journal*.

Five abstracts have been accepted for presentation during the ADSA-AMPA-ASAS-CSAS-WSASAS Joint Annual Conference in Phoenix, Arizona, USA, July 15-19, 2012:

- Ranilla, M.J., N.E. Odongo, et al., Effect of application rate of a fibrolytic enzyme product on in vitro ruminal fermentation of three low-quality substrates
- Gado, H.M., B.E Borhami and A.Z.M. Salem. The potential benefits of supplementing corn-based dairy diets with ZADO or YEAST for milk yield and production efficiency in dairy cows.
- Salem, A.Z.M., H.M. Gado, N.E. Odongo, R. Rojo, M.M.Y. Elghandour and A. Olmido. Influence of different levels of exogenous enzymes preparation at two application methods on in vitro ruminal fermentation of some fibrous feeds in sheep.
- Elghandour, M.M.Y., C.G. Peñuelas-Rivas, M. Ronquillo, A.Z.M. Salem, H. Gado and N.E. Odongo. The effect of different doses of exogenous enzymes preparation on in vitro gas production and ruminal fermentation activities of some fibrous feeds in cows.
- Gado, H.M., A.Z.M. Salem and B.E, Borhami. Effect incremental levels of exogenous enzyme preparation on extent of ruminal fermentation, nutrient digestibility and average daily gain in steers.

The next RCM will take place in 2013.

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

Technical Officer: Mario Garcia

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

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

Fourteen research contract holders from Argentina, Bangladesh, Brazil, Burkina Faso, China, Eritrea, Ethiopia, Indonesia, the Islamic Republic of Iran, Mexico, Nigeria, Pakistan, Saudi Arabia and Sri Lanka and four agreement holders from Brazil, Italy, Kenya and the United States of America are participants in the CRP.

The first part of the experimental work, the artificial challenge with infective *L3 Haemonchus contortus* larvae to animals representing resistant and susceptible breeds to quantify the relative resistance to gastrointestinal parasites has been completed in most of the participating countries, DNA has been extracted and some RC holders have sent subsets of DNA to the Animal Production and Health Laboratory in Seibersdorf, Vienna. Most contract holders are currently working on a large field trial using at least 500 animals of a single breed collecting information related to body weight, FEC, PCV, and FAMA-CHA scores. Blood samples for DNA analysis are also being collected. It is expected that both the experimental challenge and the field trial will be completed by the end of 2012.

The first research coordination meeting was held in Vienna, Austria, from 21 to 25 February 2011, and the second RCM will take place in February 2013.

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

The CRP D3.20.30 is aimed at establishing a non-invasive platform for simultaneous monitoring of migratory pathways of wild water fowl (WWF) and use of faecal/cloacal samples to detect the bird species and the presence of the avian influenza viruses (AIVs). The activities in the project will cover collection and analysis of feather samples for stable isotope analysis (SIA) and faecal samples to determine the bird species (DNA bar-coding) and presence of the AIV in WWF. The collected feather samples will be directly sent and tested in an advanced SIA laboratory in Canada. The faecal samples will be initially tested in the local laboratories using predefined M-gene protocol(s) and the cDNA from positive samples sent for further analysis in advanced AI laboratories (VLA, Weybridge and the FAO/IAEA Agriculture & Biotechnology Laboratories in Seibersdorf).

DNAs from the AIV positive and a portion of the negative WWF will be tested for genetic differences in the Mx gene, related to disease resistance in birds.

Three technical contracts [i) *Animal Health and Veterinary Laboratories Agency (VLA) Weybridge, UK*; ii) *Veterinary Science Research Institute under the College of Veterinary Medicine in Seoul, Korea* and iii) *Environment Canada, Saskatoon, Saskatchewan, Canada*]; two research agreements [i) *Leibnitz Institute for Zoo and Wildlife Research and Friedrich-Loeffler Institute, Greifswald, Insel Riems, Germany*]; and seven research contracts [i) *Beijing Institute of Animal Science and Veterinary Medicine, Chinese Academy of Agricultural Sciences; Beijing, China*; ii) *University of Forestry, Faculty of Agronomy, Department of Genetics and Selection, Sofia, Bulgaria*; iii) *Veterinary Institute of the Academy of Agricultural Sciences in Tajikistan*; iv) *Bornova Veterinary Control Institute, Bornova, Turkey*; v) *Central Veterinary Laboratory, Kathmandu, Nepal*; vi) *Animal Health Research Institute, Giza, Cairo, Egypt* and vii) *The Federal Centre for Animal Health, Vladimir, Russia (pending application)*] will be evaluated by the Committee for Coordinated Research Activities at IAEA.

The first RCM is planned for November 2012.

General information applicable to all Coordinated Research Projects

Submission of Proposals

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

Such proposals need to be countersigned by the Head of the Institutions and sent directly to the IAEA. They do not need to be routed through other official channels unless local regulations require otherwise.

Complementary FAO/IAEA Support

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

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

allele, while breeds like aseel, bangka, hrvatica, shoumenska, kadaknath, sulmtaler and altsteirer were found to have a higher frequency of the susceptible allele. Breeds like sentul, denizli and macedonia were observed to have almost equal distribution of both the alleles. Apart from the S631N locus, 11 other loci covering different exonic and 3' untranslated (3'UTR) regions were genotyped in all the 610 birds to assess the genetic variation within Mx gene. Preliminary genotypic data analysis revealed the distinct clustering of meat and egg type chicken breeds/strains (Figure 4).

