

Urinary Excretion of Combined Ascorbic Acid in Pulmonary Tuberculosis

IT has been shown before¹ that several plant tissues contain ascorbic acid in a combined state (ascorbigen) besides free ascorbic acid. This substance has since been considerably concentrated from cabbage². The presence of combined ascorbic acid in urine was observed by Scarborough and Stewart³ and by ourselves⁴. Evidence has been presented from this laboratory⁵ which indicates that ascorbic acid may have a detoxicating action both in the normal system and also in the infected condition. Thus after the injection of diphtheria and tetanus toxins into guinea pigs, excretion of free ascorbic acid in the urine was found to be diminished, associated with an increase in the output of combined ascorbic acid. Abbasy, Hill and Harris⁶ also showed that in certain infected conditions the excretion of free ascorbic acid was decreased, but the fate of the disappearing ascorbic acid is unknown. We have recently been able to investigate the relative excretion of free ascorbic acid, dehydro-ascorbic acid and combined ascorbic acid of nine normal individuals and of sixteen "patients" suffering from acute pulmonary tuberculosis: The mean values are given below and are expressed in terms of ascorbic acid (mgm.) excreted during a 24-hour period.

	Free ascorbic acid	Dehydro-ascorbic acid	Combined ascorbic acid	Total ascorbic acid	Combined ascorbic acid as percentage of the total
Tuberculous	5.82	3.52	8.11	17.45	42.24
Normal	44.62	7.41	15.93	67.96	23.82

A statistical analysis of the detailed individual figures, kindly carried out by Mr. K. C. Basak, gave the following results :

Difference of mean rates	=	18.42
Standard error of difference	=	7.56
t	=	2.44

The probability of obtaining such values of t by chance alone is less than five in a hundred. The proportion of combined ascorbic acid excreted is therefore significantly higher in tuberculous patients than in normal healthy individuals.

From these results it appears first that there is a large reduction in the urinary output of total ascorbic acid in tuberculosis, and secondly that in tuberculosis there is a tendency to a relatively greater excretion of combined ascorbic acid. Apart from the simple destruction of ascorbic acid in the infected condition owing to increased metabolism, this evidence appears to support the view that ascorbic acid probably functions as a detoxicating agent, combines with certain toxins or toxic metabolites produced in the infected condition and tries to eliminate them.

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¹ Guha and Paul, NATURE, **137**, 946 (1936); **139**, 844 (1937).

² Ghosh and Guha, *J. Indian Chem. Soc.*, **16**, 505 (1939).

³ Scarborough and Stewart, *Biochem. J.*, **31**, 2231 (1937).

⁴ Guha and Sen-Gupta, NATURE, **141**, 974 (1938).

⁵ Ghosh, *J. Indian Chem. Soc.*, **16**, 241 (1939); 16, 657 (1939).

⁶ Abbasy, Hill and Harris, *Lancet*, **ii**, 1413 (1936).