Multi-sectoral strategy for brucellosis control in peri-urban dairy production zones of West and Central Africa

Project Outline
DAKAR 15-18 June 2015
**Project sponsors and partners**

This project is supported by a grant awarded by the UK Biotechnology and Biological Sciences Research Council (BBSRC) under the Zoonoses and Emerging Livestock Systems (ZELS) programme, a multinational initiative involving BBSRC, the Department for International Development (DFID), the Economic & Social Research Council (ESRC), the Medical Research Council (MRC), the Natural Environment Research Council (NERC) and the Defence Science & Technology Laboratory (DSTL). The main project partners are: **The Royal Veterinary College Veterinary Epidemiology, Economics and Public Health Group**: is a FAO Reference Centre in Veterinary Epidemiology that will lead the project and provide skills in epidemiological study design, simulation modelling, KAP studies and animal health economics. Previous and current work includes field epidemiological studies and advice on brucellosis control in Africa and Asia. Since 2002 the group has delivered capacity building for veterinary services of 70+ countries. RVC will have primary responsibility for field surveys, epidemiological analysis and animal health economics. **The Interstate School of Veterinary Science and Medicine of Dakar (EIS MV)**: Leading training centre in veterinary science in the region (covering 15 countries). EISMV will be the regional hub for the work to be carried out in all countries, with primary responsibility on the situation analysis and the longitudinal study of farms and co-responsibility with RVC and LSHTM on the remaining field studies and the control programs. Through its strong links to the 15 countries, impact and local capacity building will be maximized. **London School of Hygiene and Tropical Medicine (LSHTM)**. Leading school for population research with expertise in study design, conduct, analysis of research into the epidemiology and control of tropical diseases including zoonoses and vaccine preventable diseases. For more than 10 years LSHTM has provided joint postgraduate training with RVC in veterinary epidemiology. The proposed research together with the collaborative working relationship with colleagues at RVC will provide a stimulating supportive environment with good potential for synergy with West and Central African collaborators. LSHTM will be responsible for transactional cost economics, surveillance of non-specific fevers and observational studies on risk of human infection. **The Animal and Plant Health Agency (APHA)** is a globally recognised UK centre of technical excellence in the detection and diagnosis of communicable veterinary disease. The laboratories at APHA include many (14) OIE Reference Laboratories, one of them for Brucellosis. The OIE Reference Laboratory for Brucellosis at the APHA (also an FAO/WHO Collaborating Centre for Brucellosis) plays a very important national role in maintaining the brucellosis free status of Great Britain, critically instrumental in achieving the eradication of brucellosis from Great Britain in 1985. It developed, holds and distributes all over the world the OIE International Standard Sera for the standardisation of the OIE prescribed serodiagnostic assays to National Reference Laboratories for Brucellosis and has been at the forefront in the development and validation of serodiagnostic techniques. The brucellosis laboratory at APHA engages in international work, joint research programmes with other OIE laboratories, for example in the development of superior serodiagnostic assays; establishing, and publishing, the first exercise in the harmonisation of serodiagnostic assays for bovine brucellosis across Europe and participates in the OIE Twinning programmes where established laboratories partner with laboratories wishing to become OIE Reference Laboratories. The brucellosis laboratory at the APHA has been engaged in two such programmes, one in Turkey and one in Sudan. In recent times, members from the APHA laboratory have delivered practical workshops in Azerbaijan, Greece, Morocco, Kosovo, Tajikistan, Tanzania and Turkey. As well as conducting such missions, the laboratory regularly hosts scientists from across the world in order to receive training specific for their national needs. APHA will be responsible for standardization of diagnostics and development of tests appropriate in the study setting–pen-side tests, tests discriminating vaccinated vs. infected animals. **The Global Alliance for Livestock Veterinary Medicines (GALVmed)** is a not for profit partnership developing the products and processes to address the critical shortfall in veterinary drugs for the world's 900 million poor livestock keepers. In the last 5 years GALVmed has been awarded £65.5 million for the delivery of projects in pursuance of this broad mission, which includes product and technology development (e.g. thermostabilised vaccines for Newcastle Disease), field projects and market development (e.g. the distribution and sale of over 500,000 doses of ECF-ITM vaccine doses to poor livestock keepers in East Africa), policy development and product availability (e.g. Establishing the process of mutual recognition for vaccine registration within East African Community member states and organising the first Pan-African meeting of veterinary vaccines regulators as the first steps towards harmonisation of vaccine registration) and capacity building to enhance the long term capacity and
efficiency of public institutions in the developing world. Within this project, GALVmed will analyse local vaccine value chains, will contribute to the implementation of the control programs and will build capacity through the vaccine value chain from manufacturers to farmers.

**Project summary**
As one of the most prevalent zoonoses, brucellosis is an important constraint on the livelihoods of poor people acting both directly on human health causing chronic disability and indirectly via decreased livestock productivity. The heaviest burden is currently on vulnerable populations in Sub-Saharan Africa where emergent livestock systems (peri-urban dairy farms) as increasingly required to supply milk to the rapidly growing urban populations. Transmission to humans is mostly by the consumption of contaminated dairy products and contact with infected animals. A range of diagnostic tools and vaccines are used in developed settings and have successfully controlled brucellosis in animals and hence humans in different parts of the world. Their use however in LMIC animal health programmes are hampered by several technical, social and economic factors g. quality and appropriateness of different vaccines for different settings, livestock keepers perceptions towards the disease, competing demands lack of incentives for its control, unrecognised human burden from the disease.

