

Summary

We tried to compare antimicrobial effectiveness of Benzalkonium bromide with various lengths of alkyl chains fixed in effective cationic section of the molecule in this dissertation. We worked with homologues that had the alkyl chain length 12, 14 and 16 carbon atoms and also with the mixture of homologues mixed in ratio 1 : 1 : 1. We were comparing the antimicrobial effectiveness against the members of G+, G- bacteria, torula, fungi and spores. We used agents from the Czech collection of microorganisms of the Natural science faculty of the Masaryk University Brno. Namely they are: *Staphylococcus aureus*, *Escherichia coli*, *Proteus vulgaris*, *Serratia rubidaea*, *Pseudomonas aeruginosa*, *Candida albicans*, *Aspergillus niger* and *Bacillus subtilis*. We determined MIC, MBC, MBC/N and MBC-B by the help of suspense micromethod for all strains except the fungi and spores members. Concerning the *Aspergillus niger* and *Bacillus subtilis* we determined only the MBC. This was executed by the standard suspension method.

The results of effective concentrations of particular tests are mentioned in g/100ml.

The antimicrobial effectiveness in the MIC test was nearly identical for all tested preparations. Concerning the bacterial strain of *Staphylococcus aureus* and *Escherichia coli* all homologues and also a mixture proved their effectiveness in concentrations under 0,0014. Concerning the strain *Pseudomonas aeruginosa* the effective concentrations for C₁₄, C₁₆ homologues was 0,004 and for homologue C₁₂ 0,0012. Concerning the *Proteus vulgaris*, *Serratia rubidaea*, *Candida albicans* strains the effective concentrations of homologue C₁₄, C₁₆ was under 0,0014 and homologue C₁₂ was equal 0,004.

The antimicrobial effectiveness against the strain of *Staphylococcus aureus* was proved in test for MBC in concentration under 0,0014 for homologue C₁₄ and the mixture of homologues, for homologue C₁₂ and C₁₆ the concentration was 0,004. Concerning the strain of *Escherichia coli*, *Proteus vulgaris*, *Serratia rubidaea* we proved that homologues C₁₄, C₁₆ and the mixture worked in concentration under 0,0014 and homologue C₁₂ worked in 0,004. For the strain *Pseudomonas aeruginosa* the C₁₂ and C₁₄ homologues and the mixture the effective concentration was 0,012 and for homologue C₁₆ it was 0,037.

Effective concentration against the strain of *Candida albicans* was under 0,0014 for homologue C₁₄ and the mixture for homologue C₁₂ and C₁₆ the concentration was 0,004. Against the strain of *Aspergillus niger* homologues C₁₄, C₁₆ and the mixture worked in concentration 0,012. Homologue C₁₂ worked in concentration 0,037. The homologues C₁₂, C₁₄ and the mixture in concentration under 0,0014 affected the spores of strain of *Bacillus subtilis*. The homologue C₁₆ affected in 0,037.

The antimicrobial effectiveness against the strain of *Staphylococcus aureus* was proved in test for MBC/N in concentration under 0,0014 for homologue C₁₄ and the mixture of homologues, for homologue C₁₂ and C₁₆ the concentration was 0,004. Concerning the strain of *Escherichia coli* the homologue C₁₆ worked in concentration under 0,0014. Homologue C₁₄ and the mixture worked in 0,0037 and homologue C₁₂ in 0,333. For the strain of *Pseudomonas aeruginosa* the C₁₂ and C₁₄ homologues and the mixture the effective concentration was 0,012 and for homologue C₁₆ it was 0,037. The effective concentration for *Proteus vulgaris* was under 0,0014 at C₁₄ homologue and the mixture and 0,004 at homologues C₁₂ and C₁₆. At *Serratia rubidaea* we proved that homologue C₁₆ and the mixture worked in concentration under 0,004 and homologues C₁₂ and C₁₄ worked in 0,012. Effective concentration against the strain of *Candida albicans* was under 0,0014 for homologue C₁₄, for homologue C₁₂ and the mixture the concentration was 0,004. Homologue C₁₆ worked in 0,012.

The antimicrobial effectiveness against the strain of *Staphylococcus aureus* was proved in test for MBC-B in concentration 0,0012 for homologue C₁₂, C₁₆ and mixture and 0,037 for C₁₄ homologue. Concerning the strain of *Escherichia coli* the homologue C₁₂ worked in concentration 0,037. Homologues C₁₄ and the mixture worked in 0,111 and homologue C₁₆ in concentration higher than 1. For the strain of *Pseudomonas aeruginosa*, the effective concentration for the C₁₂ homologue was 0,037 and for homologue C₁₄ it was 0,111, for the mixture 0,333 and for the C₁₆ homologue 1. The effective concentration for *Proteus vulgaris* was 0,037 at C₁₂ homologue, 0,012 at homologue C₁₄, 0,111 at the mixture and 1 at the homologue C₁₆. At *Serratia rubidaea* we proved that homologue C₁₄ worked in concentration 0,012 and homologues C₁₂ and C₁₆ and the mixture worked in 1. Effective concentration against the strain of *Candida albicans* was 0,037 for homologue C₁₂, for homologue C₁₆ and the mixture it was 0,111 and for C₁₄ homologue 0,333.

According to the literature the C₁₂ homologue is the most effective against torula and fungi. C₁₄ homologue works the best against G⁺ bacteria and C₁₆ homologue against G⁻ bacteria (Kuča, Kival, Dohnal, 2004 – with reference to Merianos, 1991). The results coming from our testing of different homologues against various microbial strains are not that unambiguous then the literature says. The results differ only by one dilution. Homologue C₁₄ shows better efficiency against G⁻ bacteria but only in media without the protein presence. Homologue C₁₆ shows very good properties against G⁻ bacteria but on the other hand the C₁₄ has almost the same qualities. Homologue C₁₂ embodies worse antimicrobial qualities in a majority of performed testing but it shows that it is more resistant against the media with a protein load. Quite good sporecidal efficiency of all prepared preparations was very surprising. The mixture of homologues overtakes the better properties of its particular members in antimicrobial efficiency. This information was considered as a very positive finding. Together with this positive effect we have discovered that the mixture also removes the disadvantage of homologues C₁₄ and C₁₆ with their high viscosity and tendency to crystallize from the solution. It would be recommended to verify the obtained antimicrobial effectiveness data against the different strains from the microbial collection. It would also be interesting to prove the antimicrobial properties of the mixture that would be prepared from the same particular homologues but in different ratios.