# Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors(cancers)

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## Abstract

The aim of this study in order to determine action of magnetized water for killing MRSA *S.aureus* isolated from malignant tumors(cancers) with different volume. In this descriptive study design of 20 MRSA *S.aureus* is cross-sectional study design collected from malignant tumors.

Study populations of (20) MRSA *S.aureus* from malignant tumors leukemia, stomach cancer, kidney cancer and Cochlea cancer from Baghdad hospitals through 2019. Identification by using vitek$_2$-GP system. The results of isolation inclusive: 6(30%) leukemia, 6(30%) stomach cancer, 5 (25%) kidney cancer and 3(15%) Cochlea cancer**.**

Antibiogram typing for Screening Methicillin Resistance *S.aureus* isolates (MRSA) of Phenotypic method by Discs diffusion method antibiotic disc. The results for 20 isolates toward MET 18(90%), AMC20(100%), L 4(20%), AZM 4(20%), FOX 4(20%), CAZ 3(15%), FEP 3(15%), CIP 4(20%), LEV 3(15%), DA 4(20%), CX 3(15%), E 4(20%), CN 3(15%), IMP 3(15%), NOR 3(15%), TECR 2(10%) and VA 5(25%).

D-shape test used to detect MLSB. A positive results of inducible resistance to clindamycin for MRSA isolated from malignant tumors(cancer) appear when the clear shape of the flatted edge present in facing to erythromycin disc which occur when erythromycin diffuse toward clindamycin disc will produce flattening inhibition zone of clindamycin disc in the margin adjust to the erythromycin disc to forming D-shape.

Number of MRSA *S.aureus* viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (28,20,10) colony respectively when exhibition for 1 hrs.Number of MRSA S.aureus viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (40,12,7) colony respectively when exhibition for 2 hrs.Number of MRSA *S.aureus* viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (31,6,0) colony respectively when exhibition for 3 hrs, this results indicate efficiency magnetized water to killing MRSA *S.aureus.*Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors that effect on morphological growth and killing MRSA *S.aureus* malignant tumors after exhibition for magnetized water.

**Key words: Magnetic water, Cancers, Resistance antibiotics, Bacterial malignant tumors.**

## Introduction

*Staphylococcus aureus* is facultative anaerobic, round, golden-yellow colonies, often with hemolysis when grown on blood agar,chemoorganotrophic with both respiratory and fermentative metabolism, sometimes capsulate, non-motile, non-spore forming. Catalase positive but oxidase negative [1], persist as a major cause infection of hospital and community acquired [2].Inclusive superficial lesions such as wound infection; toxinoses such as food poisoning, scalded skin syndrome and toxic shock syndrome and systemic and life-

threatening conditions such as endocarditis, osteomyelitis, pneumonia, brain abscesses, meningitis and bacteremia [3].

Pathogenesis of *S. aureus* causes different of disease like skin abscesses , bacteremia , pneumonia , endocarditis , toxic shock syndrome, urinary tract infection and wound infection, impetigo, septicemia toxic shock and scalded skin syndrome[4] by producing hyaluronidase that destroys tissues and produce virulence factors, like adhesion factors, capsular polysaccharides, staphyloxanthin and various exoenzymes (lipase, proteases , nuclease , hyaluronidase, staphylokinase) and toxin[5].

MRSA is a Gram positive coccus, one of the causative agent for high rate of morbidity and mortality associated with both HA-MRSA and CA-MRSA, is one of a number of greatly feared strains of *S. aureus* which have become resistant to most β-lactam antibiotics, Penicillin binding proteins (PBPs) are a significant component in cell wall synthesis process in bacteria.Staphylococcal resistance to penicillin mediated by penicillinase (a form of β-lactamase) production: an enzyme that cleaves β-lactam ring suchas methicillin, nafcillin, oxacillin, cloxacillin, dicloxacillin and flucloxacillin, are able to resist degradation by staphylococcal penicillinase[6,7].

MRSA infections in both hospital and community setting are commonly treated with non-β-lactam antibiotics, such as clindamycin (a lincosamine) and co-trimoxazole (also commonly known as trimethoprim/sulfamethoxazole) [8].

MLSB are commonly used antibiotics to treat *S. aureus* infection, additional to clindamycin which is frequently used to treat skin and superficial infection especially with patients have allergy to penicillin as alternative drug[9].

Magnetism played an important role in associated with magic works were taking the powder as a medicine to treat many internal diseases affect on human, used to treat back pain. Magnetization of water was used as an important method for treating water for employment in

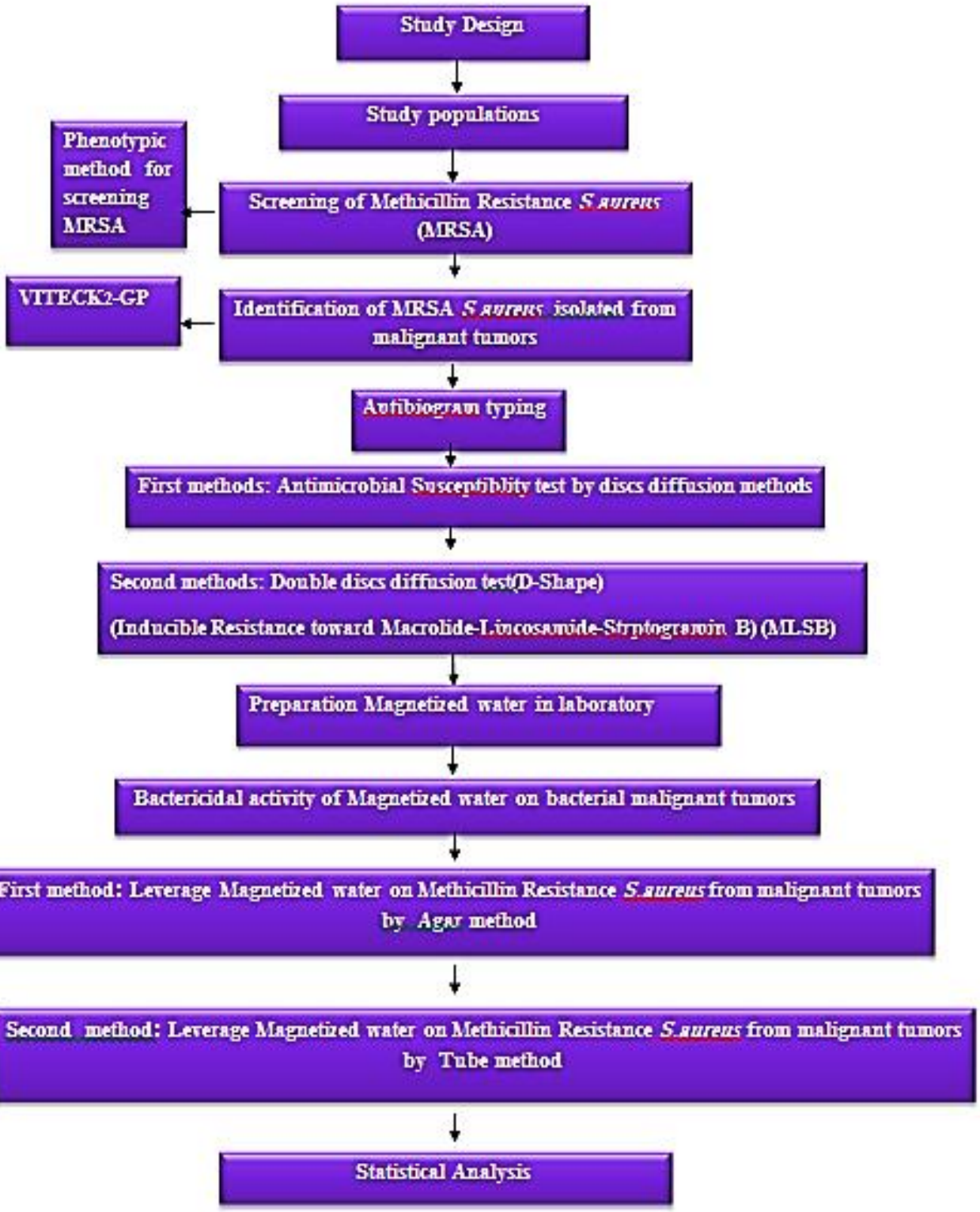
various fields. Some of the unwanted ways to get rid of toxic waste and factory waste increased by the number of desalination plants, offset by an increase in sea and river water pollution [10].One of the most important modern methods used to reduce the negative effects resulting from the use of local water is the special magnetic tubes through which water passes and magnetic tubes work to magnetize the water so-called magnetic water, the magnetic field will affect the angle of attachment of two hydrogen molecules with oxygen in water molecule where cluster groups in them decrease to 6_7 molecules compared to water in its natural state which is up to 10_12 molecules[11].

