

## Determination the Effect of Preservative Food on Staphylococcus aureus

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### Abstract

**Objective:** to detect the effect of sodium meta bisulphite on *S.aureus*, conducted at El.Neelain University, Faculty of medical laboratory sciences, and department of Microbiology.

**Method:** A total number of ten strains of *S.aureus* were isolated and each strain was diluted in different concentrations of sodium Meta bisulphate (food preservative) to determine the minimum inhibition concentration for *S.aureus*.

**Result:** The result showed that *S.aureus* can grow in a concentration that is less than 0.01% of sodium Meta bisulphate.

**Conclusion:** Sodium meta bisulphite effective against staphylococcus aureus bacteria. The (0.01%) concentration consider the higher concentration occur growth of bacteria.

**Key words:** Sodium Meta Bisulphite, *S.aureus*, food preservatives

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### Introduction

Food preservation is the process of treating and handling food to stop or slow down spoilage (loss of quality, edibility or nutritional value) and thus allow for longer storage.

Preservation usually involves preventing the growth of bacteria, yeasts, fungi, and other microorganisms [although some methods work by introducing benign bacteria, or fungi to the food], as well as retarding the oxidation of fats which cause rancidity. Food preservation can also include processes which inhibit visual deterioration in apples after they are cut. Many processes designed to preserve food will involve a number of food preservation methods. Preserving fruit, by turning it into jam, for example, involves boiling [to reduce the fruit's moisture content and to kill bacteria, yeasts, etc], sugaring [to prevent their re-growth] and sealing within an airtight jar [to prevent recontamination]. There are many traditional methods of preserving food that limit the energy inputs and reduce carbon footprint<sup>[1]</sup>.

Maintaining or nutritional value, texture and flavor is an important aspect of food preservation, although, historically, some methods drastically altered the character of the food being preserving. In many cases these changes have now come to be seen as desirable qualities – cheese, yoghurt and pickled onions being common example<sup>[1]</sup>.

### **Types of preservatives:**

**There are many kind of preservative this include:**

Antimicrobials: they prevent the growth of yeasts, molds and bacteria. For example sodium Antioxidants, which prevent nitrate in sausage and ham or sulphur dioxide in wine and beer. food items from changing colour or getting Black spots, like tocopherols in fat for cakes, ascorbyl palmitate in margarine. And sometime both kinds are also used in the same food product<sup>[2]</sup>.

**There are other kinds as will like:**

Thickening and stabilizing agents which are added to give a certain consistency and texture to food such as pectin in jam, locust bean gum in ice cream to prevent formation of ice crystals.

Emulsifiers that are used to manufacture foods containing fats and water such as lecithin in chocolates, lactic acid esters of mono and diglycerides in many bakery produce. Then there are And colours that are added as extras bflavouring agents in soft drinks, ice creams and sauces<sup>[2]</sup>.to both impart colour to food or compensate for lost colour due to processing. Such as caramel colour in soft drinks, carotenes in cheese and margarine.

Even to replace sugar in low calorie foods, one adds sweeteners that fall under the preservative range<sup>[2]</sup>.

### **Sodium Meta Bisulphite:**

Sodium meta bisulfite or sodium pyrosulfite is an inorganic compound of chemical formula  $\text{Na}_2\text{S}_2\text{O}_5$ . The substance is sometimes referred to as disodium (metabisulfite, etc.). It is used as a disinfectant, antioxidant and preservative agent<sup>[3]</sup>.

Sodium meta bisulphite is used as a preservative in foods such as baked goods, jams, wines, dried fruit and many sauces. Sulphite can be added before or after cooking. Sodium metabisulphite is also used as an antibacterial agent in wine, although some manufacturers have begun using potassium metabisulphite instead. Some winemakers have claimed that sodium metabisulphite increases the sodium content of wine <sup>[3]</sup>.

### ***S.aureus* morphology and pathogenesis:**

*S.aureus* is approximately 1Mm in diameter, and divides to form the clusters characteristic of the genus. In liquid media, singles, pairs and short chains are also seen. On blood or nutrient agar, incubated in air. For 18/24h at the optimal growth temperature of 37c .colonies are smooth, low convex, glistening. Sometime surrounded by a narrow zone of haemolysis on blood agar depending on strain. Occasional strains are capsulated <sup>[4]</sup>.

Focal suppuration [abscess] is typical of staphylococci-cal infection. From any one focus, organisms may spread via the lymphatics and bloodstream to other parts of the body. Suppuration within veins, associated with thrombosis, is a common feature of such dissemination. In osteomyelitis, the primary focus of *S. aureus* growth is typically in a terminal blood vessel of the metaphysis of a long bone, leading to necrosis of bone and chronic suppuration. *S. aureus* may cause pneumonia, meningitis, empyema, endocarditic, or sepsis with suppuration in any organ. Staphylococci also cause disease through the elaboration of toxin, without apparent invasive infection. Bilioid exfoliation, the scalded skin syndrome, is caused by the production of Exfoliative toxins. Toxic shock syndrome is associated with TSST-1 <sup>[5]</sup>.

