

Computer Mice in Public Centers: A Source of Pathogenic Bacteria

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ABSTRACT

The objective of this study was to detect the presence of, isolate and identify certain pathogenic bacteria from computer mice in a public university computer center. For this purpose, ten computer mice were randomly and aseptically sampled, from a big number present in a public computer center in the Beirut area. Standard microbiology laboratory methods were used to detect the presence of two potentially pathogenic bacteria: *Staphylococcus aureus* and *Escherichia coli*. As expected 100 % of the samples tested grew a big number of bacteria, but the growth of both organisms from 60% of the samples and one of them in 10 % of the remaining sample (indicating the isolation of each of the organisms from 70% of all the samples), warranted alerting the society of such a dangerous source of contamination. Recommendations regarding personal hygiene and proper disinfection of computer mice in public centers should be respected as the study proved that these might be the source of numerous community acquired infections.

Keywords: *Computer mice, bacterial contamination, staphylococcus aureus, escherichia coli*

1. INTRODUCTION

Computers have become a necessity for every type of work and their day to day use has become part of life for people of all ages. In various university environments, students have indicated 100% access to computers, 92.1% regularly use internet and 73.3% regularly use e-mail (1). To accommodate the extensive use of computer technology, universities have developed multiple-user "computer laboratories" on campuses for general student access (2).

Since microbes and especially bacteria are found everywhere, it is expected that computers just like other objects may harbor such microorganisms. Although most studies and researches focused on bacterial growth and its resistance in hospitals, clinics and laboratories (3,4), other studies started focusing on the microbial contamination of commonly used items by public, like computers and their accessories (5).

In universities, students, faculty and staff use computers. Given that computers and mice are not routinely disinfected, the opportunity of the transmission of contaminated microorganisms is greater. The purpose of this study is to inspect the presence of potentially pathogenic bacteria contaminating computer mice in one of the computer centers of the Lebanese American University, one of the distinguished higher education institutions in Beirut, Lebanon. In particular, the investigators specifically checked for the presence of the two bacteria *Staphylococcus aureus* and *Escherichia coli*.

Staphylococcus aureus is a gram positive coccus, that although may be part of the normal flora of the skin and nostrils of some individuals, has been associated with numerous community acquired and hospital associated mild and serious infections. The other bacterium *Escherichia coli* is a gram negative bacillus that is ubiquitous but lives mainly in the intestinal tract of animals (including man). It also is incriminated in causing numerous types of infections that may be mild but can also be very severe.

2. MATERIALS AND METHODS

2.1 Samples

For our current study, 10 computer mice were randomly selected from a big number in one of the computer centers of the Beirut campus of the Lebanese American University. The mice were wiped with sterile swabs immersed in sterile saline. The swabs were then dipped in the sterile saline tubes and transported immediately to the microbiology laboratory (5 minutes away) for immediate culture on the suitable media.

2.2 Culture

In the microbiology laboratory, the swab samples were each vortexed in the sterile saline tube and then aseptically cultured on Trypticase Soy agar (TSA), MacConkey Agar (MA) and Mannitol salt agar (MSA).

The cultured plates were incubated for 24 hours at 35°C for 18-24 h. (and the selective media were checked again after 48 hours if the indicative colonies on were not seen at 24 h.).

2.3 Processing

The TSA plates were observed for the growth of different types of bacteria (and fungi). Gram staining was also used to study the variety of organisms growing. The growth of colonies indicative of the organisms under study was observed on the selective media. Dark pink colonies (with bile precipitation) on MA and yellow colonies on MSA were isolated on nutrient agar (NA) media and incubated at 35°C for 18-24 h. The isolated organisms were then gram stained and identified by standard biochemical methods for definitive identification (6).

3. RESULTS

A total of 10 computer mice were tested for microbial contamination. It was found that the inoculated plates from all samples showed growth; but the purpose of this study was to particularly check the growth on the plates for the presence of *Staphylococcus aureus* and/or

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Escherichia coli. The suspected colonies on MA were identified to be those of *E. coli*, while the suspected colonies on MSA were identified to be those of *S. aureus*.

As expected, 100 % of the samples tested grew a big number of bacteria, but the growth of both organisms was obtained in 60% of the samples and one of each only in 10 % of the remaining sample (indicating the isolation of each of the organisms from 70% of all the samples).

4. DISCUSSION

The ability of computers to act as fomites has been previously documented in healthcare (3) and hospital environments (4). In the work place, contamination of the office environment (including the computer keyboard and mouse) with bacteria was also recognized (5).

Many studies previously confirmed that computer keyboards and mice are usually contaminated with microorganisms especially bacteria (5, 7, 8, 9, 10). The bacteria isolated in the different studies were either known or potential pathogens. Bacteria were also isolated from public centers (7, 11, 12) as well as, from higher education settings (2, 9, 10, 13). The presence of these potential pathogens makes such surfaces (computer keyboards and mice) additional reservoirs for the transmission of microorganisms and important fomites for cross-transmission of bacterial and fungal infections in the university and community (9).

This study confirms the results of previous reports (7, 10) that 100% of the tested computer mice were heavily contaminated with bacteria. Moreover, as reported in previous studies, the present study, confirms the isolation of *S. aureus* from computer keyboards and mice, (9, 10, 13); however, the frequency of isolation of the organism, in our study, was more than that previously reported. The same also applied to *E. coli*, which was also isolated from the same sources as in previous studies (7, 8, 10, 11), but with a frequency higher than that reported in those studies.

The high percentage of contamination with potentially pathogenic bacteria found in our computer laboratory warranted, not only trying to find the possible sources of such a heavy contamination but also proposing recommendations that can be followed to minimize the dangers associated with this contamination.

It is well recognized that in public places, such as offices, internet cafés and public computer laboratories or centers, it is likely that a good number of people are sick, and through them new bacteria that will eventually settle on the keyboards and mice through droplets or physical contact (8, 9). The air the computer users breathe out, sneezing, digging nose during work by hands or other reactions leave the key boards and the mice contaminated.

The nasal droplets or mucus from mouth and nose, nail cavities, etc. are also possible sources of contamination, (11)

It was also observed that the level of knowledge among the computer users in cyber café and computer centers, and people supervising the facilities, about the possibility of microorganisms on the keyboard and mouse, was very poor. So, there is an obvious lack of routine disinfection of computer keyboards and mice (9).

In conclusion, the isolation of potentially pathogenic bacteria from computer keyboards and mice is a clear indication that the sterilization/aseptic procedures/methods adopted by the operators if at all are not effective in significantly reducing the level of these organisms on these items to an acceptable level (14).

No clear legislation or widely recognized guidelines have been formulated on the hazard caused by computer components (14). This is not in the best interest of the campus students and other users especially that computer keyboards and mice could spread significant numbers of pathogens (9); however, researches try to suggest solutions to prevent the transmission and proliferation of microbes, especially for multiple-user workstations.

In every cyber café or computer center, eating should be avoided while using the computers and hand washing hygiene practices should be encouraged and maintained. Keyboard and mice should be cleaned with disinfectant on a regular basis (at least weekly) to reduce microbial load on the solid surfaces (2, 7, 9). Microbes are everywhere, including the air around us; it is therefore greatly recommended that hand-washing hygiene should be adopted before and after using the computers to reduce microbial transmission.

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