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Porcine brucellosis serology: false positives and solutions

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Introduction: Porcine brucellosis caused mainly by B. suis, has been eradicated in domestic swine in many European countries and is monitored by national surveillance programs. Serology is a key strategy for surveillance of the swine population. However, cross-reacting antibodies caused by other gram-negative bacteria, especially Yersinia enterocolitica O:9, interfere with serological diagnostics, as they can lead to false positive serological results (FPSR). Methods using antigenic components other than the smooth lipopolysaccharide (sLPS) of Brucella sp. have given promising result in confirmation of FPSR.

Methods: In this study, the performance of different serological tests was analyzed on porcine sera obtained from pigs with different brucellosis status; 1) Random sera from boars from an artificial insemination station that are seronegative for and free from brucellosis (n=65), 2) Sera from brucellosis-free herds showing FPSR (n=53), 3) Sera from a past outbreak of porcine brucellosis in Switzerland (n=25). Sera were tested with Rose Bengal Test (RBT), complement fixation test (CFT), with a commercial sLPS based Brucella-multispecies-i-ELISA (BruMS i-ELISA) and with a commercial differentiating B. suis i-ELISA based on not only sLPS but also rough LPS (rLPS). Additionally, to understand the possible source of FPSR, sera were tested with a commercial i-ELISA for pathogenic Yersinia species.

Results: The 1st group was negative in all tests for brucellosis. In the 2nd group RBT, CFT and BruMS i-ELISA revealed positivity in 45 (84%), 15 (28%) and 24 (45%) samples, respectively. In 51 (96%) of these, FPSR has been confirmed by B. suis i-ELISA which showed negative results on the rLPS. In the 3rd group, none were negative in CFT and BruMS i-ELISA, one in RBT and six in B. suis i-ELISA. In Yersinia i-ELISA, 26 (40%), 37 (70%) and 19 (76%) sera in 1st, 2nd and 3rd group respectively tested positive.

Conclusion: Considering the high specificity (96%) found in our study, the B. suis i-ELISA based on both sLPS and rLPS is found to be helpful in confirming the FPSR in sLPS based tests in porcine brucellosis serology. However, the low sensitivity (76%) makes it unsuitable for disease diagnosis. On one hand, the high positivity of Yersinia i-ELISA in the 2nd group confirms that the presence of cross-reactive antibodies against pathogenic Yersinia species is an important source for FPSR. On the other hand, the results of the 3rd group show that B. suis-specific antibodies also exhibit high cross –reactivity in the Yersinia i-ELISA.