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Determination of Adhesion, Invasion and Biofilm Formation Kinetics of Bacteria Isolated from Patients with Burn infections in Al-Samawah City

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SUMMARY

The present study includes 145 burn wound swabs collected from (100) patients, who suffered from burn wound infections, admitted to burn unit of Al-Hussein Teaching Medical Hospital in AL-Samawah city with different ages from both sexes. The period of collection was extended from December 2012 to May 2013. Out of the total samples, 315 bacterial isolates were found in 137 (94.5%) burn wound swabs and only 8 swabs (5.5%) were negative for bacterial growth. The results revealed the dominance of *Staphylococcus aureus* (42.3%) followed by *Staphylococcus epidermidis* (28.5%), *Pseudomonas aeruginosa* (22.6%), *Pseudomonas luteola* (20.4%), *Acinetobacter lwoffii* (16.79%), *Acinetobacter baumannii* (14.6), *Raoultella terrigena* (11.6%), *Klebsiella pneumoniae* (10.2%), *Aeromonas hydrophila* (9.5%), *Proteus mirabilis* (8.75%), *Escherichia coli* (8.75%), *Providencia rettgeri* (8%), *Bacillus* spp. (8%), *Corynebacterium* spp. (7.3%) and *Proteus vulgaris* (6.67%) respectively. The results of this study recorded that the risk factors (sex, age, total body surface area (TBSA) and degree of burns) significantly effected on the rate of mortality and the high incidence of burns was among children and women. Antimicrobial susceptibility was carried out to the bacterial isolates against 19 antibiotics, the most of bacterial isolates were multi-drug resistance (MDR) and other bacterial species were susceptible to the most antibiotics in this study. In MDR bacteria, Imipenem was found to be the most effective drug against *S. epidermidis, Ps. luteola, R. terrigena, Aero. hydrophila* and *P. mirabilis*, while meropenem was the most effective drug against both *Acin. lwoffii* and *Acin. baumannii*. For *Ps. aeruginosa*, Piperacillin/Tazobactam was the most effective drug and Linezolid was the most effective drug against *S. aureus*. Whereas Ciprofolxacin was the most effective drug against *K. pneumoniae*. Also, the results of this study revealed that burn wound isolates had a high ability to adhere on both living (uroepithelial cells) and non-living (urinary catheters) surfaces, where results showed that the adhesion property of burn wound isolates increased with the increasing of time, where there is a significant differences between the variable time periods and between bacterial species in the same period ($P<0.05$). *S. epidermidis* was the most attachment on both uroepithelial cells and urinary catheter surfaces. In this study, the capacity of burn wound isolates to produce biofilms was also high with a significant difference between bacterial species and between the different time periods ($P<0.05$). Where the most of tested bacteria revealed strong biofilm forming ability and the maximum biofilm production was varied between bacterial species at

the different time periods. Moreover, the biofilm formation property of these bacteria increased along the time in some bacterial species or it had a peak production at one period in other species. The ability of burn wound isolates to invade umbilical cord-derived epithelial cells was increased with the increasing of time and significantly varied between bacterial species ($P<0.05$), where *Ps. aeruginosa* was the most invasion to epithelial cells compared with other bacteria species that have been tested during the four time periods (15, 30, 45 and 60-min). Whereas *P. mirabilis* was the least of invasion to epithelial cells. The results of this study showed that 0.5 minimum inhibitory concentration (MIC) of the most effective antibiotic for each tested bacteria significantly reduced the ability of these bacteria to adhere on both uroepethelial cells and urinary catheters, and to invade umbilical cord-derived epithelial cells during variable time periods ($P<0.05$), but 0.5 MIC of these antimicrobials had no significant effect on viable cells within biofilm matrix or on the total biofilm biomass of most tested bacteria ($P>0.05$), where there is significant effect of some antibiotics on biofilm biomass. In conclusion, the most effective antibiotic for each tested bacteria in this study may inhibit bacterial adhesion and invasion, but have no effect on pre-formed biofilms.