Biofilm formation by Staphylococcus species on exposure of sub-lethal concentration of vancomycin

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Background: Staphylococcus is responsible for community acquired and nosocomial infection in different sites of human body. Drug resistant Staphylococcus such as Methicillin resistant Staphylococcus (MRSA) and vancomycin resistant Staphylococcus aureus (VRSA) has become common concern. The drug resistance increases 10 to 1000 folds when there is production of biofilm. This study has assessed level of biofilm production without and on exposure to sub-lethal concentration of vancomycin against the clinical isolates of staphylococcus.

Methods & Materials: A total 103 pure growth of staphylococci isolated at Department of Microbiology, Tribhuvan University Teaching Hospital (TUTH), Kathmandu, was included in the study. Of them 25 were MSSA, 25 MRSA, 23 MS-CONS and 30 MR-CONS. All isolates were subjected for determination of MIC of vancomycin and modified by following the standard methods (Creasten et al and modified by Stepanovic et al, 2007)

Results: Among 103 isolates of Staphylococcus species, many (97.1%) were found to have MIC of vancomycin within susceptible range, with few (2.9%) were found to have MIC of intermediate range. For Staphylococcus aureus 24.0% had MIC level of 2mg/l and for CONS 45.2% had the MIC level of ≥2mg/l showing high number of isolates towards upper limit of susceptible range of Methicillin resistant isolates.

Among the isolates, 63.1% of Staphylococcus species were producing different degree of biofilm with CONS sharing the larger percentage. Sub-lethal concentration of vancomycin has significantly (p<0.05) induced biofilm formation in both MRSA and MSSA, however, induced effect seems to be higher in MRSA isolates. On the other hand, in cases of CONS, sub-lethal concentration of vancomycin could not show significant induced effect (p>0.05)

Conclusion: This study has concluded that the MIC value of clinical isolates for Staphylococcus is increasing and the sub-lethal dose of Vancomycin induces biofilm production and thereby producing VRSA. Therefore the MIC determination prior to therapy and proper dosing should be done.

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