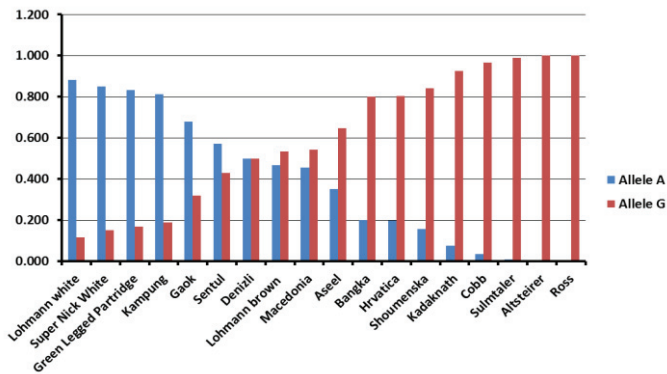


Figure 3. Distribution of resistant (allele A) and susceptible (allele G) alleles at S631N locus within Mx gene in different chicken populations

However, green legged partridge (Poland) and altsteirer (Austria) were found to be further distinct from all the other populations with respect to their variations within the Mx gene. Further analysis of data to assess the difference in chicken breeds from temperate and tropical locations is in progress.

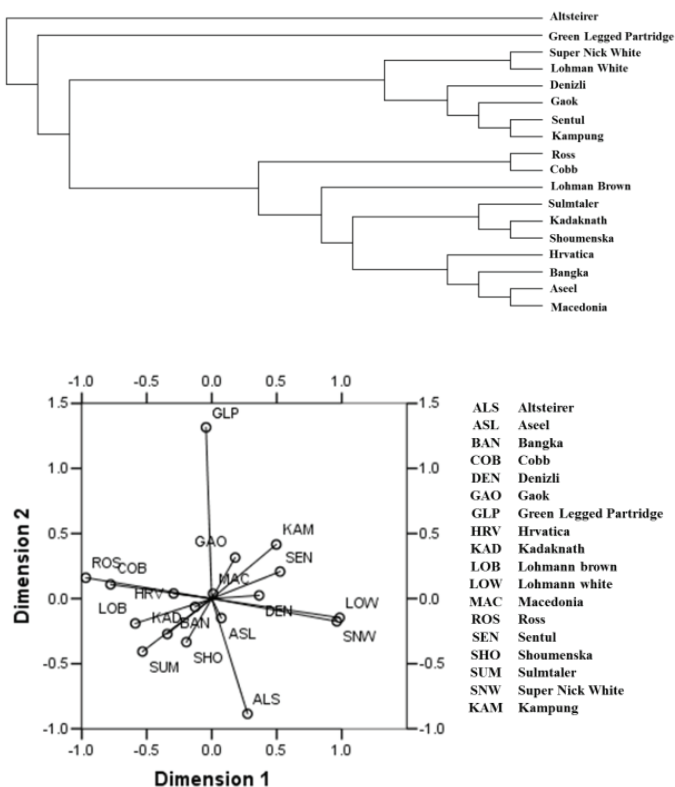


Figure 4. Phylogenetic analysis (above) and multidimensional scaling plot (below) of pair-wise Nei's genetic distance (based on genotypes

at 12 Mx gene loci) across different chicken breeds.

Supporting Member States to implement FAO's global plan of action on animal genetic resources (AnGR)

Livestock populations have evolved over centuries due to sustained natural and artificial selection with adaptation to local agricultural production systems and agro-ecological environments. The domestic animal genetic resource (AnGR) represents a unique source to respond to the present and future needs of livestock production. Responding to the rapid erosion of these resources globally and in developing countries in particular, the international community agreed to adopt the FAO Global Plan of Action (GPA) on AnGR. GPA includes 23 strategic priorities for action grouped into four major priority areas: characterization and monitoring; sustainable use and development; conservation; and policies, institutions and capacity building. IAEA through its National and Regional Technical Cooperation projects support Member States to implement GPA especially in terms of capacity building and technical support for genetic characterization of livestock using molecular DNA technologies. APHL provides technical support in microsatellite genotyping of native breeds, data analysis and interpretation of results. Mr Norbertin Ralambomana from Madagascar was trained in molecular genetic tools from 20th March to 19th May, 2012 under a TC fellowship of the IAEA. APHL will also be supporting the ARASIA member states in molecular genetic characterization of small ruminant genetic resources under the regional TC project on 'Improving the reproductive and productive performance of local small ruminants by implementing reliable artificial insemination programmes'.

Production of monoclonal antibodies and haemagglutinin protein (H) of the peste des petits ruminants virus (PPRV)

Even though, in 2011, rinderpest was officially declared eradicated worldwide, surveillance for rinderpest will continue for many years to come. It is therefore extremely important to develop specific assays that are capable of differentiating between this deadly feared disease and other diseases that have similar symptoms, such as peste des petits ruminants (PPR), that is caused by a closely related virus. For that objective, APHL is pursuing its effort in developing new reagents and tools for PPR specific diagnosis. After having developed monoclonal antibodies (mAb) anti PPRV nucleocapsid protein in the mid-2000, APHL has now produced monoclonal antibodies anti PPRV haemagglutinin protein (H). By ELISA and Western Blot, they proved to be specific to PPRV (see figure 5).

