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Detection of bacteria from mobile and effects of antibiotics on bacteria

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Abstract

Mobile phones are necessary in social life but are normally not cleaned. Therefore, they serve as a host of bacteria and may cause disease. Most of the tested mobile phones (100%) were contaminated with bacterial agents. The most prevalent bacterial contaminants were antibiotic sensitive, Norfloxacin (30µg) and Amikacin (10µg) are effects on *Staphylococcus aureus*, *S.epidermidis* and *Bacillus cereus*. The number of colony CFU/ml on covered mobile was more than uncovered mobile. *Bacillus cereus* showed better tolerance and activity of temperature than *S. aureus*and *S. epidermidis* at growth from 5 to 50°C.

Keywords: *Staphylococcusaureus , S.epidermidis and Bacilluscereus*, antibiotic resistent, tempurature

Introduction

Mobile phones have become part of health professional's device and are used widely for communication in a life [1]. Most of people never cleans or disinfects their phone, so the germs and bacteria just keep growing up. The researchers present that 94.5% of the phones were contaminated with kind of bacteria, most of which were resistant to antibiotics. Much of the disease resulting bacteria they found are transferred from people to people through touch because this bacteria is on your hands.[2].

The extensively spread use of mobile phones by women, men, workers and especially of children have become a source of disease. Mobile phones were reservoirs for bacteria that could help the transferred of bacterial isolates from one to another in different locations. A mobile phone also name a cellular phone or a hand phone is an equipment that can receive telephone calls over a radio link whilst moving around a wide geographic place [3]. A mobile phone could spread infectious diseases by contact with hands [4]. Most of research show that pathogenic bacteria are found on approximately 40% of mobile phones .Mobile phones could be a health dangers with hundreds of thousands of bacteria living on each distance of the phone. Staphylococci, especially *S. epidermidis* are normal flora of the human respiratory, urinary and skin[5]. *Staphylococcus aureus* are present regularly on contact lenses eyes , clothes, bed linen, and in the noses of up to 30% of healthy people could cause illnesses

from pimples and boils to pneumonia and meningitis[6]. The principle reservoir of *S. aureus* is the hand from where it is introduced into food during preparation .The aims of researched isolation and identification of pathogenic bacteria from mobile phone and compare CFU/ml between covered and uncovered mobile[7].

Materials and methods

Samples

The mobile phones were collected from students, workers and cleaners from Department of Life Sciences, College of Science and University of Basra. The swabs were taken from the covered and uncovered mobile[8].For isolation of bacteria the nutrient agar was prepared in 250 ml flask and was sterilized by autoclaving for 20 minutes. 20 ml of the media was spread in the plates to solidify. The swab was spread on the nutrient agar medium and the plates incubated at 37 °C for 24 hours. The plates were then observed for the presence of isolated colonies[8].Cells from isolate colonies stained by Gram stain. After that inocula were transferred onto nutrient agar for purification, incubated for 24h and the isolates identified by morphological and biochemical tests as in Bergeys Manual of Determinative Bacteriology [9].

Determination of antibiotic resistant

1ml inoculum of *B. cereus* ,*S.aureus* and *S. epidermis* was added to 100 ml of nutrient broth and then incubated at 30°C for 24h and then dilution of bacterial solution with Physiological Normal saline compared with the standard test tube McFarland for 108 cells / ml of stuck bacterial and inoculated into nutrient agar ,using L-shap to spread bacteria on Muller Hinton media , and then but antibiotic disc on bacteria and incubated dishes in the incubator for 37Cº. Then measured the diameter of the inhibition [10].

Effect of temperature on *B. cereus, S. aureus*and *S. epidermidis* .

For determination of optimum temperature,1ml inoculation was provided into 100 ml of nutrient broth medium and overnight incubation was done at different temperatures like (5,10,20,30,40,50, and 50)°C . The growth was measured in terms of OD at 600 nm by [11].

Results

Isolates of *B. cereus*were (23) isolates while *S. aureus* and *S. epidermidis* were (36) isolates from covered and uncovered mobile . All isolates can grow on nutrient agar . Identification was done according to Bergey's Manual of Determinative Bacteriology (figures 1-2) and Gram stain are shown in (figures 3-4).