**Methodology**

Clinical examination include study populations from different malignant tumors, screening of Methicillin Resistance *S.aureus*(MRSA), identification by VITECK2-GP,Antibiogram typing including antimicrobial susceptiblity tests by disc diffusion methods and second method Double disc diffusion test(D-Shape)(Inducible Resistance toward Macrolide-Lincosamide Streptogramin B) (MLSB),preparation magnetized water in laboratory by two methods inclusive: first method: Leverage Magnetized water on Methicillin Resistance *S.aureus* from malignant tumors by Agar method, Second method: Leverage Magnetized water on Methicillin Resistance *S.aureus* from malignant tumors by Tube method, Statistical analysis by[12].

**Study design**

Study design are specific plan or protocol for direct study which allows the researcher to translate the conceptual hypothesis into an operational one, another define is the formulation of trials and experiments, as well as observational studies in medical,clinical or other types of research (e.g:epidemiological) involving human beings[13].


Study Design
Study populations
Phenotypic method for screening MRSA
Screening of Methicillin Resistance S.aureus (MRSA)
VITECK2-GP
Identification of MRSA S.aureus isolated from malignant tumors
Antibiogram typing
First methods: Antimicrobial Susceptiblity test by discs diffusion methods
Second methods: Double discs diffusion test(D-Shape)
(Inducible Resistance toward Macrolide-Lincosamide-Stryptogramin B) (MLSB)
Preparation Magnetized water in laboratory
Bactericidal activity of Magnetized water on bacterial malignant tumors
First method: Leverage Magnetized water on Methicillin Resistance S.aureus from malignant tumors by Agar method
Second method: Leverage Magnetized water on Methicillin Resistance S.aureus from malignant tumors by Tube method
Statistical Analysis

**Scheme (1 ): Methodology of research project**

**Study populations**

A total of 20 MRSA *S.aureus* isolates were collected from tumors from Baghdad hospitals in 2019.These isolates were identified by conventional biochemical reactions according to the criteria established by [14].The isolates were inoculated a Nutrient agar, the results were remain for 24 h of incubation at 37°C.

**Identification of MRSA *S.aureus* isolated from malignant tumors**

**Morphological Examination**

Primary diagnostic of bacterial isolates based on morphological features of colonies in culture media including colony shape, colony texture, colony color and edges. It were studied on MacConky agar, Blood Agar and finally on Mannitol salt agar [15].

**Microscopic Examination**

Gram stain reaction was carried on isolates by picked one colony and fixed on microscopic slide to show the cell shape and arrangement and compared the result with [15].

**Identification of MRSA *S.aureus* isolated from malignant tumors by Vitek2 GP**

Identification of the bacterial isolates was conducted using Vitek2 GP system for *S.aureus* according to the procedure suggested by the manufacturing company. There are 64 biochemical tests measuring carbon source utilization, enzymatic activities and antibiotics resistance. This system is designed for the performance of 64 standard biochemical tests from a single colony of purified isolate. The bacterial suspension was prepared for Vitek2 GP suspension solution and the turbidity adjusted to 0.5 McFarland ($1.5\times10^{8}$CFU/ml). The Gram positive (GP) card is used for the automated identification of most significant Gram-positive bacteria. The GP identification card is based on established biochemical methods, Results

from the concept of the card to provide anaerobic conditions and other microbes with little need for air, according to the suitability of each test and as instructed by the company Biomerieux (2013) French and newly developed substrates with a sterile Pasteur pipette, were inoculated according to the manufactures instructions. After incubating at 37°C for 24hrs. , the identification of the isolate using the automatic analytical, rapid identification at species level had been done, The suspension tubes and GP card were placed in the cassette with one negative control well**.** The device works through a period of cuddling on the analysis and storage of biochemical patterns are subjective, and after a while cuddling analyzed the device software these patterns printed diagnostic report for each card inside Reader / Incubator, according to instructions Biomerieux company[16,17,18,19].

**Antibiogram Typing of MRSA *S.aureus* isolated from malignant tumors**

**Antimicrobial agents susceptibility tests by disc diffusion methods**

It was performed to primary screening about MRSA by using antimicrobial susceptility test by disc diffusion methods in order to determine sensitivity and resistance toward antimicrobial agents. The process was carried as recommended in [20]:

1-Bacterial suspension: was prepared by picking 2-4 pure isolated colonies from overnight culture and suspended in 2 ml normal saline. The turbidity was adjusted to ($1.5\times 10^{8}$)CFU/ml by comparing the suspension with McFarland tube 0.5.

