which is not significantly different from the normally beating heart.

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Adrenocortical Function in Some Mental Diseases. (24290)

DHIRENDRA NATH NANDI AND SACHCHIDANANDA BANERJEE
Department of Physiology, Presidency College, Calcutta, India

Controversial reports have appeared regarding the functional state of the adrenal cortex in mental diseases. In schizophrenia, hypoactivity of the adrenal cortex has been claimed(1-6) and denied(7-10). One reason for this controversy might have been the different diagnostic criteria of the workers. The present investigation deals with functional activity of the adrenal cortex in patients suffering from schizophrenia, paranoia, depression and mania. Eosinopenic response to injected epinephrine was used as the test in all the diseases. In some of the schizophrenic patients eosinopenic response to injection of ACTH and urinary excretion of 17-ketosteroids were also determined.

Methods. Patients were selected from Lumbini Park Mental Hospital at Calcutta. Normal subjects were male and female nurses of the same hospital. Patients with composite diagnosis like depression with paranoia, patients complicated with arteriosclerosis, psychosis, general paralysis of the insane, thyrotoxicosis with psychosis were avoided. The 4 groups of patients were selected according to the following basic features: *Schizophrenia* starts insidiously at adolescence and progresses slowly. There is gradual personality deterioration with disorders of feeling, thought, conduct and memory, and withdrawal of interest from environment. *Paranoia* is a focal personality disorder with delusion formation without much deterioration of personality. Hallucination may be present. Power of reasoning remains relatively unimpaired, but does not accord with the existing surroundings and patients do not realize the absurdity of their delusions or hallucinations. *Mania* is associated with elated mood with emotional instability. There is flight of ideas and psychomotor hyperactivity. Megalomanic ideas may be present. *Depression.* Patients suffer from depressed mood and retardation of thinking process. Sluggishness of psychomotor activity, sense of guilt, self-reproach and self-depreciating ideas are often present. In the schizophrenic group stress was given to the basic features, and different sub-classes of this group were not included. In manic depressive psychosis, importance was given to the nature of manifestation at time of study and patients of this group were included in either mania or depression. .3 cc of epinephrine hydrochloride (1/1000) was injected subcutaneously in early hours of morning before breakfast and blood collected from anticubital vein in oxalated tubes both before and 4 hours after injection. Eosinophils in blood samples were counted by the method of Menneman *et al.* (11). In 8 schizophrenic patients, who did not improve with insulin shock and electric convulsion therapy, 25 mg ACTH was injected subcutaneously and eosinophils were counted in the blood samples collected before and 4 hours after the injection. In these patients 17-ketosteroids in 24 hour urine samples were extracted and estimated by the method of Davidson *et al.*(12).

Results. Tables I-III summarize the results. Eosinophils of patients suffering from schizophrenia and mania were significantly

TABLE I. Blood Eosinophils and Their Reduction 4 Hours after Subcutaneous Injection of .3 cc Epinephrine Hydrochloride (1/1000).

Subjects	Eosinophils/cm blood before epinephrine	t	Reduction of eosinophils (%) after epinephrine	t
Normal (15)	386 ± 32*		63 ± 2	
Schizophrenia (26)	498 ± 37	3.1	31 ± 3	10
Paranoia (21)	300 ± 22	2.3	63 ± 2	0
Depression (10)	188 ± 32	4.5	75 ± 3	3.3
Mania (15)	566 ± 75	2.3	24 ± 3	11.8

* Mean ± stand. error.

Figures in parentheses indicate No. of subjects.

TABLE II. Blood Eosinophils and Their Reduction 4 Hours after Subcutaneous Injection of 25 mg ACTH.

Subject	Eosinophils/cm blood before ACTH	Reduction of eosinophils (%) after ACTH
Normal (15)	380 ± 31	63 ± 2
Schizophrenia (8)	622 ± 126	31 ± 6

TABLE III. 24-Hour Urinary Excretion of 17-Ketosteroids (mg).

Subjects	24-hr urinary 17-Ks (mg)
Normal (15)	16.94 ± .91
Schizophrenia (8)	3.39 ± .63
t	12.3

higher than the counts in normal persons. Eosinopenic response to injections of epinephrine was significantly lower in patients suffering from schizophrenia and mania, higher in depression, and did not differ from normal subjects in patients suffering from paranoia. Eosinopenic response to injection of ACTH was lower in schizophrenia. Urinary excretions of 17-ketosteroids were significantly lower than those of normal Indians(13).

