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An Epidemiological Situation of an Animal Brucellosis in Mongolia

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ABSTRACT. Brucellosis, which is caused by *Brucella* spp., infects domestic and wild animals worldwide, as well as humans who have contact with infected animals or contaminated dairy products. In present-day epidemiological situation in Mongolia is not quiet, especially, zoonoses such us brucellosis have been broadly spreaded.

Recently, we developed agar gel immunodiffusion (AGID) test with polysaccharide (Poly-B) antigen and an indirect enzyme-linked immunosorbent assay (i-ELISA) using soluble antigen extracted from *B. abortus* 544 by n-lauroylsarcosine (sarcosine extracts) and these tests could be used to differentiate naturally infected animals from vaccinated and *Y. enterocolitica* O9-infected ones; this assay simply and specifically diagnoses brucellosis.

To validate the method in the field and to test the effectiveness of the vaccination program in Mongolia, a serological survey of brucellosis in nomadic animal husbandry in Mongolia was performed in 2010 and 2011. In this study had been determined an animal brucellosis prevalence in Arkhangai and Khovd aimag. The result showed that 1.25% and 0.4% of cattle and 0.04 % and 0.01% of small ruminants were positive for brucellosis in Arkhangai and Khovd aimag respectively.

These results showed that *B.abortus* 159 N5R can be used as an alternative vaccine against bovine brucellosis.

Keywords: An epidemiological situation; animal brucellosis; human brucellosis.

INTRODUCTION. Brucellosis, which is caused by *Brucella* spp., infects domestic and wild animals worldwide, as well as humans who have contact with infected animals or contaminated dairy products. In present-day epidemiological situation in Mongolia is not quiet, especially, zoonoses such us brucellosis have been broadly spreaded. In many countries to control and eradicate brucellosis, cattle and sheep/goats have been vaccinating with the *B. abortus* S-19 and *B. melitensis* Rev-1 strains, respectively. In Mongolia, the national mass vaccination program of cattle, sheep, and goats against brucellosis was started in 2000 [1].

Brucella-infected animals are generally culled following their identification by conventional serological tests such as the Rose Bengal (RBT), standard tube agglutination (SAT), and compliment fixation (CFT) tests using inactivated whole bacterial cells or bacterial

lipopolysaccharide (LPS) antigens. However, a strong cross-reaction between *Brucella* spp. and *Yersinia enterocolitica* O9 in these tests has seriously complicated the diagnosis of animal brucellosis. Furthermore, it is difficult to discriminate between infected and vaccinated animals because both have high titers of anti-smooth LPS of *Brucella* antibody [2].

After vaccination, an epidemiological tracing survey of the occurrence of brucellosis is essential, and the above mentioned serological tests are generally used to do this. However, large numbers of vaccinated and healthy domestic animals could be diagnosed as positive for brucellosis by these tests, because of the cross-reaction with *Y. enterocoitica* 09 or the high anti-smooth LPS of *Brucella* antibodies in vaccinated animals. Therefore, a simple diagnostic method to specifically detect authentic *Brucella*-infections must be established to avoid culling healthy animals.

Recently, we developed agar gel immunodiffusion (AGID) test with polysaccharide (Poly-B) antigen and an indirect enzyme-linked immunosorbent assay (i-ELISA) using soluble antigen extracted from *B. abortus* 544 by n-lauroylsarcosine (sarcosine extracts) and these tests could be used to differentiate naturally infected animals from vaccinated and *Y. enterocolitica* O9-infected ones; this assay simply and specifically diagnoses brucellosis.

To validate the method in the field and to test the effectiveness of the vaccination program in Mongolia, a serological survey of brucellosis in nomadic animal husbandry in Mongolia was performed in 2010 and 2011. In this study had been determined an animal brucellosis prevalence in Arkhangai and Khovd aimag. The result showed that 1.25 % and 0.4 % of cattle and 0.04 % and 0.01 % of small ruminants were positive for brucellosis in Arkhangai and Khovd aimag respectively. Totally 747 herds from 99 bag of Arkhangai aimag and 698 herds from 86 bag of Khovd aimag were tested for brucellosis and from them 68 herds (9.1 %) and 19 herds (2.7 %) were infected with brucellosis in Arkhangai and Khovd aimag, respectively.

