PHOTODESTRUCTION OF ANTIBACTERIAL MEDICINES OF THE GROUP OF BETA-LACTAM ANTIBIOTICS USING THE EXAMPLE OF AMOXICILLIN TRIHYDRATE

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This research presents the results of studying the possibility of using photodestruction for the chemical neutralization of the pharmaceutical substance amoxicillin trihydrate. It has been shown that under the influence of direct sunlight, a change in the optical density of solutions of the test substance occurs, both with the addition of hydrogen peroxide and without the addition of reagents.

Keywords: photodestruction, beta-lactam antibiotics, amoxicillin.

Today, there is an important issue about the disposal of medical waste, which, among others, includes pharmaceutical waste due to its adverse impact on the environment. The first reports on the presence of drugs in wastewater and natural water reservoirs were published back in 1977, and since that moment this topic has not lost its relevance [1].

The purpose of the research is to develop approaches to the chemical destruction of antibacterial drugs of the beta-lactam antibiotic group using amoxicillin trihydrate as an example.

The process of degradation of the substance in solution was carried out by photodestruction without adding reagents, as well as by adding 30% hydrogen peroxide to a 1% aqueous suspension of amoxicillin trihydrate (test sample 1) and a 0.15% aqueous solution of amoxicillin trihydrate (test sample 2) solution in ratio of 1 part reagent to 10 parts test

solution. The solutions were kept under the influence of direct sunlight with periodic recording of the completeness of chemical destruction using a spectrophotometric method. The study period was 148 days.

The change in the structure of amoxicillin trihydrate during photodestruction was analyzed from the absorption spectra of the test solutions using absorption spectrophotometry in the UV and visible regions at wavelengths from 200 to 800 nm. To obtain the absorption spectrum of the analyzed samples, 0,025 ml of initial solutions were taken and brought to 5,00 ml with distilled water (1:200). The solvent used as a compensation solution was distilled water. The results were recorded using a Solar spectrophotometer PB2201 series.

During the photodestruction of amoxicillin trihydrate without adding additional reagents, a change in the absorption spectrum is observed for both samples under study. For test sample 2, a decrease in optical density in the region of the absorption maximum (228 nm) by 24,59% and the appearance of a new absorption maximum at 354 nm are observed. In test sample 1, a new absorption maximum appears at 354 nm and an increase in optical density at 228 nm, which may be due to the transition of the destruction products of amoxicillin trihydrate to a dissolved state.

During the analyzing the absorption spectra of the test samples after adding 30% hydrogen peroxide to them, a sharp increase in optical density is observed, which makes it impossible to analyze the absorption maxima for test sample 2. At a wavelength of 200 nm, a decrease in optical density by 88,87% was observed. For test sample 1, a new absorption maximum appeared at 354 nm and the absorbance fluctuated at 228 nm with a final decrease of 27,95%.

In addition to changes in the absorption spectra, a change in the color of the tested samples was observed. Both during photodestruction with and without the addition of hydrogen peroxide, the supernatant acquired a yellow-orange color. A change in the color of test solution 1 was also observed upon photodestruction without the addition of hydrogen peroxide (the solution acquired a light yellow color).

The results obtained indicate the destruction of amoxicillin trihydrate in solution during photodestruction, both with and without the addition of 30% hydrogen peroxide. Further studies using Raman spectra, high-performance liquid chromatography and mass spectrometry will allow us to evaluate the structure of the resulting destruction products and the degree of decomposition of the starting substance.

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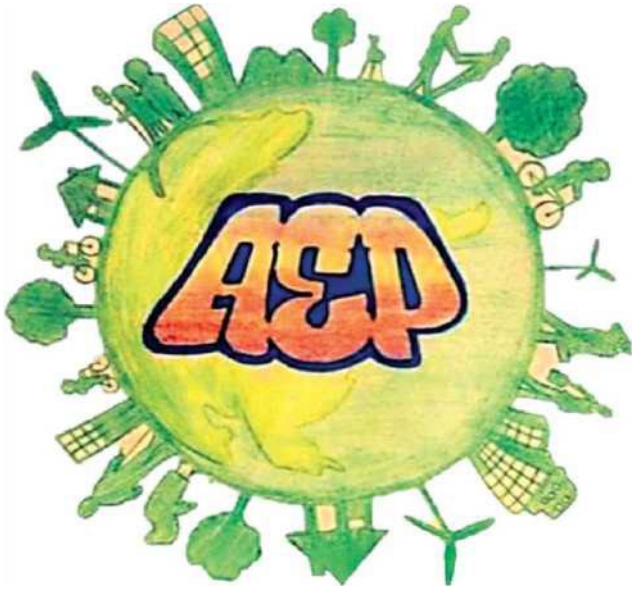

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