Hospital testing of a rapid bioluminescent assay for MRSA

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Methicillin resistant Staphylococcus aureus (MRSA) is a major cause of hospital acquired infections and is directly responsible for about 1,000 deaths per annum in the UK alone. Standard methods take 2-4 days to determine the presence of MRSA in clinical samples. This limits the value of testing to the monitoring of infection trends rather than providing information for immediate use in the treatment of patients. Having previously shown the feasibility of using a bioluminescence-based assay to detect MRSA from swabs in 3-4 hours, we conducted blind trials on over 300 patient samples to determine the correlation of the rapid test with a standard method. The standard method involved suspension of material from swabs in a salt-containing broth and overnight incubation at 30°C to allow selective amplification of Staph. aureus. The broth is then plated onto agar containing oxacillin, (methicillin is no longer available), to select for antibiotic resistant cells. The semi-automated rapid method involved: pre-incubation in salt broth with oxacillin to allow amplification of target cell numbers and to lyse antibiotic sensitive cells; selective extraction and concentration of Staph. aureus using immunomagnetic separation; and estimation of cell numbers through ATP bioluminescence following an adenylate kinase-based amplification step. The rapid method was modified during the course of the trials and in final form used fibrinogen as the capture agent on the magnetic beads and lysostaphin as a selective release agent for the endpoint assay. Although some false positive and false negative results (relative to the standard test) were obtained, the overall outcome has justified taking the rapid method forward for larger scale trials.

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