PREVALENCE OF BACTERIA ISOLATED FROM SURFACES OF AUTOMATED TELLER MACHINE - POTENTIAL HEALTH HAZARD TO UNIVERSITY STUDENTS?

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Abstract

Contamination of pathogens on environmental surfaces poses health risks to the general public, especially people who have weak immune defenses. Depending on the types of pathogens, bacteria particularly, can survive for long period of time outside their hosts. Pathogens which can survive on surfaces which are commonly touched by many people stand the chance of spreading diseases from one person to another. Many studies reported that various different surfaces such as automated teller machines (ATM), elevator buttons, public toilet door plates, computer keyboards and telephones are common sites of bacterial contamination. Bacteria isolated from these sites include *Staphylococcus* spp., *Aeromonas* spp., *Bacillus* spp., *Enterobacter* spp., *Escherichia* spp., *Klebsiella* spp., *Pseudomonas* spp. and *Salmonella* spp. As most universities in Malaysia are equipped with ATMs, university students are at risk of exposure to potential pathogens from the surfaces of ATMs. The aim of this study was to identify the bacteria found on the surfaces of ATMs in university settings and also, to determine the prevalence of the bacteria. Swab samples of all the ten keypads of ATMs of seven universities around Klang Valley, Malaysia were collected and immediately immersed in enrichment medium prior to culture on blood and MacConkey agars. Following 24 hours of incubation, the colonies on both agars were purified and gram-stained was performed. Then, the identification of the bacteria was carried out by using VITEK® 2 Compact. From a total of 88 swabs, gram-staining of the isolated bacteria revealed that gram-positive rods were found to be the most predominant (43.6%), followed by gram-negative rods (30.7%), gram-positive cocci (20.5%) and gram-negative cocci (5.1%). Sixteen bacterial genus were identified with *Bacillus cereus* being the most commonly (42.7%) isolated from all the universities. Other bacteria isolated were *Staphylococcus* spp., *Streptococcus* spp., *Enterococcus* spp., *Alloicoccus* spp., *Micrococcus* spp., *Pantoea* spp., *Pseudomonas* spp., *Sphingomonas* spp., *Acinetobacter* spp., *Comamonas* spp., *Enterobacter* spp., *Leclercia* spp., *Rhizobium* spp., *Serratia* spp. and *Sphingobacterium* spp. From the results obtained, although most of the bacteria isolated were mainly of environmental origin, some of the species of these bacteria are potential human pathogens. We conclude that ATMs in the universities around Klang Valley are inhabited with potential pathogens and thus, could be the point of transmission of bacterial diseases. These data will also help to formulate effective hygienic policies and create awareness among the university population.

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Contents

1.0 INTRODUCTION

1.1 Background

1.1.1 Bacteria and environmental surfaces

Bacterial transmission from environmental surfaces in communities had not been fully understood. The bacterial spread depends mostly upon their environmental survival before they can transfer to another host (Maier, Pepper, & Gerba, 2009). The pathogens may survive from hours to years outside the host when transmission through the environment occur, however, it depends on the organism and the environment (Pepper, Gerba, & Brusseau, 2011). Some pathogenic bacteria, such as *Staphylococcus aureus, Enterococcus spp., Acinetobacter spp.* and *Pseudomonas aeruginosa* can grow and survive for months on dry surfaces (Kramer, Schwebke, & Kampf, 2006). Some bacteria are able to adhere to certain dry surfaces, such as stainless steel (Peng, Tsai, & Chou, 2001) and plastics surfaces (Boost, O'Donoghue, Him, & Keung, 2008). However, bacterial survival rate on surfaces of stainless steel and plastics, where it can be transmitted to human in accessible public sites, can be reduced by changing the elements of both stainless steel and plastic (Zhao et al., 2008). It is clearly seen that certain bacteria are able to survive on different environmental surfaces that do not provide optimal growth conditions.

Several recent studies had looked into bacterial contamination on various different surfaces, such as in transportations and hospitals public area, (Otter & French, 2009), computer keyboards (Srikanth, Sivasubramanian, Sudharsanam, Thangavel, & Jagannathan, 2012), telephones (Ciragil, Gul, & Aral, 2006), elevator button, drink vending machine, ticket vending machine, escalator belt and public toilet door plate (Boost et al., 2008). In these four studies, Methicillin Resistant *S. aureus* (MRSA) was not isolated from any of the community environmental surfaces studied (Boost et al., 2008; Otter & French, 2009) as opposed to other studies that were done in hospital settings