The Unit headed by Dr. GARIN-BASTUJI is dealing with the bacterial diseases of animals with a high level of risk for (human) public health and with a high economical incidence in livestock (Anthrax, Brucellosis, Chlamydiosis, Glanders, Mycobacteria and Tularaemia). The Unit's task is to give a scientific and technical support to national (DGAL, COFRAC, AFNOR, InVS), European (EU, EDQM) and international (OIE, FAO, WHO, IAEA) bodies for the implementation and evaluation of relevant regulations and standards. The Unit is the NRL for all these diseases and OIE Ref. Lab./ FAO Collaborating Centre for Brucella and Mycobacteria..

Dr. GARIN-BASTUJI has been expert or consultant for several national and international (OIE, WHO, FAO, IAEA, European Commission) organisations for the diagnosis and control of animal and human brucellosis. He has been consultant for that purpose in several countries of Europe, Northern Africa, South America, Middle East, Asia and Oceania.

In terms of technical support and expertise, the tasks of the Unit are essentially those of a reference laboratory: scientific and technical expertise, identification of bacterial strains, confirmation of cases or outbreaks, organisation of proficiency ring-trials, control of diagnostic reagents and vaccines, serological expertises, training and information.

In terms of research and development, the work of the Unit concerns:

- The development of molecular tools for studying the epidemiology of bacterial strains,
- The development, assessment and validation of direct (molecular biology) or indirect (immunology) diagnostic tools and their insertion in a sanitary decision system validated at the epidemiological level.

Dr. GARIN-BASTUJI has attended more than 30 national/international seminars/congresses in France and abroad, and has been co-author of ca. 50 scientific and technical communications in scientific and technical meetings. He has collaborated to ca. 50 original scientific publications in peer-reviewed journals or textbooks and ca. 50 popularisation publications or reviews. He is also the author or co-author of several national or international standard operating procedures (EU, OIE) for the diagnosis of animal brucellosis.

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BRUCELLOSIS DIAGNOSIS AND CONTROL IN ASIA-PACIFIC REGION:

A Joint FAO-APHCA and OIE initiative

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Brucellosis, in particular due to Brucella melitensis, is an old disease with minimal mortality but it is recognized as a significant public health challenge, of major economic and financial importance, in countries where the disease remains endemic. Yet human brucellosis remains the commonest zoonotic disease worldwide, with over 500 000 new cases annually, is associated with substantial residual disability, and is an important cause of travel-associated morbidity. It is still common in the Mediterranean region, Middle East, Central Asia and Latin America. Over the last 10 years, the infection has re-emerged in other countries, and in particular in Eastern Europe and Western, Central and Northern Asia [El Idrissi, 2009]1. Economic losses from B. melitensis infections are significant and include decreased productivity (abortion, weak offspring, decreased milk production) as well as lost trade opportunities. B. melitensis is very contagious for humans and the disease, unless diagnosed and treated both promptly and effectively, can become chronic thus affecting multiple body systems. Infection is acquired following ingestion of unpasteurised dairy foods, and from occupational exposure to infected live animals or carcasses. While sheep and goats are the major reservoir of infection, there is increasing evidence of B. melitensis emergence in cattle and camels.

For several decades, FAO and OIE have been joining forces to combat animal diseases on a global scale, in particular those with an epidemic or zoonotic impact. As far as brucellosis is concerned, while OIE has adopted relevant standards and guidelines to assist countries with the improvement of governance for disease control as well as with the facilitation of trade in animals and their products, FAO has been responsible for assisting in developing sound strategies for sustainable control programmes in countries where brucellosis impacts significantly on both human health and livestock on which households depend for their income and food security.

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In the case of a zoonotic disease such as brucellosis, both organisations believe that protection of human health must be achieved through the control of the disease in animals. Some key international recommendations for brucellosis control within a country include:

- programmes are to be properly planned, coordinated and well-resourced;
- control and prevention require effective collaboration within and between sectors;
- eradication can only be achieved by test-and-slaughter, animal movement control and preventive measures but vaccination with an effective vaccine and a proper strategy is a key component of both control and prevention;
- development of a coordinated surveillance programme to measure progress;
- need for flock/herd management, food/occupation hygiene and education/awareness programmes.

