Paper ionophoresis of alkaloids.

The technique of paper chromatography has been applied in the separation of various types of alkaloids as described by CRAMER[1]). Since the technique of paper ionophoresis is found to be one of the most efficient tools in micro-separations, the ionophoretic behaviour of alkaloids on filter paper has been studied and their separation by paper ionophoresis has been attempted. This communication presents the preliminary results.

Horizontal migration method was followed and the equipment used for that purpose was designed according to that described by MCDONALD[2]) and constructed mainly out of perspex. The equipment is shown in the photograph (Fig. 1). Ionophoresis of the individual alkaloids as well as their mixture can be carried out side by side on a number of paper strips arranged on the frame. Hanovia "Chromatolite" ultraviolet lamp, (as shown in the photograph, Fig. 1) emitting 2537 Å radiation only was used to detect the alkaloids on paper. Some of the alkaloids (quinine, quinidine, chinchonidine, papaverine etc.) were detected by their fluorescence, while others were detected by the fluorescence-quenching technique of HOLIDAY and JOHNSON[3]). These appeared as blue-black spots due to quenching of fluorescence of paper in those regions.

10 mg. of each alkaloid was dissolved in 1 ml. of N/10 sulphuric acid, 0·01 ml. of this solution was applied on the buffer-soaked paper. Citric acid-phosphate buffer was invariably used. An electric field of 220 volts was applied and the current passing through the system was kept constant by a variable resistance. Ionophoresis was continued for about 8 hours. The ionophoretic behaviour of some of the chinchona, opium and strychnos alkaloids has been investigated. Studies with other alkaloids are in progress.

Between p_H-ranges 2—10 all the alkaloids move towards the negative electrode, this is expected from their basic character. Towards alkaline p_H there is sometimes multiplicity of spots, which may be due to more than one ionic species e.g. free base, dissociated and undissociated salts etc., as it was observed by ARONOFF[4]) in case of lysine during paper chromatography.

With increasing p_H of the conducting medium the mobilities of the alkaloids are expected to decrease. This is evident in case of chinchona alkaloids, but in case of opium and strychnos alkaloids the change in mobility with p_H is so small that any decrease or increase is not appreciable. Alkaloids belonging to the same group are found to possess very close mobilities, e.g. in case of chinchona alkaloids (quinine, quinidine, chinchonine and chinchonidine used in this study) all the four form a single spot at p_H's 2 and 4, at higher p_H's chinchonine moves a bit ahead of the other three, remaining unseparated from each other.

In case of opium alkaloids again, the mobilities are found to be close to each other at all p_H's. More than one spot are formed, however, out of the mixture of five alkaloids studied (morphine, thebaine, papaverine, narceine and narcotine). Of these five, narcotine and narceine are always found to have less mobilities. At p_H's 2·4 and 6 they together form the least mobile spot though at p_H 4 papaverine coincides with them. Papaverine due to its sparing solubility in alkaline medium forms a dragged spot at p_H 8 or 10 and thus becomes separated from the others. Morphine and thebaine together form the fastest moving spot. At p_H 6 the mixture of five alkaloids just separated out into three groups, the slowest being composed of papaverine, the middle one of narceine and narcotine, the fastest includes morphine and thebaine.

Only two strychnos alkaloids, strychnine and brucine, have been chosen for the study. They too have almost identical mobilities at different p_H's though at p_H's 6 and 8 the two resolve out into two distinct spots, strychnine being a bit ahead of brucine.

The separation of alkaloids belonging to different groups is rather easy as the mobilities are found to vary to certain extent from group to group, e.g. in acidic p_H the chinchona alkaloids generally move faster than the opium and strychnos alkaloids, in alkaline p_H opium alkaloids move faster than the chinchona and strychnos alkaloids.

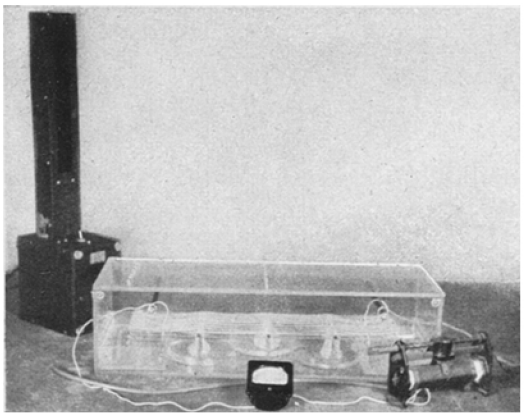

Fig. 1. Equipment for paper ionophoresis of alkaloids.

My sincerest thanks are due to Dr. D. M. BOSE, Director, Bose Research Institute, for his kind interest and continued encouragement during the progress of the work.

Bose Research Institute, Calcutta, India.
D. P. BURMA.

Eingegangen am 19. November 1953.

[1]) CRAMER, F.: Papierchromatographie, S. 97. Weinheim: Verlag Chemie 1953.
[2]) MCDONALD, H. J.: J. Chem. Ed. **29**, 428 (1952).
[3]) HOLIDAY, E. R., and E. A. JOHNSON: Nature [London] **163**, 216 (1949).
[4]) ARONOFF, S.: Science [Lancaster, Pa.] **110**, 590 (1949).