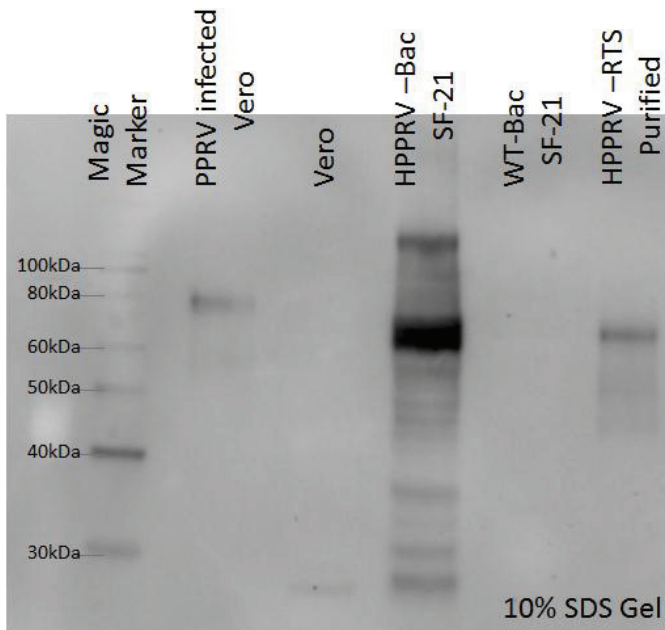


Figure 5. Western blot analysis – characterization of 12A9.2 anti-HPPR monoclonal antibody. ‘Bac’ and ‘RTS’ refers to the origin of the host that produces the protein, namely insect and bacteria respectively. Vero cells are mammalian cells. H of PPRV produced in mammalian cells is migrating in the electrophoretic gel differently from that of the protein produced in bacterial or insect system because of the differences in the glycosylation for each system.

One of these mAbs is being used for PPR diagnosis test development.

Global reference genetic repository of livestock breeds for animal genetic research

In order to strengthen the collaborative animal genetic research across different countries, a global reference genetic repository of livestock breeds was established at APHL to collect, preserve and maintain genomic DNA from distinct breeds of various livestock species, including cattle, sheep and goat. Various information of DNA samples like location of sample collection, sex of animal, age, breed, extraction method, buffer, concentration, quality, etc. are maintained in the genetic repository database. The genetic repository is constantly strengthened by addition of new DNA samples every year. A total of 492 samples from 13 breeds including chicken (Sulmtaler, Altsteirer, Hrvatica, Denizli, etc), sheep (Krainer-Steinschaf, Hamdani, Karakachanska, Copper Red Shoumenska, etc) and cattle (Fleckvieh) were added to the repository during the last six months.

Peste des petits ruminants diagnosis service

After having developed in 2009 a new cell line highly sensitive in PPRV isolation from pathological samples, APHL is receiving regularly from FAO and IAEA Member States specimen for the identification and characterization of PPRV strains. In this service was provided to five countries in the first half of 2012.

Fellowships

Mr Norbertin Ralambomana from ‘Centre national de la recherche appliquée au développement rural’, Madagascar was attached to APHL for two months (20th March to 19th May, 2012) to work on molecular genetic characterization of livestock breeds.

Mr Tesfaye Rufael from the National Animal Health Diagnostic and Investigation Center (NAHDIC), Sebeta, Ethiopia, spent 4 months, January 15 - May 15, 2012, in APHL for training on the diagnosis of capripox and peste des petits ruminants viruses: genotyping by realtime PCR, virus isolation in cell culture.

Mr Arinaitwe Eugene, a scientist from the National Animal Disease Diagnostics and Epidemiology Center, Entebbe, Uganda, spent 3 months in APHL, January 16 - April 14, for training on peste des petits ruminants diagnosis techniques (RT-PCR, qRT-PCR, virus isolation in cell culture).



50th Anniversary of the Agency's Nuclear Sciences and Applications Laboratories in Seibersdorf

Believe it or not: the Agency's Nuclear Sciences and Applications (NA) Laboratories in Seibersdorf have just completed half a century of dedicated support to Member States in their efforts to optimally exploit 'atoms for peace'. It seems to be an appropriate time to celebrate the completion of these five decades in a fitting manner.

Throughout these many years, the activities of the NA Laboratories in Seibersdorf have continuously evolved, also through their partnership with FAO, in response to the ever changing landscape of nuclear technologies and applications, and to the multitude of expectations of national and international organizations for cooperation in nuclear research and technology transfer. In this process, the Laboratories have consistently remained at the forefront of assisting Member States in fostering the use of nuclear science and technology wherever these offer unique opportunities or provide added value.

The Laboratories have indeed come a long way. Starting with a mere 1736 m² of combined laboratory, office and corridor space in 1962, the original U-shaped building housed 14 professional and 24 general service staff. Today, it covers an area of more than 13 000 m² and is a dynamic hub for nearly one hundred scientists, technicians, fellows, visitors, interns and students from all over the world that are engaged in a wide range of activities dedicated to supporting global development and cooperation. These dedicated and concerted efforts have led to a myriad of success stories in the many areas of work in the Laboratories, which is both satisfying and enthralling.

Many of you have, at some stage in your career, interacted with the NA Laboratories in Seibers-

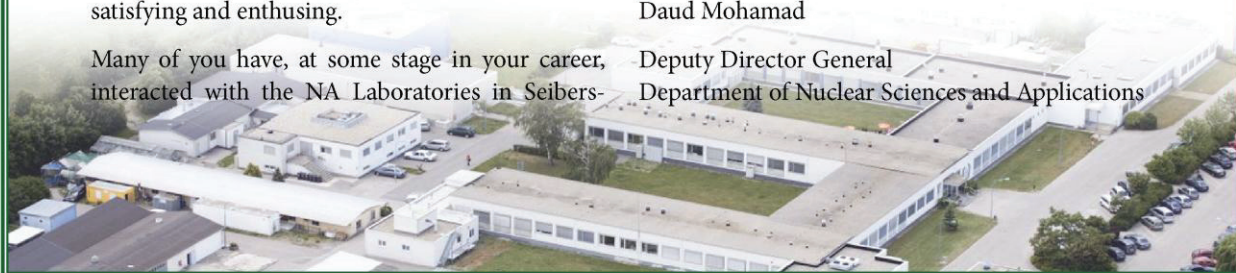
dorf and contributed to these successful projects and programmes, which are glowing examples of success stories that fully justify the mandate of these Laboratories. We are very grateful to all of you for seamlessly working with us, as we realize that it is only through the dedication, the enthusiasm and the numerous ideas of our many internal and external stakeholders, that it has been possible for the Laboratories to consistently remain at the forefront in our numerous and very diverse endeavours.

