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# Adsorption of Tetracycline on Untreated and Modified Surfaces of Waste Biosorbent

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## Extended Abstract

With sustainable development in mind, our task is to ensure the water and medicine needs of 8 billion people. Maintaining water quality at an appropriate level in the 21st century is one of humanity's greatest challenges. Cleaning our wastewater from "emerging" pollutants has always been a problem, and it still is today since their removal with traditional water purification methods is sometimes impossible [1]. Mishandling of drugs and chemicals is increasingly recognized and of concern [2]. The main source of these is wastewater from the pharmaceutical industry, as well as the improper processing and storage of drugs with an expired warranty. "Pseudo-persistent" drugs typically occur in trace amounts in the parts per trillion (ppt or ng/l) and parts per billion (ppb or μg/l) ranges [3]. Micropollutants also include antibiotics, which are organic substances in their composition and have a great influence on our environment. The sensitivity of the traditional water purification technologies used today was not developed for the removal of micropollutants - drug residues - as their permissible limits in our natural/drinking/wastewater are not regulated in current legislation. Several methods can be used to remove organic substances in water: biological treatments, chemical precipitation, ion exchange, membrane process, chemical oxidation or reduction, coagulation or flocculation, reverse osmosis, and adsorption.

Our goal was to develop the use of *Saccharomyces cerevisiae* - brewery waste - as an adsorbent, which in the future can even be used industrially in wastewater treatment. The goal is to develop a simple, cost-effective applicability that does not require a special environment (requirement of chemicals, reduction or increase of temperature, expensive raw materials). During the adsorption process, we have the possibility to remove the antibiotic tetracycline from water.

We would like to carry out the research using the methodological steps described in the literature and based on the results of our previous research, so that our results are representative and reproducible [4].

The research thus includes 3 main activities:

1. Procurement, characterization, and surface treatment of the adsorbent (HCl, NaOH, ZnO)
2. Adsorption studies - optimization: concentration, amount of biosorbent, pH, temperature, surface treatment
3. Examination of the mechanism of the adsorption process - computer processing of the results: E%, $q_e$, determination of the linearized version of mathematical isotherm and kinetic models.

The results obtained during the research prove that *Saccharomyces cerevisiae* is suitable for removing tetracycline from an aqueous solution in untreated form or even after physical/chemical treatment. When examining the parameters, there was outstanding efficiency in all cases. The optimal experimental conditions prove that there is no need for chemical treatment and heat treatment to remove tetracycline from aqueous solution. Based on the isotherm and kinetic models, we concluded that the removal of tetracycline can be achieved by both chemical and physical adsorption.

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