Other considerations at the national and regional levels include:

- programmes must be adapted to local specific conditions;
- brucellosis must be a national/regional priority and capacities must be available;
- national legislation must be developed and implemented;
- as animals, their products, and pathogens ignore borders, collaboration between neighbouring countries and regions is desirable.

Some of the generic disease control and eradication policies that are applicable to brucellosis include:

- use of standardized definitions and concepts to promote harmonization;
- surveillance to establish the status quo;
- transparency in cases/outbreaks notifications;
- minimum standards for diagnostic techniques and vaccines (OIE/WHO);
- scientifically based criteria for disease control;
- zoning/compartmentalization with a biosecurity border where appropriate within a country;
- import risk analysis and evaluation of veterinary services [Knopf, 2009][1].

Livestock contributes for 40% of the global value of agricultural output, and supports the livelihood and food security of almost a billion people [FAO][2]. Livestock production in developing countries has rapidly increased over the past 30 years[3]. This has resulted from increased numbers of animals and yields, in Asia by 3-4% per year, with lower prices for livestock products and a rapidly growing demand among urban consumers. But it has contributed to the spread of several animal diseases and the increase in meat and milk product consumption has increased the risk of exposure of human populations (both professionals and consumers).

The consequence is a worsening situation of both animal and human brucellosis in Asia: Available data in Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan and Uzbekistan show a steady incidence pattern. While the disease remains

endemic in India, Iran and Pakistan, as well as in several regions of Thailand, an increase of prevalence has been reported in China [Pappas et al., 2006][4].

Taking into account this evolution, FAO and OIE placed brucellosis, in 2007, as one of the top priorities for their future joint-actions in the Region. Since protection of human health can only be achieved through the control of the disease in animals, they decided to focus their actions on this sector. Since the control programmes implemented by the veterinary services are usually based on the advice of vet. laboratory scientists, this was the target population for advancing the regional practical knowledge on the disease, its diagnosis and its control in animals. Three successive annual workshops (2008-2010) open to all FAO-APHCA and OIE Asia-Pacific Office's member countries were organised in collaboration with DLD and Anses. The objectives were to update on brucellosis situation in the Asia-Pacific region; to update protocol development for the control of brucellosis; to provide hands-on training on standard diagnostic tests; and to promote collaboration on diagnosis and control of brucellosis in the region.

The workshops were attended by participants from 20 member countries: Bangladesh, Bhutan, Brunei, Cambodia, India, Indonesia, Iran, Laos, Malaysia, Mongolia, Myanmar, Nepal, Papua New Guinea, Pakistan, Philippines, Samoa, Singapore, Sri Lanka, Thailand and Vietnam.

They included technical lectures on diagnosis of brucellosis in animals and control/eradication strategies; review of laboratory diagnosis and standardization; and laboratory practices based on standard operating procedures for serological and bacteriological diagnosis. Participants were also invited to report on the livestock population, brucellosis situation and national surveillance/control programmes, laboratory organization focusing on brucellosis diagnosis and country plan/policy in their own country.

Each workshop was finalized by a round-table discussion where conclusions/recommendations were made and are summarised as follows:

- brucellosis, in particular in sheep and goats, is still one of the significant animal and public health concerns in the region and important efforts are still needed to improve the situation in some countries.
- laboratory testing and a good epidemiological information are the key elements for the application of appropriate control measures.
- Rose Bengal and Complement Fixation tests are so far the most widely used and effective methods for the serological diagnosis of Brucellosis in ruminants. For all susceptible animal species, diagnostic techniques including procedures and diagnostic reagents should be in compliance with the OIE standards. However, no single test can confirm the infection or certify the free status. Relevant tests should be conducted repeatedly.
- key elements to design and adopt adequate control measures are: actual epidemiological situation; technical capacity of veterinary services, adequate facilities and long term financial support (budget availability) for implementing disease control and laboratory diagnosis.

