

Physicochemical basis for the microbicidal action of polyvinylpyrrolidinone-iodine disinfection solutions

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Introduction

Substance such as PVP-iodine has been known for almost 50 years and has been used very successfully for over 40 years as a local broad-spectrum antiseptic. At first sight, it might appear that it requires no further discussion. However, as a result of work in this field, it has become necessary to investigate the particular and possibly surprising properties of PVP-iodine solutions

Purpose and methods

Some authors considered the role of free non-complex iodine in the effectiveness of PVP-iodine solutions. In aqueous solutions containing polymers with iodophor properties, the chemistry of iodine is complex, since macromolecules interact with iodine forms. The iodine moiety of the PVP-iodine complex is present in an aqueous iodophor solution in the different thermodynamically stable anionic iodine species and as diatomic iodine. According to many authors, it is the equilibrium iodine alone that exerts the antiseptic action of the preparation at any given moment. Efforts were directed towards developing methods for measuring the quantitative extent of complexing between the iodine and the organic polymer in order to formulate iodophor antiseptic preparations with improved stability and reproducibility. The aim of this study was to develop a new empirical and statistically adequate equation to express the dependence of the various physico-chemical properties of aqueous PVP-iodine solutions on bactericidal activity. We proposed the potency coefficient, referred to as the disinfection activity coefficient of a solution (DACS).

Results

The DACS index, which is the sum of four terms (fluidity, surface tension, redox potential and osmolality), results in good correlation with the germicidal activity at different dilutions. Factor statistical analysis was applied to all the terms; the first two factors account for over 96% of the total variation of the data set (factor 1, 71.7%; factor 2, 24.5%).