Proceedings
of the
Society
for
Experimental Biology and Medicine

VOL. 113 JUNE 1963 No. 2

SECTION MEETINGS

MINNESOTA
University of Minnesota
March 21, 1963

SOUTHERN CALIFORNIA
Santa Monica, California
March 9, 1963

Distinctive Protein Patterns in Functional Psychoses.* (28332)

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Recent studies have confirmed the findings of abnormal serum proteins in psychiatric patients hospitalized for acute and chronic mental disorders(1,2,3). This report demonstrates that patients with manic-depressive psychoses have significantly different 19S levels than those with schizophrenic psychoses.

Materials and methods. Sera were obtained from acutely ill, manic-depressive and schizophrenic patients who were seen during the past 2 years at 2 hospitals: U. S. Naval Hospital (USNH), Oakland, and Langley Porter Neuropsychiatric Institute (LPNI), San Francisco. At the times of hospital admission and discharge, patients were evaluated clinically, using the criteria established by the American Psychiatric Assn.(4). Ultracentrifugal analyses were done by the Institute of Medical Physics (Belmont, Calif.) and electrophoretic analyses, in the laboratory of one author (W.J.F.), using cellulose acetate as the supporting medium. The modified "t" test of Lord(5) was used in the statistical comparisons; p values less than 0.005 were considered significant.

Results and discussion. Ultracentrifugal analyses of the sera from 50 severely disturbed patients admitted to the acute treatment wards of LPNI showed significantly higher levels of 4S and 19S classes of serum proteins than a control population of 48 unselected donors(1),

* This work was supported in part by contract between Office of Naval Research, Dept. of Navy, Washington, D. C., and Dept. of Medicine, Univ. of California Medical Center, San Francisco; also in part, by U. S. Public Health Service grant. Opinions or assertions contained herein are private ones of authors and not to be construed as official or necessarily as reflecting views of Medical Dept. of Navy or Naval Service at large.

TABLE I. Analytical Ultracentrifuge Data—Mean Levels of Protein Fractions in Grams % (± 1 Standard Deviation).

Groups	No. in group	4S	7S	19S	
LPNI					
Acute treatment ward patients	50	6.1 (± .73)	1.6 (±.34)	.316 (± .111)	
Blood donor controls	48	5.4 (± .51)	* 1.5 (±.28)	.234 (± .083)	*
Schizophrenics	10	6.6 (±1.1)	1.8 (±.15)	.392 (± .136)	
Manic-depressives	9	5.9 (± .46)	1.5 (±.30)	.209 (± .085)	*
USNH					
Schizophrenics	6	6.5 (± .24)	1.9 (±.20)	.325 (± .039)	
Manic-depressives	6	6.1 (± .37)	1.7 (±.21)	.183 (± .048)	*

* These values are significantly different.

Ultracentrifugal data for the 10 schizophrenic and 9 manic-depressive patients among that group of 50 are tabulated separately in Table I. The schizophrenic patients from both LPNI and USNH had greater 4S and 19S levels than those of the total group from LPNI. The manic-depressive patients from both LPNI and USNH had 19S levels even lower than those of the blood donor controls, but their mean 4S levels were similar to those of the total group of 50 from LPNI.

At each hospital the schizophrenic patients had greater mean values for the ultracentrifugally determined serum proteins than did the manic-depressive patients; indeed the mean 19S concentrations of both groups with schizophrenic psychoses were about double the amount found in the comparative groups with manic-depressive psychoses. The schizophrenic patients at both hospitals had mean 4S, 7S and 19S concentrations in the same order of magnitude. The manic-depressive patients at both hospitals also had mean values that were similar. Of course there was an overlap between the 19S levels of some of the individual manic-depressive and schizophrenic patients. The highest 19S value in the LPNI manic-depressive patients was 310 mg%; the lowest 19S concentration in the LPNI schizophrenic patients was 192 mg%. At the USNH, the highest 19S value in manic-depressive patients was 274 mg% and the lowest 19S value in the schizophrenic patients was 262 mg%.

It is possible that the overlap of 19S levels in the schizophrenic and manic-depressive patients may reflect the clinical combinations of primary thought disorders with primary affective disorders. The rise in 19S concentrations of a USNH manic-depressive patient from 171 to 274 mg% followed the development of a thinking disorder with mild persecutory ideas; 2 schizo-affective patients at the USNH had 19S concentrations in the same order of magnitude as did those with schizophrenia. Serial determinations on one of these schizo-affective patients showed a decrease of the 19S value to the lowest level of the comparative schizophrenic range (262 mg%) after the clinical improvement of his thinking disorder. A manic-depressive patient at the USNH also showed a decrease in 19S values (from 182 to 148 mg%) after remission of the minimal persecutory ideas he had at time of admission.

