Short Communication

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A possible Approach to Preventing Antibiotic Resistance

Gerd Helmecke*

Facharzt für Innere Medizin, Germany

***Corresponding author:** Gerd Helmecke, Facharzt für Innere Medizin, Germany

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ABSTRACT

Background: The global increase in antibiotic resistance poses a serious health problem. Improper or prolonged antibiotic therapy, especially in chronic infections, promotes the selection of resistant pathogens.

Objective: This study examines the extent to which targeted combination therapies of bactericidal and bacteriostatic substances, particularly those involving trimethoprim/sulfamethoxazole, can help prevent the development of resistance.

Methodology: Based on over four decades of clinical experience in the treatment of chronic infections, including osteomyelitis, bronchiectasis, and chronic pyelonephritis, a practice-oriented approach is described. An exemplary case report illustrates the effectiveness of long-term combination therapy in treatment- resistant osteomyelitis.

Results: The combined use of cephalosporins and trimethoprim/sulfamethoxazole stabilized chronic infection processes in complex cases without progression of the disease. At the same time, no resistance or secondary infections occurred in the patient environment.

Conclusion: Targeted combination therapy, especially using trimethoprim/sulfamethoxazole, can help reduce the development of resistance and lessen the environmental burden of resistance. Careful microbiological diagnosis and individualized therapy planning are essential for this.

Keywords: Antibiotic Resistance; Combination Therapy; Trimethoprim/Sulfamethoxazole; Long-Term Therapy; Infection Prophylaxis; Osteomyelitis

Introduction

The increase in antibiotic-resistant pathogens is one of the greatest challenges facing modern medicine (RKI [1,2]). In addition to global factors such as the excessive use of antibiotics in human and veterinary medicine, improper use in clinical practice also plays a decisive role. In particular, long-term, non-indicated antibiotic therapies contribute significantly to the development of resistance. These include, for example, unnecessarily prolonged treatment periods for diabetic gangrene or periodontal disease. The aim of this study is to show that the targeted combination of bactericidal and bacteriostatic substances can reduce or prevent the development of resistance.

Clinical Background

During my more than 40 years of medical practice in internal medicine, none of my patients suffered a fatal case of sepsis. I have treated numerous groups of chronically infected patients, including those with pre- and terminal renal failure, patients with bronchiectasis, transplant recipients, and patients with chronic gastroenterological and infectious diseases, including osteomyelitis. Since I took and interpreted several chest X-rays myself every day, pneumonia was one of the most common clinical pictures in my daily practice. The following observations are based on this extensive experience.

Pharmacological Principles

Antibiotics are only effective if they reach the site of infection in sufficient concentrations. Treatment is therefore limited in poorly perfused tissues. Nevertheless, longer treatment cycles are often necessary, for example in cases of immunosuppression, impaired cellular defense, or anatomical abnormalities such as bronchiectasis or chronic pyelonephritis. However, long-term therapies must be carefully considered and monitored to prevent the development of resistance. This requires a thorough understanding of the pharmacokinetic and pharmacodynamic properties of the active substances used.

Principles of Rational Antibiotic Therapy

Before starting any therapy, a comprehensive analysis of the clinical situation is essential. In the case of uncomplicated infections, such as community-acquired pneumonia, an empirical approach based on established experience can often be taken. More complex infections or those requiring long-term therapy, on the other hand, require targeted combination therapy. Microbiological diagnostics with pathogen and resistance determination are mandatory in this case. The selection of a suitable second antibiotic is particularly relevant in order to compensate for potential resistance developments. In my clinical practice, the combination of trimethoprim/sulfamethoxazole ("Bactrim forte") has proven to be extremely effective. Resistance development is extremely rare with sulfonamides; at the same time, the combination appears to be suitable for counteracting secondary resistance to primarily used substances.

Case Study

A 58-year-old male dialysis patient suffered from chronic osteomyelitis of the tibia following osteosynthesis. Despite two years of treatment at a university hospital, there was no improvement; on the contrary, multiple septic episodes occurred and radiological examination revealed almost complete lysis of the tibia. After the patient was transferred, an antibiogram was performed, which revealed sensitivity to a specific cephalosporin. Due to the history of septic episodes, combination therapy with the tested cephalosporin and trimethoprim/sulfamethoxazole was initiated (dose adjusted to the dialysis situation). Treatment was continued for two and a half years. During this time, the osteomyelitis remained stable and amputation was avoided.

Long-Term and Recurrence Prevention

In patients with chronic pyelonephritis, functional residual urine bladders, or bronchiectasis, it was found that after successful treatment of the acute infection, a once-weekly dose of trimethoprim/sulfamethoxazole over long periods of time was effective in preventing recurrence. It was noteworthy that in these cases, no development of resistance was observed in contact persons – neither in family members nor in the home environment.

Discussion

The present observations suggest that targeted combination therapy, particularly involving trimethoprim/sulfamethoxazole, can contribute to reducing the development of resistance. These results are consistent with current epidemiological findings, which show a close correlation between inappropriate antibiotic use and resistance rates (Noll, et al. [3,4]). At the same time, they illustrate that individual clinical experience and rational therapy planning remain indispensable for reducing resistance pressure and environmental contamination with resistant germs [5].

Conclusion

The choice of antibiotic should always be based on clinical experience and microbiological diagnostics. In complex cases, combining a primarily effective antibiotic with trimethoprim/sulfamethoxazole can help prevent the development of resistance while minimizing the environmental impact of resistant pathogens.

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Gerd Helmecke. Biomed J Sci & Tech Res

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