

**PUI PROJECT PROPOSAL ON BUILDING AND IMPROVEMENT OF ANIMAL DISEASE
DIAGNOSTIC CAPACITIES OF VETERINARY LABORATORIES IN ASIA BY TRANSFER OF
NUCLEAR AND NUCLEAR RELATED TECHNIQUES: A REGIONAL APPROACH FOR THE
EFFECTIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES (TAD)**

Countries initially targeted: Bangladesh, Mongolia, Myanmar, Nepal, Lao People's Democratic Republic and Pakistan.

Countries were selected based on their exposure (via animal movements or trade) to animal (Foot and Mouth Disease, (FMD), Peste des Petits Ruminants (PPR) and African Swine Fever (ASF) etc.) and zoonotic (HPAI H5N1/H7N9/H1N1, Rabies, Brucellosis, etc.) diseases, the level of their veterinary diagnostic laboratory proficiencies and Member States' requests. This list of Asian countries is not exclusive and could be extended to other Member States in the region upon request

Rationale:

Poverty, hunger and food security are three major challenges facing the world and the problems are most acute in developing countries. For the 900 million people in the developing world who live in rural areas on less than US \$1 a day, agriculture is vital for their livelihood and survival. The World Bank estimates that, for the world's poorest people, Gross Domestic Product (GPD) growth originating in agriculture is four times more effective in reducing poverty than growth in any other sector.

In developing countries, most of the farmers are also subsistence livestock keepers, and they use their animals not only for meat and milk but also for draught power (i.e. ploughing the fields etc) and for social and cultural reasons. Hence, livestock in developing countries is essential for food security, poverty alleviation and indeed a token of people's livelihoods. Livestock productivity is threatened by a number of infectious, transboundary animal diseases (TADs) that cause high morbidity and mortality in domesticated animals. These TADs are capable of spreading rapidly over long distances, not only from one country to a neighbouring one, but also from continent to continent. Two examples are:

- 1) the highly pathogenic avian influenza (HPAI) caused by the influenza virus sub-type HPAI-H5N1 which broke out in Asia in 2003 and quickly invaded Europe and Africa, as well as the current LPAI-H7N9 threat from China to neighbouring countries;
- 2) The African Swine flu which was endemic mainly in Africa during the past 30 years, with the exception to Sardinia, broke out in the Caucasus and the Russian Federation in 2007 and since then is well established in those regions, threatening the pig production in East Europe and Central Asia,

Two other examples of TAD causing important losses to livestock production in Asia are Foot and Mouth disease (FMD) and peste des petits ruminants (PPR).

- Foot-and-mouth disease (FMD): The United Kingdom foot and mouth disease (FMD) crisis in 2001, which was a consequence of an importation from Asia, was responsible for a reduction of 0.2% of the Gross Domestic Product with direct losses on food production and processing of €3.9 billion of Euros and indirect losses of €3.4-4 billion (source: World Organisation for Animal Health (OIE)).
- Peste des petits ruminants (PPR): A disease which threatens more than one billion sheep and goat (small ruminants). PPR is seen as a big threat to the least developed economies since an outbreak of PPR in their regions would have devastating consequences locally and for international trade. Small ruminant losses would be most devastating for smallholder farmers. An FAO study carried out in Kenya estimated an annual loss of livestock-based income of 42 to 100% in 2008.

Some TADs, such as the severe acute respiratory syndrome (SARS) and avian influenza (H5N1/H7N9) have the potential to cause deadly diseases in humans. The Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE) reported that 75% of emergent animal diseases occurring in the past decade have zoonotic implications and therefore are of veterinary public health concern. These TADs constitute a constant threat not only to animal production and food security but also to human health and to the world economy at large. Therefore, the early and rapid diagnosis and control of these diseases are of utmost importance for both livestock and their owners. Because of their transboundary nature, their control is not a task of a single country but of a region and even the whole world. The second infectious disease which has been successfully eradicated worldwide, after small pox in humans, is Rinderpest, a transboundary animal disease for which the actions from IAEA is much appreciated by Member States. This success has been made possible through international, collaborative and concerted actions. . The IAEA has played an important role in the development and transfer of nuclear based techniques (highly sensitive and rapid in providing specific results) for the sero-monitoring of the vaccination campaigns against Rinderpest (i.e. which animals are vaccinated and which animals are at risk to the disease) and the surveillance (i.e. where is the disease and which animals are infected) of the disease. It is estimated that the eradication of Rinderpest brings to Africa alone a net benefit of more than US \$1 billion per year. The three major influenza epidemics, caused by H1N1 (2009 pandemic pig flu), H5N1 (2003 epidemic) and H1N1 (1918 Spanish Flu epidemic) viruses, both of animal origin, and the constant FMD threat to animals and international trade serve as a reminder that more can, and must be done, in terms of improved disease surveillance, identification, and preparedness in order to ensure that Member States have the capacity to initiate and maintain programmes for disease control and prevention. These epidemics clearly show that the developing world is not properly equipped to deal with such emerging and re-emerging diseases in an effective way. There is therefore an urgent need to strengthen surveillance and enhance laboratory capacities in selected regions in order to achieve more timely disease detection that will lead to more effective control. It is recognized that the strengthening of veterinary diagnostic laboratories in Asia and Africa and the organization and management of a laboratory network and information exchange, in particular in Africa, has been one of the keys of the success of the Global Rinderpest Eradication Programme (GREP). Presently, about 90% of OIE reference laboratories and

