Bacterial Contamination between Computers in Computer Labs

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Abstract

This study was conducted to identify the role of computers in transmitting bacterial infections to users of these devices. The bacteria on the surface of computers (mouse and keyboard) were isolated to identify their genotypes and their effects on the health of their users. The study sample included 100 samples divided as follows: 10 computers for each section of the Technical Institute in Baquba. Wipes grew on the following circles: Macconkey agar, Nutrient agar, Blood agar for its study and recognition of its shape and was dyed with chrom. The most common species in the studied samples were Staphylococcus spp. The prevalence of Gram-positive spherical bacteria on the surface of computers (mouse and keyboard) was higher than that of Bacillus and Gram negative bacteria. (192) isolates of computers and the percentage of contamination of the computer keyboard higher than the percentage of contamination of the mouse as the number of isolates of the phenomenon of swabs taken from the keyboard (117) and the proportion of about (60.9%) while the number of isolates visible from swabs taken from the mouse (75%). The percentage of bacteria found on the surface of the keyboard is more numerous than the bacteria on the mouse surface. The results of the antibiotic sensitivity test showed that all of these species were sensitive to antibiotics but to varying degrees.

Keyword: *Bacterial contamination, computer labs, computers.*

Introduction

The use of computers has spread to include all age groups including children. This may pose a risk to their health, for their weak immunity if the computer proves to be a catalyst for the transfer of microbes. Computers are becoming necessary for every kind of work and their use is becoming part of the lives of people of all ages. The study of different university environments indicates that students who use computers (100%) and the number of students who use the Internet in an organized manner (92.1% And (73.3%) use the email[1].

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The capability of a pc to act as fomites has been formerly documented in healthcare[2] And sanatorium Environment[3]. In art work place, infection of the office environment Which encompass the laptop(keyboard and mouse) with bacteria is likewise recognized[4]. Universities have developed a multi-user (pc lab) on college computers for general scholar access[5]. The availability of multi-user computers in many numbers at the university or institute and that these gadgets are treated through many customers on a each day foundation and given that the computer systems aren't robotically cleared (periodic), the hazard of transmission of polluting microbe is widespread no matter our information For the abundance of microorganisms within the surroundings develops but the threat or gravity of the pollution this is formed via computer and mouse keyboards has now not yet been completely understood and no clear policies or even widely identified hints had been formulated for the dangers brought on via computer components (keyboards, Mouse), this isn't in the hobby of campus

students mainly that computer keyboards and mouse may be the cause of many diseases spread[1]. Surface infection of public user interface systems enables spread disease, raising many questions. Although the studies effects have shown many proof in guide Of their lively role in this regard, common purchaser interfaces such as laptop keyboard and mouse (being confined in near contact) And ordinary hands) as reservoirs for the transport of microorganisms[6,7]. The purpose of this observe become to have a look at the microbial infection of the computer keyboard and the mouse, computer components that serve as popular interfaces for users within the Internet cafe[8].

Materials and Methods

Collection of samples

During the study period, 100 computer labs were collected in the following sections (community health department, pathological analysis department, computer systems department, electricity department, survey department, nursing department, materials management department, accounting department, mechanics department, department). Swabs were implanted on the McConkey agar medium and the blood-containing center containing 5% of the sheep's blood 5% blood agar. In plate streaking method, dishes were incubated aerodynamically and at 35-37 ° C for 24-48 hours.

Central collection of the sample : This medium consists of the use of Normal saline to collect swabs and bacteria before isolation and technology.

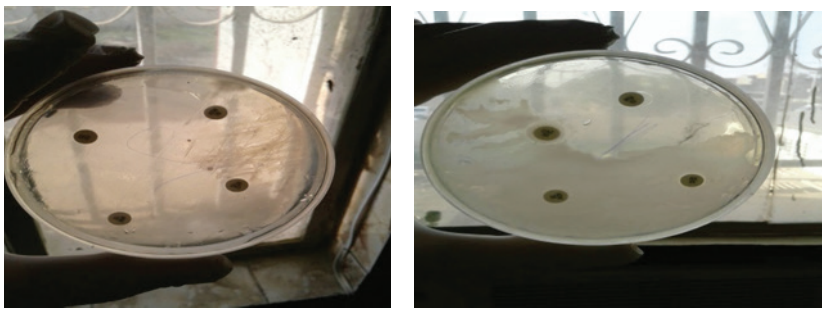
Culture and isolation

Nutrient agar:14gm was dissolved in 500 ml of distilled water, and the environment was sterilized at 121 ° C for 15 minutes.6 This medium was used for the development and isolation of different species of bacteria as well as for the study of morphological characteristics of bacterial colonies and for the purpose of purification of plantations. **Blood agar:**10.5gm was dissolved in 500 ml of distilled water and 5 ml sterile blood was added. The nutrient environment was first fed, then sterilized and then sterilized. Sterilized blood was then added to the study of blood decomposition by the bacteria[9]. Macconkey agar**:** Prepare as in previous seasons and use this environment to isolate negative bacteria and to ferment fermented from non-fermented to lactose sugar[9,10]. Pigmentation: dyed by chromium dye and used to determine the type of pigment and form of bacteria[11].

