

Interaction between Nucleic Acid and a Cationic Detergent

THE effect of cetyl-trimethyl-ammonium bromide ('Cetavlon') on the infectivity of Rous sarcoma extracts has already been described by one of us^{1,2}. It was suggested that the reversible decrease of the infectivity could be attributed to interaction between the virus nucleic acid and the detergent. It seemed therefore of interest to analyse in detail some aspect of the interaction between 'Cetavlon' and ribonucleic acid.

The precipitation reaction of 'Cetavlon' and ribonucleic acid was studied by turbidimetry in the Beckmann spectrophotometer at 580 m μ , or, better, by determination of the optical density at 260 m μ of the supernatants after 60 min. centrifugation at 18,000*g*. Preliminary experiments showed that several commercial preparations of ribonucleic acid contain variable amounts of dialysable material, absorbing at 260 m μ , which could not be precipitated by 'Cetavlon'. The preparations used in the present investigation were therefore further purified by precipitation with alcohol or 'Cetavlon'.

Fig. 1 shows the pattern of the precipitation of a fixed quantity of ribonucleic acid (50 μ gm./ml., in water, at 20° C., final pH 7) by increasing amounts of 'Cetavlon'. The results have been reported as per cent ribonucleic acid precipitation versus the weight-ratio 'Cetavlon'/ribonucleic acid. They clearly indicate that the maximum precipitation is obtained for a detergent/ribonucleic acid ratio of 1-2: outside the region of maximum precipitation the curve falls steeply.

The ratio 'Cetavlon' ribonucleic acid for optimum precipitation appears to depend somewhat on the absolute concentration of the ribonucleic acid, going from 1 to 3. The precipitation of ribonucleic acid by 'Cetavlon' is strongly affected by the salt concentration of the medium. Fig. 2 shows the quantity of ribonucleic acid in the supernatant after centrifugation, for a 'Cetavlon'/ribonucleic acid ratio of 2, for different concentration of salts in the medium.

It is clear that the amount of ribonucleic acid in the supernatant increases with the salt concentration and that the effect varies with different salts. Urea and glucose are without appreciable effect.

In the presence of a small salt concentration the precipitation of ribonucleic acid as a function of the 'Cetavlon'/ribonucleic acid ratio shows a pattern different from that observed in water; particularly as regards the zone of detergent excess (Table 1).

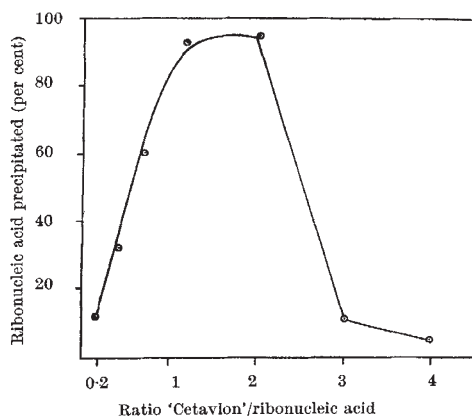


Fig. 1

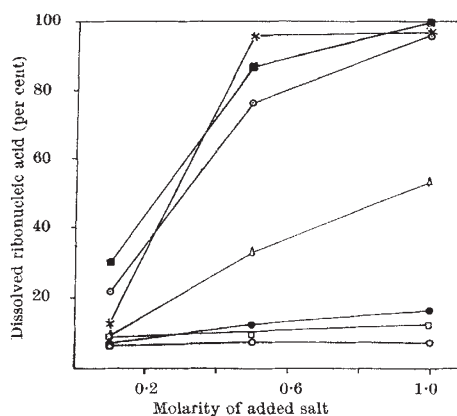


Fig. 2. Per cent of dissolved ribonucleic acid for a reaction 'Cetavlon' + ribonucleic acid ('Cetavlon'/ribonucleic acid ratio = 2) as function of molarity of added salt. *—*, sodium chloride; ○—○, sodium sulphate; ●—●, glycine; ■—■, sodium citrate; △—△, sodium phosphate; □—□, glucose; ○—○, urea

Table 1. INFLUENCE OF SODIUM CHLORIDE ON THE AMOUNT OF RIBONUCLEIC ACID (RNA) (IN PER CENT) IN SUPERNATANTS OF 'CETAVLON'-RIBONUCLEIC ACID MIXTURES AFTER CENTRIFUGATION

'Cetavlon'/RNA	Water	8 × 10 ⁻² M NaCl
0.2	39.2	91.5
0.4	69.0	72.0
0.8	41.2	42.0
1.6	6.8	8.3
2	5.6	3.7
3	39.0	4.3
4	95.0	7.7

In salt solutions the precipitation is not affected significantly by pH between pH 5 and 9, but on both sides of these pH's the amount of ribonucleic acid which can be precipitated by the 'Cetavlon' decreases considerably with increase of acidity or basicity.

There is evidence that the precipitate appearing after the interaction of ribonucleic acid and 'Cetavlon' is due to the formation of an insoluble complex. This complex (obtained by mixing ribonucleic acid and 'Cetavlon' in Miller and Golder buffer at pH 7.0, 0.1 ionic strength) was collected by centrifugation, repeatedly washed, and dissolved in 1.0 M sodium chloride. It contained about 30 per cent ribonucleic acid by weight.

The precipitation reaction between 'Cetavlon' and ribonucleic acid is of interest as a model for the study of the interaction of detergents with virus particles.

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¹ Guerritore, D., *Z. Krebsfor.*, **61**, 649 (1957).
² Guerritore, D., *Nature*, **181**, 419 (1958).

Inhibition of Liver Hexokinase by Dehydroascorbic Acid and Alloxan

THE structure and properties of dehydroascorbic acid are to a certain extent similar to those of alloxan, and both the substances are diabetogenic in rats^{1,2}. It was previously reported by Bhattacharya, Robson and Stewart³ that dehydroascorbic acid causes a precipitous but temporary fall in the reduced gluta-