

ABSTRACT

This diploma thesis deals with the synthesis and use of new quaternary ammonium salts (QACs). These substances have been commonly used for decades as disinfectants, antiseptics, antimicrobial additives, preservatives, and currently their decontamination potential using micellar catalysis is being investigated.

The theoretical part contains information about the mechanism of action on individual types of microbes, an overview of physicochemical properties, especially solubility and determination of logP, micelle formation. Furthermore, microbial resistance and the mechanism of cross-resistance between QACs and antibiotics (ATB) are described here.

The experimental part mainly deals with the synthesis of new QACs, which we expect to have an antimicrobial effect and the potential of creating a micellar microenvironment for micellar catalysis.

The first series of reactions is focused on the preparation of three molecules of monoquaternary ammonium salts from the starting material benzylamine, to which two homologous aliphatic alkyl chains C₈, C₁₀ and C₁₂ and a hydroxyethyl group are attached. This structure is a necessary carrier of the antimicrobial effect and the formation of micelles. All three molecules were successfully prepared.

The second series of reactions is focused on the preparation of nine molecules of bisquaternary ammonium salts, which are attached to the aromatic ring in the *ortho*, *meta* and *para* positions. Diethanolamine, to which the C₈, C₁₀ and C₁₂ hydrocarbon chain is attached, was chosen as the nitrogenous precursor. The synthesis was successful for substances in position 1,3 and 1,4. Substances substituted in position 1,2 were prepared, but it was not possible to successfully isolate them most likely due to low yields caused by steric hindrance between positions 1 and 2 and a large amount of starting material, which prevented recrystallization.

Another part of the work is focused on the evaluation of substances, in this work their solubility is measured. Cytotoxicity and antimicrobial efficiency tests will be carried out for the prepared substances and critical micelle concentration (CMC) will be measured for selected substances.

From the results so far, the substances from the first series show very poor solubility, high cytotoxicity, and the sensitivity of gram-positive bacteria was demonstrated for the tested microbes, while the substances from the second series are well soluble, have low cytotoxicity, and the sensitivity of the tested microbes from the groups of gram-positive and gram-negative bacteria was demonstrated.

The best mentioned values were shown by the substance *N,N'*-diethanol-*N,N'*-dodecyl-2,2'-[(1,3-xylyl)methylen]amonium-dibromid, which was marked as **2-m-C₁₂**.

Key words: disinfectants, antiseptics, quaternary ammonium compounds, synthesis.