collaborating centres are in Europe, North America, Japan, Australia and China. In order to reach a more globally balanced and efficient situation, reference laboratories should also be located in African and Asian countries (i.e. instead of sending disease samples to the World Reference FMD Centre in the UK for FMD-Type O confirmation, this should be done in the region). Often this is not possible given capacity and infrastructural limitations. To this end, capacity building in countries or the regions must include a broad range of measures related to disease control, the most crucial being pathogen identification and characterization.

Project Description

Based on the experience of the IAEA Animal Production and Health Subprogramme in the development, evaluation, validation, and transfer and sustainable use of atomic, nuclear and nuclear related techniques in developing countries for animal disease diagnosis, and also the success of the PUI and ARF programmes in Sub-Saharan Africa, this proposal is designed to focus on research and development of diagnostic platforms to build the diagnostic capacities of veterinary diagnostic and control laboratories in the Asia region. As a starting point and based on the level of veterinary diagnostic laboratory proficiencies and on Member States' requests, six Member States countries/national diagnostic laboratories (Bangladesh, Mongolia, Myanmar, Nepal, Lao People's Democratic Republic and Pakistan) were selected. This list is not limited and some other laboratories/countries can be added based on Member States' needs and requests. Training and technical support will be provided to local staff. In addition, as molecular techniques are rapidly evolving, it is envisaged that yearly refreshment training courses/workshops will be conducted as part of a continuous education programme. The proposal will focus on the development, evaluation and validation of diagnostic platforms and procedures, the training of veterinary diagnostic staff to assist in the field validation of the tests (i.e. proof of principle in the field), the development of a laboratory management information system (LIMS) and its field evaluation, the exchange of information and experiences (research coordination meetings with targeted and specific training), the development, evaluation and validation of the mobile field laboratory (mobile lab) to assess its applicability at bird markets and farmer days etc. Equipment and reagents will be provided to each of the participant laboratories according to their needs and requests and as it relates to this project. The performance of the targeted laboratories in their routine diagnostic work will be assessed by organizing internal proficiency and external proficiency tests, the results of which will allow the detection and correction of potential weaknesses in laboratory competence.

Planned Activities

This proposal aims to develop and evaluate animal disease diagnostic technologies and platforms and concomitant laboratory management systems to prepare Member States' veterinary diagnostic laboratories to react in a timely and effective manner to the threat of TADs and those diseases that affect humans. The project will concentrate on the following areas:

1. Development, evaluation and validation of early and rapid diagnostic platforms and procedures that are highly specific and sensitive (i.e. to detect a pathogen/diagnose a disease before the onset of that disease), provision of SOPs, guidance and technical support. Cognisance has to be taken of high security and biosafety criteria (BSL3 laboratory agents);
2. Provision of selected equipment, reagents, consumables to perform the tests. Equipment and reagents will be provided to each of the participant laboratories according to their needs and requests and as it relates to this project;
3. The training of veterinary diagnostic staff to assist in the field validation of the tests (i.e. proof of principle in the diagnostic laboratory). Again cognisance has to be taken of high security and biosafety criteria (BSL3 laboratory agents) and the training of staff;
4. The development of a laboratory management information system (LIMS) and its field evaluation and validation;
5. The exchange of information and experiences (research coordination meetings with targeted and specific technical training); the promotion and strengthening of veterinary laboratory networks to exchange ideas, knowledge and experience and to facilitate interaction;
6. The development, evaluation and validation of the mobile field laboratory (mobile lab) to assess its applicability at bird markets, village clinics and farmer days etc.;
7. The performance of the targeted country veterinary diagnostic laboratories in their routine diagnostic work will be assessed by organizing internal proficiency and external proficiency tests, the results of which will allow for the validation of the developed tests.