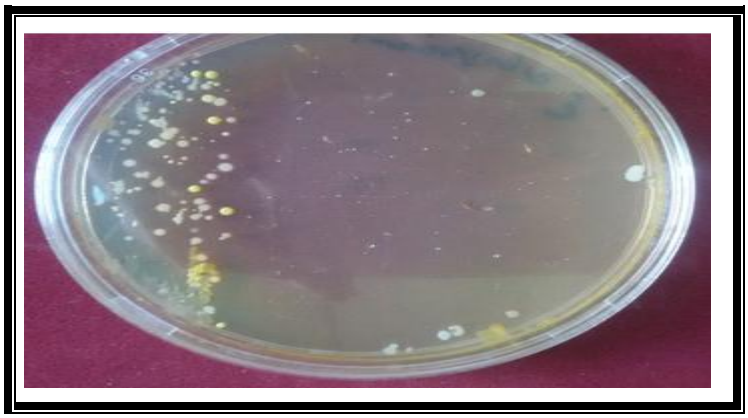


Figure (1):*Staphylococcus* grown on nutrient agar (12.1 pixels)
Yallow colony : *S.*aureus; **White colony :** *S. epidermidis*

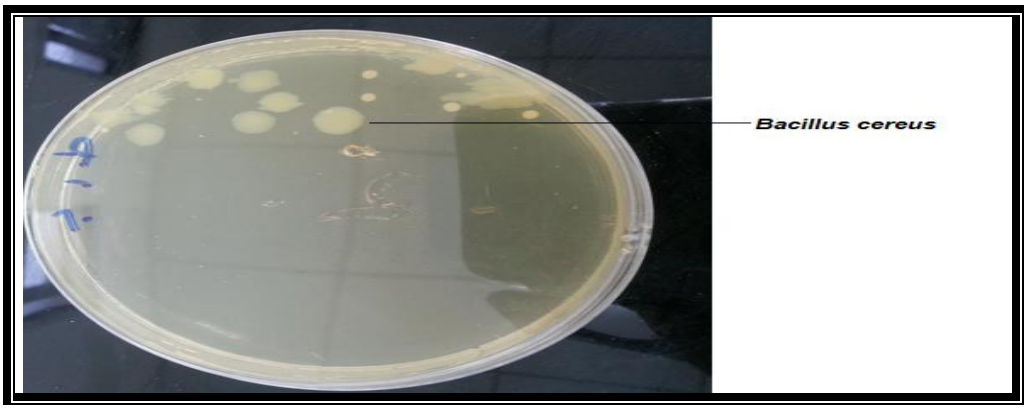


Figure (2):*B. cereus* grown on nutrient agar (12.1 pixels)

