

Short Communication

Bacteria found on banks' automated teller machines (ATMs)

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Increasing number of people have used automated teller machines (ATMs) by years, but we know less about their bacterial colonization status. For this purpose, we performed bacterial swab cultures from a total of 100 ATM devices in our city. All devices were found positive for *Bacillus* spp., and coagulase negative staphylococci (CNS) were isolated from nine devices, including one methicillin resistant strain. *Staphylococcus aureus* grew in two devices, where one of them was identified as methicillin resistant (MRSA). Three devices were found positive for *Escherichia coli*. Our results suggest that ATMs might be potential areas for pathogen accumulation, and they might have a role in microbial transmission in the community.

Key words: Bacteria, automated teller machines (ATM), public health.

INTRODUCTION

Pathogens spread among people with direct or indirect contact on hands or on inanimate objects. In the health care settings, certain infection control measures have been established to reduce microbial transmission in these ways (Mathai, 2010). Currently, such measurements have been adopted for community because of the large outbreaks that emerged in the recent years. In a meta analyses, Larson (2006) stated that improving the hand hygiene is an important strategy that may significantly reduce the spread of respiratory tract pathogens in the public, after vaccination and education practices.

Bank ATMs are the essential requirements of our social life. They are frequently localized in city centers, trade areas, and around the hospitals. Hundreds of people whose socio-economic levels and hygienic status are quite different with each other use ATMs daily. Customers contact with their hand the surfaces of key-pad and/or screen of these devices. However, there is limited data about their status for microbial colonization. Therefore, investigation of the bacterial load of these devices may be valuable to increase our awareness about the possible transmission ways of pathogens in the

public.

MATERIALS AND METHODS

This study was performed on May 2011 in Malatya City which had an estimated 550 000 urban population. A total of 100 ATM devices which were located in the city center and in the large supermarkets were selected for this study. Verbal permission for procedure was obtained from the authority owner of each device. Samples were collected from key-pad and screen parts of the devices with sterile cotton swabs soaked in the physiologic saline. Obtained material was cultured immediately on blood agar, Eosine Methylene Blue agar, and chocolate agar mediums.

After 24 h incubation at 35°C, breeding bacterial colonies were selected and identified with classic bacteriologic analyses. The number of bacteria grown on the culture mediums was quantified as colony forming unit (cfu) by a single investigator. Antimicrobial susceptibility of the pathogens were investigated with disc diffusion method according to recommendations of Clinical and Laboratory Standards Institute (CLSI, 2008).

RESULTS AND DISCUSSION

A total of 83 swab samples were obtained from key-pad,

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Table 1. The types and numbers of organisms isolated from the ATM devices.

| Organism | Number of positive ATMs | Quantity (cfu) (minimum - maximum) | |
|-------------------------|-------------------------|------------------------------------|---------------------|
| <i>Bacillus spp.</i> | 100 | 1x10 ³ | 5x10 ⁴ |
| CNS | | | |
| MRCNS | 1 | 4x10 ³ | |
| MSCNS | 8 | 1.5x10 ³ | 1.2x10 ⁴ |
| <i>S. aureus</i> | | | |
| MRSA | 1 | 5x10 ³ | |
| MSSA | 1 | 9x10 ³ | |
| <i>E. coli</i> | 3 | 2x10 ³ | 3x10 ³ |

and 17 from screen parts of the devices. All samples were found positive for *Bacillus spp.* (1x10³-5x10⁴ cfu). Coagulase-negative staphylococci (CNS) grew in nine samples [(key-pad: 8; screen:1) (1.5x10³ to 1.2x10⁴ cfu)], and *S. aureus* was isolated from 2 samples [(key-pad:2) (5x10³-9x10³ cfu)]. Methicillin resistance was found in one *S. aureus* and in one CNS strains. Three devices were found positive for *E. coli* [(key-pad:2; screen:1) (2x10³-3x10³ cfu)]. Non of the *E. coli* isolate exhibited extended spectrum of beta-lactamase production. The results are summarized in the Table 1.

Cash machines have been used all over the world. Requirement for these devices has increased parallel to their expanded functions in financial procedures. Today, they are not only used for cash supply to the costumers, but also they give service on different kind of monetary procedures such as money transfer, stock market transactions, and bill payments. Consequently, by the time, growing number of people has used these devices with increasing frequency.

The handborne transmission is one of the important routes for many infectious agents to spread in the community. Although the pathogen colonization status of physical environment in hospitals have been investigated in detail, such practices are not adequately performed in the public. After the emerging of Shiga toxin-producing *E. coli* outbreak in Europe on May 2011 (Jansen, 2001) and H1N1 pandemic in 2009 to 2011 (WHO, 2009), the need for understanding the possible transmission ways of pathogens among the healthy persons has increased. In that point, shared items and frequently-handled objects may be important issues for public health policy makers, due to their potential role for microbial accumulation.

Although they have been used for some decades, there is no data about the potential infection risk originated from ATMs in the medical literature. Therefore, ATMs are considered as the focus of interest in this study. When the published papers were reviewed, we found that majority of the studies focused on the improvement of these devices' functionalities for the costumers functionalities for the costumers especially for disabled persons (Manzke, 1998) for disabled persons (Manzke, 1998).

In a systematic review, Kramer et al. (2006) reported that many bacterial, fungal, and viral pathogens could survive on the inanimate objects for several months, and such pathogens could cause epidemic infections as a result of direct or indirect transmission in "hand-object-susceptible patient" ring. Specifically, high rates of microbial accumulation were found on the mobile phones and computers' keypads which had similar features with ATMs according to their physical and operational aspects. Tekerekoglu et al. (2011) reported that cell phones of patients, visitors and health care workers carried multidrug-resistant hospital pathogens including *Acinetobacter spp.*, *S. aureus*, and extended-spectrum β -lactamase ESBL-positive *Enterobacteriaceae*, hence, they suggested frequent disinfection of mobile phones to reduce bacterial reservoir on these devices. Similarly, Dogan et al. (2008) found many types of pathogens on the computers' mice and key-pads which were used in hospitals and in education institutes. Therefore, public health professionals would like to know hygienic status of bank ATMs to develop preventive measurement against the health risks caused by such devices.

In this study, we found all the studied ATMs were positive for a bacterial strain. Although the majority of the organisms detected were low virulent strains such as *Bacillus spp.* and CNSs, they might be regarded as the potential pathogens in some susceptible hosts such as older, or immune-compromised individuals. Furthermore, less number of certain pathogens including *S. aureus* and *E. coli* were found on the devices. We thought that *Bacillus spp.* were from the environmental origin and the CNSs, *S. aureus* and *E. coli* strains were from the hand floras of the costumers.

The contact time of the costumers' fingers with the surfaces of these devices may be considered to be short. Though we did not perform clonal analyses in this study, we believed that microbial transmission could occur from the hands of users to the keyboard, or vice versa. Investigation of the genetic relatedness of the isolates from fingerprint cultures of the costumers and devices' surfaces may explain the exact transmission dynamics.

According to the results of this study, people must keep in mind that the ATM devices might be as potential areas

for pathogen accumulation. Frequent disinfection of the keyboards and screen parts, using antibacterial covers for the contact surfaces, or using alcohol wipes before and after use may be benefit for limiting the bacterial accumulation and transmission with cash machines. Further investigations are required to determine the status of ATMs according to viruses and fungi which were not studied in this investigation.

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