A previous study carried out by Yammani M.I (2008) IN Jordan University, reported that sodium Meta bisulphite had the inhibitory effect at 0.01% content. The investigators prepared hummus and divided the product into several portions. To each portion they added: potassium sorbate, sodium benzoate or sodium Meta bisulfate at four different concentrations, 0.05%, 0.01%, 0.005% and 0.0025% (w/w). Control samples that did not have any preservatives were also tested.

The samples were mixed well and divided into three portions. The portions were stored at 5, 10 and 15 C to determine how each portion's shelf life might differ. Samples were withdrawn daily and analyzed for total bacterial population <sup>[6]</sup>.

This study is aimed to determine the effect of sodium meta bisulphite on *Staphylococcus aureus*.

### **Material and Methods**

This study dealing with qualitative experimental approach, conducted in 10 strains of *staphylococcus aureus* at Microbiology lab, AL-Neelain University, Faculty of Medical laboratory sciences.

**Study procedure:****Materials:**

10 strains of staphylococcus aureus bacteria, Sodium meta bisulphite, Mannitol salt agar media, Nutrient agar media, Sterile D.W, Sterile test tube, Normal saline, Micro pipette, Sterile Petri-dish, Autoclave, barium chloride powder, Incubator and Sterile loop.

**Methodology:**

- 10 strains of Staphylococcus Inoculated in Mannitol salt agar and incubated overnight.
- The different 10 strains of Staphylococcus aureus Sub-cultured from Mannitol salt agar medium to nutrient agar by divide the plate into four parts and then incubated in incubator at 37°C overnight.
- Sodium meta bisulphite solution Prepared by dissolve 0.01g of powder in 100 ml of sterile D.W then 1ml taken from this solution and serial dilutions of sodium meta bisulphate in 4 test tubes for each strain contain 1 ml of normal saline (0.01%, 0.005%, 0.0025% and 0.00125%).
- Bacterial suspension that compare with standard barium chloride was prepared.
- Into each tube constant volume (50µl) was added from bacterial suspension.
- Incubated in incubator at 37°C overnight.
- Serial dilution mentioned above was cultured in Mannitol salt agar medium and incubated in incubator at 37°C overnight.
- Then the colony is counted.

**Ethical consideration:** Approval was taken from faculty management.

**Results**

This study was carried out to assess the effect of sodium meta bisulphite on 10 isolate of staphylococcus aureus strain by use of different concentration of sodium meta bisulphite (0.01%, 0.005%, 0.0025%, 0.00125%).

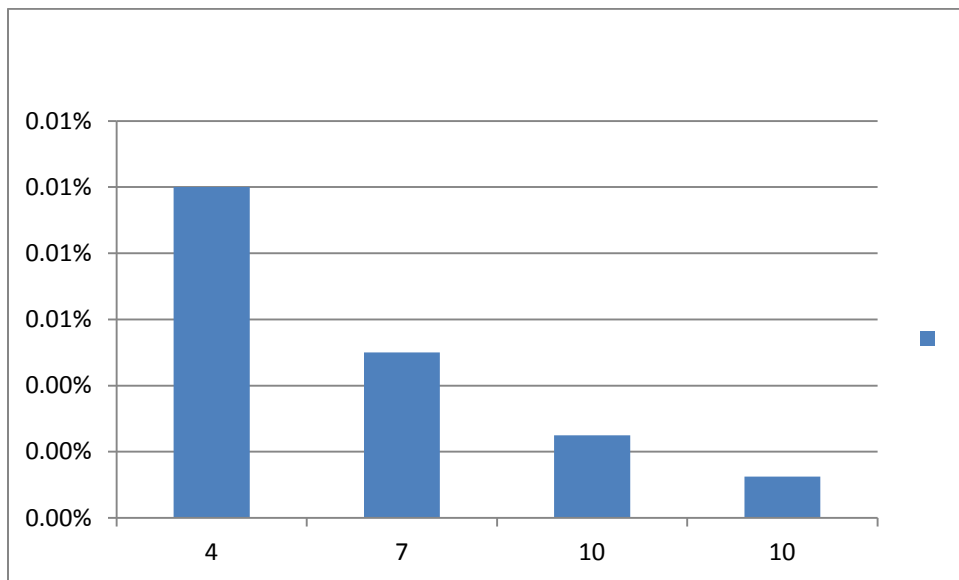
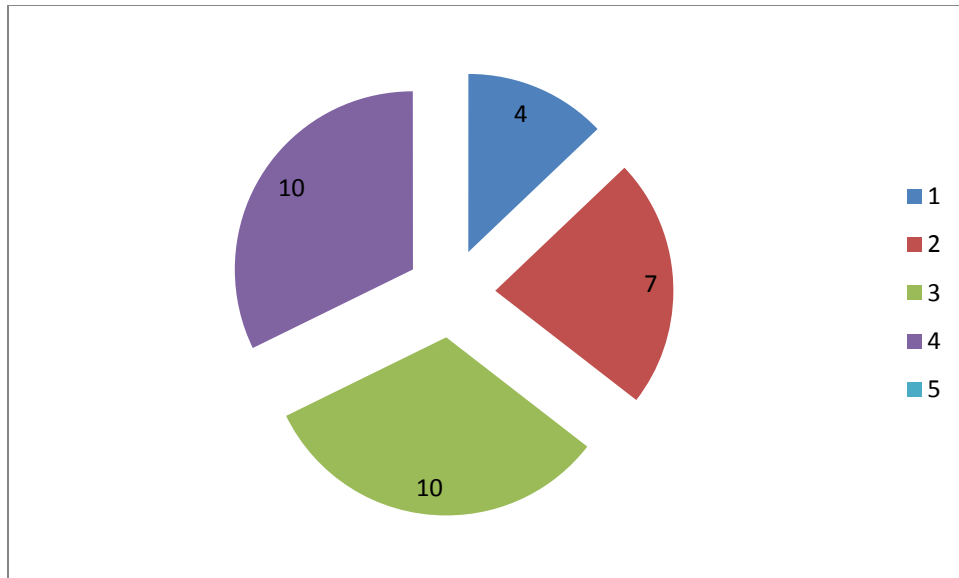
10 strain of staphylococcus aureus were included in this study , [ A ] strain showed (0) colonies on concentration (0.01%), (0) colonies on concentration (0.005%), (3) colonies on concentration (0.0025%), and (10) colonies on concentration (0.00125%). [B] strain showed (0) colonies on concentration (0.01%), (4) colonies on concentration (0.005%), (9) colonies on concentration (0.0025%), and (12) colonies on concentration (0.00125%). [C] strain showed (0) colonies on concentration (0.01%), (0) colonies on concentration (0.005%), (2) colonies on

