would seem that they are certainly of general importance.

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PSYCHIATRY

Erythrocyte Cholinesterase-levels in Mental Patients

Rubin has published data[1a] on erythrocyte acetylcholinesterase which showed a bimodal distribution of this enzyme in schizophrenic patients. This paper was criticized[1b] and the criticism answered[1c]. Our work was an attempt to repeat Rubin's findings in larger groups of patients and normals.

The assay procedure we used is based on the following reactions:

acetylthiocholine + erythrocyte acetylcholinesterase → acetate + thiocholine

thiocholine + dithiobisnitrobenzoate → yellow colour

The rate of formation of the yellow anion of 2-nitro-5-thiobenzoic acid is proportional to the enzyme activity. This method is rapid and uses small amounts of blood (10 μl.) and is useful for surveys of this type. The plasma esterase was inhibited by addition of quinidine sulphate to the reaction mixture[3]. The assays reported in this communication are therefore of the erythrocyte esterase. Details of this method have been published[2].

Blood samples for the patient group were collected by the clinical laboratory staff from each patient on admission to this Institute. At that time the patient's record number and the date of the blood withdrawal were noted. A portion of the blood sample was assayed in our laboratories for erythrocyte acetylcholinesterase. At the time the assay was performed, the clinical diagnosis was unknown to us. After we had determined the erythrocyte acetylcholinesterase-levels of 64 patients, the diagnosis and status of these patients were studied. A psychiatrist (E. C.) examined all the hospital records on members of this group. The patients were then placed in the categories listed in Table 1 on the basis of the diagnosis recorded in the hospital record, supplemented by first-hand examination of the patients' chart. The results we obtained are shown in Table 1.

Table 1. Erythrocyte Acetylcholinesterase-levels

Type	$\bar{x}$	σ	n
Normal *A*	1·08	0·18	75
Normal *B*	1·01	0·16	8
Schizophrenic, no drugs	0·98	0·12	16
Schizophrenic, on phenothiazine	1·02	0·22	6
Organic psychoses and epilepsies	0·98	0·42	11
Psychoneuroses	1·00	0·23	13
Depressions	1·12	0·15	10

$\bar{x}$, Observed mean-rate (moles substrate hydrolysed per min. per red blood cell × 10^{15}).
σ, Standard deviation of the group.
n, No. in each group.

The group labelled Normal *A* is a sample of individuals who volunteered finger-tip blood during a display of medical research facilities held on this campus. The equipment for assaying the erythrocyte acetylcholinesterase was on display and the assays were performed in public. Persons whose blood was taken by our clinical laboratory and who were not patients (for example, physicians, nurses, staff, students, etc.) are included in the classification Normal *B*.

The results indicate that we cannot distinguish hospitalized mental patients from non-hospitalized, presumably normal persons, on the basis of mean erythrocyte acetylcholinesterase rates. The group called 'psychoses and epilepsies' did show considerably greater variability than the other groups. For this reason, we decided to follow the erythrocyte acetylcholinesterase rates for several days in these patients, to see if this difference was significant.

In summary, an epileptic patient was hospitalized for more than a month. During that period 28 erythrocyte acetylcholinesterase determinations were performed on his blood cells. Some of these were shortly prior to, others shortly after, seizures; some were quite distant in time before or after seizures. In addition, on two occasions we were able to make determinations at regular intervals after a seizure. In no case was there any obvious correlation of the duration or time of occurrence of the seizure with the observed erythrocyte acetylcholinesterase-level. Nor were his rates different from the normal (1·09 ± 0·12, Table 1) for the whole series. In a smaller series from two other such patients similar negative findings were observed. We believe, therefore, that the original observed large variability in this group of patients was an artefact of the small sample.

In re-examining Rubin's results it is clear that the major difference between his results and ours is the magnitude of the standard deviations observed. Our normals show about 15 per cent variation from the mean value. In a series of 101 human adult subjects, Sabine[4] showed a standard deviation of 10 per cent about her mean value. Sawitsky[5] reports a standard deviation of a group of 15 normal subjects which is 9·6 per cent of their mean activity. Rubin, on the other hand, observed a 3 per cent variation. Had his variation been as large as 10 per cent, his results would have been similar to ours.

The number of verifiable physiological differences between mentally ill patients and normals is small and any new observations in this field would be of value in assessing the etiology and progress of the disease. The difficulties of confirming the results of one investigation by another investigator in the field of mental health has been discussed by Kety[6]. We have been unable to confirm Rubin's results.

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