Sensitivity Test

Use five types of antibiotics to check the sensitivity or resistance of bacteria to these antibiotics**: (Amoxcillin ,Aztreonam ,Imipenem ,Gentamycin ,Levofloxacin).**

Antibodies were then distributed to the incubated environment for 18-24 hours at 37 ° C and the incubation period was measured in millimeters (mm).



analysis

Statistical evaluation of the results of the current have a look at the use of the Statistical Package for Social Sciences conducted (SPSS) metadata. Test was used T-test, variance analysis ANOVA, Chi-square, percentage, standard deviation and standard error in the present study to find a moral differences and their relationship to cutaneous leishmaniasis infections and immunological and compared the moral differences between the mean values depending on the testing Game-Howell and there were significant differences (P<

0.05).

Results and Discussion

The results indicated that the percentage of pollution in the computers (keyboard, mouse) in the computer labs in the sections of the technical institute in Baquba under study was uneven.

Table (1): Percentage of contamination of computers (keyboard, mouse) in the sections of the Technical Institute Baquba.

Place of collection	Number of samples	type of isolates				Total isolates
		Keyboard	%	Mouse	%	
community health techniques	10	15	12.821	8	10.667	23
Nursing techniques	10	18	15.385	9	12	27
Techniques for pathological analysis	10	7	7.983	6	8	13
Electricity technologies	10	8	6.838	6	8	14
Accounting Techniques	10	11	9.402	8	10.667	19
Space techniques	10	6	5.128	7	9.333	13
Computer Systems Technologies	10	20	17.094	11	14.667	31
Techniques of machinery and equipment Materials	10	11	9.402	7	9.333	18
Techniques Management	10	13	11.111	8	10.667	21
Mechanics techniques	10	8	6.838	5	6.667	13
Total	100	117	100.000	75	100.000	192

The percentage of contamination of the computer keyboard was higher than the percentage of mouse contamination. The number of isolated isolates from the swabs taken from the keyboard was (117) and the percentage was about (60.9%) while the number of isolated isolates from the swabs taken from the mouse (75) The percentage of micro organism on the surface of the keyboard is more than the number of bacteria on the surface of the mouse and this may be due to the area of the computer keyboard larger than the mouse area, making it more susceptible to microbial contamination[12].

We note from the first table that the highest percentage of pollution was inside the computer labs of the computer systems department followed by the nursing department and the community health department.

Table (2): Distribution of microbial isolates taken from the keyboard and mouse from computer labs

Place of collection	Community health		Nursing		pathological analysis		Electricity		Accounting		Space technique		Computer Systems		machinery and equipment Materials		Techniques Management		C.	
Isolates	keyboard	Mouse	Keyboard	mouse	Keyboard	mouse	Keyboard	Mouse	keyboard	mouse	keyboard	Mouse	keyboard	mouse	keyboard	Mouse	keyboard	mouse	Keyboard	Mouse
Staphylococcus spp.	+	+	+	+	-	-	-	-	+	+	+	-	+	+	-	+	+	-	-	+
Bacillus spp.	+	-	+	-	+	-	+	-	+	-	-	-	+	+	+	-	+	-	-	-
Streptococcs spp.	+	-	+	-	+	-	-	-	-	-	-	-	+	-	+	-	-	-	+	-
Escherichia coli	-	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-	+	-	+	-
Fungi	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

The table 2: shows that most of the isolates were *Staphylococcus spp,*[13] which may be due to normal appearance on the skin and nose and are found in people with skin injuries because they are opportunistic bacteria[14]. followed by bacteria *Bacillus spp* bacteria through the exposure of keyboards and mouse to environmental pollution from the air or dust or water when washing the hands after eating food or baths in addition to the emergence of isolates from bacteria *Streptococcs spp, Escherichia coli* while all isolates showed the presence of fungi on the surface Keyboard and mouse for computer.

Table (3): Distribution of the effectiveness of antibiotics on isolates taken from computer (keyboard, mouse).

