EFFICACY EVALUATION OF DETECTING AND IDENTIFYING BACTERIAL ENDOCARDITIS AGENTS FROM BLOOD CULTURES BY MATRIX-ASSISTED LASER DESORPTION IONIZATION-TIME OF FLIGHT MASS SPECTROMETRY

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Abstract. Early identification of etiologic agents of infective endocarditis is important for reducing morbidity and mortality. Therefore, we aimed to evaluate the efficacy of the matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS) for the early identification of the etiologic bacterial agents of infective endocarditis in Thailand from blood cultures compared to the VITEK 2 (bioMérieux) method. Nine causative agents of endocarditis were retrieved from Siriraj hospital bacterial culture collection and evaluated: *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Streptococcus oralis*, *Haemophilus parainfluenzae*, *Aggregatibacter actinomycetemcomitans*, *Cardiobacterium hominis* and *Eikenella corroden* with the last 4 species being fastidious. *E. coli* cannot be differentiated from *Shigella* spp with the MALDI-TOF MS method therefore it was not tested in our study. Artificially created positive blood cultures were used for this study. Each bacterial suspension mixed with human blood was injected into a blood culture bottle (BACTEC™ FX blood culture system). An initial bacterial concentration of 10-100 CFU/ml in the blood culture was used to simulate the bacterial concentration typically found in the blood of a bacterial endocarditis patient. Time to bacterial identification of these cultures using the VITEK 2 method and the MALDI-TOF MS method were compared. Since the manufacturer (Bruker Daltonics) MALDI-TOF MS database is limited, we created our own in-house (Siriraj Hospital) MALDI-TOF MS database and combined it with the manufacturer's database. Only non-fastidious bacteria were consistently identified to the species level with the MALDI-TOF MS method but both fastidious and non-fastidious bacteria were detected with the VITEK 2 method. The MALDI-TOF MS method identified the studied non-fastidious bacteria to the species level from the blood cultures faster than the VITEK 2 method (7.2-12.7 hours versus 57.2 – 63.8 hours; $p < 0.001$). The optimal time to identification of *H. parainfluenzae* could not to be determined for the MALDI-TOF MS method since the

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times varied too much (SD = 8.9 hours). The MALDI-TOF MS method identified *E. corrodens* only to the genus level and did not identify *A. actinomycetemcomitans* or *C. hominis* at all. The VITEK 2 method identified all studied organisms, both fastidious and non-fastidious, to the species level, but took time longer than the MALDI-TOF MS method. The VITEX 2 method gave sensitivity results, which the MALDI-TOF MS method cannot. These findings indicated the MALDI-TOF MS method should never be used by itself for identification of bacteria from blood cultures, but only in combination with other methods. The MALDI-TOF MS also requires an additional step and expense of removal of contaminated protein from the blood culture prior to being conducted. Further studies are needed to determine if this early identification of species without sensitivity testing can make a significant difference in patient management and outcomes.

Keywords: bacterial infections, endocarditis, diagnosis