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Culture or PCR? Benchmarking Brucellosis Diagnosis Without a Gold Standard

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Brucellosis is a zoonosis of major public health concern. However, its near-eradication in high-income countries has limited recent research, and the performance of diagnostic tests in livestock remains unclear due to the lack of a gold-standard.

This study evaluated the performance of bacteriological culture and qPCR for diagnosing brucellosis in buffaloes and cattle.

A total of 5,149 animals, slaughtered in 2022 from confirmed or suspect infected herds in Campania (Italy), were tested according to the protocols provided by the European Union Reference Laboratory. Tissue samples from both seropositive and seronegative animals underwent culture and qPCR. Results were analysed using Bayesian latent class analysis, which estimates test performance without prior knowledge of true infection status.

Overall, 35.9% of animals tested positive to at least one method. Culture sensitivity ranged from 43.9% to 59.2% (median = 51.7%), and qPCR from 65.8% to 82.2% (median = 74.4%). Culture specificity ranged from 89.8% to 99.4% (median = 94.3%), and qPCR from 84.2% to 94.0% (median = 89.3%). Despite qPCR showing higher sensitivity overall, culture yielded better positive predictive values in seronegative animals.

These large-scale results provide robust benchmarking of brucellosis diagnostic and confirm that qPCR cannot fully replace culture, especially in low-prevalence settings. Moreover, the enhanced culture protocol adopted here showed promising results warranting further evaluation.

Keywords

Brucellosis, Bayesian Latent Class Analysis, Bacteriological culture, qPCR, Sensitivity, Specificity, Livestock

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Professional Status of the submitter, who is also the speaker

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