TABLE I.
Analytical Values for Type II Pneumococcus Specific Precipitate.
All values are corrected for ash and moisture. The nitrogen fractions are expressed as percentages of the total nitrogen.

	I %	II %
Ash	0.16	0.18
Moisture	6.0	6.1
Total N	15.9	16.0
Amide N	3.7	3.6
Humin N	0.58	0.66
Amino N (after hydrolysis)	76.8	73.4
Phosphorus	none	none
Sulfur	1.3	1.2
Tyrosine	5.5	5.5
Tryptophane	2.0	2.0
Cystine	3.1	3.1
Arginine	5.7	5.4
Histidine	1.0	1.1
Lysine	4.9	4.7
Aspartic Acid	4.3	4.5
Glutamic Acid	6.1	6.4

values in Table I are much higher, the tryptophane values slightly higher and the tyrosine values somewhat lower than those reported by Hewitt[1] for diphtheria toxin-antitoxin floccules, for which amino acids the mean values are 2.05%, 1.80% and 5.85% respectively. The amide N value found by Hewitt is very high, being 9.1% as compared to 3.65% in the table. From these comparative values it seems very probable that more complete chemical analyses of highly purified products will afford valuable information concerning the chemical composition of antibodies, their probable method of formation and the nature of the reactions between antigens and antibodies.

7986 C

Specific Rotation of Cystine Excreted in Cystinuria.

BARKER H. BROWN AND HOWARD B. LEWIS.

From the Department of Physiological Chemistry, Medical School, University of Michigan, Ann Arbor.

The identity of stone cystine and protein cystine has been generally accepted in recent years. Gortner and Hoffman[1] in an examination of cystine isolated from kidney calculi observed a specific ro-

[1] Gortner, R. A., and Hoffman, W. F., PROC. SOC. EXP. BIOL. AND MED., 1926, **23**, 691.

tation at 20° in 0.1 N hydrochloric acid of —242.6°, a figure much higher than any value recorded in the literature for either stone or protein cystine. They believe that the conflicting observations make necessary the conclusion "that cystine is an extremely labile compound and possibly occurs in more than one form so that persons working with cystine are probably working with a mixture of substances and that this mixture varies in composition depending at least upon (1) the source of the biological material from which the cystine is prepared, and (2) the method of preparation which is used for the isolation and purification of the amino acid." The different values for specific rotations of cystine recorded in the literature can in all probability be explained by varying degrees of racemization or by failure to use standard conditions for the determination of the specific rotation,[2, 3] but it remains to be demonstrated that the optical properties of cystine vary with the biological source of the amino acid.

In studies with a cystinuric patient we observed that crystals, which were observed to be almost pure cystine on microscopic examination,[4] separated very rapidly after the sample was collected. Since the pH of the urine was 6.8 to 7.2, an opportunity was afforded to determine the specific rotation of the cystine excreted in cystinuria, a cystine which had not been subjected to high concentrations of acid or alkali and which should show minimal racemization.

The urine was filtered through a Buchner funnel with fritted glass disc; the precipitate was repeatedly washed with distilled water and with a small volume of 10% acetic acid to remove any phosphates. After further washing with water, the cystine was dissolved on the filter in a small volume of 3% hydrochloric acid. The filtrate was immediately treated with a saturated solution of sodium acetate and the precipitated cystine was washed repeatedly by centrifugation with distilled water and finally with alcohol and with ether. The cystine was once recrystallized under the same conditions and the product was dried for 6 hours in an oven at 95-100° and then in a desiccator over phosphorus pentoxide for 2 months. The cystine thus obtained had not been in contact with alkali or acid for any considerable period of time.

This cystine was compared with a sample of cystine from protein

2 Andrews, J. H., *J. Biol. Chem.*, 1925, **65**, 147.

3 Toennies, G., and Lavine, T. F., *J. Biol. Chem.*, 1930, **89**, 153.

4 A microphotograph of typical urinary cystine crystals of this patient is shown in Lewis, H. B., *Ann. Internal Med.*, 1932, **6**, 183.

showing maximal optical activity[2] generously placed at our disposal by Professor J. H. Andrews of the University of Pennsylvania. When analyzed by the Sullivan-Lugg method, the urinary cystine showed a purity of 99.7% as compared with a purity of 99.5% for the protein cystine, values within the range of accuracy of the Sullivan-Lugg procedure.[5]

0.5 gm. samples of each of these cystines were dissolved in 50 cc. of N hydrochloric acid and the rotations determined in 2 dcm. tubes at 30° using sodium light. With the urinary cystine an $[\alpha]_D^{30°}$ of —201.0° was obtained; with the protein cystine, a rotation under the same conditions of —202.5°. As a further check on our determinations, the optical activities of the 2 cystines were determined independently by Professor Andrews. Values of —214.0° and —215.0° at 25° respectively were obtained.

If our values are corrected to a temperature of 20°, using the factor of Toennies and Lavine,[3] the specific rotations are —221.6° and —223.1° respectively, values which compare favorably with the classical values of Fischer and Suzuki,[6] —223.6° for stone cystine and —221.9° for cystine from hair.

These data offer no evidence that cystine which crystallized spontaneously from cystinuric urine and which had had minimal opportunity for racemization, differed significantly in its specific rotation from the maximal values usually given for the rotation of *l*-cystine from protein hydrolysates.

7987 P

Charcoal Adsorption as a Method for the Preparation of a Concentrated Liver Extract.

JEAN L. KYER. (Introduced by Raphael Isaacs and Cyrus C. Sturgis.)

From the Thomas Henry Simpson Memorial Institute for Medical Research, University of Michigan, Ann Arbor.

It has been noted that in concentrating liver extracts for the treatment of pernicious anemia to very small volumes a considerable degree of potency was lost in the precipitate which formed. In the search for a satisfactory method of obtaining a concentrated liver extract which could be administered intramuscularly and which

[5] Lugg, J. W. H., *Biochem. J.*, 1933, **27**, 668.

[6] Fischer, E., and Suzuki, V., *Z. physiol. Chem.*, 1905, **45**, 405.