Nonetheless, this is not the time to lay back in satisfaction but a time to look forward to further enhance the performance of the Laboratories and to improve our outreach. While the NA Laboratories in Seibersdorf have served the Member States well over the last half century, they need to be modernized and upgraded to cater to growing demands and to keep pace with increasingly rapid technological developments. The planned 50 year anniversary celebration of the Laboratories is an apt time to look back and feel proud of the numerous achievements, as well as to plan the future road map that will enable the Laboratories to retain the high level and quality of service that Member States have come to expect.

So, when we celebrate the 50th anniversary of the NA Laboratories in Seibersdorf, it is really you we are celebrating. We sincerely hope to see as many of you as possible during this year of celebration or maybe even at the actual event in late November 2012 at the Laboratories.

Daud Mohamad

Deputy Director General
Department of Nuclear Sciences and Applications



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 bios</p>	M. Garcia / I. Naletoski
ANG/5/010	<p>Characterizing Indigenous Animal Breeds for Improving the Genetic Quality of Local Cattle Breeds and Small Ruminants</p> <p>Objective: To undertake phenotype and genotype characterization of indigenous animal breeds for improving the genetic quality of local and adapted cattle breeds</p>	M. Garcia
BEN/5/006	<p>Improving Animal Health and Productivity</p> <p>Objective: To strengthen, diagnose, and control African swine fever, and increase animal productivity.</p>	H. Unger / A. Diallo
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 has been developed that aims at a sustainable intensification of peri-urban agricultural production through the integration of cropping-livestock systems.</p>	N. Odongo / G. Viljoen
BKF/5/008	<p>Strengthening the Development of Small Ruminant Production</p> <p>Objective: To combat poverty in the rural environment in Burkina Faso by improving production by evaluating the productivity of different genetic types of small ruminants, improving productivity and reproduction performance of local small ruminants through improved feeding and management practices, and evaluating the impact of gastrointestinal and reproductive diseases in small ruminants and the effectiveness of the medicinal plants commonly used by breeders.</p>	M. Garcia / 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 using in breeding programmes and better health and reproductive management</p>	M. Garcia
BOH/5/001	<p>Reducing the Incidence of Brucellosis in Animals and Humans by Surveillance and Control</p> <p>Objective: To reduce the incidence of brucellosis in animals and humans in Bosnia and Herzegovina</p>	I. Naletoski
BOL/5/019	<p>Implementing Molecular Techniques to Upgrade the Diagnostic Facilities of National Animal Health Programmes</p> <p>Objective: To strengthen the diagnostic capacity of the animal health laboratories supporting programmes for the control and eradication of animal diseases in Bolivia through the use of molecular diagnostic techniques and training of staff in the use of the techniques; to provide rapid and precise diagnosis of animal diseases to allow better control of economically important diseases of livestock.</p>	I. Naletoski
BOT/5/005	<p>Improving Diagnosis of Animal Diseases</p> <p>Objective: To employ nuclear molecular diagnostic techniques for improved diagnosis of trans-boundary animal diseases, such as foot and mouth disease, contagious bovine pleuropneumonia, and avian influenza.</p>	G. Viljoen

TC Project	Description	Technical Officer(s)
BOT/5/008	Using Nuclear and Molecular Diagnostic Techniques for Improved Diagnosis of Animal Diseases Objective: To employ nuclear and molecular diagnostic techniques to improve diagnosis of animal diseases.	G. Viljoen / A. Diallo
BUL/5/012	Developing and Validating Molecular Nuclear Technologies for Rapid Diagnostics of Foot and Mouth Disease and Genotyping of Indigenous Cattle Breeds Objective: To improve livestock by rapid diagnosis and effective control of foot and mouth disease, and genotyping of indigenous cattle breeds through development and validation of molecular nuclear methodologies.	I. Naletoski / G. Viljoen
BZE/5/004	Strengthening the Veterinary Diagnostic Laboratory with Capacities in Polymerase Chain Reaction Diagnosis (Not funded) Objective: To ensure food security through early detection of H5/H7 avian influenza, and other exotic diseases, and to ensure the capacity for quick response to disease outbreaks with epidemiological surveillance.	G. Viljoen
BZE/5/006	Establishing Early and Rapid Diagnosis of Transboundary Animal Diseases to Support Food Security Objective: To establish an early and rapid nuclear/nuclear related serological/molecular diagnostic and control capability for transboundary animal diseases:- Building capacity, strengthening of a national diagnosis and surveillance system for transboundary/zoonotic	G. Viljoen
CAF/5/004	Improving Livestock Production Through Disease Control and Artificial Insemination Objective: To improve animal production in the Central African Republic through livestock disease control and improved breeding by use of artificial insemination.	I. Naletoski / M. Garcia
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. Garcia
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. Garcia
CMR/5/017	Improving Animal Productivity and Health Objective: To strengthen capacity and outreach regarding artificial insemination in ruminants, and to control livestock diseases impeding reproduction and productivity.	H. Unger / M. Garcia
CMR/5/018	Improving Productivity of Indigenous Breeds and Animal Health Objective: Improved productivity of indigenous breeds and animal health.	H. Unger
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	N. Odongo
ERI/5/006	Controlling Major Epizootic Diseases and Other Mycoplasma Infections of Livestock Objective: To improve the control of transboundary animal diseases, and continue the eradication of tuberculosis and brucellosis.	H. Unger / Naletoski
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. Garcia / N. Odongo

