ZEOLITE: AN ALTERNATIVE SOLUTION FOR ANTIBIOTIC REMOVAL FROM WASTEWATER

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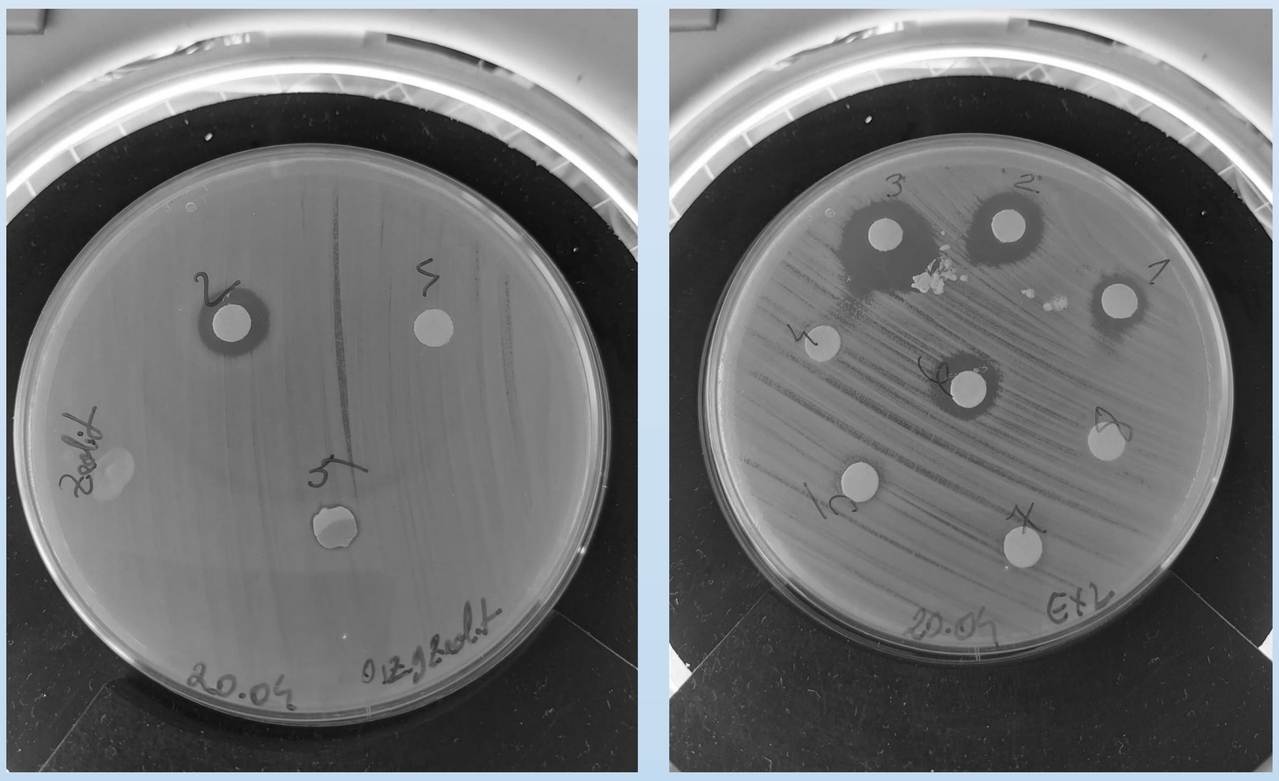
Introduction

Antibiotic pollution has become a global emergency because these chemical compounds are one of the main causes of generating antibiotic resistant bacteria. Antibiotics have been frequently detected in surface water, groundwater, soil, sediments and sewage treatment plants, indicating their resistance to biodegradation and persistence in natural environments. There are a few antibiotic removal methods, among them antibiotic adsorption (eg with zeolites) or bacterial biodegradation. This study focused on the removal of the fluoroquinolone antibiotic norfloxacin from aqueous solutions using synthetic zeolite (synthetic ZSM-5, zeolite Socony Mobil-5) and the degree of antibiotic removal was monitored by disc diffusimetric method on *Escherichia Coli* (ATCC 25922) bacterial growth.

