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Synthesis, Physicochemical Characterization and Study of the Antimicrobial Activity of Chlorobutanol

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Abstract : Introduction and objectives: Chlorobutanol is a raw material, mainly used as an antiseptic and antimicrobial preservative in injectable and ophthalmic preparations. The main objective of our study was the synthesis and evaluation of the antimicrobial activity of chlorobutanol hemihydrates. Material and methods: Chlorobutanol was synthesized according to the nucleophilic addition reaction of chloroform to acetone, identified by an infrared absorption using Spectrum One FTIR spectrometer, melting point, Scanning electron microscopy and colorimetric reactions. The dosage of carvedilol active substance was carried out by assaying the degradation products of chlorobutanol in a basic solution. The chlorobutanol obtained was subjected to bacteriological tests in order to study its antimicrobial activity. The antibacterial activity was evaluated against strains such as *Escherichia coli* (ATCC 25 922), *Staphylococcus aureus* (ATCC 25 923) and *Pseudomonas aeroginosa* (ATCC = American type culture collection). The antifungal activity was evaluated against human pathogenic fungal strains, such as *Candida albicans* and *Aspergillus niger* provided by the parasitology laboratory of the Hospital of Tizi-Ouzou, Algeria. Results and discussion: Chlorobutanol was obtained in an acceptable yield. The characterization tests of the product obtained showed a white and crystalline appearance (confirmed by scanning electron microscopy), solubilities (in water, ethanol and glycerol), and a melting temperature in accordance with the requirements of the European pharmacopoeia. The colorimetric reactions were directed towards the presence of a trihalogenated carbon and an alcohol function. The spectral identification (IR) showed the presence of characteristic chlorobutanol peaks and confirmed the structure of the latter. The microbiological study revealed an antimicrobial effect on all strains tested (*Sataphylococcus aureus* (MIC = 1250 µg/ml), *E. coli* (MIC = 1250 µg/ml), *Pseudomonas aeroginosa* (MIC = 1250 µg/ml), *Candida albicans* (MIC =2500 µg/ml), *Aspergillus niger* (MIC =2500 µg/ml)) with MIC values close to literature data. Conclusion: Thus, on the whole, the synthesized chlorobutanol satisfied the requirements of the European Pharmacopoeia, and possesses antibacterial and antifungal activity; nevertheless, it is necessary to insist on the purification step of the product in order to eliminate the maximum impurities.

Keywords : antimicrobial agent, bacterial and fungal strains, chlorobutanol, MIC, minimum inhibitory concentration
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