TC Project	Description	Technical Officer(s)
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	A. Diallo
HON/5/005	Improving the Nutrition and Health Conditions of Livestock in Order to Increase Productivity and Reproductivity (Phase II) Objective: To strengthen and improve livestock production in Honduras.	M. Garcia / N. Odongo / G. Viljoen
IVC/5/030	Assessing the Genetic Profile for Improved Livestock Production Objective: To assess the genetic profile of livestock for the effective revival of stockbreeding in Côte d'Ivoire.	M. Garcia / H. Unger
IVC/5/032	Establishing Epidemiological Surveillance of Peste des Petits 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 Cote d'Ivoire	G. Viljoen / A. Diallo
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
KEN/5/027	Assessment of Local Feed Resources for Enhancing Fertility and Productivity of Smallholder Dairy Cattle Objective: To assess the potential of local feed resources for enhancing the fertility and productivity of smallholder dairy cattle in the Nakuru District of Kenya.	N. Odongo / M. Garcia
KEN/5/028	Applying Nuclear Based Techniques to Control Animal diseases Objective: To improve the capacity to diagnose and carry out surveillance of contagious bovine pleuro-pneumonia (CBPP), brucellosis, Rift Valley fever (RVF), peste des petits ruminantes (PPR) and highly pathogenic avian influenza (HPAI) using nuclear and related technologies.	H. Unger
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.	N. Odongo / A. Diallo
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
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. Garcia / N. Odongo / 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. Garcia
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	N. Odongo

TC Project	Description	Technical Officer(s)
MAU/5/003	<p>Improving the National Capacity in Diagnostics for Animal Diseases (Infection and Parasitic Diseases)</p> <p>Objective: To strengthen the diagnostic capacity of the Centre National D'Elevage et de Recherches Veterinaires (CNERV) to monitor and control trans-boundary animal diseases, particularly foot and mouth disease and contagious bovine pleuropneumonia.</p>	H. Unger / I. Naletoski
MLI/5/023	<p>Improving National Capabilities for Characterization of Serotypes of Major Animal Diseases Using Molecular Biology Techniques</p> <p>Objective: To identify various serotypes present in Mali in order to improve animal health and increase productivity in milk and meat through increased capabilities for diagnosis and control of foot and mouth disease, trypanosomes and tuberculosis.</p>	H. Unger / I. Naletoski / G. Viljoen
MLI/5/025	<p>Improving National Capacities to Characterize Serotypes of Major Animal Diseases Using Molecular Biology Techniques for the Development of a National Disease Control Strategy</p> <p>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.</p>	I. Naletoski
MLW/5/001	<p>Strengthening the Essential Animal Health and Veterinary Infrastructure for Disease Control and Management Services in Urban and Rural Areas</p> <p>Objective: To develop capacity and strengthen infrastructure for animal disease control and management services in urban and rural areas of Malawi.</p>	H. Unger
MON/5/017	<p>Supporting the Sustainable Production and Supply of Vaccines and Diagnostic Kits for Transboundary Animal Diseases</p> <p>Objective: To produce vaccines and diagnostic kits for transboundary animal diseases.</p>	G. Viljoen / I. Naletoski
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>	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>	N. Odongo
MOZ/5/002	<p>Promoting sustainable Animal Health, Reproduction and Productivity Through the Use of Nuclear and Related Techniques</p> <p>Objective: To obtain sustainable improvement in animal reproduction and breeding and animal health through the use of nuclear and nuclear related technologies.</p>	G. Viljoen
MYA/5/018	<p>Enhancing the Lifetime Health and Performance of Offspring and Improving the Profitability of Livestock Production Systems Through Selective Breeding and Management of the Maternal Environment</p> <p>Objective: To improve livestock production and thereby increase profitability through improved management of the maternal environment and health care programmes; b) To train technicians in advanced technologies in the field of research and development, breeding, reproduction, dairy production, nutrition and waste management and train technical staff in livestock data analysis and data processing.</p>	M. Garcia / A. Diallo / H. Unger

TC Project	Description	Technical Officer(s)
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. Garcia
NAM/5/011	<p>Establishing Research and Diagnostic Capacity for the Effective Control of Animal Diseases in the Northern Communal Areas and Improving Veterinary Public Health Services</p> <p>Objective: To control trans-boundary and parasite-borne animal diseases in the Central and Northern Communal Areas (NCA) and to improve veterinary-public health</p>	H. Unger
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>	I. Naletoski
NER/5/013	<p>An Integrated Approach for Improvement of Livestock Productivity</p> <p>Objective: To increase the productivity of livestock through implementation of an integrated programme dealing with nutrition and reproduction.</p>	N. Odongo / M. Garcia / A. Diallo
PAR/5/009	<p>Increasing the Quantity and Quality of Forage to Increase Production, Efficiency and Quality of Milk Produced by Small and Medium Scale Dairy Farmers</p> <p>Objective: Identify and characterize forage and agricultural by-products to generate alternatives of local food management so as to improve dairy cattle productivity in small and medium-size farms in Paraguay</p>	N. Odongo / M. Garcia
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
RAF/5/057	<p>Strengthening Capacities for the Diagnosis and Control of Transboundary Animal Diseases in Africa (AFRA)</p> <p>Objective: To strengthen the diagnostic capacity of national veterinary services to monitor and control major transboundary animal diseases, particularly foot and mouth disease, peste des petits ruminants and contagious bovine pleuropneumonia.</p>	H. Unger / A. Diallo
RER/5/015	<p>Supporting Early Warning and Surveillance of Avian Influenza Infection in Wild and Domestic Birds and Assessing Genetic Markers for Bird Resistance</p> <p>Objective: To establish early bird flu diagnosis and assessment of genetic markers for AI resistance with nuclear molecular methods in the region of Bosnia and Herzegovina, Bulgaria, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Uzbekistan, Kyrgyzstan and the Russian Federation.</p>	I. Naletoski / A. Diallo
RLA/5/049	<p>Integrated Control of Fascioliasis in Latin America (in support of National Programmes)</p>	G. Viljoen / I. Naletoski
SIL/5/011	<p>Controlling Economically Important Livestock Diseases</p> <p>Objective: To design epidemiological surveys and adopt appropriate rapid laboratory techniques for the diagnosis of PPR and NCD in small ruminants and local chickens.</p>	H. Unger / I. Naletoski
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. Garcia

