inhibitory. The degree of inhibition of arylamine formation in the fortified system, by low concentrations of aureomycin, was similar to the inhibition in original untreated extracts. It was found that dihydrodiphosphopyridine nucleotide (DPNH) could replace the requirement of the system for L-malate and DPN. In this system, aureomycin was considerably less effective in inhibiting arylamine formation. When 10^{-3} *M* L-malate, 2 × 10^{-4} *M* DPN and 0.05 ml. dialyzed extract were incubated together in 0.05 *M* tris-(hydroxymethyl)-aminomethane buffer, *p*H 7.5 and the formation of DPNH determined by absorption at 340 mμ in the Beckman DU spectrophotometer, it was observed that no formation of DPNH occurred unless 6 × 10^{-3} *M* Mn^{++} was added to the reaction mixture. These results indicated that aureomycin inhibited arylamine formation by preventing the formation of DPNH and consequently the transfer of hydrogen to nitro groups. Since Mn^{++} was essential for the formation of DPNH, it seemed possible that aureomycin could prevent the formation of DPNH by binding Mn^{++}.[6] If such were the case, excess Mn^{++} added to the reaction might be expected to reverse the inhibitory activity of aureomycin. Table I shows that Mn^{++} reverses aureomycin inhibition of arylamine formation.

TABLE I

The tubes were incubated at 37° for 120 minutes. Each tube contained (final concentration) 0.05 *M* tris-(hydroxymethyl)-aminomethane buffer, *p*H 7.5; 3 × 10^{-4} *M* chloramphenicol, 1 × 10^{-3} *M* L-malate, 1 × 10^{-5} *M* DPN; 5 × 10^{-3} *M* L-cysteine; 0.30 ml. dialyzed extract, final volume 1.5 ml.

Aureomycin concn., micrograms/ml.	Micrograms arylamine formed/ml. No Mn^{++}	6 × 10^{-3} *M* Mn^{++}
0	17.0	14.6
90	1.1	6.3
45	1.7	8.3
18	2.8	9.4
9	4.0	10.8

In the present system, it would seem that aureomycin inhibits by binding Mn^{++}; possibly this effect is due to the formation of a chelate.[7] Other biological reactions with a need for metal activators are being studied in order to determine whether the inhibition by aureomycin is a general phenomenon of cation-requiring reactions. The implication of the findings in terms of antibiotic activity of aureomycin are under investigation.

(6) Due to the high absorption of aureomycin in the spectrophotometer at 340 mμ, it has not been possible to show directly the inhibition of DPNH formation by aureomycin.

(7) The binding of metallic cations by aureomycin and terramycin was reported very recently by A. Albert, *Nature*, **172**, 201 (1953).

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CORRELATION OF RATES OF SOLVOLYSIS

Sir:

We wish to point out the usefulness of the two-parameter equation

$$\log (k/k^0)_A - \log (k/k^0)_{A_0} = ab$$

where A and A^0 refer to any compound and to a standard compound (*e.g.*, methyl bromide) respectively, *k* is the first-order rate constant for solvolysis of A or A^0 in any solvent, k^0 is the corresponding rate constant in a standard solvent (*e.g.*, 80% ethanol), *a* is a constant characteristic of only the compound, and *b* is a constant characteristic of only the solvent.

Those data on the solvolysis of organic bromides and chlorides in which at least three solvents have been investigated for each compound were used to test the equation; these are for 124 reactions of 15 compounds and 19 solvents, including 18 reactions which form substituted amines or quaternary ammonium salts. After assigning $a = 0.00$ for methyl bromide (A^0), $a = 1.00$ for *t*-butyl chloride, and $b = 0.00$ for 80% ethanol–20% water by volume, the best values of *a* and *b* for other compounds and solvents may be found without any complicated methods or equipment.

The average error in $\log (k/k^0)_{calcd.} - \log (k/k^0)_{obs.}$ is 0.18, corresponding to a factor of 1.52 in *k* itself, excluding 33 standard cases where the error is zero. The maximum error, which corresponds to a factor of 7.6, occurs with benzhydryl chloride in 90% acetone. This is a more than satisfactory fit considering the wide range of rates being correlated; *e.g.*, the ratios of the fastest to the slowest rate measured are 2.8 × 10^6, 8.7 × 10^4 and 3.4 × 10^5 for methyl bromide, benzhydryl chloride and *t*-butyl chloride, respectively.

The 15 compounds and their *a* values are picryl chloride (−0.42), *p*-nitrobenzoyl chloride (− 0.37), phenacyl bromide (− 0.04), methyl bromide (0.00), benzoyl chloride (+ 0.06), ethyl bromide (+ 0.15), *i*-butyl bromide (+ 0.16), *n*-butyl bromide (+ 0.18), benzyl chloride (+ 0.19), *p*-methylbenzoyl chloride (+ 0.41), *i*-propyl bromide (+ 0.42), α-phenylethyl chloride (+ 0.64), benzhydryl chloride (+ 0.78), *t*-butyl bromide (+ 0.93) and *t*-butyl chloride (+ 1.000).

The 19 solvents and their *b* values are triethylamine (− 17.3), *n*-butylamine (− 10.2), pyridine (− 9.66), aniline (− 4.78), 100%, 96.7% and 69.5% methanol (−0.94, −0.51, +0.61), 100%, 90%, 80%, 60% and 50% ethanol (−0.79, −0.52, 0.00, +0.88, +1.14), 90%, 80%, 70% and 50% acetone (−0.72, +0.04, +0.42, +1.02), water (+2.95), acetic acid (+0.57) and formic acid (+4.00).

The success of this correlation is due to effective cancellation of kinetic energy and entropy terms which restrict the applicability of many linear free-energy relationships.

Strictly, this type of approach should be confined to compounds whose leaving group is the same or closely similar to the leaving group of the standard compound; furthermore, the atom which is the reaction site should be of the same species in both the standard compound (A^0) and the compound being studied (A). In all the cases above, a bromide or chloride ion is the leaving group, and the reaction is a simple displacement at a carbon atom.

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