Correlation of bactericidal properties of the α,α,α-trifluoromethylphenols with physico-chemical parameters

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Although many studies have been made of bactericidal activities of ring-halogenated phenols, there appears not to have been any study of side-chain-halogenated phenols. We have investigated the bactericidal effects of the isomeric trifluoromethylphenols on *Escherichia coli*, by the method of viable counts.

Physico-chemical parameters determined were partition coefficients, pKa values, dipole moments and infrared shifts. Rank-order correlations were found between bactericidal activity and all these parameters.

Of particular importance are the correlations with partition coefficient. Three systems were examined: oleyl alcohol, methyl oleate and cyclohexane, all against McIlvaine's buffer, pH 5. Fig. 1 shows the relationship between bactericidal activity and partition coefficients in the three systems. Good correlations are obtained with oleyl alcohol and methyl oleate as

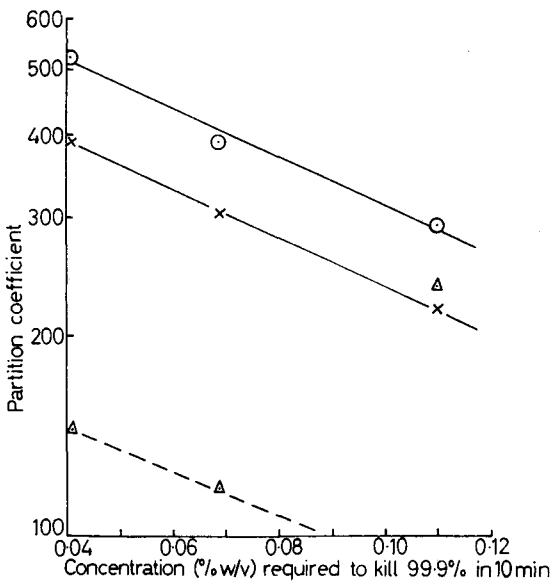

FIG. 1. Correlation of bactericidal activity and partition coefficient of the trifluoromethylphenols. Partition coefficients determined with oleyl alcohol (●), methyl oleate (×), and cyclohexane (▲). Partition coefficients in cyclohexane–buffer are shown × 100.

non-aqueous phases, but in the cyclohexane–buffer system, the partition coefficient of the *o*-isomer appears to be too high by a factor of three. It is suggested that this is due to intramolecular hydrogen bonding in this isomer; this reduces the solubility in water, giving an anomalously high partition coefficient. "Normal" partition coeficients are observed when polar solvents such as oleyl alcohol are used, because the intramolecular hydrogen bond is ruptured in such solvents. The above hypothesis is confirmed by an examination of the partition coefficients of the cresols (the *o*-isomer of which cannot form an intramolecular hydrogen bond), which do not show the above anomaly. Thus, in partition systems representing body membranes, the lipophilic solvent should be polar.