

## **BIOGENE AMINES (NEUROTRANSMITTERS) IN BLOOD PLATELETS**

This test measures the concentration of biogene amines (neurotransmitters) in platelets.

### **NEUROTRANSMITTERS**

Neurotransmitters are the classic neuro-messengers that are released rapidly by the presynaptic neuron, diffuse across the synaptic cleft, and have either an excitatory or an inhibitory effect on a postsynaptic neuron. There are three classes of neurotransmitters: biogenic amines, amino acids and peptides.

The biogenic amines (monoamine) consist of three catecholamines, which are structurally related to a group of organic compounds designated as catechols, (norepinephrine, epinephrine, dopamine), and indoleamine (serotonin), an ethylamine (histamine) and a quaternary amine (acetylcholine).

The biogenic amine neurotransmitters are well known to most psychiatrists, because they were the first neurotransmitters discovered and, therefore, have been the subject of research studies for the longest amount of time. Most of the standard psychiatric drugs have one or more of the biogenic amine neurotransmitters as their initial site of action.

Catecholamines influence virtually all tissues and many functions. In most instances, however, catecholamines are not the sole or exclusive regulators; they participate with other hormonal and neuronal systems in regulation of a multitude of diverse physiological processes, thus contributing to a redundancy that ensures both a great physiological reserve and the possibility of very fine or discriminating control.

### **THE TEST**

Platelets take up dopamine, epinephrine and nor-epinephrine against a concentration gradient into the 5-HT storage organelles; and serotonin is present in highest concentration in the blood platelets. Platelet catecholamine levels provide a stable index of circulating plasma catecholamine concentration and these are unaffected by acute elevations of plasma levels with physical and psychological stress.

In Plasma, the concentration of catecholamines is extremely low and their estimation has required that methods be used at the limit of their sensitivity. Stress of venipuncture and upright posture can greatly affect plasma catecholamine levels.

Urinary catecholamine concentrations reflect plasma and peripheral sympathetic nervous system activity, tonic stimulation of adrenal medulla and metabolic breakdown of nor-epinephrine. Also, since free catecholamine excretion occurs by a renal tubular mechanism, it is highly dependent on urinary pH being facilitated in an acid urine and retarded in an alkaline one.

### **TEST INDICATIONS**

The effect of catecholamines on illnesses like cardiovascular, visceral, metabolic disorders etc. is well established. The catecholamine levels are increased after severe exercise, by emotional stress and by smoking. Other diseases or conditions that may increase circulating or urinary catecholamines are hypothyroidism, diuretic therapy, heavy alcohol intake, hypoglycemia, hypoxia, severe acidosis, Cushing's Syndrome, myocardial infarction, hemolytic anemia, essential hypertension and occasionally lymphoma or severe renal disease. On the other hand, symptoms like autism, attention deficit disorder, specific developmental delays in childhood etc. shows reduced circulating catecholamine.

Some of the specific physiological conditions attributed to the function of individual biogenic amines are described below.

#### Platelet Epinephrine

Platelet Epinephrine level provides valuable information for patients with:

Stressful conditions such as Hypoglycemia

Essential Hypertension

Myocardial Infarction

Suspected tumor in adrenal gland

Neuroblastoma

Progressive Muscular Dystrophy and Myasthenia Gravis

Physical exhaustion

Hypothyroidism, diuretic therapy, and Cushing's syndrome

### Platelet Norepinephrine

Platelet Nor-epinephrine levels might be supportive in the following conditions:

Failure of Baroreceptor Reflexes

Differentiating Hypertension from Pheochromocytoma

Various Autonomic Nervous Failure (e.g., Shy-Drager Syndrome)

### Platelet Dopamine

Many conditions, particularly chronic ones, warrant the investigation of dopamine, including the following:

Orthostatic hypotension

T-Wave abnormalities (ECG) and arterial fibrillation

Seizure with hypotension

Stress-related hypertension

Hypomagnesemia

Impaired ejaculation and excessive urination at night

Behavioral changes with respect to mania and depression

Schizophrenia

Tardive dyskinesia

Parkinsonian symptoms

### Platelet Serotonin

#### Increased Value Indicate:

Cystic fibrosis

Ovarian carcinoid tumor

Tropical sprue

Severe pain of sciatica or skeletal

Smooth-muscle spasm

Bronchial adenoma, carcinoid type

Malabsorption of food

Celiac disease

Whipple disease

Stasis syndrome

Chronic intestinal obstruction

Oat cell cancer of respiratory system

Prolonged alimentary hyperglycemia

Prolonged insomnia

Compromised MAO production or secretion

Malignant lymphoma of stomach

Accentuated manic phase of bipolar illness

#### Decreased Value Indicate:

Depressive illness

Small-intestinal resection

Phenylketonuria (PKU)

Hartnup's disease

Mastocytosis

#### Very High Value Indicate:

Iliac tumor

Large carcinoid tumor

Pancreatic tumor

Duodenal tumor

Biliary tumor

### Clinical alert

Platelet serotonin assay may detect some carcinoid missed by urinary serotonin and 5 HIAA assay.

### **COMPLEMENTARY TESTS**

Thyroid hormones in 24h urine: The actions of thyroid hormones and the catecholamines, norepinephrine and epinephrine are intimately interrelated. Epinephrine increases the metabolic rate, stimulates the nervous system, and produces cardiovascular effects similar to those of thyroid hormone, although the duration of these actions is brief. Norepinephrine has generally similar actions. Thyroid hormones increase the number and affinity of B-adrenergic receptors in the heart and possibly in some other tissues, and the effects of thyroid hormones on the heart resemble those of B-adrenergic stimulation. Although circulating catecholamine levels are normal in hyperthyroidism, the cardiovascular effects, involuntary trembling and sweating produced by thyroid hormones can be reduced or abolished by an operation on some portion of the sympathetic nervous system.

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