2-Muller- Hinton agar plates were inculcated with bacterial suspension using sterilizes cotton swab, then the plates left about five min to dry and absorb bacterial suspension.

3-Antimicrobial discs were distributed on plate surface medium (maximum six disc per plate) by sterile forceps, then incubation at 37 C$^{o}$ for 18-24 hrs. Two replicas were done for each isolates.

4-The results were read by measuring the inhibition zone diameter (mm) of each antimicrobial agent and compared them with standard inhibition zone and break point according to recommendation in Clinical and Laboratory Standard Institute,(2020).

**Double Disc Diffusion Test (D-shape) (Inducible Resistance toward Macrolide-Lincosamide Streptogramin B) (MLSB)**

It was used to screen bacterial sensitivity, constitutive or inducible resistance toward the antimicrobial agents macrolide- lincosamide streptogramin B [MLSB] by using Clindamycin (2 µg/disc) and Erythromycin (15 µg/disc). The process was carried as recommended in CLSI,(2020)

1-Preparation of bacterial suspension and inoculate plate.

2-Clindamycin and Erythromycin discs were placed at the distance (15-20 mm) edge-to-edge on the surface of medium by sterile forceps .The plates were incubated at 37 °C for (18-24) hrs.

3-The results were as follow:

- Constitutive Macrolide Lincoseamide Streptogramin B (cMLSB) phenotype – isolates showing resistance to both erythromycin (zone size ≤13mm) and clindamycin (zone size ≤14mm) with circular shape of zone of inhibition if any around clindamycin.
- Inducible Macrolide Lincoseamide Streptogramin B (iMLSB) phenotype– isolates showing resistance to erythromycin (zone size ≤13mm), while being sensitive to clindamycin (zone size ≥21mm) with a D shaped zone of inhibition around clindamycin and flattening edge towards erythromycin disc.
- Macrolides resistance and clindamycin sensitive (MS) phenotype – isolates showing resistance to erythromycin (zone size ≤13mm) while being sensitive to clindamycin (zone size ≥21mm) with a circular zone of inhibition around clindamycin.

**Table(1): Antimicrobial discs Code, Concentration with origin of company**

| No. | Antibiotics | Code | Concentration µg/disk | Company and origin |
|---|---|---|---|---|
| 1 | Methicillin | Met | 15µg | |
| 2 | Amoxicillin / Clavulanic acid | AMC | 20/10µg | |
| 3 | Lincomycin | L | 15µg | |
| 4 | Azithromycin | AZM | 15µg | |
| 5 | Cefoxitin | FOX | 30µg | |
| 6 | Ceftazidime | CAZ | 30µg | |
| 7 | Cefepime | FEP | 30µg | |
| 8 | Ciprofloxacin | CIP | 5µg | |
| 9 | Levofloxacin | LEV | 10µg | |
| 10 | Clindamycin | DA | 2 µg | |
| 11 | Cloxacillin | CX | 10µg | |
| 12 | Erythromycin | E | 15µg | Bioanalyse / |
| 13 | Genetamici | CN | 10µg | |

| | | | | |
|---|---|---|---|---|
| | n | | | Turkey |
| 14 | Imipenem | IMP | 10µg | |
| 15 | Norfloxacin | NOR | 10µg | |
| 16 | Teicoplanine | TECR | 20µg | |
| 17 | Vancomycin | VA | 30µg | |

S= sensitive I= intermediate R= resistant

**Prepartion Magnetized water in laboratory**

Magnetized water prepared when exposed to magnetic water device, magnetized water prepared 2ml, 4ml, 8ml and 10ml exposure to magnetic device for 1/2 hrs., 1 and hrs. 2 hrs.

The magnetic water device designed as shown in figure(1) :

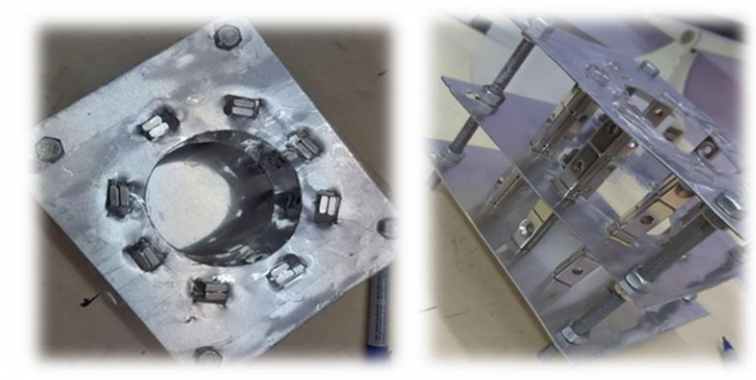


**Figure (1): installation of the magnetic water device**

The equation of calculating the killing of MRSA *S.aureus* isolated from malignant tumors:

$$\text{Killing of MRSA } S.aureus\ \% = \frac{\text{Control} - \text{Patronize}}{\text{Control}} * 100$$

**Statistical analysis :**

Statistical Analysis System- SAS .program was used to effect of difference factors in study parameters . Chi-square test was used to significant compare between[12].

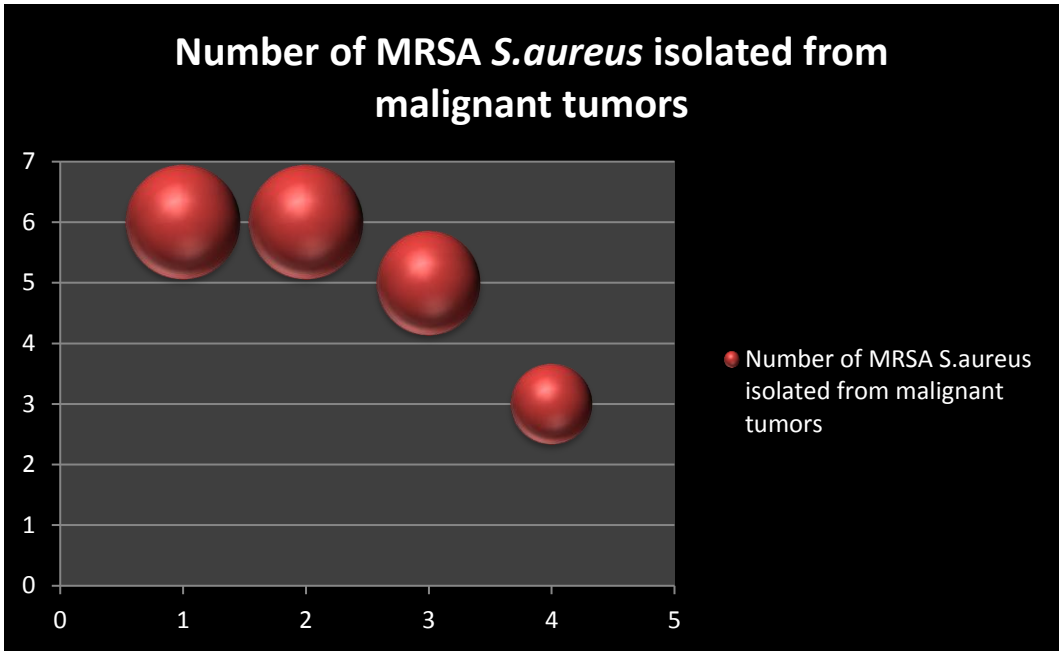
**Results and Discussion**

**Study design**

In this descriptive study design of (20) MRSA *S.aureus* by cross-sectional study design collected from malignant tumors.