concentration (0.0025%), and (5) colonies on concentration (0.00125%). [D] Strain showed (0) colonies on concentration (0.01%), (1) colonies on concentration (0.005%), (10) colonies on concentration (0.0025%), and (32) colonies on concentration (0.00125%). [H] strain showed (110) colonies on concentration (0.01%), (115) colonies on concentration (0.005%), (145) colonies on concentration (0.0025%), and (161) colonies on concentration (0.00125%). [K] strain showed (24) colonies on concentration (0.01%), (46) colonies on concentration (0.005%), (145) colonies on concentration (0.0025%), and (200) colonies on concentration (0.00125%). [J] strain showed (11) colonies on concentration (0.01%), (85) colonies on concentration (0.005%), (89) colonies on concentration (0.0025%), and (155) colonies on concentration (0.00125%). [ATO] strain showed (0) colonies on concentration (0.01%), (0) colonies on concentration (0.005%), (1) colonies on concentration (0.0025%), and (3) colonies on concentration (0.00125%). [3224] strain showed (6) colonies on concentration (0.01%), (32) colonies on concentration (0.005%), (55) colonies on concentration (0.0025%), and (74) colonies on concentration (0.00125%). [Mehad] strain showed (0) colonies on concentration (0.0025%), and (80) colonies on concentration (0.00125%).

In table (1-1) showed on the higher concentration (0.01%), (4) strains were grown (H,K,J,3224). In (0.005%) concentration, (7) strains were grown (B,H,D,K,J,3224,Mehad). In (0.0025%) concentration, (10) strains were grown (A, B, C, D, H, J, K, 3224, ATO, Mehad). And in (0.00125%) concentration, (10) strains were grown.

**Table1: Effect of sodium meta bisulphite against different strains of Staphylococcus aureus**

Concentration of sodium meta bisulphite	No of grown strain
0.01%	4
0.005%	7
0.0025%	10
0.00125%	10



## Discussion

Food preservation is the process of treating and handling food to stop or slow down spoilage (loss of quality, edibility or nutritional value) and thus allow for longer storage.

Preservation usually involves preventing the growth of bacteria, yeasts, fungi, and other micro-organisms [although some methods work by introducing benign bacteria, or fungi to the food], as well as retarding the oxidation of fats which cause rancidity.

Sodium meta bisulphite is used as a preservative in foods such as baked goods, jams, wines, dried fruit and many sauces. Sulphite can be added before or after cooking.

Used different concentration of sodium meta bisulphite (0.01%, 0.005%, 0.0025%, 0.00125%), and study the affected of this different concentration on the growth of 10 strain of *Staphylococcus aureus* (Table1).

This finding was similar to that reported by Yammani (2008) In Jordan university, who reported that used different concentration of sodium meta bisulphite (0.05%, 0.01%, 0.005%, 0.0025%) can affected on the bacteria.

This result is agree with most study that found at higher concentration (0.01%) the bacteria will grow and above it well not grow.

## Conclusion

- Sodium meta bisulphite effective against *staphylococcus aureus* bacteria.
- The (0.01%) concentration concenter the higher concentration occur growth of bacteria.

## Recommendation

- It is very important to promote studies that search on the effect of sodium meta bisulphite against pathogenic micro-organism in certain amount of concentration.
- Should be used the preservative food by suitable concentration to avoid growth of pathogenic bacteria.

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## Referances

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