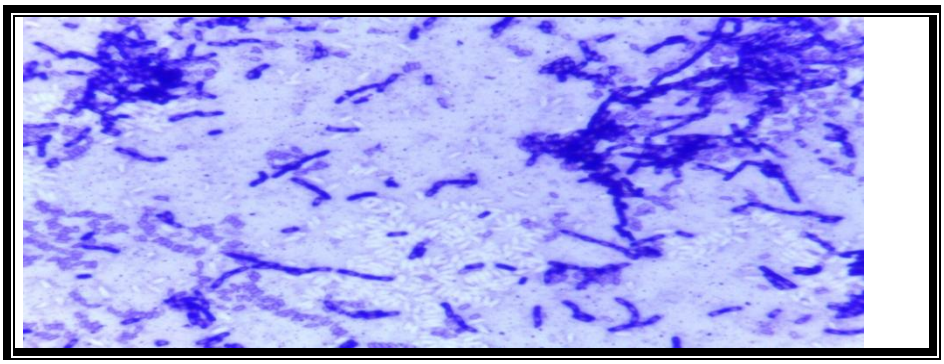


Figure (3): *B. cereus* stained with Gram stain magnification 1000X

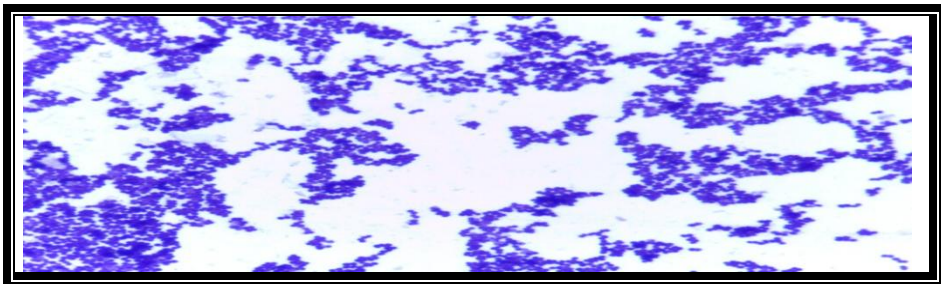


Figure (4): *S.ureus* stained with Gram stain magnification 1000X

Summary of the main characteristics of the isolates of *S. and B.* species are shown in (Tables1-2). Identification was done according to Bergey's Manual of Determinative Bacteriology as revealed by Gram staining, growth and biochemical tests.Figure(5) shows hydrolysis of Manitolwith*S.aureus and S. epidermidis*

Table (1) : Biochemical tests of*S.aureus*and *S.epidermidis*

Basic Characteristics	***S.aureus***	***S.epidermidis***
Capsule	Non-Capsulated	Non-Capsulated
Catalase	+	+
Citrate	+	_
Coagulase	+	_
Gelatin Hydrolysis	+	_
Gram Staining	+	+
H2S	-	+
Hemolysis	+	_
Motility	_	_
MR (Methyl Red)	+	_
Nitrate Reduction	+	+
Hemolysis	+	_
Oxidase	_	_
Pigment	+	_
Shape	Cocci	Cocci
Spore	Non-Sporing	Non-Sporing
Urease	+	+
VP (VogesProskauer)	+	+
Fermentation of Arabinose	_	_
DNase	+	_
Fructose	+	+
Galactose	+	+
Glucose	+	+

Lactose	+	+
Mannitol	+	_

Table (2) : Biochemical tests of *Bacillus cereus*

Characteristic	*B.cereus*
Motility	+
Cell diameter >1.0µm	+
Spore formation	+
Ellipsoidal	+
Cylindrical	_
Spherical	_
Catalase	+
Aerobic growth	+
An aerobic growth	_
Voges-Proskauer	+
Acid from L-Arabinose	_
Acid from D-Glucose	+
Acid from D-Mannose	_
Hydrolysis of casein	+
Hydrolysis of starch	+
Citrate Utilization of:	+
Hydrolysis of gelatin	+
Nitrate reduction	+
Growth in 6.5% NaCl	+