TC Project	Description	Technical Officer(s)
SRL/5/041	<p>Maximizing Productivity on Goat Farms through Cost-Cutting and DNA-Based Technology in Selection for Breeding</p> <p>Objective: To improve the productivity of goats of smallholder farmers in Sri Lanka, by introducing new strategies such as supplementary feeding, improved management practices and disease control and by transferring genetic technologies to assist in proper selection of superior breeding animals.</p>	M. Garcia / N. Odongo / G. Viljoen
SRL/5/042	<p>Applying Molecular Diagnostics to Zoonotic Diseases</p> <p>Objective: To enhance the long-term epidemic preparedness by developing competence in molecular diagnosis and surveillance of zoonotic infections.</p>	Kashyap (NAHU) / Unger
UGA/5/030	<p>Improving the Diagnostic Capacity in Animal Diseases (Phase II)</p> <p>Objective: To strengthen the diagnostic capacity of the National Animal Diseases Diagnostics and Epidemiology Laboratory in the detection of animal disease and food-borne pathogens including drug residues.</p>	H. Unger / I. Naletoski
UGA/5/032	<p>Improving Animal Production and Productivity through Advanced Animal Disease Control and Animal Production Measures</p> <p>Objective: To improve animal production and productivity through advanced animal disease control and animal production measures</p>	H. Unger
URT/5/027	<p>Improving Livestock Production and Productivity through Sustainable Application of Nuclear and Related Techniques</p> <p>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.</p>	N. Odongo / M. Garcia
URU/5/026	<p>Increasing the Profitability of Dairy Producers by Improving Reproduction Efficiency, Rational Sustainable Use of Genetic Resources</p> <p>Objective: To implement integrated management strategies to improve the profitability of medium size grazing dairy farms by means of (a) integrated nutritional strategies; (b) strategic reproductive interventions; and (c) marker-assisted selection.</p>	M. Garcia / N. Odongo
URU/5/028	<p>Improving the Diagnosis of Bacterial, Viral and Parasitic Zoonotic Diseases that Impact the National Economy and Human Health</p> <p>Objective: Improvement of the diagnosis of important zoonotic diseases (e.g. Newcastle disease, fascioliasis, leptospirosis, micobacterium and others).</p>	G. Viljoen
ZAI/5/021	<p>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</p> <p>Objective: To support the sustainability of food security and poverty alleviation through animal diseases diagnosis and immunisation.</p>	G. Viljoen / I. Naletoski
ZAM/5/028	<p>Improving Productivity of Dairy Animals Maintained on Smallholder Farms through Selected Breeding and Effective Disease Diagnosis and Control Using Isotopic and Nuclear Techniques</p> <p>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 technologies.</p>	N. Odongo / I. Naletoski / M. Garcia
ZIM/5/016	<p>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</p> <p>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.</p>	I. Naletoski

Publications

A whole-genome radiation hybrid panel for goat

Du, X.Y., J.E. Womack, K.E. Owens, J.S. Elliott, B. Sayre, P.J. Bottcher, D. Milan, M. Garcia Podesta, S.H. Zhao and M. Malek

Small Ruminant Research 105: 114–116, June 2012

A 5000 rad goat–hamster panel of 121 whole-genome radiation hybrids was generated and preliminarily characterized. A normal diploid fibroblast culture from a male Boer goat was fused with a recipient thymidine kinase-deficient hamster cell line. The generated 121 radiation hybrids were grown and produced an average of 8.4 mg of DNA per radiation hybrid. A SINE-PCR test showed that almost all radiation hybrids retained goat DNA. The retention frequencies of the 121 hybrids were preliminarily estimated using a collection of 42 unlinked molecular markers. An optimized panel of therein 90 radiation hybrids (CHRH5000) with an average retention frequency of 34.2% was screened on the basis of interspersed repetitive DNA content and chromosome retention frequency. The development of this WG-RH panel will provide a fundamental tool for advanced goat genome mapping studies and for mammalian comparative mapping.

The role of nuclear technologies in the diagnosis and control of livestock diseases—a review

Gerrit J. Viljoen and Antony G. Luckins

Trop. Anim. Health Prod. In press. DOI 10.1007/s11250-012-0077-5

Nuclear and nuclear-related technologies have played an important role in animal health, particularly in relation to disease diagnosis and characterization of pathogenic organisms. This review focuses primarily on how and where nuclear technologies, both non-isotopic and isotopic methods, have made their impact in the past and where it might be expected they could have an impact in the future. The review outlines the extensive use of radiation attenuation in attempts to create vaccines for a multiplicity of pathogenic organisms and how the technology is being re-examined in the light of recent advances in irradiation techniques and cryopreservation/lyophilization that might obviate some of the problems of maintenance of viable, attenuate vaccines and their transport and use in the field. This approach could be used for a number of parasitic diseases where vaccination has been problemat-

ic and where investigations into the development of molecular vaccines have still failed to deliver satisfactory candidates for generating protective immune responses. Irradiation of antigens or serum samples also has its uses in diagnosis, especially when the samples need to be transported across international boundaries, or when handling the pathogens in question when carrying out a test presents serious health hazards to laboratory personnel. The present-day extensive use of enzyme immunoassays and molecular methods (e.g., polymerase chain reaction) for diagnosis and characterization of animal pathogens has its origins in the use of isotope-labeled antigens and antibodies. These isotopic techniques that included the use of ^{75}Se , ^{32}P , ^{125}I , and ^{35}S isotopes enabled a level of sensitivity and specificity that was hitherto unrealized, and it is prescient to remind ourselves of just how successful these technologies were, in spite of their infrequent use nowadays. Finally, the review looks at the potential for stable isotope analysis for a variety of applications—in the tracking of animal migrations, where the migrant are potential carriers of transboundary animal diseases, and where it would be useful to determine the origins of the carrier, e.g., highly pathogenic avian influenza and its dissemination by wild water fowl. Other applications could be in monitoring sequestered microbial culture (e.g., rinderpest virus) where in the case of accidental or deliberate release of infective culture it would be possible to identify the laboratory from which the isolate originated.

