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SHORT COMMUNICATION

Improving the Diagnostic Capacities of Brucellosis, Enhancing the Vaccination and Control Strategies in the Middle East and North Africa

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ABSTRACT

A regional workshop, sponsored by UN Development Program, to address brucellosis in the Middle East and North African (MENA) region, was held at the Jordan University of Science and Technology, Irbid-Jordan from 5-7 January, 2014. Forty-four key scientists from universities and governments in 5 countries (Jordan, Palestine, Egypt, Algeria, and Afghanistan) gathered to present and discuss various aspects of brucellosis surveillance and control. They were joined by Dr. Bruno Garin-Bastuji, Director of the OIE/FAO Reference Laboratory for Brucellosis, who provided helpful comments and guidance throughout. Using scientific presentations, laboratory sessions, and targeted discussion sessions, participants shared perspectives and gained valuable information on control of this important transboundary animal disease and public health problem. This paper describes highlighted discussion points and presents consensus summary statements regarding possible paths forward.

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INTRODUCTION

Brucellosis is considered to be the most common bacterial zoonosis, with 500,000 new cases in humans recorded each year (Pappas, 2006). The Middle East and North Africa has long been considered an area with high endemicity, and many of the countries with the highest incidence for human brucellosis are in the MENA region (Rubach *et al*., 2013).

Sheep and goats, the primary source of *Brucella* infection for humans, are the major form of animal agriculture in this part of the world. These animals are well adapted to the semi-arid conditions, predominantly herded by poor farmers, and are considered the backbone of rural economies. Infected animals with *Brucella* are not only likely to lose their young through abortion, but also serve as a source of infection for humans. So, controlling the disease in animal populations has both economical and public health implications (Anonymous, 2006).

The workshop had sessions covering three main themes: testing and surveillance, control programs, and public health implications. Each of these three main themes is covered below, with major discussion points described.

Testing and surveillance: There is a variety of serological tests available for brucellosis. The Rose Bengal (RB) test is an excellent screening tool, and favors IgM, so is especially good for diagnosing acute (or recent) infection. Also, it is inexpensive, allowing for the possibility of mass screening even in relatively resource-poor countries. Some countries presented their surveillance data by describing the use of Rose Bengal as a screening test followed by a "confirmatory" test. In fact, all *Brucella* serology tests are complementary, not confirmatory at individual level. In endemic areas or in infected flocks/herds, if a laboratory is using two different tests for diagnosis, *e.g*., RB and complement fixation, any

animal that is positive in either test should be considered infected, or recently vaccinated.

Several countries reported surveillance using total animal numbers (individual prevalence) rather than flock/herd prevalence, which dramatically underestimate the *Brucella* burden in a region or country. Thus, it was agreed that, the epidemiological unit for *Brucella* control programs should be the herd or flock and not the individual prevalence.

Testing for the organism can be done through culture or PCR. Culturing is generally not used for diagnosis due to lack of sensitivity and biosafety concerns in the laboratory. PCR can be a useful tool for diagnosis of cause of infection, and can be used on milk, vaginal swabs or placenta. However, properties of the organism (presence of oxidase) may cause degradation of the DNA and so results may be falsely low.

Several speakers emphasized that in sheep and goats, there are multiple infectious causes of abortion, including not only *Brucella melitensis*, but also *Chlamydophila abortus*, *Toxoplasma gondii*, and *Campylobacter fetus*. Of the 5 countries represented at the meeting, none had done a study of all causes of abortion, so the true incidence of any of these infectious agents of abortion in the region remains unknown.

Control programs: All agreed this is a very challenging disease to control. Adequate tests and vaccines are readily available, but these need to be applied in a strategic and consistent manner. Clearly, when resources are limited, extensive vaccination is the most efficient tool to decrease the incidence of the disease in humans. Long-term political will and support from all stakeholders is also essential to effect eradication. Examples were given of carefully planned multi-year programs, in which there was breakdown in ability to vaccinate due to civil insecurity, or unexpected poor vaccine quality. The result was failure of the multi-year program and a huge surge in cases in animals. Another example was given of effective control implemented only for sheep and goats, with a corresponding increase in human cases because of lack of attention to disease in cattle.

If the herd/flock prevalence is very high, it will not be enough to simply vaccinate the young animals each year, it will probably be necessary to vaccinate all the animals as the environmental load will be high enough to overcome positive effects of vaccinating just the young animals.

A large unknown is the effectiveness of Rev-1 vaccination in cattle. The Rev-1 vaccine is not registered for use in cattle, but this vaccine is designed to be effective against *B. melitensis* in sheep and goats and most countries reported that brucellosis in cattle is due to *B. melitensis*. An urgent need is to examine the Rev-1 vaccine for safety and efficacy in cattle.

Infection of humans: Every country reported that the main source of human infection is consumption of unprocessed dairy products. Participants from several countries indicated that local fresh cheese is common at the village level, and represents a cottage industry that is extremely difficult to regulate.

Consumption of raw milk is practiced in many rural areas. It may be consumed as part of festivities, or may be consumed for perceived health benefits. In particular, raw camel milk is perceived to have anti-cancer effects and those who wish to consume it strongly resist boiling, as it is believed pasteurization will negate the positive health benefits.

Several countries reported positive serologic titers in their district veterinarians who are involved in control programs. However, all felt that self-inoculation with the vaccine was extremely infrequent. Rather, it was believed that as veterinarians become involved in the control programs, they are more exposed to infected animals and so acquire the infection naturally.

The public health authorities present at the meeting all recognized that brucellosis is a major cause of human disease in this region, and agreed it is very challenging to diagnose in people as it can present with such nonspecific symptoms. Also, although it is known that the Middle East has the highest incidence/prevalence of the human brucellosis, and that it is a reportable disease, it is not always reported, and so the true extent of human disease may be underestimated.

Summary and consensus recommendations: Many countries expressed that one of the great values of this conference was learning that they were not alone in confronting this difficult animal and public health problem, as each nation is facing similar obstacles and problems. The group worked together to develop a consensus plan on greatest needs for the region. It was agreed that what is most needed is a Regional Center for Brucellosis Control. This could be simply a virtual center, and would serve as a clearinghouse of information, sharing of field and research queries and projects, and also could be used to create information campaigns. Participants expressed that if they had known previously about success or failure of a particular experiment or control program in the country next door, they would have organized their own testing and control programs differently. All were keen to know more about Rev-1 experiments in cattle, which were described at this conference, but not yet published. Also, all agreed that farmer and village awareness is critical. The farmers need to understand the risk associated with this disease and the importance of vaccinating and reporting. The general public needs to understand the significant dangers associated with consumption of unprocessed dairy products. A Regional Center could easily coordinate efforts for the countries in the region, and could work to garner funding for a public education campaign aimed at consumers.

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