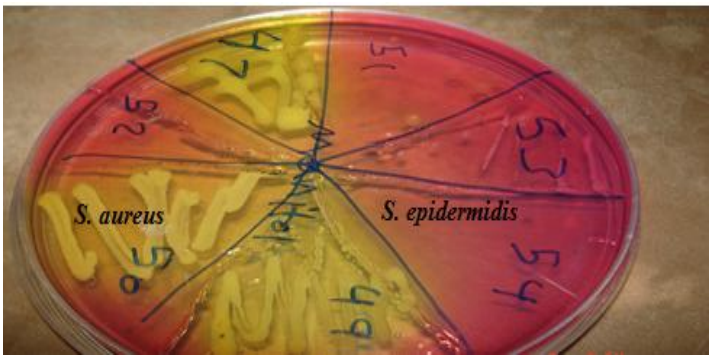


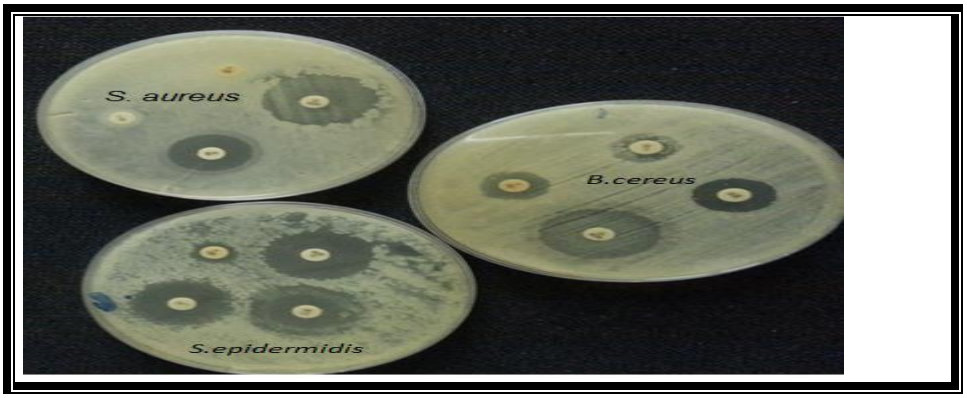
Figure (5): Hydrolysis of Manitol with *S.aureus* and *S. epidermidis*

The isolates which were selected from covered mobile highly contaminated with bacteria compared to uncovered in all staff of life of science ,isolates showed high significant difference of CFU/mlwith an LSD=0.07800 with $p<0.01$. Table (3) show Mean +and – SDbetween covered and uncovered mobile phone

Table (3) : Number of colonies(CFU/ml)in plates of covered anduncovered mobilesand Mean +and – SD of contamination

Number	uncovered mobiles	covered mobiles	Mean +and – SD in uncovered mobiles	Mean +and – SD in covered mobiles
students	22-35	104-168	21.00 6.83	142.25 42.41
workers	18-53	134-214	19.25 8.18	120.25 37.02
cleaners	30-72	178-264	32.75 3.86	212.50 29.55

The isolates which were selected from covered and uncovered mobile sensitive to antibiotics of Norfloxacin and Amikacinin all staff of life of science (figure6) and (Table4)



Figure(6):Antibiotics testes for *S. aureus,S.epidermidis* and *B.cereus*

Table(4) : Antibiotic test *for S.aureus , S.epidermidis* and *B. cereus*diameter of inhibition (mm)

Samples	**Nitrofurantion 300 µg**	**ChloramphenicoI 30µg**	**Norfloxacin 10µg**	**Amikacin 10µg**
Standard measures	≥14	≥18	≥17	≥17
s. aureus	0 (R)	0 (R)	23 (S)	19 (S)
S.epidermis	10 (R)	24 (S)	26 (S)	23 (S)
B.cereus	14 (S)	13 (I)	17 (S)	25 (S)

F:Nitrofurantion , C:Chloramphenicol NOR:Norfloxacin and AK:Amikacin
R: Resent S:Sensitinve I:Intermidite

High significant difference was observed among the *B. cereus*, *S. aureus*and *S. epidermidis* regarding temperature resistance . *B. cereus* showed better tolerance activity than *S. aureus*and *S. epidermidis* with an LSD=0.0905with $p<0.01$,optimum temperature for *B. cereus* was 30°C while 37 °C for *S. aureus*and *S. epidermidis* figure (7).