**Study populations**

MRSA *S.aureus* (20) isolated from malignant tumors from leukemia, stomach cancer, kidney cancer and Cochlea cancer from Baghdad hospitals through 2019. Identification by using vitek2-GP system. The results shown in figure(1) of isolation from human inclusive: 6(30%) leukemia, 6(30%) stomach cancer, 5 (25%) kidney cancer and 3(15%) Cochlea cancer as shown in figure(2).




**Figure(2):Study populations of MRSA *S.aureus* isolated from malignant tumors, in the X axis represent MRSA *S.aureus* isolated from: 1 mean Leukemia, 2 mean Stomach cancer, 3 mean Kidney cancer and 4 mean Cochlea cancer; Y axis represent Number of MRSA *S.aureus* malignant tumors.**

*S. aureus* is a commensal bacteria which almost colonizes the nose of healthy persons. It causes a wide spectrum of infection, beginning from skin and soft tissue infections to invasive diseases because *S.aureus* have numerous virulence factors, this will help to colonize and distribute in different environments. Rapid emergence of MRSA had been observed in the last two dedicate associated with complication in the control of infection [21].

**Identification of MRSA *S.aureus* isolated from malignant tumors**

**Morphological and Microscopic examination of MRSA *S.aureus* isolated from malignant tumors**

The collected isolates were initially diagnosed in hospitals as *Staphylococcus.* To confirm this preceding diagnostic, all isolates were cultured on MacConkey agar and here no growth was appeared because this media contains bile salts which prevent gram positive bacteria from growth but it considered a selective media for gram negative[15].

Results in figure(3) shown blood hemolysis of MRSA *S.aureus* isolated from malignant tuomrs for identification this bacteria.

**Figure(3): Blood hemolysis on Blood Agar plate for study hemolysis by MRSA *S.aureus* isolated from malignant tumors.**

In blood agar (important enrichment media to differentiate between hemolytic and non hemolytic bacteria), *S. aureus* isolates produce clear β-Hemolysis around their colonies [22].

Results in figure(4) growth MRSA *S.aureus* isolated from malignant tumors on Mannitol salt agar for morphological identification of Methicillin Resistance *S.aureus***.**

**Figure(4): Growth *MRSA S.aureus* on plate agar medium.**

Mannitol salt agar represent a selective and differential media for *S. aureus* , it contains 7.5 % salt and phenol red as indicator, *S. aureus* colonies appeared golden yellow surrounding with large yellow zone, round, smooth, raised and mucoid. The yellow color comes from fermenting mannitol and producing acids leading to convert the indicator phenol red from pink to yellow, because *S. epidermis* devoid the ability to ferment mannitol thus the indicator will not changed[23].

**Antibiogram Typing of MRSA *S.aureus* isolated from malignant tumors**

It is a phenotypic method for MRSA typing by comparison the sensitivity of isolates toward arrange of antibiotics. The pattern of antibiotic resistance reflected the relatedness between isolates so it consider the first indicator for an outbreak of isolates[24].

Antibiogarm typing was carried by different techniques, disk diffusion method still the most spreading used in routine clinical laboratories[20], however many commercial system available for MRSA double disc diffusion method to screening about MRSA resistance toward Macrolides-Lincoseamide- Streptogramin B (MLSB), it quick, easy and low cost technique (mohammedi *et al*.,2014), dilution methods represented by agar dilution and

microdilution, E-test method gives MIC results and affected by test conditions in a similar to other MIC and diffusion methods and many automated system such as VITK [25].

Firstly Screening for Methicillin resistance *S. aureus* isolates (MRSA)by Phenotypic method to screen for MRSA by Disc diffusion method using either methicillin, oxacillin or cefoxitin antibiotic disc. In this study, cefoxitin disc has been used to screen about MRSA .The results explain 20 isolates resistance for this antibiotics as shown in figure(5).

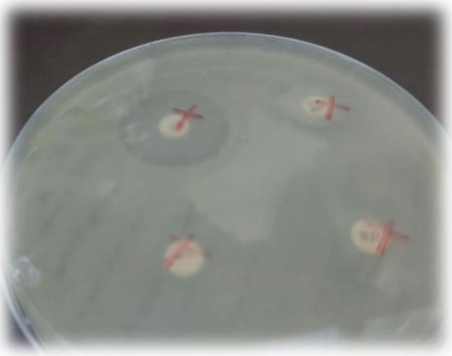


**Figure (5): Firstly screening of MRSA *S. aureus* from malignant tumors resistance to Methicillin, Cefoxitin and Oxacillin antibiotic disc (MRSA)**

The antibiotics sensitivity test is rapid, inexpensive and easy to perform with benefit for screening of epidemic isolates utilizing for typing method to MRSA isolates[26].

The results of this study is very close to study by AL-kazaz (2014) who referred in her study the percentage of MRSA isolates was (72%), while AL-azawi (2014) who (also local study) mentioned in her research that (21.62%) of *S. aureus* was MRSA. Unfortunately MRSA become major problem to healthcare and increase the prevalence in last dedicates over all the world, furthermore the variation in values leading to vary in prevalence of MRSA in different communities[27].

Cefoxitin has recently been investigated as an alternative agent for detection MRSA using disc diffusion method and the studies indicated that test is more reliable and less laboratory requirements are needed [25].

Many factors might interfere with disc diffusion method like inoculum size, incubation period, temperature, salt concentration and pH of the medium [20], therefore disc diffusion method less sensitivity and specificity[28].

**Antimicrobial susceptibility by discs Agar diffusion methods**

Twenty MRSA *S. aureus* isolated from malignant tumors were collected from hospitalized patients in Baghdad, all of them were subjected to (17) antimicrobial agents and the resistance patterns according to the recommendation of CLSI,(2020).

In this study MRSA isolates high resistance toward MET 18(90%), AMC20(100%), L 4(20%), AZM 4(20%), FOX 4(20%), CAZ 3(15%), FEP 3(15%), CIP 4(20%), LEV 3(15%), DA 4(20%), CX 3(15%), E 4(20%), CN 3(15%), IMP 3(15%), NOR 3(15%), TECR 2(10%) and VA 5(25%) as shown in figure (6).

