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The Antibacterial Properties of Extracts from *Agaricus bisporus* and their Combined Effects with the Antistaphylococcal Medication AFN-1252

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Introduction

The increasing prevalence of antibiotic-resistant bacteria poses a significant challenge to public health. Staphylococcus aureus, particularly Methicillin-Resistant Staphylococcus Aureus (MRSA), is a major cause of hospital and community-acquired infections. The search for new antibacterial agents and the enhancement of existing antibiotics are critical steps in combating these resistant strains. One promising area of research is the use of natural products, such as extracts from medicinal plants and fungi, in conjunction with conventional antibiotics to enhance their efficacy. *A. bisporus*, commonly known as the white button mushroom, is one of the most widely consumed edible mushrooms globally. It is renowned not only for its nutritional value but also for its medicinal properties. Recent studies have demonstrated that extracts from *A. bisporus* exhibit various bioactive properties, including antibacterial activity. This paper explores the antibacterial properties of *A. bisporus* extracts and investigates their combined effects with AFN-1252, an antistaphylococcal medication specifically targeting Staphylococcus aureus. *A. bisporus* contains a variety of bioactive compounds, including polysaccharides, lectins and phenolic compounds, which have been shown to exhibit antimicrobial activities. The mechanism by which these compounds exert their antibacterial effects varies, including disrupting bacterial cell walls, inhibiting protein synthesis, and interfering with nucleic acid synthesis [1].

Description

Polysaccharides are one of the major bioactive components in *A. bisporus*. These complex carbohydrates have been shown to enhance the immune response and exhibit direct antimicrobial properties. Studies suggest that polysaccharides from *A. bisporus* can induce the production of cytokines and other immune modulators that enhance the body's ability to fight bacterial infections. Lectins are carbohydrate-binding proteins that play a role in the immune response and have been shown to possess antibacterial properties. *A. bisporus* lectins can bind to specific carbohydrate structures on the surface of bacterial cells, leading to agglutination and inhibition of bacterial growth. This binding can also trigger a cascade of immune responses that further help to eliminate bacterial infections. Phenolic compounds are well-known for their antioxidant properties, but they also exhibit significant antibacterial activity. These compounds can disrupt bacterial cell membranes, leading to cell lysis and death. Additionally, phenolics can interfere with bacterial enzymes and inhibit the synthesis of essential bacterial proteins and nucleic acids [2].

In a study examining the antibacterial activity of *A. bisporus* extracts, researchers found that the extracts inhibited the growth of several bacterial strains, including Staphylococcus aureus. The study utilized disk diffusion and broth microdilution methods to assess the antibacterial activity. Results indicated that the extracts had a broad spectrum of activity, with Minimum Inhibitory Concentrations (MICs) comparable to those of standard antibiotics. Another study investigated the combined effects of *A. bisporus* extracts and AFN-1252 against MRSA. The researchers conducted checkerboard assays to evaluate the synergy between the extracts and the antibiotic [3]. The results demonstrated a significant reduction in the MIC of AFN-1252 when used in combination with the extracts, indicating a synergistic interaction. Time-kill assays further confirmed that the combination treatment resulted in a more rapid and complete bacterial eradication compared to either agent alone. *In vivo* studies have also provided evidence for the enhanced antibacterial effects of combining *A. bisporus* extracts with AFN-1252. Animal models of MRSA infection have been used to evaluate the efficacy of the combination treatment. In these studies, animals treated with the combination therapy showed significantly lower bacterial loads in infected tissues and improved survival rates compared to those treated with either agent alone. Histopathological analysis revealed reduced tissue damage and inflammation in the combination treatment group, suggesting an enhanced resolution of the infection [4].

The combination of *A. bisporus* extracts and AFN-1252 holds promise for the treatment of staphylococcal infections, particularly those caused by MRSA. This combination therapy could be especially valuable in settings where antibiotic resistance is prevalent and conventional treatments are ineffective. For skin and soft tissue infections caused by Staphylococcus aureus, topical formulations combining *A. bisporus* extracts and AFN-1252 could provide a potent treatment option. The extracts' ability to disrupt biofilms and enhance immune response, combined with the targeted action of AFN-1252, could lead to improved outcomes for patients with chronic or resistant infections. For systemic infections, oral or intravenous administration of *A. bisporus* extracts alongside AFN-1252 could enhance the overall antibacterial efficacy and reduce the risk of resistance development. The immune-boosting properties of the extracts could also help to mitigate the immunosuppressive effects often associated with severe infections [5].

Conclusion

The antibacterial properties of *A. bisporus* extracts and their combined effects with the ant staphylococcal medication AFN-1252 offer a promising approach to combating Staphylococcus aureus infections, including those caused by MRSA. The diverse mechanisms of action of the extracts, including membrane disruption, immune enhancement and enzyme inhibition, complement the targeted action of AFN-1252, resulting in synergistic antibacterial effects. Experimental evidence from in vitro and in vivo studies supports the efficacy of this combination therapy, demonstrating enhanced bacterial clearance and improved clinical outcomes. The potential clinical applications of this combination therapy, particularly for resistant infections, warrant further investigation.

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Conflict of Interest

None.

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