

Table 1. COPPER CONTENT OF HUMAN HAIR AND NAILS ( $\mu\text{g}/\text{g}$ )

	Hair	Finger nails	Toe nails
Normal males	18.8	17.2	6.0
	14.5	18.9	6.9
	15.2	13.4	8.1
	17.5	—	—
	19.1	15.1	5.1
	16.5	—	8.0
	19.4	8.1	15.5
	7.1	—	—
Mean $\pm$ S.D.	16.0 $\pm$ 4.0	14.8 $\pm$ 3.8	7.8 $\pm$ 3.6
Normal females	16.7 (15.0)	6.8	—
	20.5	11.5	9.7
	16.9	—	—
	20.6	12.2	6.2
	13.7	—	8.6
	19.2	9.9	8.7
	21.4	10.9	7.6
	14.8	—	—
	25.7	15.3	7.5
	20.3	7.8	5.3
	22.4	—	—
	21.0	—	—
Mean $\pm$ S.D.	19.5 $\pm$ 3.4	10.6 $\pm$ 2.8	7.7 $\pm$ 1.5
Wilson's disease	M 9.0 (8.6)	21.1	—
	M 12.7	32.2 (7.8)	— (3.5)
	M 14.9	—	2.7
	F 24.5	11.4	—
Wilson's disease heterozygotes	M 13.6 (14.4)	13.4	—
	F 15.5	16.2	—
	F 12.8	8.3	—
Wilson's disease siblings	F 12.8	14.0	—
	F 13.4	10.9	—
Huntington's chorea	M 11.8	—	3.1
	M —	10.5	—
	M 19.5	11.3	—

M = male, F = female, ( ) = repeat assays on independent samples

value of 32.2  $\mu\text{g}/\text{g}$ ; another specimen from this patient yielded copper values of only 7.8  $\mu\text{g}/\text{g}$ . In the interim, the patient had had an additional series of treatments with BAL. Unusually higher copper concentrations were not observed in hair from the three male patients with Wilson's disease. Only one normal individual had a copper value higher than that of the single female patient, however. (Copper concentrations of 35.4 and 42.0  $\mu\text{g}/\text{g}$  were found in independent samples of hair from a female laboratory technician who had been continuously engaged in chemical and biochemical investigations of copper for two years; these values were not included in Table 1.) The limited data from Wilson's disease heterozygotes, siblings and patients with Huntington's chorea were not unusual.

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GEORGE M. MARTIN

Department of Pathology,  
University of Washington School of Medicine,  
Seattle 5, Washington.

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### Erythrocyte Glutathione-levels in Patients of a Mental Hospital

THE work of Beutler<sup>1</sup> on erythrocyte glutathione 'instability' has demonstrated the significance of the glutathione content of red cells for the maintenance of overall erythrocyte structure (and presumably function). In addition, Rigas *et al.*<sup>2</sup> have shown how the interaction of haemoglobin and oxidized glutathione can lead to increased rates of splenic erythrocyte destruction. A number of disease states have been related to increased instability of erythrocyte glutathione; for example, Theil *et al.*<sup>3</sup> have shown a significant decrease of blood glutathione-levels in patients with acute renal insufficiency.

Our interest stems from reports suggesting that the blood glutathione-levels in certain classes of mentally ill patients is reduced<sup>4,5</sup> or unchanged<sup>6,7</sup>. The importance of the sulphhydryl group in maintaining the cellular structure intact, its potential importance in the control of the state of activity of many -SH enzymes, and the possibility that the blood-levels may reflect the tissue-levels suggest that it is of considerable interest to investigate this controversy. Certainly, any lead concerning the abnormality of the physiological state of the mentally ill patient is, *per se*, of great interest.

The blood glutathione-levels of a series of patients admitted to this Institute were determined by a method which we developed in our laboratories. The details are, however, essentially identical to the recent technique described by Beutler *et al.*<sup>8</sup>.

Table 1. BLOOD GLUTATHIONE-LEVELS IN HUMAN BEINGS (MG/100 ML. RED BLOOD CELLS)

	Mean	S.D.	No.
Staff personnel	69.64	7.89	20
Patients	68.85	11.14	24

Results of these determinations are given in Table 1. The blood samples were obtained from the patients on admission to this Institute. Samples were obtained by the clinical laboratory personnel as part of the regular admissions procedure, and represent consecutive admissions for a 15-day period.

Like Barak *et al.*<sup>7</sup>, we find no significant difference between patients and normals. The comments of Altschule<sup>9</sup> concerning the 'large variation' observed by Barak refer, in fact, to the variability of results from patient to patient; the variability which Barak reported was like those found by others<sup>5,6</sup> and ourselves. It is, furthermore, of the magnitude frequently observed for many other blood constituents in human and other species<sup>10</sup>. We conclude that the mean values of erythrocyte glutathione-levels obtained from patients does not differ significantly from normal values.

GEORGE L. ELLMAN  
GEORGE L. GAN

Langley Porter Neuropsychiatric Institute,  
San Francisco 22, California.

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### Regulation of Ascorbic Acid Synthesis in Rat-liver Extracts: Experiments with Growing Rats

THE synthesis of ascorbic acid from glucuronolactone is impaired in liver extracts from fasted and from carbohydrate-deprived rats. This impairment has been interpreted as an adaptive metabolic response to these dietary changes<sup>1</sup>.

This communication presents the results of an investigation on the synthesis of ascorbic acid in liver extracts from new-born, growing, and adult rats, and on its relationship with the modifications of the dietary régime occurring during growth.

Male, Wistar strain, rats were used. Females during pregnancy were given a commercial pelleted diet supple-