# STUDY OF THE ANTIMICROBIAL ACTIVITY OF CHEMOTHERAPEUTIC AGENTS AGAINST MICROORGANISMS IN WOMEN WITH BREAST CANCER

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***Abstract:*** *Breast cancer remains one of the most prevalent oncological diseases worldwide and represents a major cause of morbidity and mortality among women. Modern treatment strategies, particularly chemotherapy, have significantly improved survival rates [1]. However, these treatments are often associated with immunosuppression, increasing the risk of infectious complications [3]. The interaction between chemotherapeutic agents and microorganisms has become an important area of research [5]. This review analyzes the antimicrobial activity of commonly used chemotherapeutic drugs against microorganisms isolated from the genital tract of women with breast cancer.*

***Keywords****: breast cancer, microorganisms, chemotherapy, antimicrobial activity, doxorubicin, in vitro.*

## Introduction

Breast cancer is one of the most common malignant diseases affecting women worldwide and remains a leading cause of cancer-related morbidity and mortality [1]. According to global epidemiological data, the incidence of breast cancer continues to rise, particularly in developing countries, due to demographic changes, lifestyle factors, and improved diagnostic capabilities [1]. Despite significant advances in early detection and treatment, breast cancer continues to pose serious clinical challenges.

Modern oncological treatment strategies, including chemotherapy, radiotherapy, and targeted therapies, have significantly improved survival rates and quality of life for patients [5]. Among these, chemotherapy remains one of the most widely used treatment modalities. However, chemotherapeutic agents are associated with a range of adverse effects, one of the most important being immunosuppression [3]. This condition significantly increases the risk of infectious complications, which are a major cause of morbidity and mortality in cancer patients [3,10].

Infectious complications in oncology patients are often caused by opportunistic microorganisms, including both Gram-positive and Gram-negative bacteria, as well as fungi [3]. The genital tract microbiota plays a crucial role in maintaining the physiological balance and protecting against pathogenic colonization. However, in women with breast cancer, especially those undergoing chemotherapy, this balance is frequently disrupted, leading to dysbiosis and increased susceptibility to infections.

Recent studies have highlighted the important role of microbiota in modulating the effectiveness and toxicity of anticancer therapies [5,8]. The interaction between chemotherapeutic agents and microorganisms is complex and bidirectional. On one hand, chemotherapy may alter microbial composition and reduce immune defenses. On the other hand, microorganisms can influence drug metabolism, efficacy, and toxicity through various biochemical mechanisms [9,10].

Particularly, some chemotherapeutic agents, such as doxorubicin, have been shown to possess intrinsic antimicrobial properties due to their ability to interfere with nucleic acid synthesis [6,7]. This raises important questions regarding their potential dual role in cancer treatment and infection control. However, the antimicrobial activity of many chemotherapeutic drugs remains insufficiently studied.

Given the high prevalence of infectious complications in cancer patients and the widespread use of chemotherapy, investigating the antimicrobial effects of these drugs on clinically relevant microorganisms is of significant scientific and practical importance. Understanding these interactions may contribute to the development of more effective therapeutic strategies, including optimized combination therapy with antimicrobial agents.

**Materials and Methods**

This study is based on the analysis of experimental data and published literature. The antimicrobial activity of chemotherapeutic agents such as doxorubicin, endoxan, docetaxel, and paclitaxel, as well as cefazolin, was evaluated in vitro.

Microorganisms isolated from the genital tract of women with breast cancer were cultured on Mueller–Hinton agar. The disk diffusion method was used to determine sensitivity, following standard microbiological protocols [2]. The plates were incubated at 37°C for 24–48 hours, and inhibition zones were measured in millimeters.

**Results and Discussion**

The findings demonstrate that chemotherapeutic agents exhibit varying degrees of antimicrobial activity. Doxorubicin showed the highest antimicrobial effect, inhibiting the growth of most microorganisms. This may be related to its mechanism of action involving interference with nucleic acid synthesis [6,7].

Docetaxel and paclitaxel demonstrated moderate antimicrobial activity, affecting certain strains such as Staphylococcus spp., Escherichia coli, and Enterococcus. Endoxan showed minimal antimicrobial activity.

Cefazolin exhibited strong antibacterial activity against most tested microorganisms, confirming its effectiveness as a broad-spectrum antibiotic [4].

Recent studies suggest that microbiota plays a crucial role in modulating chemotherapy outcomes and toxicity [5,8,9]. Additionally, microbial metabolism of chemotherapeutic drugs, such as doxorubicin, may influence drug efficacy and resistance [10].

These findings highlight the importance of considering microbial factors in cancer treatment. Combined therapy using antibiotics and chemotherapeutic agents may improve patient outcomes.

**Conclusion**

Chemotherapeutic agents demonstrate varying antimicrobial properties. Doxorubicin showed the most significant activity, while other drugs exhibited moderate or minimal effects. Understanding these interactions is essential for optimizing treatment strategies and reducing infectious complications in cancer patients.

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