Antibiotic effect on bacterial growth

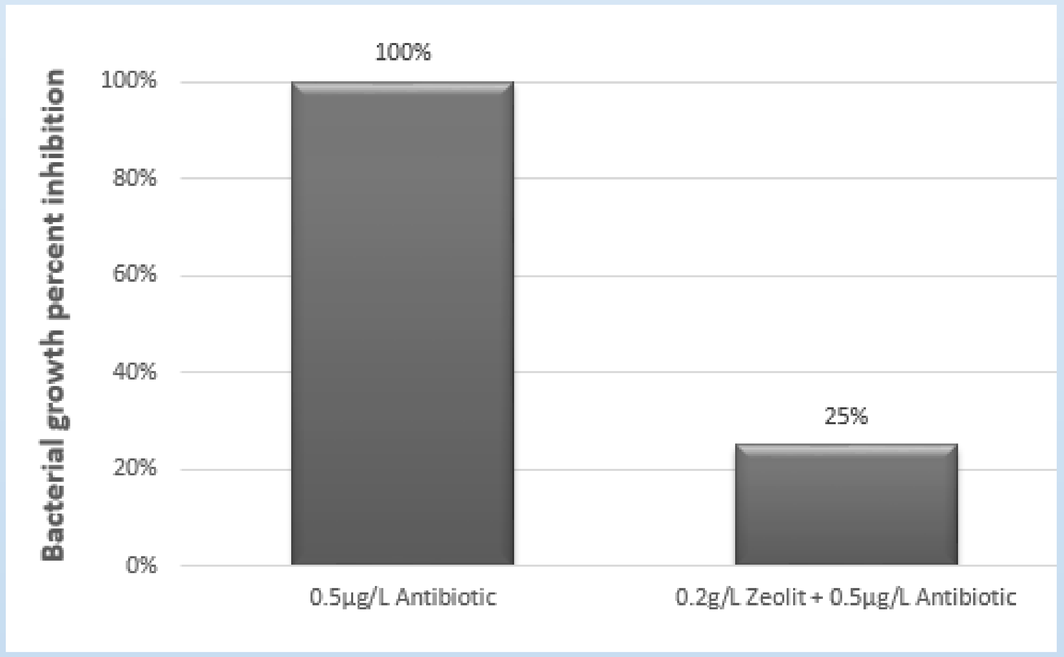
Bacterial inhibition was directly related to antibiotic concentration

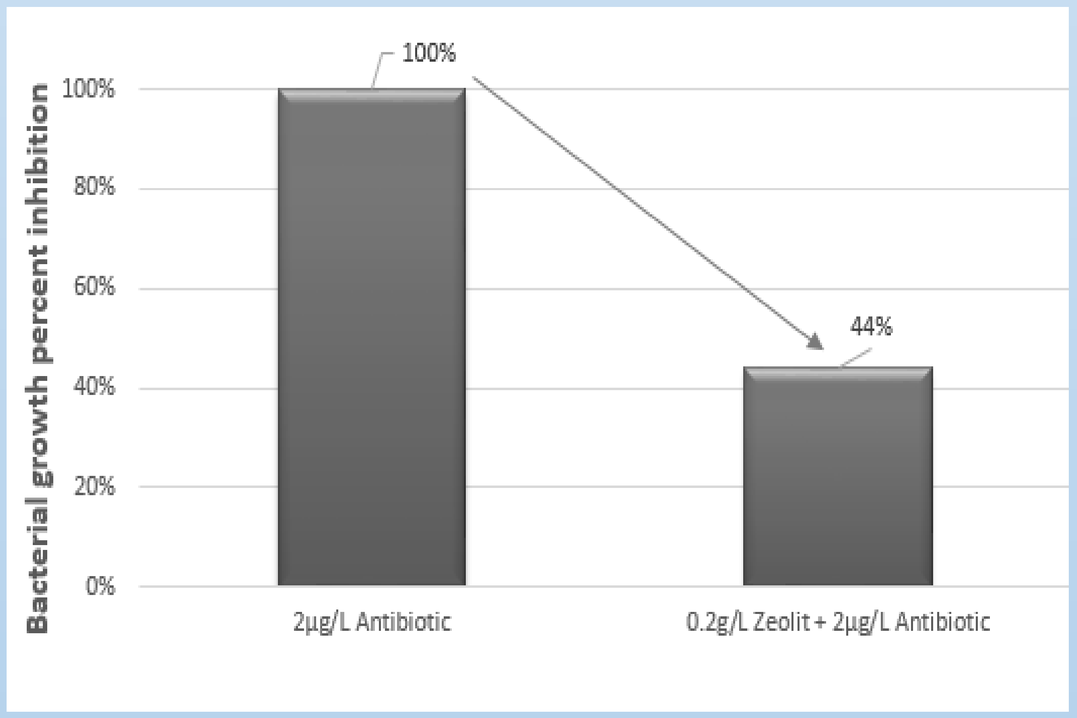


A pure bacterial culture of *Escherichia Coli* was distributed in a Petri dish with medium by cloth seeding technique. Qualitative sensitivity screening was performed by a Mueller Hinton solid medium diffusion fit method.

The batch adsorption study was performed by adding 0.2 g zeolite to a solution of 0.5 µg/L and 2 µg/L norfloxacin for 5 minutes at room temperature (approximately 22°C) in a series of 250 mL conical flasks. Diffusimetric discs were soaked in the supernatant from the zeolite-antibiotic adsorption tests. The soaked discs were applied to the petri dish at a distance of approximately 2 cm from the edge of the petri dish and at a distance of 3 cm from each disc, then incubated at 35°C for 22 hours.

Zeolite modulates the effect of 2µg/L or 0.5µg/L antibiotic on bacterial strains.





Addition of zeolite to antibiotic solutions decreased their inhibitory effect on bacterial strains of 2 µg/L antibiotics by 56% and for 0.5 µg/L antibiotics by 75% .

Conclusions

- ability of zeolites to remove pollutants is based on excellent adsorbent properties and ion exchange capacity.
- special pore architecture of zeolites makes them suitable candidates for hosting and further delivering, a variety of molecules of pharmaceutical interest.
- antibiotic removal by zeolite was monitored by the disk diffusion method.
- zeolite an excellent alternative for antibiotic removal during the wastewater treatment and subsequently could prevent fueling the emergence and spreading the antibiotic resistant bacteria, which according to WHO the antibiotic resistance phenomena is the third major issue to be solved by the human society.

Acknowledgments

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