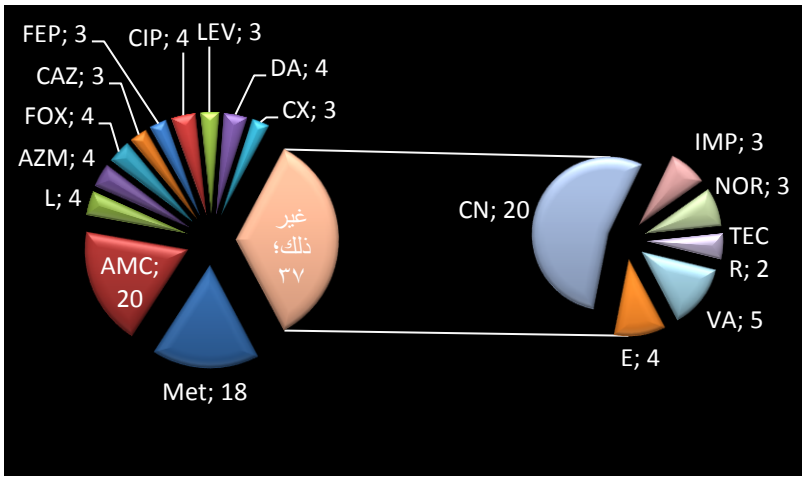


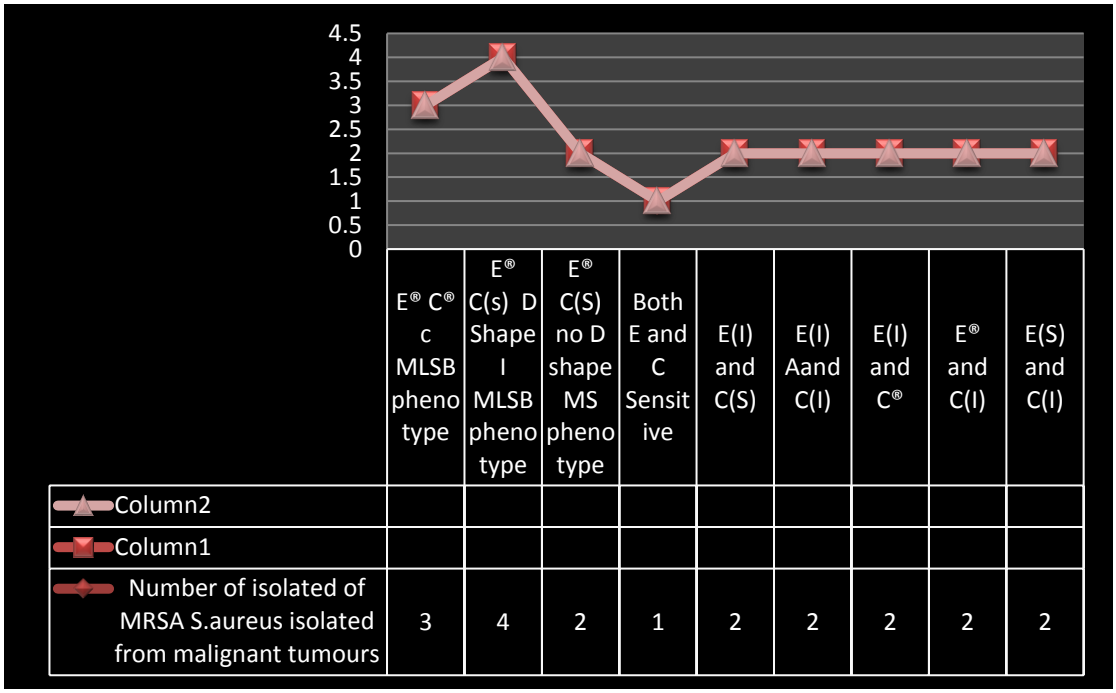

**Figure (6): Antimicrobial Susceptiblity test for MRSA *S. aureus* from malignant tumors resistance to diferent of antibiotic disc (MRSA)**

The results of the current study closely with local studies concerted with MRSA isolates [29] who found that 100% of MRSA isolates in Al-Diwaniya city resisted to oxacillin .Also [30] mentioned the complete high resistance in MRSA isolates (100%) toward oxacillin in hospitalized patents in Baghdad, while [31] indicted the high resistance of MRSA isolates toward Amoxicillin /Clavulinic acid (93.1%) and low resistance.

A previous study by [32] who showed that the rate of MRSA isolates resistance was (13.63%) toward gentamycin but the rate of resistance was (29.3%).It observed variant expression level of resistance toward gentamycin among MRSA isolates, belong to transposon Tn*4001* has different chromosomal binding site for integration so low insertion specificity leading to low expression of resistance genes**.**

**Discs diffusion test (D-Shape) (Inducible Resistance toward Macrolide- Lincosamide-Strptogramin B (MLSB)**

D-shape test was used to detect MLSB. A positive results of inducible resistance to clindamycin as shown in figure(7)and figure(8) for MRSA isolated from malignant tumors(cancer), the clear shape of the flatted edge appeared facing to erythromycin disc which occur when erythromycin diffuse toward clindamycin disc will produce flattening inhibition zone of clindamycin disc in the margin adjust to the erythromycin disc to forming D-shape.




**Figure(7 ):Phenotypic results of MRSA *S. aureus* isolates toward MLSB by double diffusion discs.**

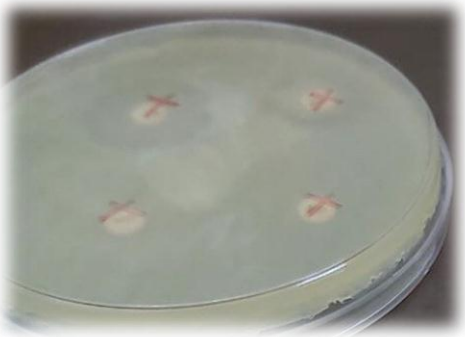


**Figure (8) MRSA *S.aureus* isolated from malignant tumors for positive iMLSB (D-shape).**

According to this test, the isolates of the current study were classified to four distinct resistance phenotype categories as shown in figure(7). The results revealed that constitutive resistance to erythromycin (cMLSB) phenotype.

In the present study, a higher prevalence of the cMLSB phenotype were recognized among MSSA isolates compared with MRSA isolates.This results disagree with others studies which showed higher frequency of constitutive resistance to erythromycin (cMLSB) in MRSA isolates when it reached to 20/29(68.9%) in the study of Bottega *et al*.(2014) while the rate decrease to (52.3%) in the study of [33].The prescription level of clindamycin resistance is much higher causing selective pressure for a high prevalence of clindamycin resistance[34].

