### The microbial contamination in the surgery operation theater at Al-zahraa General Teaching Hospital

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### Abstract

One of the most disturbing problems in the hospitals and especially surgery operation theaters (OT) is the microbial contamination which is a challenging issue and difficult to fight. For such reason, we had initiated this study to investigate the presence of this contamination in the OT in Al-zahra'a General Teaching hospital, Al-Kut, Iraq. Five hunderds swabs were performed from the (OT) cultivated in different culture media to study macroscopic and microscopic features, the biochemical tests were done for primary identification of bacteria. The study was done during March, July, and August of 2016, the rates of the isolated bacteria from the OT were 15.13%, 11.91%, and 15% respectively with a significant presence (p<0.05) in March. While the rates of the total Gram negative bacteria isolated from the OT were 49.65%, 54.27%, and 78.27% respectively with a significant occurrence (p<0.05) in September. These rates for the Gram positive bacteria isolated from the OT were 48.5%, 20.57%, and 23.20% respectively. The isolated fungi and yeast were at rates of 4.02%, 2.19%, and 3.10% respectively

with significant presence of the *Candida albicans* during March. *E. coli* was significantly was the highest among the isolated coliform bacteria (p<0.05); 35.45%, 37.48%, and 42.85% respectively. The current study confirms the presence of high contamination of the surgery operation room by bacteria and fungi.

Key words: Surgery operation room, bacterial, contamination, fungi.

### Introduction

The infection of the incisions sites considered to be the second or the third of the infectious conditions that are related to the health care (1, 2). These infections most likely followed by many side effects that cause serious diseases that might be fatal at rate of 70% of the patients (3). This indicates that there are many factors that be involved in the infections in the OT (4). So there is a need to follow hygienic systems in the OT to limit the occurrence of such conditions.

It was found that most of the microbes that are implicated in the incision sites infections are from those that naturally live in the patients` epidermis, mucous membrane, or intestine (5). During favorable situations such as skin or mucous membrane wounds, the microbial flora can invade the interior parts of the tissues. This flora includes aerobic Gram positive cocci such as *Staphylococcus aureus*. It also includes the

above, other factors that include the case history, smoking history, and obesity of the patients are also necessary to be taken care of (6).For all the mentioned reasons, we had

fecal flora such as anaerobic Gram positive

and negative bacteria, especially when the

wounds are close to the anal and the thigh

origin areas. In case of gastrointestinal

surgeries, the most common bacteria that

were isolated from the incisions areas are

the Gram negative bacteria such as *E coli*, in

addition to the Gram positive bacteria such

as those belong to Enterococci and Bacilli

(4). The other sources of this microbial

infection are OT staff, OT environment,

tools, and apparatuses that are used during

the surgery. Most of the microbial flora that

belongs to the latter sources is aerobic Gram

positive bacteria. It is important to decrease

the infection sources by using clean sterile

environment in the OT, sterile instruments,

preoperative antibiotics, and suitable air

system. In addition to what mentioned

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initiated this study to investigate the presence of this contamination in the OT in Al-zahra'a General Teaching hospital, Al-Kut, Iraq. This study was conducted to investigate the presence of the contamination in the OT in Al-zahra'a General Teaching hospital, Al-Kut,Iraq.

### Aim of the study:

#### **Materials and Methods**

The study was done during March, August, and September of 2016. We collected 500 swabs from OT, preterm room, respiratory care unit, and the ENT surgery room. The swabs were collected from the surfaces of the previous places, as high as one meter (level of the patient`s bed) in terms of 2 times during each month of the study before and after surgeries. We cultivated the swabs on 5% sheep blood, MacConkey agar, blood agar, Mannitol salt agar, and Sabouraud dextrose agar using the agar plate streaking method at 37°C, for 24-48 hours. Different appearance features of the growing bacteria were studied such as the lactose and manitol fermentation, blood hemolysis, pigmentation and mucus secretion on the media using the oxidase test. The results were confirmed using Citrate test, Vogasproskauer test, Methyl red test, Urease test, Motility test, Triple sugar Iron agar test, Coagulase test, and Germ tube test (5, 6, 7).

#### Results

### Results of the statistical analysis of the total positive isolates:

The results of the study showed high significant differences (p<0.05) in the total positive culture during the study months.

The differences were with high level in March that was followed by significant decrease (p<0.05) during August and September as shown in table 1.