Project Outcomes/Outputs

1. Developed and validated diagnostic platforms and procedures with associated technologies, Standard Operating Procedures (SOPs), guidance and technical support for both BSL2 and BSL3 laboratories and agents;
2. Provision of selected equipment, reagents, consumables to perform the tests based on needs;
3. Trained veterinary diagnostic staff - to assist in the laboratory and field validation of the tests;
4. Developed and validated laboratory management information system (LIMS);
5. Established and functional laboratory network;
6. Mobile field laboratory (mobile lab) evaluated and validated;
7. Developed veterinary diagnostic capacities;
8. Improved transboundary animal disease control and epidemiological capabilities.

Estimated Budget for the project:

Estimated budget Year 1:	€1 238 200
Estimated budget Year 2:	€ 831 900
Estimated budget Year 3:	€ 962 000
Estimated budget Year 4	€ 333 400
Estimated budget Year 5	<u>€ 385 200</u>
Total:	€3 750 700

BUDGETARY BREAKDOWN

Year 1	
€ 352 900	Development of technical capacities (e.g. technical workshops in Member States and at NA Laboratories in Seibersdorf, evaluation and accreditation activities, etc.)
€ 100 000	Training; fellowships; provision of experts (TC)
€ 117 900	1 st Research Coordination Meeting
€ 586 400	Procurement (equipment, reagents consumables – both for MS and Seibersdorf), development of technologies, development of the Laboratory Information Management System (LIMS)
€ 81 000	Programme Support Costs (7%)
€1 238 200	Year 1 sub-total
Year 2	
€ 87 900	Development of technical capacities (e.g. technical workshops in Member States and at NA Laboratories in Seibersdorf, evaluation and accreditation activities, etc.)
€ 100 000	Training; fellowships; provision of experts (TC)
€ 589 600	Procurement (equipment, reagents consumables – both for MS and Seibersdorf), development of technologies, development of the Laboratory Information Management System (LIMS)
€ 54 400	Programme Support Costs (7%)
€ 831 900	Year 2 sub-total
Year 3	
€ 112 700	Development of technical capacities (e.g. technical workshops in Member States and at NA Laboratories in Seibersdorf, evaluation and accreditation activities, etc.)
€ 100 000	Training; fellowships; provision of experts (TC)
€ 117 900	2nd Research Coordination Meeting
€ 568 500	Procurement (equipment, reagents consumables – both for MS and Seibersdorf), development of technologies, development of the Laboratory Information Management System (LIMS)
€ 62 900	Programme Support Costs (7%)
€ 962 000	Year 3 sub-total
Year 4	
€ 53 700	Development of technical capacities (e.g. technical workshops in Member States and at NA Laboratories in Seibersdorf, evaluation and accreditation activities, etc.)
€ 100 000	Training; fellowships; provision of experts (TC)
€ 157 900	Procurement (equipment, reagents consumables – both for MS and Seibersdorf), development of technologies, development of the Laboratory Information Management System (LIMS)
€ 21 800	Programme Support Costs (7%)
€ 333 400	Year 4 sub-total
Year 5	
€ 24 200	Development of technical capacities (e.g. technical workshops in Member

€ 100 000	States and at NA Laboratories in Seibersdorf, evaluation and accreditation activities, etc.)
€ 117 900	Training; fellowships; provision of experts (TC)
€ 117 900	3rd Research Coordination Meeting
€ 25 200	Procurement (equipment, reagents consumables – both for MS and Seibersdorf), development of technologies, development of the Laboratory Information Management System (LIMS)
€ 385 200	Programme Support Costs (7%)
€ 385 200	Year 5 Sub-total
€3 750 700	TOTAL

	NA	TC	TOTAL
Estimated budget Year 1	€1 138 200	€ 100 000	€1 238 200
Estimated budget Year 2	€ 731 900	€ 100 000	€ 831 900
Estimated budget Year 3	€ 862 000	€ 100 000	€ 962 000
Estimated budget Year 4	€ 233 400	€ 100 000	€ 333 400
Estimated budget Year 5	€ 285 200	€ 100 000	€ 385 200
TOTAL	€3 250 700	€ 500 000	€3 750 700