Resistance toward erythromycin in *S. aureus* bacteria occur due to the present *erm* genes (methylase gene) which causes methylation of binding site and resistance type MLSB and iMLSB are either constitutively or inducible, respectively ,in case of present of erythromycin molecules that have ability to induce resistance by production of methylase enzyme[38].

On the other hands, iMLSB phenotype 4(6.55%) isolates was observed among *S. aureus* specially MRSA isolates more frequently in urine, blood and general secretions as shown the phenotype in MRSA SP1, MRSA B1, MRSA N1 and MRSA S21. This finding is closely with [35] who mentioned that 3(2.1%) isolates of MRSA showed positive D- test while the local study[36] who showed that (17.1%) of MRSA isolates displayed positive D- test. Furthermore the results of the current study showed 9(14.7%) MS phenotype while[37] mentioned that the prevalence of MS phenotype among MRSA was high to be (44.6%)

In fact macrolides, lincosamides and streptogramin B display the same mode of activity represent by inhibition of protein biosynthesis. Erythromycin can induce cross-resistance with the two others groups, thus *S. aureus* isolates which appear resist to erythromycin will resist to linocosamides and strptogramin B [38].However importance of Erythromycin in decennium was flagged by discovering new macrolides and substituted by ketolides and azalid which have not only better than erythromycin pharmacokinetics but also less side

effects[39]. Prevalence of iMLSB phenomenon is found in all *Staphylococcus* species pathogenic and non-pathogenic to human and has critical role as reservoir for resistance genes and possibly consider the source of spread them to environment, because the little concentration of erythromycin can induce resistance against lincosamides so it consider potential risk for human health [38].

*S. aureus* isolates can resistant to macrolides by two mechanism, ATP-dependent efflux pump which encoded by *mrs*A gene also macrolides efflux effected by the role of membrane protein which coded by *mef* gene[40].

Another mechanism encoded by *erm* genes family which have nearly forty types of *erm* genes, expression only one type can lead to resistance against MLSB antibiotics [38]. The resistance presented by single alteration in ribosomal target site, *erm* genes encode to N6-demethylase which play the role in N6 demethylation of an adenine residue in the 23S rRNA causing conformational alteration in ribosome and increasing the resistance of *S. aureus* strains to MLSB group[41].

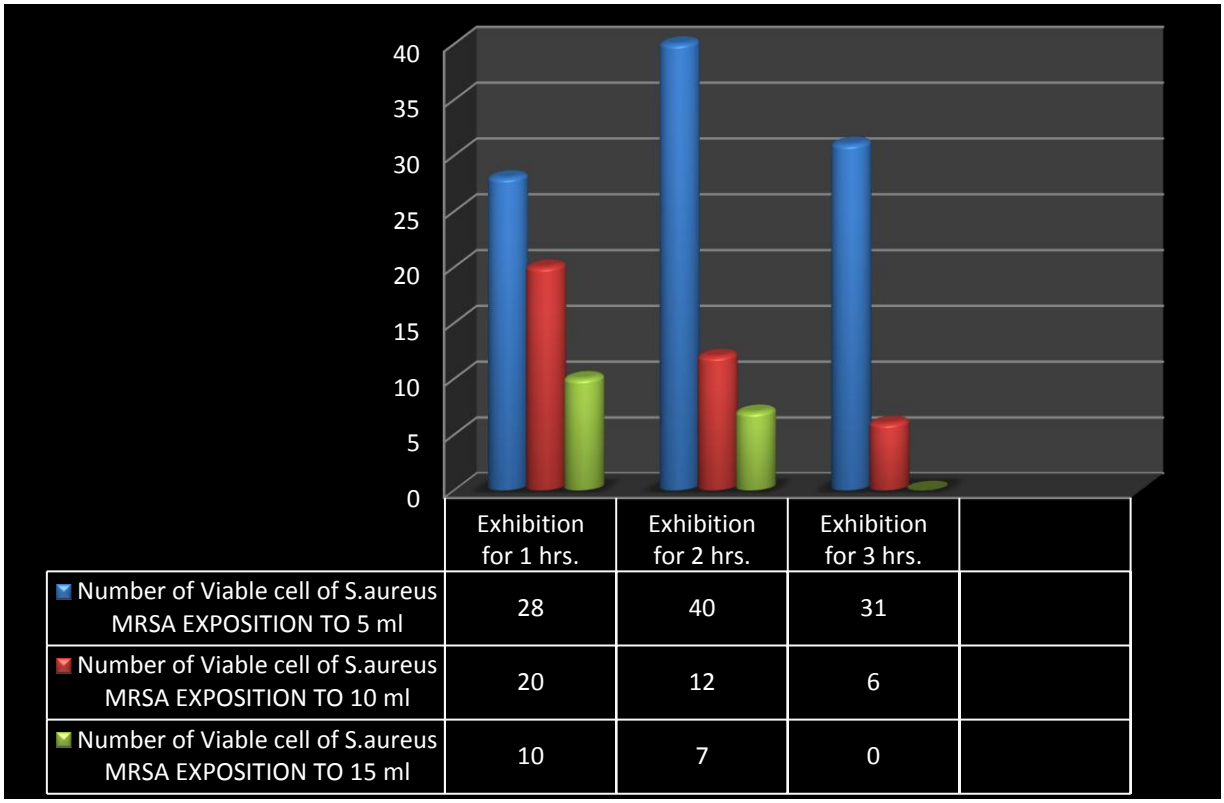
**Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors**

Results in figure(9) and figure(10) explain Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors that effect on morphological growth of MRSA *S.aureus* malignant tumors after exhibition for magnetized water.

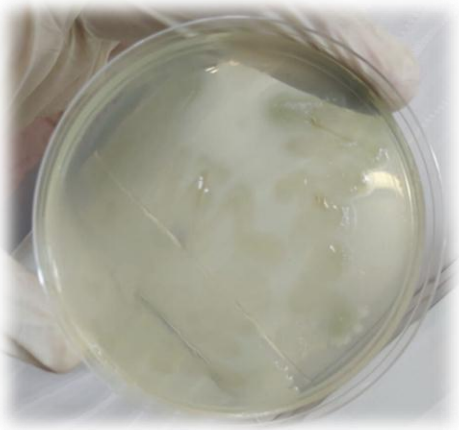
Number of MRSA *S.aureus* viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (28,20,10) colony respectively when exhibition for 1 hrs.

Number of MRSA S.aureus viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (40,12,7) colony respectively when exhibition for 2 hrs.

