Inhibitory and resistance-modifying potential of plant-based alkaloids against methicillin-resistant staphylococcus aureus (MRSA)

ABSTRACT

Increased prevalence of methicillin-resistant Staphylococcus aureus (MRSA) has become a major threat to the health sector worldwide due to their virulence, limited therapeutic options and their distribution in both hospital and community settings. Discovery and development of new anti-MRSA agents as alternatives to the very few antibiotics left in the armamentarium are, thus, urgently required. Recently, an efflux mechanism in MRSA has been identified as one of the main contributors of resistance towards various structurally unrelated antibiotics. The potential of reserpine (a phytoalkaloid) as efflux pump inhibitor (EPI) against various microbes remains limited as the concentration needed for inhibition is toxic to humans. This study therefore aimed to evaluate 13 alkaloid compounds as potential inhibitory agents and/or potential EPIs against a panel of three MRSA isolates which not only differ in their susceptibility to vancomycin (amongst the last drugs available to treat serious MRSA infection), but also exhibited active efflux activity. Results indicated berberine's moderate inhibitiory activity against two MRSA isolates scoring a minimum inhibitory concentration (MIC) value of 125 microg/ml. Notable efflux inhibitory activity (ranging from two- to eightfold Ethidium Bromide MIC reduction) meanwhile was detected from quinine, piperine and harmaline using reserpine as the positive control. Findings from this study support the opinion that a vast number of potential phytocompounds with pharmacological potential await discovery. Therapeutic application of these compounds, however, warrants further investigation to ascertain their pharmacodynamics and safety aspects.