Sensitivity and Specificity of Some Serological Tests Used for Diagnosis of Bovine Brucellosis in Egypt on Bacteriological and Molecular Basis

Authors : Hosein I. Hosein, Ragab Azzam, Ahmed M. S. Menshawy, Sherin Rouby, Khaled Hendy, Ayman Mahrous, Hany Hussien

Abstract : Brucellosis is a highly contagious bacterial zoonotic disease of a worldwide spread and has different names; Infectious or enzootic abortion and Bang's disease in animals; and Mediterranean or Malta fever, Undulant Fever and Rock fever in humans. It is caused by the different species of genus Brucella which is a Gram-negative, aerobic, non-spore forming, facultative intracellular bacterium. Brucella affects a wide range of mammals including bovines, small ruminants, pigs, equines, rodents, marine mammals as well as human resulting in serious economic losses in animal populations. In human, Brucella causes a severe illness representing a great public health problem. The disease was reported in Egypt for the first time in 1939; since then the disease remained endemic at high levels among cattle, buffalo, sheep and goat and is still representing a public health hazard. The annual economic losses due to brucellosis were estimated to be about 60 million Egyptian pounds yearly, but actual estimates are still missing despite almost 30 years of implementation of the Egyptian control programme. Despite being the gold standard, bacterial isolation has been reported to show poor sensitivity for samples with low-level of Brucella and is impractical for regular screening of large populations. Thus, serological tests still remain the corner stone for routine diagnosis of brucellosis, especially in developing countries. In the present study, a total of 1533 cows (256 from Beni-Suef Governorate, 445 from Al-Fayoum Governorate and 832 from Damietta Governorate), were employed for estimation of relative sensitivity, relative specificity, positive predictive value and negative predictive value of buffered acidified plate antigen test (BPAT), rose bengal test (RBT) and complement fixation test (CFT). The overall seroprevalence of brucellosis revealed (19.63%). Relative sensitivity, relative specificity, positive predictive value and negative predictive value of BPAT,RBT and CFT were estimated as, (96.27 %, 96.76 %, 87.65 % and 99.10 %), (93.42 %, 96.27 %, 90.16 % and 98.35%) and (89.30 %, 98.60 %, 94.35 %and 97.24 %) respectively. BPAT showed the highest sensitivity among the three employed serological tests. RBT was less specific than BPAT. CFT showed the least sensitivity 89.30 % among the three employed serological tests but showed the highest specificity. Different tissues specimens of 22 seropositive cows (spleen, retropharyngeal udder, and supra-mammary lymph nodes) were subjected for bacteriological studies for isolation and identification of Brucella organisms. Brucella melitensis biovar 3 could be recovered from 12 (54.55%) cows. Bacteriological examinations failed to classify 10 cases (45.45%) and were culture negative. Bruce-ladder PCR was carried out for molecular identification of the 12 Brucella isolates at the species level. Three fragments of 587 bp, 1071 bp and 1682 bp sizes were amplified indicating Brucella melitensis. The results indicated the importance of using several procedures to overcome the problem of escaping of some infected animals from diagnosis.Bruce-ladder PCR is an important tool for diagnosis and epidemiologic studies, providing relevant information for identification of Brucella spp.

Keywords : brucellosis, relative sensitivity, relative specificity, Bruce-ladder, Egypt