Before implementation of the Governmental program for “Eradication of cattle and small ruminant brucellosis”, the average prevalence of brucellosis in both above mentioned aimags were 2–2.5 % and 0.2–0.4 % in cattle and small ruminants, respectively. As a results of the mass vaccination campaign of all female and young animals annually, the brucellosis prevalence were reduced up to 0.4–1.25 % and 0.01–0.04 % in cattle and small ruminants, respectively. However, results of the serosurveillance were showed that brucellosis prevalence is remaining a high in Arkhangai aimag.

CONCLUSION. The characteristics of *B.abortus* 135 and *B.abortus* 159 strains, isolated in Bulgan and Khuvsgul aimags, Mongolia, respectively, are correlated with the description of the former *B.abortus* biovar 7, according to Alton G.G, ...et.al (4). The isolation of these two strains introduces the question of the reinstatement of *B. abortus* biovar 7 in the list of *Brucella*. Using these strains we developed the rough mutant strain *B.abortus* 159 N5R and tested it as a potencial vaccine candidate. Immune responses and resistance to infection with virulent *B.abortus* 544 were measured in mice (local strain, IMV, Mongolia and BalB/c Cler, Japan) following vaccination with B.abortus 159 N5R and *B.abortus* S19. Live bacteria persisted for 4 and 8 weeks in spleens of mice vaccinated with $4x10^5$ or $2x10^8$ CFU of *B.abortus* 159 N5R, respectively, whereas bacteria persisted for 10 and more weeks vaccinated with $4x10^5$ CFU of *B.abortus* S19 and infected with same CFU of virulent *B.abortus* 544 or 159, respectivelly. Mice vaccinated with S19 strain had antibody to smooth-LPS at 2, 4, 6, 8, and 10 weeks after vaccination. In contrast, mice vaccinated with *B.abortus* 159 N5R did not produce detectable antibody to S-LPS. Mice challenged 10 weeks and 8 or 13 weeks after vaccination with B.abortus 159 N5R strain exhibited significant protection at 2 and 7 weeks postinfection (p.i), respectivelly. Also this mutant strain did not cause abortion in pregnant heifers. These results showed that *B.abortus* 159 N5R can be used as an alternative vaccine against bovine brucellosis.

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Эпидемиологическая ситуация по бруцеллезу животных в Монголии

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Аннотация. Бруцеллез Brucella SPP. поражает домашних и диких животных во всем мире, а также людей, которые имеют контакт с инфицированными животными или загрязненными молочными продуктами. В современной эпидемиологической ситуации в Монголии, в частности, бруцеллез был широко распространен. Недавно мы разработали агар гель иммунодиффузии (AGID) тест полисахаридов (Poly-B) антигена и косвенные иммуноферментного анализа (ИФА-я) с помощью растворимого антигена, извлеченные из B. выкидыш 544 n-lauroylsarcosine (саркозин выдержки) и эти тесты могут быть использованы для различения инфицированных животных от вакцинированных и Y. enterocolitica O9-инфицированных.

Для проверки метода в данной области и эффективности программы вакцинации в Монголии, серологические обследования на бруцеллез кочевым животноводством в Монголии были проведены в 2010 и 2011 годах. В этом исследовании были определены распространенность животных бруцеллезом в Архангай аймака и Ховд. Результат показал, что 1,25 % и 0,4 % крупного рогатого скота и 0,04 % и 0,01 % мелкого рогатого скота были положительными на бруцеллез в Архангай и Ховд аймаков соответственно. Эти результаты показали, что B.abortus 159 N5R может быть использована в качестве альтернативы вакцины против бруцеллеза.

Ключевые слова: Эпидемиологическая ситуация; бруцеллез животных; бруцеллеза человека.