Number of MRSA *S.aureus* viable cells for exhibition this bacteria to magnetized water in order to killing bacteria when adding (5,10.15) ml in nutrient agar are (31,6,0) colony respectively when exhibition for 3 hrs, this results indicate efficiency magnetized water to killing MRSA *S.aureus* as shown in figure(9).



**Figure(9):Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors**



**Figure(10):Leverage Magnetized water on growth Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors when adding magnetic water with 5 ml for 1 hrs. with viability 28 colony.**

**Statistical analysis :**

Results of Statistical Analysis System- SAS program approved significant.

**Conclusions**

**1**-There are high number of *MRSA S.aureus* resistance for antibiotics isolated from malignant tumors.

**2-** There are isolates resistance for Macrolide-Lincosamide Streptogramine B (MLSB) MRSA *S.aureus* isolated from malignant tumors(cancers) when done test for resistance of Erythromycin and Clindamycine antimicrobial agents together.

3- Leverage Magnetized water on Methicillin Resistance *Staphylococcus aureus* (MRSA) isolated from malignant tumors for killing this bacteria with different volume of magnetized water that exposure to different time for Magnetic field.

**Refrences**

1-**Stevens**, D. (2007) . Genetics of MRSA: The United States and Worldwide. MRSA. InformaHealthcare, New York. In : J.A. Weigelt (ed.): 31 -41.

2-**Venkatesh**,V.N.; Shwetha,D.C.; Ravish Kumar,M.; Sudhindra,K.S. and Srinivasa,S. (2014). Study of antibiotic susceptibility pattern of methicillin resistant *Staphylococcus aureus* at tertiary care unit hospital in South India. *J.of Biomedical and Pharmaceutical Research.* 3(2) .25-28.

**3-Chen,**L.H.; Xiong, Z.H.; Sun, L.L.; Yang, J, and Jin,Q.( 2012). VFDB update: toward the genetic diversity and molecular evolution of bacterial virulence factors. *Nucleic Acids Res.* 40(Database issue):D641-D645.

**4-Patrick**,M.; Rosental, K. S. and Pfaller, M.A.(2009). Chapters 2,3,16,17 in Medical Microbiology, 6th edition by. Mosby Inc.

**5-Abbas**, H.A.;El-Masry, E.M.; Shaker, G.H.; Mohsen, I. (2013).Bacteriological etiological and antimicrobial resistance of burn wound infections in a burn unit in hehia general hospital. *International J. of Biological & Pharmaceutical Research.*4(12): 1251-1255.

**6-** Lim, T.T.; Coombs, G.W. and Grubb,W.B.(2002). Genetic organization of mecA and mecA-regulatory genes in epidemic methicillin-resistant *Staphylococcus aureus* from Australia and England. *Journal of Antimicrobial Chemotherapy*.50: 819–824.

**7- Chambers**, H.F.(2005). Community-associated MRSA-resistance and virulence converge. *N. Engl. J. Med*. 07;352(14):1485-7.

**8-Johnson,** M; (2001). "Catalase Production". Biochemical Tests. Mesa Community College.

**9-Sedighi**, I; Mashouf, R.Y.; Pak, N.; Mohammad Ali Seif Rabiee, M. A. S. (2009). DTest Method for Detection of Inducible Clindamycin Resistance in *Staphylococcus aureus. Iran J Pediatr*. Vol 19 (No 3), Pp:293-297.

**10-Stover**,C.K.; X.Q.Pham ,A.L. Erwin ,S.D. Mizoguchi ,P. Warrener and M.J.Hickey (2000). Complete genome sequence of *Pseudomonas aeruginosa* PAO1 , *an opportunistic pathogen*. 406:959-964.

**11-Barefoot**,R. R. and C. S. Reich. (1992). The calcium factor: The scientific secret of health and youth. South eastern, PA: Triad Marketing; 5th edition.

**12-Collins** , M.D. and Lawson, P.A. (2000). The genus A biotrophia (Kawamura *et al*.) is not monophiletic: proposal of Granulicatella gen. nov., Granulicatella adiacens comb.nov., Granulicatella elegans comb. nov.and Granulicatella balaenopterae comb. nov. *Int. J. Syst. Evol. Microbiol*. ;50:365-369.

**13-Porta**,M. (2014) "A dictionary of epidemiology", 6th edn, New York: Oxford University Press. ISBN 9780199976737.

**14- Forbes**, B.A.; Sahm, D.F. and Weissfeld, A.S. (2007). Baily and Scott's Diagnostic Microbiology. 11th edition. Mosby, Inc. Baltimore, USA., 384-398.

**15-Holt**, J.G.; Krieg, N.R.; Sneath, P.H.A.; Staley, J.T. and William, S.T. (1994). Berge's Manual of Determinative Bacteriology. 9th. ed. Williams&Wilkins, USA . P.532-551.

**16- Biomeruex** corporation. (2010) . VITEK . USA .

**17- Carlton,** R.M.; Noordman, W.H.; Biswas, B.; de Meester, E.D. and Loessner, M.J.(2005). Bacteriophage P100 for control of Listeria monocytogenes in foods: genome sequence, bioinformatic analyses, oral toxicity study, and application. *Regul Toxicol Pharmacol* 43(3):301-12.

**18-Barros**, R.R; Carvalho , G.S; Peralta, J.M.; Facklam, R.R. and Teixeira, L.M. (2001). Phenotypic and Genotypic Characterization of Pediococcus Strains Isolated from Human Clinical Sources. *J. Clin. Microbiol*. 39:1241-1246.

**19-Chang**, Y.H.; Han, J.; Chun ,J.; Lee, K.C.; Rhee, M.S.; Kim, Y.B. and Bae, K.S. (2002). *Comamonas koreensis* sp.nov., a non-motile species from wetland in Woopo, Korea. *Int. J. Syst. Evol. Microbiol*., 52:377-318.

**20-Clinical** and Laboratory Standard Institute(CLSI).(2020).Analysis and presentation of cumulative antimicrobial susceptibility test data. 3rd ed. Approved guideline M39-A3. Wayne PA USA.

**21-Gopal**, T.; Nagarajan, V. and Elasri, M.O. (2015) . SATRAT: *Staphylococcus aureus* transcript regulatory network analysis tool. *PeerJ* 3:e717

**22-Harley**, J.P. and Prescott, L.M. ( 2002) . Laboratory Exercises in Microbiology. 5th.ed. The McGraw-Hill Companies, Inc., New York.

**23-Atlas,** R.M; Brown, A.E & Parks, L.C. (1995). Laboratory manual of experimtal microbiology. 1st ed .Mosby,st.Louis U.S.A

**24-O'Neill**, G.L.; Murchan, S.; Gil-Setas, A. and Aucken, H.M.(2001) Identification and characterization of phage variants of a strain of epidemic methicillin-resistant *staphylococcus aureus* (EMRSA-15). *J Clin Microbiol* .39:1540-8.