Electrophoretic analyses showed differences between manic-depressive and schizophrenic patients at the same hospital. The USNH group of 6 manic-depressive patients had significant ($p < 0.005$) elevations of the *beta*-globulin levels (mean = 15.5% ± 1.5%) as compared with the 6 schizophrenic patients (mean = 10.5% ± 1.9%). The 10 LPNI schizophrenic patients, however, had somewhat higher percentages of *beta*-globulin (mean = 9.4% ± 1.8%) than did the 9 LPNI manic-depressive patients (mean = 8.7% ± 1.1%). This discrepancy is being investigated.

Summary. Analytical ultracentrifugation of the sera of patients with manic-depressive psychoses demonstrated different mean concentrations of protein fractions than were found in patients with schizophrenia. Values were similar for the comparative patient samples within 2 different hospital populations. Sera from manic-depressive and schizophrenic patients could be differentiated by their 19S levels.

We are indebted to Commander R. H. Watten, MC, USN, Clinical Investigation Center, for advice in the design of our studies, and to E. L. Alpen,

Ph.D., U. S. Naval Radiological Defense Laboratory, for assistance in statistical evaluation.

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Received March 28, 1963. P.S.E.B.M., 1963, v113.

Production of a Polysaccharide by *Staphylococcus aureus*. I. Enhancement by Penicillins. (28333)

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Previous investigations from this laboratory have demonstrated that various bacteria other than mucoid strains of Groups A and C streptococci synthesized mucopolysaccharides which were depolymerized by hyaluronidase(1-4). The results of these studies showed that mucopolysaccharides were not limited to the capsular structure of the organism as in streptococci but that substrates depolymerized by hyaluronidase may be synthesized by gram negative bacteria as endocellular and exocellular metabolic products.

Studies aimed at determining the role of polysaccharides of *Staphylococcus aureus* in resistance to penicillin revealed that a polysaccharide extracted from washed suspensions of staphylococci was depolymerized by bovine testicular but not by bacterial hyaluronidases. In addition, the production of this staphylococcal constituent was markedly increased when the organisms were grown in a medium containing sub-bacteriostatic amounts of potassium penicillin G. It seemed of interest, therefore, to study some of the properties of this polysaccharide and to ascertain the effect of potassium penicillin G and sodium nafcillin* on the accumulation of the polysaccharide in strains of *S. aureus*.

Materials and methods. Bacterial cells. The experiments described were performed with a penicillin-sensitive strain (GF7) and a penicillin-resistant strain (CHP) of *S. aureus*. The latter, a penicillinase producer, was highly resistant to potassium penicillin G but susceptible to sodium nafcillin(5). Steinman(6) found sodium nafcillin to be markedly resistant to destruction by staphylococcal penicillinase. Organisms were grown on the surface of agar in Blake bottles; each bottle contained the following medium: casein hydrolysate (enzymatic) 50 g; $Na_2HPO_4 \cdot 12H_2O$, 11.2 g; KH_2PO_4, 0.96 g; $MgSO_4$, 0.04 g; Ca-d-pantothenate, 1 mg; pyridoxine HCl, 1 mg; riboflavin, 0.1 mg; glycerol, 2.0 ml; agar, 3.0 g; distilled water, 200 ml. The medium was adjusted to pH 7.6-7.8 with 5N NaOH and sterilized by autoclaving at 120°C for 20 minutes. Following sterilization, the bottles were heavily seeded with an 18-hour nutrient agar slant culture of the organism taken up in 10 ml of saline and incubated for 18-24 hours at 37°C. *Quantitative determinations.* Since the polysaccharide gave a fairly stable colloidal suspension with dilute acidified horse serum (pH 3.1) similar to that produced by hyaluronic acid, a turbidimetric procedure(7) was employed in quantitating the polysaccharide. As a standard it was found convenient to dilute the polysaccharide with acetate buffer so that a turbidity of 100-150 scale divisions on the Klett colorimeter (red filter No. 66) was produced by the interaction of 1.0 ml of polysaccharide, 0.5 ml of 0.1 M acetate buffer pH 6.0, and 4.0 ml of a 1:40 dilution of acidified horse serum pH 3.1. The depolymerization of crude and partially purified polysaccharide by hyaluronidase was deter-

* Wy-3271 [6-(2-ethoxy-1-naphthamido)penicillanic acid].