

## Natural product activity against Methicillin-Resistant *Staphylococcus aureus* genes.

### ABSTRACT

Methicillin Resistant *Staphylococcus aureus* (MRSA) implicated in many post-surgical and cancer treatment as well hospital and community fatalities need to be treated with an effective alternative antimicrobial agent. In the search for anti-MRSA agent, 2 types of natural products were investigated for inhibitory activity against MRSA. In addition to the bioassay, the activity of the anti-MRSA agent was elucidated based on the effect of both natural products on nucleotide changes of chromosome-encoded genes. In this study, the methanol extract of the red marine algae and the natural pure honey were studied for its antibacterial property based on disc diffusion test and Minimum Inhibitory Concentration (MIC). The effects of both natural products on selected gene sequences of *S. aureus*'s were determined by RT-PCR analysis. The genes of interest, which have been chosen in this study, are genes that are involved in the antibacterial mechanism including inhibition of cell wall synthesis, protein synthesis and nucleic acid synthesis. Five genes of interest chosen in this study include *mecA* gene, *mecR1* gene, *mecI* gene, *adaB* gene and *sav1017* gene. The results for antibacterial property showed the methanol extract of a red seaweed and the pure honey, inhibited growth of *S. aureus* strain according to the inhibition zones around discs saturated with the seaweed extract and pure honey, respectively. The MIC test showed decrease in growth of MRSA isolates after growing in broth incorporated with the extract and honey, respectively. The effect of the inhibitory activity of the natural products on selected gene sequences showed that several nucleotide changes occurred in the sequences of certain genes of interest based on the gene sequences of the cDNA after RT-PCR was carried out on the mRNA of *S. aureus* treated with the natural products. This research underlined that the inhibition effect of the natural products may be chromosome mediated evidenced by the changes of chromosome-encoded genes. The significant findings on activities of the seaweed extract and pure honey may become very useful in the process to find a better treatment for *S. aureus* infection especially, for the multiple drug resistant isolates. In addition, it is also, a new finding for natural product discovery through gene-expression analysis.

**Keyword:** Methicillin resistant *staphylococcus aureus*; Minimal inhibitory concentrations; Minimal bactericidal concentrations; Seaweed; Honey; Polymerase chain reaction; Malaysia.