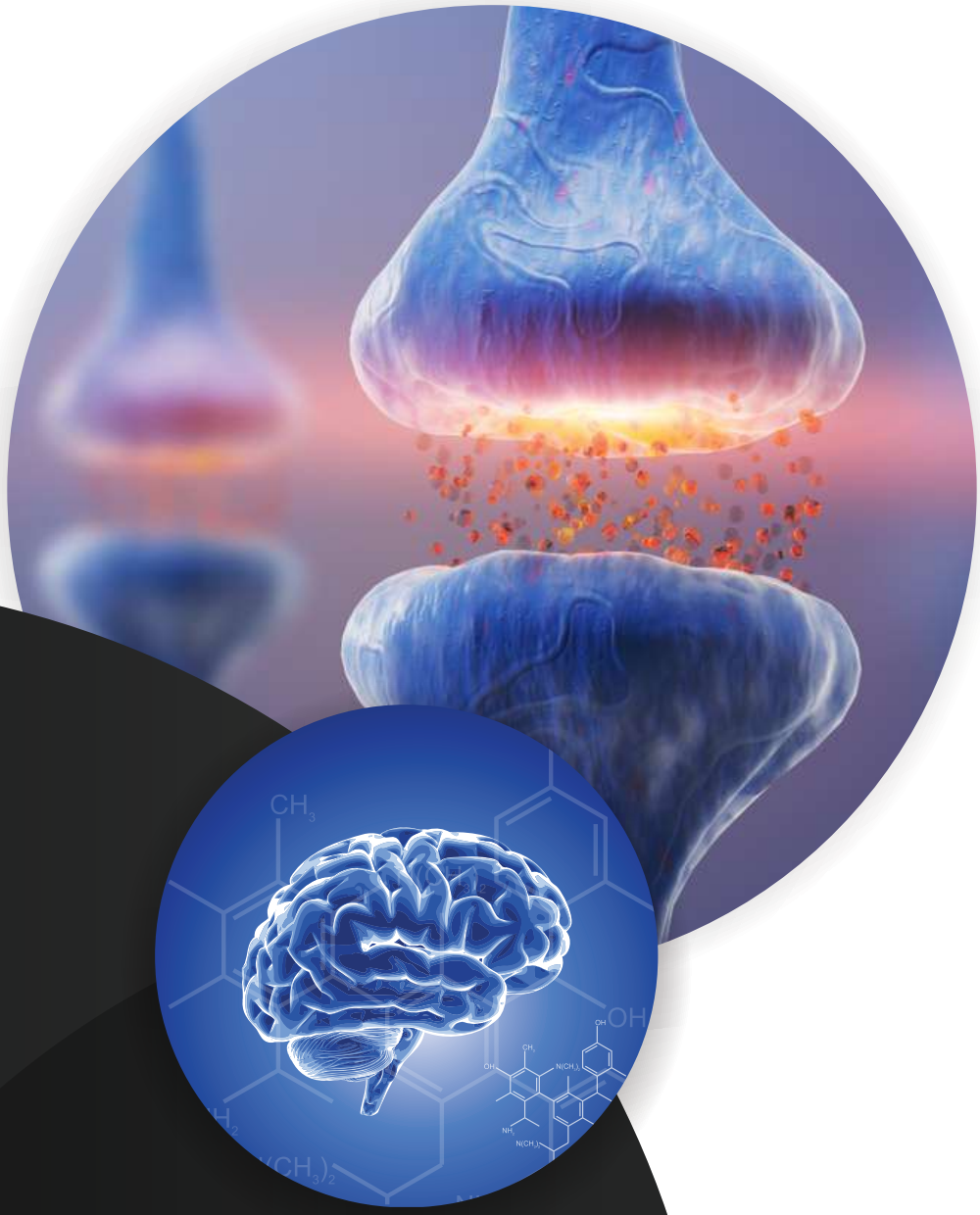

Neurotransmitters

Test the messengers of your neural network

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Final Report Date:	10-26-2019 21:53	Specimen Collected:	10-20-2019 10:30
Accession ID:	1512010000	Specimen Received:	10-22-2019 08:00

LAST NAME	FIRST NAME	GENDER	DATE OF BIRTH	ACCESSION ID	DATE OF SERVICE
TESTNAME	PATIENT	FEMALE	1989-02-23	1512010000	10-22-2019

PATIENT

Name: PATIENT TESTNAME
Date of Birth: 1989-02-23
Gender: Female
Age: 30

Telephone #: test@vibrantsci.com
Street Address: 1021 HOWARD AVENUE SUITE B
City: SAN CARLOS
State: CA Zip #: 94070

Fasting: FASTING No. of hours: 12.0

PROVIDER

Practice Name: Vibrant IT4 Practice
Provider Name: Vibrant IT4, MD (999999)
Phlebotomist:
Street Address: 999999 PRACTICE STREET AVE
City: SAN CARLOS
State: CA
Zip #: 94404
Telephone #: 666-666-6662
Fax #: 111-222-0000

For doctor's reference

Vibrant Wellness is pleased to present to you, **'Neurotransmitters'**, to help you make healthy lifestyle, dietary and treatment choices in consultation with your healthcare provider. It is intended to be used as a tool to encourage a general state of health and well-being.

The Vibrant Neurotransmitters is a test to measure inhibitory, excitatory and other neurotransmitters. The panel is designed to give a complete picture of an individual's levels of neurotransmitters in urine.