- in countries where prevalence is low to moderate and there are constraints/limitations in undertaking appropriate eradication measures, long-term vaccination is the main tool to control the disease; where the infection is endemic, the long-term mass vaccination is the best option to be considered; where the disease has never been reported, an appropriate surveillance should be implemented to detect possible introduction of the disease.
- progress was made in some countries in terms of laboratory diagnostic capacity such as quality assurance including standardization of testing procedures and reagents. However, continuous efforts are still needed to utilise the knowledge and techniques acquired from the workshops. Each participant should take active action to transfer the know-how and technology gained in the workshops to other laboratory staff in his/her respective country.
- member countries should actively share information on the disease situation and laboratory diagnostic data amongst themselves to strengthen the regional (laboratory) networking and collaboration to improve the disease situation in the region.
- FAO-APHCA and OIE Asia-Pacific should continue providing financial and technical supports to strengthen brucellosis diagnostic capacity in national laboratories in the region through assisting the NIAH relevant activities. Anses should continue assisting the member countries to improve diagnostic capacity and study brucellosis epidemiology in the region. Close collaboration between Anses and NIAH should be further facilitated.

In the meantime, both Anses and NIAH have decided to apply jointly for an OIE twinning programme. The objective was to enable NIAH to fulfil the requirements in order to apply for a future recognition as an OIE Reference Laboratory. The aim was first to complete the level of expertise already existing in the lab. as far as brucellosis serological and bacteriological diagnosis is concerned, and then to assist the NIAH in acquiring the expertise in the control of diagnostic reagents and vaccines and in the organization of Regional serology proficiency ring-trials as well as in Brucella typing and molecular detection and identification, according to the methods and standards described in the OIE Manual. All procedures to be implemented fulfil the requirements of ISO/CEI 17025 Standard. The duration of the twinning project is 3 years (2010-2013 – budget: 99,300 €). The project included 3 annual training sessions for senior lab. technicians/veterinarians in Anses and 3 visits of Anses experts in NIAH 6 months after each training sessions in order to assist the NIAH in improving the organisation and the quality management of brucellosis activities as far as the topic of the previous training session was concerned. The project included also:

- The participation of NIAH to the International proficiency ring-trials in order to monitor the progress in the quality of serological testing in NIAH
- The collection of large volumes of serum from positive cattle, buffaloes, sheep and goats in order to establish a common serum collection for the establishment of regional secondary standard sera, further

organisation of regional ring-trials, and quality assurance and test validation controls.

- The establishment of a NIAH collection of Brucella strains, including reference and field strains from infected animals at the regional level.
- Assistance in completing the quality assurance system in place (acc. 17025 ISO/CEI std.)
- Assistance in designing research activities as studies on the distribution, both, geographical and by animal species, of Brucella species in the region.

In 2013, a complementary action is supported by both FAO-APHCA and OIE Asia-Pacific Office in order to organize a regional proficiency ring-trial regarding the serological diagnosis of brucellosis.

This project included also an adequate re-organisation of the NIAH laboratory with the acquisition of the necessary equipment and materials for the improvement of Brucella bacteriology (NIAH budget).

In conclusion, the FAO-APHCA and OIE Asia-Pacific's joint initiative for improving the diagnosis and control of brucellosis in the Region clearly contributed to:

- An increased and shared knowledge of the epidemiological situation of brucellosis as well as regarding the control programmes in place in the Region;
- An increased level of scientific and technical skills regarding the international recommendations for implementing control strategies as well as the standard protocols for the diagnosis of the disease;
- The establishment of a regional network of animal brucellosis laboratories, with a Regional coordinator in Thailand, soon in position to apply as an OIE Regional Reference Laboratory.

These should be the first steps to convince authorities of the member countries to:

- Implement proper studies for investigating the situation of the disease in both animal and human populations and, when necessary, to implement sound and appropriate surveillance and/or control programmes in animal population, including selective or mass vaccination programmes where it is required;
- Improve trans-boundary collaboration for limiting the spread of the disease regionally;
- Take appropriate measures for limiting the transmission of brucellosis from animal to humans through education and awareness programmes as well as, when necessary, the pasteurisation of dairy products.
- Encourage and contribute to maintain an active regional network of brucellosis laboratories.

[1] http://www.fao.org/docrep/012/i1402e/i1402e00.pdf

[2] http://www.fao.org/docrep/012/i0680e/i0680e.pdf

[3] http://www.ifad.org/rpr2011/index.htm

[4] Pappas G, Papadimitriou P, Akritidis N, Christou L, Tsianos EV. The new global map of human brucellosis. Lancet Infect Dis 2006;6:91–9.