PREDICTING OF BACTERICIDAL ACTIVITY OF CHEMICAL DISINFECTANTS USING DISINFECTION ACTIVITY COEFFICIENT OF SOLUTION

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INTRODUCTION AND AIM

Knowing antiseptic activity of chemical disinfectant substances has great practical value. It is evidential that there is the need for defining standard technique for quantitative determination of bactericidal activity of chemical disinfectant substances, as well as the need for defining parameter for comparing various chemical disinfectants. Solution of phenol (5%) was considered as referent standard for evaluation of efficacy of disinfectant aqueous solutions. Phenol coefficient shows how many times bactericidal activity of examined disinfectant is greater or lower than bactericidal activity of standard phenol solution (5%). However, phenol coefficient gives only limited information. Suitability of phenol coefficient for evaluation of nonphenolic disinfectants is still opened question. On the other side the methods for evaluation of antiseptic activity of disinfectant aqueous solutions are microbiological methods.

The aim of this study is to develop a new empirical coefficient which is capable to express the various physic-chemical properties of disinfectant solutions on bactericidal activity. The basic duty of this parameter (Disinfection Activity Coefficient of Solution - DACS) is to express capability for comparison and prediction of disinfectant activity. The DACS index, which is the sum of four terms (fluidity, surface tension, redox potential and osmolality), results in good correlation with the activity at different disinfectant aqueous solutions. The DACS index can be calculated using additive and statistical models.
The usefulness of DACS is demonstrated for analyze of bactericidal activities on different disinfectant solutions containing boric acid, chlorhexidne, chlorhexidine with cetrimide, chloroxylenol, chlorophen, eosin, hydrogen peroxide, phenyl mercury borate, povidon-iodine, thiomersal, tosilchloramide and phenol.

RESULTS AND DISCUSSION

Results for bactericidal activities obtained from microbiological tests on Staphylococcus aureus was compared with activities predicted with DACS, using the following equation:

$$RF^{abs.(s)}_{calc.\,01} = 0.999\ DACS_1^{abs.(s)} - 0.005 \qquad (1)$$

Tab. 1. Bactericidal activity of different disinfectant solutions to Staphylococcus aureus ATCC 6583 with exposition time 15 seconds.

Disinfectant solution	RF_{exp} for 15s
0.05% Chlorhexidine	0.5
0.05% Chlorhexidine with 0.5% Cetrimide	2.3
0.245% Chloroxylenolum	0.9
0.04% Chlorophen	0.8
10% Povidon-iodine	0.4
0.2% Tossilchloramide sodium	0.8
0.5% Tossilchloramide sodium	2.1

Tab. 2. Bactericidal activity of different disinfectant solutions, calculated according to the equation (1)

Disinfectant solution	$RF^{dil.\,(s)}_{calc.01}$
0.05% Chlorhexidine	0.547
0.05% Chlorhexidine with 0.5% Cetrimide	2.432
0.245% Chloroxylenolum	0.931
0.04% Chlorophen	0.576
10% Povidon-iodine	0.461
0.2% Tossilchloramide sodium	1.149
0.5% Tossilchloramide sodium	1.698

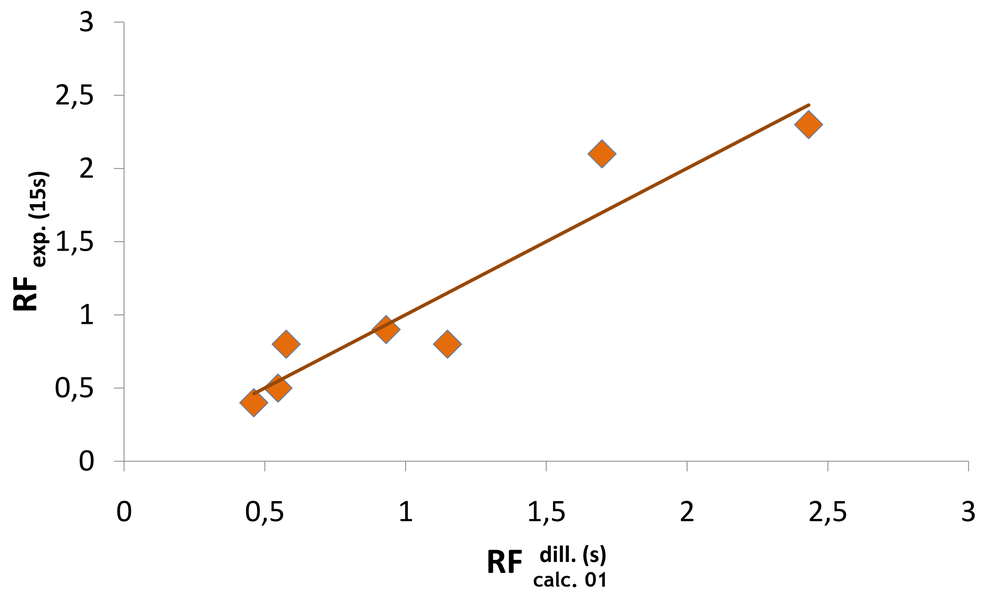

Fig. 1. Plot of the observed disinfection activity to *S. aureus*, after 15s of exposition ($RF_{exp.\,(15s)}$) vs the calculated activity with $DACS_1$ ($RF^{dill.\,(s)}_{calc.\,01}$)

CONCLUSION

As the conclusion, it is considered good correlation between experimental and calculated values for bactericidal activity of different disinfectant solutions. It is pointed out that the DACS index can be used in studies for prediction of disinfectant activity.