**Table 1:** the statistical analysis of the total positive isolates during March, August, andSeptember, 2016.

Month	Mean	<u>SE</u>	<u>St. Dev.</u>	LSD
March	25.9	± 10.3	30.4	4.5
August	44	± 12.7	32.6	
September	34.8	± 17.9	23.3	

SE: standard error

St.Dev: standard deviation

## Results of the statistical analysis of the total microbial isolates during March:

The results of the study showed high significant differences (p<0.05) between the

Gram positive and the Gram negative bacteria during March. Those differences were with high level in Gram negative bacteria compared to the Gram positive as shown in table 2.

**Table 2:** the statistical analysis of the total microbial isolates during March

Bacteria	Mean	SE	St. Dev.	LSD
Gram negative	1.8	± 0.19	1.3	0.83
Gram positive	2.3	± 0.24	1.7	

The results also showed significant differences (p<0.05) between the distribution of the Gram positive bacteria in the OT as shown in table 3. The results also

showed significant differences in the levels of Gram negative bacteria during March as shown in table 4.

Bacteria	ОТ	Mean	SE	St. Dev.	LSD
	General surgery	2.3 * <sup>a</sup>	± 0.19	0.4	
Gram	Delivery room	2.5 <sup>a</sup>	± 0.28	0.2	0.79
Positive	ENT	3.1 <sup>c</sup>	± 0.20	0.6	
	Ophthalmology	<b>2.8</b> <sup>a</sup>	± 0.22	0.9	

**Table 3:** the statistical analysis of the Gram positive bacteria during March

Different letters refer to significant differences (p<0.05).

**Table 4:** the statistical analysis of the Gram negative bacteria during March

Bacteria	ОТ	Mean	SE	St. Dev.	LSD
	General surgery	<u>1.6 a</u>	± 0.27	1.5	
Gram	Preterm room	<u>2.5 a</u>	± 0.19	1.17	0.41
negative	ENT	<u>1.7 c</u>	± 0.21	1.31	
	Psychological	<u>1.3 a</u>	± 0.39	1.05	
	care				

Different letters refer to significant differences (p<0.05).

# Results of the statistical analysis of the total microbial isolates during August

The results of the study showed high significant differences (p<0.05) between the

Gram positive and the Gram negative bacteria during August in different OT. Those differences were with high level in Gram negative bacteria compared to the Gram positive as shown in table 5.

**Table 5:** the statistical analysis of the total microbial isolates during August

Bacteria	Mean	SE	St. Dev.	LSD
positive	1.9	± 0.11	1.90	0.44
negative	2.3	± 0.20	1.33	

### Results of the statistical analysis of the total microbial isolates during September

The results of the study showed high significant differences (p<0.05) between the

Gram positive and the Gram negative bacteria during September in different OT. Those differences were with high level in Gram negative bacteria compared to the Gram positive as shown in table 6.

Table 6: Results of the statistical analysis of the total microbial isolates during September

Bacteria	Mean	SE	St. Dev.	LSD
positive	1.2	± 0.71	1.30	0.3
negative	2.3	± 0.54	1.23	

#### Discussion

The current study has found that there are significant differences in the total positive cultures during the months of the study. It also showed that during March, the positive bacteria increased Gram significantly compared to their levels during August and September. This might be related to the effect of high temperature and low humidity during the summer months, these results agree with and other researchers (4, 5, 8, 9). The results of this study showed high significant differences (p<0.05) between the Gram positive and the Gram negative bacteria during the months of the study in different OT. Those differences were with high level in Gram negative bacteria compared to the Gram positive bacteria that agree with other studies (10, 11, 12, 13, 14). The reason of these results might be related to the ability of the Gram negative bacteria to live in the presence of biological materials and water (15). While the Gram positive bacteria are able to live in dry environments (16). Different studies recommends following hygienic conditions to solve such problems (17). E coli was the most isolated bacteria since those isolates were collected from the intestinal contents of the patients that might indicate that the food. and patients` intestines water.

themselves are the sources of these infections as agree with (18). E coli was the most significant bacteria among the colonic bacteria especially in the general health surgery room and the Fractures room that agree with others (19, 20, 21). Pseudomonas aeruginosa recorded the third place of the other bacteria during March and August, while it was in the second place during September. Antibacterial solutions are the main sources in this bacterial contamination. Pseudomonas aeruginosa are from the opportunistic bacteria that can live in humid environments and so the ability to survive in the hospital environments due to its ability

to survive antibiotics and disinfectants. These bacteria considered to be one of the fatal factors for patients in contaminated OT (22). The excessive use of antibiotics such as methicillin is the main reason that lead to initiate resistance of the Pseudomonas aeruginosa. Fungi such as Candida albicans are also found to be one of the most contamination sources in OT that may or may not indicates general infections in hospitals. To find out the source of contamination. techniques such as polymerase chain reaction. gel field electrophoresis, and single clone to indicate the source of bacterial infection (23, 24).

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