Study of the Effect of Pentostam on Some Bacterial Species Isolated from Skin Infections

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Abstract:
In the current study, Pentostam treatment, used to treat cutaneous leishmaniasis, was used against some types of bacteria isolated from skin infections (Klebsiella and Staphylococcus) to determine the extent of the bacteria's resistance to this treatment. The results showed that staph bacteria were more sensitive than Klebsiella bacteria.

On the Mueller-Hinton medium and measuring the inhibition zone, some types of vitamins were used in this study, such as vitamin C and vitamin B, without and with Pentostam, to determine their effect in increasing or decreasing the effectiveness of Albutostam against bacteria. The findings demonstrated that vitamin B did not affect the bacteria's sensitivity to vitamin C alone. However, when they were combined with pentostam treatment, the results showed that vitamin B had the effect of reducing the effectiveness of pentostam against staph. Bacteria and klebsiella bacteria, while vitamin C was shown to increase the effect of pentostam treatment on Both types of bacteria.

Keywords: pentostam, sodium streptoluconate, Kebsiella, staphylococcus, vitamin.

Introduction
Petnostam is considered one of the most effective treatments against parasitic skin infections resulting from the Leishmania parasite (Sundar, & Chakravarty, 2010), which may have effects against some types of bacteria that infect humans (Oryan, & Bahrami, 2018). Pentostam has another name, which is the scientific name: Sodium Stibugluconate, and the basis of its action depends on the effect on. Enzymes break down sugar inside the parasite, which affects its metabolic processes and thus can be eliminated. (Croft, & Olliaro, 2011) This treatment may have side effects for edematous patients using it, as it depends on their health condition and the dose used.

Bacteria are considered tiny microscopic organisms of diverse shapes that spread very widely and cause different types of bacterial infections. They are divided into two types based on the gram stain, where they are either negative or positive for the gram stain depending on some structural differences in the outer walls (Beveridge, 2001).

Staphylococcus is a gram-positive bacterium that is facultatively anaerobic (Costa, et al., 2013). This bacterium is one of the types that cause bacterial skin infections. Klebsiella is a gram-negative bacterium that is non-motile and non-aerobic (Todar, 2004). These bacteria have several types that cause bacterial infections in humans. Their bacillary shape characterizes them, they have mucous-like colonies (Mandell, 2009), and they cause some skin and gastrointestinal infections (Tzouvelekis, et al., 2012).
Vitamin C is considered one of the most beneficial and strengthening vitamins for the skin. It is basically ascorbic acid. Vitamin C helps the skin resist various skin injuries and infections and restores it to its ideal shape. It also helps strengthen the skin's defenses against ultraviolet rays. It also helps in healing wounds, stimulating collagen, and rebuilding tissues (Telang, 2013).

Vitamin B is also one of the essentials that the human body needs, as it helps boost immunity, strengthen bones, and increase enzymatic activity, as well as increase the growth of different parts of the body (Fratoni, & Brandi, 2015).

Materials and Methods

Sample Collection

In the current study, two types of dye-positive Staphylococcus aureus bacteria were used. Gram and Klebsiella were negative for Gram stain, and the sample was isolated in Al-Hussein Teaching Hospital in the city of Nasiriya, southern Iraq.

Pentostam (P) treatment was used (100 mg of pentavalent antimony per mL). Centurion (INDIA) Alone on two types of bacteria, then divided into two groups. The first was to mix Pentostam with vitamin C (P+C), while the second group was with vitamin B (P+B). (Dissolve 100 mg of vitamin C in 1 ml of water. Nature-made USP (USA).

The vitamins were also tested on two types of bacteria to determine their effects.

The Culture Medium

Various media were used to diagnose the samples, including blood medium and McConkey agar. Gram stain, microscopic examination, and biochemical tests were also used.

The samples were grown on Neutron Akar medium to activate them in the incubator at 37 degrees for 24 hours, then spread on Muller-Hinten Akar medium, which is considered the ideal medium for conducting allergy testing and is approved by the FDA (Al-Gorani, et al., 2024).

Antibiotic Susceptibility Test

Pentostam was tested on bacteria grown on Muller-Hintin Agar medium using the disc diffusion method (Bauer, et al., 1966).

The plates were left in the incubator for 24 hours, after which the results were read by measuring the areas of inhibition.

Results and Discussion

The results indicated that Pentostam exhibited the highest effectiveness against both Staphylococcus aureus and Klebsiella, with inhibition zones measuring 10.5 mm and 7 mm, as shown in Table 1 and Figure 1.
This dissimilarity may be due to. Sodium stibogluconate, which contains the element antimony, has an antimicrobial effect (Liu, Yang, & Zhong, 2018). Vitamin C showed moderate effectiveness, with inhibition zones of 6 mm against Staphylococcus aureus and 5 mm against Klebsiella. On the other hand, Vitamin B did not show any significant effect on either Staphylococcus aureus or Klebsiella.

Vitamin C could even effectively counteract biofilm formation by methicillin-resistant S. aureus. Another study showed that vitamin C inhibited the growth of Staphylococcus aureus bacteria more than P. aeruginosa and E. coli (Mousavi, Bereswill, & Heimesaat, 2019).

While Al-Talib, et al. (2013) showed in 2013 that ascorbic acid is an antimicrobial agent. These results indicate that the combination of pentostam with vitamin C is effective against both Staphylococcus aureus 10mm and Klebsiella 7.5 mm, while the combination treatment with vitamin B shows less effectiveness against bacterial species 9 mm and 2 mm.

We notice an increase in the effectiveness of pentostam and vitamin C treatment on bacterial species because vitamin C is considered an antimicrobial agent and helps eliminate staph and klebsiella (Isela, et al., 2013; El-Gebaly, et al., 2012). When using vitamin B against bacterial species, it was not affected, as it is considered ineffective (Yoshii, et al., 2019). Instead, some bacteria can produce these types of vitamins, including vitamin B (Al Ali, et al., 2023; Barrak, et al., 2023; Riyas, et al., 2024). However, when using the vitamin with pentostam, it helped significantly reduce the effect of treatment on bacteria, especially in dye-negative bacteria (Barrak, Al-Aidy, & Bonyadi, 2024).
Conclusions

The study revealed that pentostam treatment affects bacterial species, as it has a more significant effect on Gram-positive bacteria than Gram-negative bacteria. Vitamin C also had a noticeable effect on bacterial species, while Vitamin B had no effect.

As for the combined effect of vitamins and treatments,

We noticed that vitamin C helps increase the effectiveness of treatment against bacteria, while vitamin B reduces its effectiveness, especially in gram-negative bacteria.

References