Discussion. Schizophrenia. All patients had possibly hypofunctioning adrenal cortex as evidenced by eosinopenic response to epinephrine and ACTH and urinary excretion of 17-ketosteroids. Epinephrine may directly depress the eosinophil count as has been observed by Thorn(14) but the depression was less in schizophrenics than normal subjects. ACTH also produced less depression of eosinophil count in schizophrenics than normal persons. Eosinopenic response to epinephrine and ACTH was qualitatively similar in both schizophrenics and normal persons. It is, therefore, likely that epinephrine acted indirectly through the pituitary by liberating ACTH and eosinopenic response to epinephrine may be considered as a suitable test for determination of functional activity of the adrenal cortex in schizophrenia. Average daily urinary excretion of 17-ketosteroids in patients suffering from schizophrenia was 3.39 mg; corresponding excretion in normal subjects of the same economic and social status was 16.94 mg. Patients were between 21 and 35 years of age. The depressed output of 17-ketosteroids was, therefore, possibly not due to the aging process(15). It, however, might have been a non-specific reflection of chronic disease. The contradictory reports on functioning of the adrenal cortex by various workers might be due to the different diagnostic criteria followed in placing a patient suffering from mental diseases under schizophrenia. Patients suffering from mania also showed diminished activity of adrenal cortex. The finding was similar to that reported by Lehman *et al.*(16). Symptoms similar to those of mania are usually seen in prefrontal leucotomised subjects. Vargha *et al.*(17) observed that after leucotomy operation eosinophils of blood increased. It might be that leucotomy depressed functional activity of the adrenal cortex. As the pituitary-adrenal axis is regulated by the hypothalamus, a disorder in the relation between prefrontal cortex and hypothalamus in mania might be responsible for the malady.

The type of mental reaction in depression is the reverse of mania. Hyperactivity of the adrenal cortex was observed in patients suffering from depression. From the psychological point of view superego is hyperactive in cases of depression. The somatic structure responsible for superego activity in all probability lies in the prefrontal area of the cerebral cortex. The symptoms of depression might be due to hyperactivity of prefrontal cortex. In depression, therefore, the possible site of depression might be in the cortical hypothalamic relation leading to increased pituitary

adrenocortical activity. The functions of adrenal cortex were normal in paranoia. In this disease the psychical disturbance is limited within certain spheres of mental organization and condition of stress is less in comparison with other psychotic diseases. The functional activity of the adrenal cortex, therefore, possibly did not change. Diminished urinary excretion of 17-ketosteroids in schizophrenia might be due to hypofunction of testes Leydig cells, of adrenal cortex or of both these organs. Hemphill *et al.*(18) observed degenerative changes in the testes of schizophrenics and changes in most patients were similar to those of the testes of hypophysectomized animals. Urinary excretions of 17-ketosteroids also decreased both after electric convulsion therapy(18,19) and prefrontal leucotomy (18). The disorder in schizophrenia seems likely to be in the cerebral control of pituitary.

Summary. Eosinopenic response to injected epinephrine was studied in patients suffering from schizophrenia, paranoia, depression and mania. Eosinopenic response was lower in cases of schizophrenia and mania, higher in depression and normal in paranoia. Eosinopenic response to injected ACTH which was studied in 8 schizophrenic patients was very low. 24-hour urinary excretion of 17-ketosteroids by these schizophrenic patients was also very low.

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Potentiating Effects of Reserpine on Thyrotoxicity in the Rat.* (24291)

BENJAMIN H. ERSHOFF

Department of Biochemistry and Nutrition, University of S. California, Los Angeles

Considerable data are available indicating that reserpine under various experimental conditions has an anti-thyroid effect. Thus Kuschke and Gruner(1) reported that large doses of reserpine prevented the increase in oxygen consumption produced by parenterally administered thyroxine in rats. De Felice *et al.*(2) observed that reserpine reduced oxygen consumption of euthyroid and hyperthyroid guinea pigs. A direct *in vitro*

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