Effects of tea saponins on rumen microbiota, rumen fermentation, methane production and growth performance—a review

Jia-Kun Wang, Jun-An Ye and Jian-Xin Liu.

Trop. Anim. Health Prod. 44:697–706, April 2012

Reducing methane emission from ruminant animals has implications not only for global environmental protection but also for efficient animal production. Tea saponins (TS) extracted from seeds, leaves or roots of tea plant are pentacyclic triterpenes. They have a lasting antiprotozoal effect, but little effect on the methanogen population in sheep. There was no significant correlation between the protozoa counts and methanogens. The TS decreased methanogen activity. It seems that TS influenced the activity of the methanogens indirectly via the depressed ciliate protozoal population. The TS addition decreased fungal population in the medium containing rumen liquor in *in vitro* fermentation, but no such effect was observed in the rumen liquor of sheep fed TS. Tea saponins had a

minor effect on the pattern of rumen fermentation and hence on nutrient digestion. When added at 3 g/day in diets, TS could improve daily weight gain and feed efficiency in goats. No positive associative effect existed between TS and disodium fumarate or soybean oil on methane suppression. Inclusion of TS in diets may be an effective way for improving feed efficiency in ruminants.

A fibrolytic enzyme additive for lactating Holstein cow diets: Ruminal fermentation, rumen microbial populations, and enteric methane emissions

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

Journal of Dairy Science 95: 1419-1427, March 2012

The objective was to determine if supplementing a dairy cow diet with an exogenous fibrolytic enzyme additive (Econase RDE; AB Vista, Marlborough, Wiltshire, UK) altered fermentation, pH, and microbial populations in the rumen or enteric methane (CH₄) emissions. In a companion study, this enzyme additive improved efficiency of fat-corrected milk production in a dose-dependent manner by up to 11% for early lactation dairy cows. Nine ruminally cannulated, lactating Holstein cows were used in a replicated 3×3 Latin square design with 21^d periods. Dietary treatments were 0 (control), 0.5 (low), and 1.0 (high) mL of enzyme/kg of total mixed ration dry matter. Rumen contents were collected on 2 d (d 15 and 19), ruminal pH was measured continuously for 6 d (d 13 to 18) by using an indwelling system, and enteric CH₄ production was measured for 3 d (d 16 to 18) using the sulphur hexafluoride tracer gas technique. The enzyme additive did not alter volatile fatty acids, NH₃, pH, or population densities of total protozoa, bacteria, and methanogens in ruminal fluid. However, population densities of certain bacteria, calculated as copy number of species-specific 16S-rRNA, were affected by enzyme treatment. Population density of *Ruminobacter amylophilus* was increased and that of *Fibrobacter succinogenes* tended to be increased by the high enzyme treatment. *Selenomonas ruminantium* tended to increase linearly with increasing levels of enzyme in the diet, although its population density was only numerically increased by the high enzyme treatment. *Streptococcus bovis*, however, tended to be decreased by the low enzyme treatment. Increasing the level of enzyme supplement in the diet also linearly increased enteric CH₄ production, even when adjusted for feed intake or milk production (19.3, 20.8, and 21.7g of CH₄/kg of dry matter intake or 12.9, 13.6, and 15.1g of CH₄/kg of milk for the control, low, and high enzyme treatments, respectively). This shift in ruminal bacterial communities and higher CH₄ emissions could imply increased ruminal digestion of feed, which needs to be substantiated in longer term studies.

DNA multigene sequencing of topotypic specimens of the fascioliasis vector *Lymnaea diaphana* and phylogenetic analysis of the genus *Pectinidens* (Gastropoda)

Maria Dolores Bargues, Roberto Luis Mera y Sierra, Patricio Artigas and Santiago Mas-Coma

Mem Inst Oswaldo Cruz, Rio de Janeiro, 107: 111-124, February 2012

Freshwater lymnaeid snails are crucial in defining transmission and epidemiology of fascioliasis. In South America, human endemic areas are related to high altitudes in Andean regions. The species *Lymnaea diaphana* has, however, been involved in low altitude areas of Chile, Argentina and Peru where human infection also occurs. Complete nuclear ribosomal DNA 18S, internal transcribed spacer (ITS)-2 and ITS-1 and fragments of mitochondrial DNA 16S and cytochrome c oxidase (cox)1 genes of *L. diaphana* specimens from its type locality offered 1,848, 495, 520, 424 and 672 bp long sequences. Comparisons with New and Old World Galba/Fossaria, Palaearctic stagnicolines, Nearctic stagnicolines, Old World Radix and Pseudosuccinea allowed to conclude that (i) *L. diaphana* shows sequences very different from all other lymnaeids, (ii) each marker allows its differentiation, except cox1 amino acid sequence, and (iii) *L. diaphana* is not a *fossarine lymnaeid*, but rather an archaic relict form derived from the oldest North American stagnicoline ancestors. Phylogeny and large genetic distances support the genus *Pectinidens* as the first stagnicoline representative in the southern hemisphere, including colonization of extreme world regions, as most southern Patagonia, long time ago. The phylogenetic link of *L. diaphana* with the stagnicoline group may give light to the aforementioned peculiar low altitude epidemiological scenario of fascioliasis.