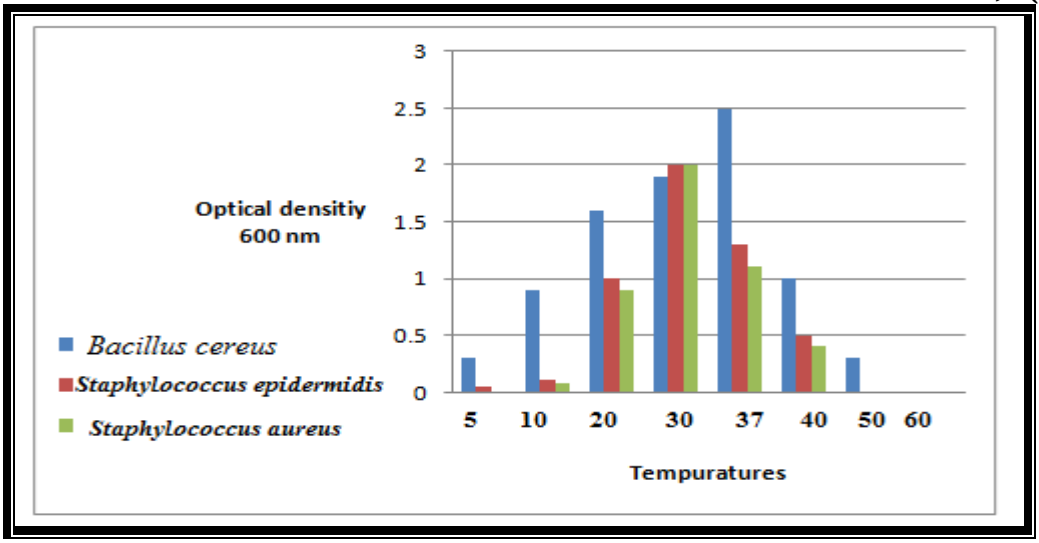


Figure (7):Effect of temperature on *B. cereus*, *S. aureus*and *S. epidermidis*

Discussion

From results in shapes (1-2) the Spread plating is the way appropriate to isolate the bacteria contaminated the mobile. There are a number of procedures available for the isolation of microorganisms from mixed culture. But the initial and the most simpler method of isolation is spread plating on solid agar medium to isolate individual colony . The most of bacterial species that have been present on phone surfaces are those that are part of the microorganism of the body because the constant contact with the hands and face. The normal flora of the skin includes up to 10^{12} bacterial cells, the most common species being *B. cereus* ,*S.aureus* and *S. epidermidis* [4].Bacteria is found in the mouth and the upper respiratory tract can also spread through aerosols and droplets that are released while breathing or talking into the mouthpiece [7]. Most of bacteria are resistant to dry and can found on phone surfaces for long times, colonization and growth of bacteria is due to the lostof nutrients and moisture on the plastic and glass surfaces of mobilephones.*S.epidermidis* is the mainly found on phone surfaces [2]. *S. epidermidis* is a gram positive,cocci and can be transmitted onto other plastic surfaces, including those that are inter into the body such as catheters and prosthetic implants. When inside the body, these surfaces provide an appropriate places for *S. epidermidis* to remain and grow into biofilms [11,12].

From result in table (3) The CFU/ml more on covered mobilethan on uncovered according to study [15]due to themost of mobile cover is made of plastic and leather are examples of natural polymers that have been known and used to made mobile cover,bacteria which was by starvation and adapted to utilize the plastic materials for carbon source[13]. Plastics are composed of very large molecules called polymers. Polymers are consist from small molecular fragments known as monomers that are bind together. This group includes biopolymers such carbohydrates and proteins that are important and necessary of all living organisms[14,15]. The majority of person do not clean their mobile equipment, this lead to a risk factor[16].

From result in figure (6) and table (4) Norfloxacin and Amikacinare effects on most bacteria due to most of bacteria consist of a cell wall that is composed of molecule called peptidoglycan, made up of amino sugars and short peptides.

Norfloxacinstopped the final cross-linking step, or transpeptidation and inhibits bacterial growth by prevent protein synthesis[17,18]. Both bacteria and humans carry out protein synthesis on ribosomes. Norfloxacincould pass through the membranes of microorganism and accumulate in high concentrations in the cytoplasm. Noroflaxin then joined a single site on the ribosome 30S smaller ribosomal subunitand blocks a key RNA interaction, which shuts off the lengthening protein chain[19].

In this study, *B.cereus* showed highest resistance pattern of temperature (5-50)C° while *S.epidermidis* and *S.aureus* showed (7-40) C°harmony to study [20].*B. cereus* is a spore forming has the ability togrow at low and high temperatures while *S.epidermidis* and *S.aureus* couldn't grow in 5°Cand 50°C due to low temperatures affected on growth, colony morphology, cellularstructure and amino acid composition in the cytoplasmic hydrolysatewhile high temperature affected the bacterial cell viability,morphology ,physiology of cells,the bulkof biofilm and the polymeric properties of the extracellular polymeric substance (EPS) . After incubation of a one hour heat treatment at 45°C cell reproduction ceased and at 60°C cell viability and growth were significantly reduced[21]

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