**25-Brown**, D.F; David; Edwards; Peter, Hawkey, M; Donald Morrison, D; Geoffrey, L. Ridgway; Towner, K. J. and Michael, W. D. Wren.(2005) on behalf of the Joint Working Party of the British Society for Antimicrobial Chemotherapy, Hospital Infection Society and Infection Control Nurses Association Guidelines for the laboratory diagnosis and susceptibility testing of methicillin-resistant *Staphylococcus aureus* (MRSA). *Journal of Antimicrobial Chemotherapy* .56: 1000–1018.

**26-Bertelli**, C. and Greub, G. (2013). Rapid bacterial genome sequencing: methods and applications in clinical microbiology. *Clin Microbiol Infect*. .19(9):803-13.

**27-Okwu1**, M. U.; Mitsan, O. and Okeke, O.P.(2014). Prevalence and antimicrobial susceptibility profiles of community-acquired methicillin-resistant Staphylococcus aureus

(CA-MRSA) isolates among healthy individuals in Okada, South-South, Nigeria. *Pharmaceutical, Biological & Chemical Sciences J.* 1(1): 1 - 9.

**28-Alobaidy**, R.A.A.(2014). Molecular characterization of Panton Valentine leukocidine and Exfoliatine toxins in local isolates of Methicillin resistant *Staphylococcus aureus.* Thesis. PHD.AL-Mustansyriah University, College of Science, life of Science department.

**29-Al-azawi**, I.H.S.(2013). Antibiotic Susceptibility Pattern And MecA Gene Detection In Methicillin Resistance *Staphylococcus aureus* (MRSA) Isolated From Burn And Wound In Al-Diwaniya City. *J. of Babylon University/Pure and Applied Sciences.* 21(3).

**30-Abdulrazaq**, R.A.; AL-Marjani, M. F. and Othman, S. H.(2014) Prevalence of genes encoding Exfoliatin toxin A and Panton-Valentine Leukocidin among Methicillin resistant *Staphylococcus aureus* in Baghdad. *Int.J.Curr.Microbiol.App.Sci.* 3(6): 595-600.

**31-Al-Hassnawi**, H.H.; Al-Charrakh, A.H. and Al-Khafaj, J. K.(2012) Antibiotic Resistance Patterns of Community Acquired Methicillin Resistance *Staphylococcus aureus* (CA-MRSA) in Al-Hilla/ Iraq. *Kerbala J. of Pharmaceutical Sciences*. 4.

**32-Al-Geobory**, H. A. (2011). Comparative study between Methicillin resistant *Staphylococcus aureus* (MRSA) and Methicillin sensitive *Staphylococcus aureus* (MSSA), and detect the antimicrobial effects of some plant extracts on them. Msc. Thesis. College of Science/ Baghdad University. Iraq.

**33-Seif**, N.; Kahani, N.; Askari, E.; Mahdipour, S. and Naderi, N.M.(2012) Inducible clindamycin resistance in *Staphylococcus aureus* isolates recovered from Mashhad, Iran. *Iran J Microbiol* 2012; 4:82-86

**34-Holde**, M. T; Hsu, L.; Kurt, K.; Weinert, L.A.; Mather, A. E.; Harrism, S.R.; Strommenger, B.; Layer, F.; Witte, W.; de Lencastre, H.; Robert Skov, R.; Westh, H.; Helena, Z.; ˇkova´, E.; Coombs, G.; Angela, M. Kearns, A. M.; Robert, L.R.; Hill; Edgeworth, J.; Gould, I.; Vanya Gant, V.; Cooke, J.; Edwards, G. F.; McAdam, P. R.; Templeton, K. E.;

McCann, A.; Zhou, Z.; Castillo-Ramı´rez, S.; Feil, E. J.; Hudson, L.O.; Enright, M. C.; Balloux, F.; Aanensen, D.M.; Spratt, B. G.; Fitzgerald, J.R., ; Parkhill, J.; Achtman, M.; Bentley, S. D. and Nu¨be,U.(2013).A genomic portrait of the emergence, evolution, and global spread of a methicillin resistant *Staphylococcus aureus* pandemic23:653–664 _ 2013, Published by Cold Spring Harbor Laboratory Press; ISSN 1088-9051/13

**35- Bottega**,A.; Rodrigues, M. D.; Carvalhol, F.A.; Wagner, T.F.; Leal,I. A.; dos Santos, S.O.; Rampelotto, R.F. and Hörner,R..(2014). Evaluation of constitutive and inducible resistance to clindamycin in clinical samples of *Staphylococcus aureus* from a tertiary hospitalRevista da Sociedade Brasileira de Medicina Tropical. 47(5):589-592.

**36-Al-kadmy**, I.(2013) A Genetic study to differential HA/CA MRSA isolated from clinical cases in Iraq hospitals. *Mintage journal of Pharmaceutical & Medical Sciences:*57-62.

**37-Lyall**, K. D. S.; Gupta, V. and Chhina, D.(2013). Inducible clindamycin resistance among clinical isolates of *Staphylococcus aureus*. *Journal of Mahatma Gandhi Institute of Medical Sciences* . 18(2).

**38-Stefanie**, H.e. & Gallert, C.(2014). Demonstration of *Staphylococci* with inducible macrolide–lincosamide–streptogramin B (MLSB) resistance in sewage and river water and of the capacity of anhydroerythromycin to induce MLSB. *FEMS Microbiol Ecol* .88.48–59.

**39-Witte** W, Altiner A & Altmann D. (2011) GERMAP 2010 – Antibiotika-Resistenz und – Verbrauch. Bericht €uber den Antibiotikaverbrauch und die Verbreitung von Antibiotikaresistenzen in der Human- und Veterin€armedizin in Deutschland. Antiinfectives Intelligence-Gesellschaft f€ur klinisch-mikrobiologische Forschung und KommunikationmbH, Rheinbach, Germany.

**40-Zmantar**, T.; Kouidhi, B.; Miladi, H. and Bakhrouf, A.(2011). Detection of macrolide and disinfectant resistance genes in clinical *Staphylococcus aureus* and coagulase-negative *staphylococci*. BMC Res Notes. 4:453.

**41-Martineau**, F.; Picard, F.J.; Lansac, N.; Ménard, C.; Roy, P.H.;Ouellette, M. & Bergeron, M.G. (2000). Correlation between the Resistance Genotype Determined by Multiplex PCR Assays and the Antibiotic Susceptibility Patterns of *Staphylococcus aureus* and *Staphylococcus epidermidis. J. Antimicrob. Agents Chemother.* 44(2):231–238.