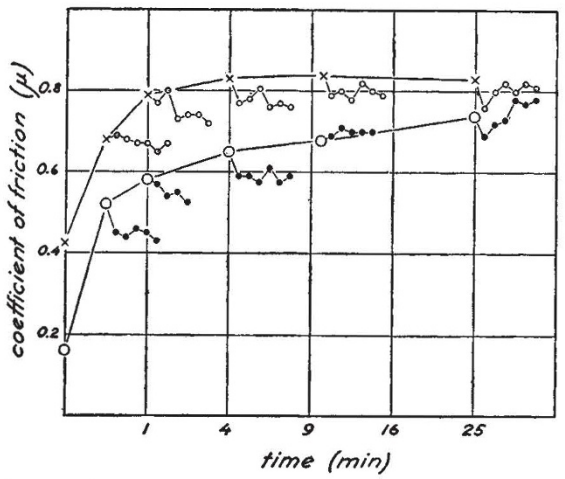

Fig. 2. FRICTIONAL COEFFICIENTS OF WOOL (○, WITH-SCALE; ×, ANTI-SCALE) AFTER TREATMENT WITH 2 PER CENT POTASSIUM HYDROXIDE IN 95 PER CENT ALCOHOL

considerably increased by only a few slippings in the apparatus, and the rubbings of the fibres during measurement eliminate the difference between the anti-scale and the with-scale friction. There is no corresponding effect for the potash-treated wool, where rubbings of the fibres do not noticeably change the friction. All the measurements recorded in the graphs were made in distilled water. Measurements on chlorine-treated wool in soap solutions show a considerable decrease in the frictional coefficients (μ about 0·15); but there is still no difference between anti-scale and with-scale friction. For the potash-treated fibres, the friction in soap solutions is somewhat lower than in distilled water, but there is still a difference between the two coefficients.

It is assumed that the non-felting is caused by the elimination of the difference between anti-scale and with-scale friction. An increase of both coefficients, as with potassium hydroxide treatment, causes a decrease in felting, but not complete elimination[2].

We hope to get more information about the chemical reaction between wool and various non-felting reagents by further studies of the frictional properties.

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[1] Lindberg, J., and Gralén, N., [*Medd. Svenska Textilforskningsinst. Göteborg*, No. 6 (1948)].
[2] Harris, M., and Frishman, D., *Amer. Dyestuff Reporter*, **37**, P52 (1948).

Pharmacology of Some *bis*-Trimethyl Ammonium Compounds

THE curare-like action of a series of *bis*-quaternary ammonium polymethylenes has recently been described by Barlow and Ing[1] and by Paton and Zaimis[1], and we can confirm that the C_3 compound curarizes, but is relatively inactive compared with *d*-tubocurarine chloride on the rat diaphragm (1 per cent). Its action was completely reversed by prostigmine. (Tetramethyl ammonium chloride showed about 2·5 per cent of the activity of *d*-tubocurarine chloride on the rat diaphragm.) The C_5 compound had no action on the rat diaphragm. The C_3 compound has marked cholinergic action—salivation, lachrymation, bradycardia in decerebrated guinea pig—together with relaxation of decerebrate rigidity at a dose of 1·0 mgm. per kgm. It produced a response of the rabbit's ileum similar to that of acetyl choline (potency about 0·1 per cent that of acetyl choline). It has slight activity as an anticholinesterase (rat brain). It has no action on pseudo-cholinesterase (horse serum). Its cholinergic activity, apart from its low curarizing activity, would clearly render it unsuitable as a clinical substitute for *d*-tubocurarine. The C_5 compound has about the same anticholinesterase activity as the C_3.

The overlapping of 'muscarine', 'nicotine', and anticholinesterase activities is a very striking phenomenon which constantly recurs in complex quaternary ammonium compounds. If the chain includes phenyl groups the effect of increasing the distance between the $\overset{+}{N}$ atoms is not to increase the curarizing activity, but to develop anticholinesterase activity. $\overset{+}{N}(CH_3)_3.C_6H_4.CH_2.C_6H_4.\overset{+}{N}(CH_3)_3.2I$, in which the distance between the quaternary nitrogens is a little less than that of the C_7 *bis*alkyl ammonium, is about 6 per cent of the activity of *d*-tubocurarine on the rat diaphragm, and shows 'muscarine' effects but is not an anticholinesterase. If four more CH_2 groups are inserted into the chain, the curarizing activity drops to 2 per cent, but the compound is a very active anticholinesterase—of the same order of activity as eserine. Clearly the nature of the chain, as well as the distance apart of the $\overset{+}{N}$ atoms, affects considerably the activity of the compound.

We have attempted to determine the distance between the nitrogen atoms in Fisher – Hirschfelder models of the tubocurarine ion. Unfortunately, at least seven possible configurations can be constructed, any one of which might represent *d*- or *l*-tubocurarine, or *d*- or *l*-curine, and no one of which is convertible into another without breaking one bond or another. The distance apart of the nitrogen atoms varies for different models from that corresponding to C_3 to that corresponding to C_8 straight chains.

With regard to the species variation, remarked on by Barlow and Ing, and Paton and Zaimis, we showed in July 1947, at the Pharmacological Society, some results with two closely related compounds—*d*-tubocurarine and its dimethyl ether.

The ratio of the potency of the dimethyl ether to *d*-tubocurarine is:

	Intact animal	Diaphragm
Rabbit	9	3
Rat	3	3
Guinea pig	2	1
Albino mouse	0·5	0·4

Not only does the ratio vary between different species, but also especially in the rabbit the discrepancy may be larger in the intact animal.

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[1] *Nature*, **161**, 718 (1948).