Ascertaining gene flow patterns in livestock populations of developing countries: a case study in Burkina Faso goat

Amadou Traoré, Isabel Álvarez, Iván Fernández, Lucía Pérez-Pardal, Adama Kaboré, Gisèle MS Ouédraogo-Sanou, Yacouba Zaré, Hamidou H Tambourá and Félix Goyache

BMC Genet. 13: 35, May 2012

Background: Introgression of Sahel livestock genes southwards in West Africa may be favoured by human activity and the increase of the duration of the dry seasons since the 1970's. The aim of this study is to assess the gene flow patterns in Burkina Faso goat and to ascertain the most likely factors influencing geographic patterns of genetic variation in the Burkina Faso goat population.

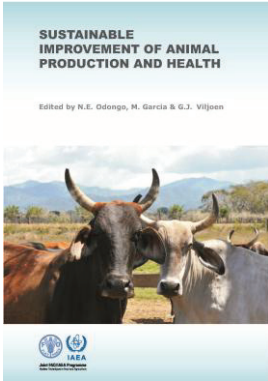
Results: A total of 520 goat were sampled in 23 different locations of Burkina Faso and genotyped for a set of 19 microsatellites. Data deposited in the Dryad repository: <http://dx.doi.org/10.5061/dryad.41h46j37>. Although overall differentiation is poor ($F_{ST} = 0.067 \pm 0.003$), the goat population of Burkina Faso is far from being homogeneous. Barrier analysis pointed out the existence of: a) genetic discontinuities in the Central and Southeast Burkina Faso; and b) genetic differences within the goat sampled in the Sahel or the Sudan areas of Burkina Faso. Principal component analysis and admixture proportion scores were computed for each population sampled and used to construct interpolation maps. Furthermore, population graph analysis revealed that the Sahel and the Sudan environmental areas of Burkina Faso were connected through a significant number of extended edges, which would be consistent with the hypothesis of long-distance dispersal. Genetic variation of Burkina Faso goat followed a geographic-related pattern. This pattern of variation is likely to be related to the presence of vectors of African animal trypanosomosis. Partial Mantel test identified the present Northern limit of trypanosome vectors as the most significant landscape boundary influencing the genetic variability of Burkina Faso goat ($p = 0.008$). The contribution of Sahel goat genes to the goat populations in the northern and eastern parts of the Sudan-Sahel area of Burkina Faso was substantial.

The presence of perennial streams explains the existence of trypanosome vectors. The south half of the Nakambe river (Southern Ouagadougou) and the Mouhoun river loop determined, respectively, the eastern and northern limits for the expansion of Sahelian goat genes. Furthermore, results from partial Mantel test suggest that the introgression of Sahelian goat genes into Djallonke goat using human-influenced genetic corridors has a limited influence when compared to the biological boundary defined by the northern limits for the distribution of the tsetse fly. However, the genetic differences found between the goat sampled in Bobo Dioulasso and the other populations located in the Sudan area of Burkina Faso may be explained by the broad goat trade favoured by the main road of the country.

Conclusions: The current analysis clearly suggests that genetic variation in Burkina Faso goat: a) follows a north to south clinal; and b) is affected by the distribution of the tsetse fly that imposes a limit to the Sahelian goat expansion due to their trypanosusceptibility. Here we show how extensive surveys on livestock populations can be useful to indirectly assess the consequences of climate change and human action in developing countries.

Recently Published

Sustainable improvement of animal production and health

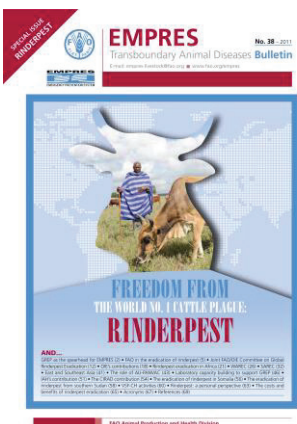


The growing world population is vulnerable to limitations in the production of agricultural products and to any change, be it climatic realities and/or variations or civil strife, that upset the delicate balance of providing affordable food for all. It is alarming that the world's poorest people, some one billion living mostly in Africa and Asia, depend on

livestock for their day to day livelihood. To reduce poverty, fight hunger and ensure global food security, there is an urgent need to increase livestock production in sustainable ways. An international symposium on 'Sustainable Improvement of Animal Production and Health' was organized by the APH subprogramme of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in cooperation with the Animal Production and Health Division of the Food and Agriculture Organization of the United Nations in 2009 to address the animal husbandry and public health issues that threaten global food security and safety.

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

Freedom from rinderpest



Rinderpest (also known as cattle plague), a highly contagious viral disease of cattle, buffalo, yak and several wildlife species, is no more. Countries that had suffered from the ravages of rinderpest were officially recognized as disease free by the World Organisation for Animal Health (OIE) in May 2011 and by the Food and Agriculture Organization

of the United Nations (FAO) in June 2011, when those organizations declared that rinderpest had been eradicated worldwide. The IAEA (together with FAO, OIE and AU) made significant technical contributions over

a period of almost 20 years through the development, evaluation, validation and distribution of immunological and molecular nuclear and nuclear related technologies for the diagnosis and control of rinderpest. This EMPRES special issue on 'rinderpest' highlights the contribution of the different organizations to its eradication.

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

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CD-ROMs

A CD-ROM is available dealing with training material for the diagnosis of rinderpest and for the preparation for the OIE pathway. It was produced under an IAEA Technical Cooperation project RAF/0/013 ICT based training to strengthen LDC capacity. Contact Gerrit Viljoen at g.j.viljoen@iaea.org for further information.

A new batch of CDs with a training package to help artificial insemination (AI) technicians to improve the performance of AI and field services provided to farmers was produced for users with a slow internet connection and is now available through the APHS. It is also accessible from the APHS website:

<http://www-naweb.iaea.org/nafa/aph/index.html>

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Impressum

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