LETTER

Electrophoresis of Desoxypentose Nucleic Acids Treated with Acid and Alkali

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Recently, some physico-chemical studies of the effect of acids and bases on the macromolecular properties of desoxypentose nucleic acid (DNA) have been carried out by several investigators.(1)

During the electrophoretic studies on nucleic acids(2) now in progress, the present authors have found an appreciable variation of the mobility of DNA after the treatment with alkali as well as acid. The acid-treatment also causes a change in the electrophoretic pattern.

DNA was prepared from herring sperm or calf thymus by the modified Hammarsten's method and dissolved in water. A neutral solution was brought to *p*H 12.0 by adding sodium hydroxide and immediately neutralised again directly with hydrochloric acid or by dialyzing against the phosphate buffer of *p*H 7.7 In both cases, only one homogeneous component was found, as in the case of native DNA, when examined by electrophoresis in phosphate buffer (*p*H 7.7, ionic strength 0.2) using a Tiselius-type apparatus. The mobility of the alkali-treated samples, however, was considerably lower than that of the untreated DNA, while Creeth *et al.*(3) reported the absence of any difference between the mobilities of both treated and untreated samples in the wide *p*H range. Representative results are shown in Table 1, together with the mobility of the sample which had been boiled in an alkaline solution for one hour and precipitated with HCl-containing ethanol. It is rather curious that the mobility of this alkali-boiled DNA is still larger than that of yeast nucleic acid (YNA), the latter being *ca.* -14×10^{-5} cm²/sec. volt, though those two nucleic acids have similar molecular size and shape.(4) This result also differs from Cohen's data(5) that Leven's DNA migrates with the same mobility as YNA.

Table 1

Electrophoretic Mobilities of Alkali-treated DNA at 0°C. (In phosphate buffer of *p*H 7.7 and ionic strength 0.2)

Samples	Mobilities (calcd. from descending pattern), $\times10^5$ cm²/sec. volt
(a) Untreated DNA	−16.0
(b) Alkali-treated DNA	−15.0
(c) (a) + (b)	−15.2, −16.4
(d) Alkali-boiled DNA	−15.5
(e) (d) + YNA	−15.3, −13.9*

* The mobility of YNA.

On the other hand, somewhat different phenomena have been observed after the acid treatment. For example, the sample, once brought to *p*H 3.0 and immediately neutralised again, showed a slightly inhomogeneous pattern indicating the presence of a small amount of faster component. When kept at *p*H 3.0 for 48 hours before the neutralisation, this faster component became more distinct. In both cases, the mobility of the main (slower) component was exactly the same as that of the alkali-treated DNA.

Details of this work will be published elsewhere with the discussion on the possible explanations for these experimental results.

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(1) C. F. Vilbrandt and H. G. Tennent, *J. Am. Chem. Soc.*, **65**, 1806(1943); J. M. Gulland, D. O. Jordan and H. F. W. Taylor, *J. Chem. Soc.*, **1947**, 1131; J. M. Creeth, J. M. Gulland and D. O. Jordan, *ibid.*, **1947**, 1141; R. Cecil and A. G. Ogston, *ibid.*, **1948**, 1382; I. Jungner, *Acta physiol. Scand.*, **20**, Suppl. 69(1950); S. Zamenhof and E. Chargaff, *J. Biol. Chem.*, **186**, 207(1950).

(2) I. Watanabe and N. Ui, *Repts. Radiation Chem. Research., Inst., Tokyo Univ.*, **5**, 17(1950).

(3) J. M. Creeth, D. O. Jordan and J. M. Gulland, *J. Chem. Soc.*, **1949**, 1406.

(4) I. Watanabe and T. Kitamura, unpublished data.

(5) S. S. Cohen, *J. Biol. Chem.*, **146**, 471(1942).