Isolates	Genes	Amoxicillin	Aztreonam	Imipenem	Gentamycin	Levofloxacin	p-value
Staphylococcus spp.	12	25mm	20mm	27mm	27mm	29mm	
Bacillus spp.	9	27mm	20mm	25mm	15mm	21mm	
Streptococcs spp.	5	27mm	20mm	22mm	21mm	20mm	
Escherichia coli	5	15mm	21mm	28mm	20mm	15mm	
Mean ±ED	2.500±0.645	23.500±2.872	20.250±0.250	25.500±1.323	20.750±2.462	23.333±2.848	0.0088
SD	1.291	5.872	0.500	2.646	4.924	4.933	
Lower	0.446	14.359	19.454	21.290	12.290	11.079	
Upper	4.554	32.641	21.046	29.710	28.586	35.587	

Table (3):indicates the effectiveness of antibiotics for microbal in the present study that all isolates were sensitive to antibiotics but there was a difference for each bacterial genotype.*Staphylococcus spp* ranged from 29 to 20 mm, The *Bacillus spp* ranged from 27 to 15 mm, *Streptococcs spp.* ranged from 27-20 mm and *coli Escherichia* ranged from 28 to 15 ml . There were significant differences at the the probability level ($P < 0.05$).

Conclutions

The study conducted on the computer surfaces concluded that:

1-Computer surfaces (keyboard, mouse) are the source of different types of bacteria, including pathogens.

2- Computer keyboard is more polluted than the mouse.

3-The micro-computer pollution varies from one section to another.

There are a number of tips that if applied, it is possible to reduce the risk of bacteria on the surface of the computer are:

1-Wash hands frequently and regularly.

2-Clean the computer regularly and repeatedly.

3-Do not eat and drink in computer laboratories.

4-In the case of personal computer not give it to children because this increases the likelihood of infection with bacterial.

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Ethical Clearance: There is no violation of human rights and environmental pollution

References

1. Palmer, S.R and Bray, S.L.: Longitudinal study of computer usage in flexible engineering education, Australian Journal of Educational Technology; 2001; 17:313.
2. Huber JS, Pelon W.: Low cost screening for microbial

contamination in aerosols generated in a dental office. Gen. Dent; 2005; 53: 270-271.

3. Buers S, Fishbain JT, Uyehara CFT, Parker JM, Berg MW.: Computer keyboards and faucet handles as reservoirs of nosocomial pathogens in the intensive care unit. Am. J. Infect. Control; 2000; 28: 465-470.
4. Hirsch S.: Germs are working overtime at the office; 2005; (http//www.latimes.com).
5. Anderson, G and Palombo, E.A.: Microbial Contamination of computer key boards in a university setting, American journal of infection control; 2009; 37 : 507-509.
6. Obinna O. Nwankiti, James A. Ndako, Amarachi et al.: Computer Keyboard and Mouse: Etiologic Agents for Microbial Infections. Nature and Science; 2012;10 (10).
7. Kassem, I.I, Sigler, V.and Esseili, M.A.: Public computer surfaces are reservoirs for methicillin – resistant staphylococci. International society for Microbial Ecology journal; 2007; 1: 265 – 268.
8. Hirsch S.: Germs are working overtime at the office; 2005; (hppt/www.latimes.com).
9. Alsaliama, Ali Abdullah Wazir and Ali Mohamed Ali.: Scientific Experiments in Medical Bacteria. Scientific Publishing and Printing, King Saud University, Riyadh; 2005.
10. Cheesbrough M.: District laboratory practice in tropical countries; 2006; (Cambridge Univ Pr).
11. Cheesbrough M. District Laboratory Practice in Tropical Countries Part 1 2nd ed. Cambridge, UK: Cambridge University Press; 2005.
12. Awe, S., Eniola, K.I.T And Livingstone S. T.: Bacteriological Assessment Of Computer Keyboards And Mouse Used In Salem University, Lokoja. Department Of Bioscience, Salem University Lokoja, Km 16 ,Lokoja –Ajakuta Rd., Pmb 1060,Lokoja Kogi State Nigeria; 2013; 1(12).
13. Ire F. S, Oduyiga A.S, Ossai-Chidi L. N.: Assessment of Surface Bacteria on Keyboards, Mobile Phones and Floors in the University of Port Harcourt. Journal of Pharmaceutical, Chemical and Biological Sciences; 2017.
14. Albert,Y.E.: Pathogenic effects of Staph.aureus. Journal medicine; 2004; 12(5):15-17.