This project will be on peri-urban farm systems in collaboration with the Interstate School of Veterinary Science and Medicine of Dakar (EISMV) a regional educational hub in 15 West and Central African countries. A multidisciplinary research and development programme linking appropriately to industry is proposed to provide biological, social and institutional answers to the effective control of the disease by vaccination. Field studies will measure the burden of brucellosis in livestock, productivity and human health peri-urban areas identify routes by which people become infected, assess farmers’ perceptions and attitudes toward the disease, assess vaccines for effectiveness in livestock, and explore key stakeholder and institutional relationships to identify how to effectively deliver use control measures for Brucella. Training and capacity building will be a central part of the work.

**Scope of the project**
In this proposal we focus on brucellosis, one of seven zoonoses considered by WHO to be neglected and identified in a recent DFID report as one of the 13 “most important zoonoses to poor livestock keepers”. We target a production system (peri-urban dairy farming) and geographical region (West and Central Africa) where the available evidence suggests that the impact of brucellosis is among the highest in Sub-Saharan Africa. Specifically, we will work on the main peri-urban dairy production areas of 15 West and Central African countries formally linked through their involvement in the Interstate School of Veterinary Science and Medicine of Dakar (EISMV): Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo, Côte d’Ivoire, Gabon, Mali, Mauritania, Niger, Rwanda, Senegal, Chad & Togo. In this setting, our goal is to facilitate the long-term implementation of brucellosis control programs based on vaccination. It is well known that sustained vaccination in an endemic setting can markedly reduce the prevalence of ruminant and human brucellosis and benefit local livelihoods. However, the implementation of control programs based on vaccination is hindered by a number of obstacles as a result of which, livestock keepers in most of our target countries do not currently have access to vaccines either through government or privately. In this proposal, the question addressed is how to achieve a sustainable reduction of the prevalence of brucellosis in peri-urban dairy farming systems in West and Central Africa to pre-eradication levels. Given the multidimensional nature of the problem, we integrate several research disciplines and engage actively and in an innovative way with public and private sectors, international agencies and NGOs.
Aim and objectives of the project

The problem being addressed is how to achieve a sustainable reduction of the prevalence of brucellosis in peri-urban dairy farming systems in West and Central Africa to pre-eradication levels. We are targeting the main peri-urban dairy production areas of 15 West and Central African countries linked through their involvement in the Interstate School of Veterinary Science and Medicine of Dakar (EISMV). Although available evidence suggests that these countries have the highest prevalence of ruminant brucellosis in Sub-Saharan Africa, formal control programs are lacking as a result of a combination of issues including knowledge gaps, technical challenges and institutional barriers. We will adopt a multidisciplinary approach to identify and address these issues and will work with national partners in the design, implementation and evaluation of pilot programs for the sustainable and effective reduction of the prevalence of brucellosis in this system.

Our aim is to systematically investigate and address barriers towards the implementation of programs for the sustainable reduction of the prevalence of brucellosis in the main peri-urban dairy areas in West and Central Africa. A series of specific questions will be addressed by a team of veterinary, medical and social scientists with strong involvement of local partners. The results will be used to design, implement and test locally adapted control programs. Our specific objectives are:

1. To estimate the frequency of *Brucella* spp infection in the main peri-urban dairy production zones of the 15 West and Central African countries members of the Interstate School of Veterinary Science and Medicine of Dakar (EISMV): Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Gabon, Mali, Mauritania, Niger, Rwanda, Senegal, Chad & Togo.
2. To assess knowledge, attitudes and practices relevant for brucellosis control among keepers of dairy cattle in the above systems and to identify socioeconomic drivers for brucellosis control.
3. To isolate and molecularly characterize at subspecies level, *Brucella* species infecting cattle in the above systems.
4. To work with local partners in the design and implementation of locally-adapted, sustainable programs for the reduction of the prevalence of brucellosis in the above systems incorporating methods to differentiate vaccinated and infected cattle.
5. To identify and address with local partners, using a transactional cost economics framework, the social, regulatory and institutional barriers for the implementation of a control strategy based on vaccination in the above systems.
6. To identify and overcome with local partners barriers for the distribution, availability and access of quality diagnostics and vaccines necessary for a control strategy based on sustainable vaccination in the above systems.
7. To assess burden of disease and main routes of exposure to *Brucella* spp in the local population of selected urban areas in the above countries.
8. To build local capacity in diagnostics, epidemiology and vaccine supply chain in the region.
9. To disseminate key lessons learned beyond the study area to other endemic and resource-scarce settings.
Program of work (April 2015 – March 2020)

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<tr>
<th>Month</th>
<th>Situation Analysis (Akakpo)</th>
<th>Preparation of Seroprevalence &amp; KAP studies (Akakpo)</th>
<th>Preparation of proficiency program (Akakpo)</th>
<th>Workshop 1-Brucellosis Diagnostics (McGiven)</th>
<th>Seroprevalence &amp; KAP studies (Senior RVC postdoc)</th>
<th>Longitudinal studies in cattle (Akakpo, Feusson)</th>
<th>Pilot control programs in cattle (Senior RVC postdoc)</th>
<th>Pilot study detection of human cases (Nguipdop)</th>
<th>Cross-sectional studies of human cases (Nguipdop)</th>
<th>Case-control studies of human cases (Nguipdop)</th>
<th>Field work on transactional cost economics (Roberts)</th>
<th>Field work on vaccine value chains (Dungu)</th>
<th>Workshop 2-Epidemiology / Public Health (Mangtani)</th>
<th>Workshop 3 - Vaccine value chain (Donadeu)</th>
<th>Final reporting &amp; Outreach (Guitian)</th>
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