Interpretation of Report: The report contains the complete list of the all urine neurotransmitters tested with quantitative results to enable a full overview along with the corresponding reference ranges. The classification of Red indicates a result that is outside the reference range and the classification of Green denotes a result that is within the reference range. Additionally, the previous value is also indicated to help check for improvements every time the test is ordered. Diurnal results are also provided for specific tests which comprises of the results of the analyte across a day with four samples collected and is also represented in a graphical format indicating the levels of the analyte variation within a day along with corresponding reference ranges. All contents provided are purely for informational purposes only and should not be considered medical advice. Any changes based on these choices are to be made in consultation with the clinical provider.

The Vibrant Wellness platform provides tools for you to track and analyze your general wellness profile. Testing for the Neurotransmitters panel is performed by Vibrant America, a CLIA certified lab CLIA#:05D2078809. Vibrant Wellness provides and makes available this report and any related services pursuant to the Terms of Use Agreement (the "Terms") on its website at www.vibrant-wellness.com. By accessing, browsing, or otherwise using the report or website or any services, you acknowledge that you have read, understood, and agree to be bound by these terms. If you do not agree to accept these terms, you shall not access, browse, or use the report or website. The statements in this report have not been evaluated by the Food and Drug Administration and are only meant to be lifestyle choices for potential risk mitigation. Please consult your physician for medication, treatment, diet, exercise or lifestyle management as appropriate. This product is not intended to diagnose, treat, or cure any disease or condition.

Please Note - It is important that you discuss any modifications to your diet, exercise and nutritional supplementation with your physician before making any changes.

To schedule an appointment with Vibrant Clinical Dietitians please call: Toll-Free 866-364-0963.

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FULL NAME: **PATIENT TESTNAME** ACCESSSION ID: **1512010000** DATE OF SERVICE: **10-22-2019**

Test Name	Current Result	Previous Result	Ref. Range
URINARY INHIBITORY NEUROTRANSMITTERS			
Serotonin	100.6	99.5	51.2-127.9 mcg/g Cr
GABA	203.5	205.8	170.1-375.8 mcg/g Cr
Glycine	123.4	123.5	54.8-175.3 mg/g Cr
Taurine	45.6	46.7	27.3-122.5 mg/g Cr
5-HIAA	4623	4625	1711-9788 mcg/g Cr
URINARY EXCITATORY NEUROTRANSMITTERS			
Dopamine	178.2	177.0	125.2-254.7 mcg/g Cr
Norepinephrine (pooled)	23.1	24.5	15.4-34.3 mcg/g Cr
Epinephrine (pooled)	1.5	1.8	1.2-5.1 mcg/g Cr
Histamine	12.3	13.4	4.8-21.7 mcg/g Cr
Glutamate	1737.2	1739.2	1479.8-3566.9 mcg/g Cr
Aspartate	2315.2	2317.1	900.5-3178.7 mcg/g Cr
Tryptophan	13.5	14.5	4.15-15.9 mg/g Cr
Acetylcholine	2.1	2.5	1.7-5.9 mcg/g Cr
PEA	15.7	16.3	4.1-22.4 mcg/g Cr
DOPAC	1122.3	1124.7	577.3-1655.5 mcg/g Cr
HVA	5466	5469	3535-8455 mcg/g Cr
Normetanephrine	21.3	22.6	15-36.7 mcg/g Cr
VMA	3412.1	3415.6	2411.2-5047.8 mcg/g Cr
Oxytocin	603.5	606.3	250.1-705 mcg/g Cr
OTHER NEUROTRANSMITTERS			
Metanephrine	78.3	79.2	40.6-127.8 mcg/g Cr
Tryptamine	56.7	57.2	15.8-115.7 mcg/g Cr
Tyrosine	6091	6095	5011-12668 mcg/g Cr
Tyramine	178	173	200.1-457.2 mcg/g Cr
Serine	23.4	24.1	13.7-40.9 mg/g Cr
5-HTP	81.3	83.5	11.4-185.6 mcg/g Cr
L-DOPA	4.6	5.3	0.1-855.8 mcg/g Cr

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Test Name	Current Result	Previous Result	Ref. Range
OTHER NEUROTRANSMITTERS			
3-Methoxytyramine (3-MT)	10.2	10.7	13.6-35.2 mcg/g Cr
Xanthurenic acid	0.5	0.8	0.1-1.6 mg/g Cr
URINARY DIURNAL NOREPINEPHRINE			
Norepinephrine (1st Morning)	12.3	13.2	9-20.6 mcg/g Cr
Norepinephrine (2nd Morning)	1.6	1.2	12.5-39.7 mcg/g Cr
Norepinephrine (Evening)	26.8	30.9	20.4-40.1 mcg/g Cr
Norepinephrine (Night)	32.1	30.5	19.8-36.9 mcg/g Cr
URINARY DIURNAL EPINEPHRINE			
Epinephrine (1st Morning)	0.64	0.64	0.6-1.5 mcg/g Cr
Epinephrine (2nd Morning)	0.2	0.3	0.7-6 mcg/g Cr
Epinephrine (Evening)	5.7	5.1	2.5-8.7 mcg/g Cr
Epinephrine (Night)	0.7	1.0	1.1-4 mcg/g Cr
RATIO			
Norepinephrine/Epinephrine	11.3	10.6	6.7-12.8
URINARY CREATININE			
Creatinine (pooled)	1.4	1.2	0.2-2.2 mg/ml
Creatinine (1st Morning)	0.4	0.5	0.2-2.2 mg/ml
Creatinine (2nd Morning)	1.4	1.1	0.2-2.2 mg/ml
Creatinine (Evening)	1.5	1.4	0.2-2.2 mg/ml
Creatinine (Night)	2.1	1.9	0.2-2.2 mg/ml

<dL = Less than the detectable limit of the lab.
N/A = Not applicable; 1 or more values used in this calculation is less than the detectable limit.

PATIENT REPORTED THERAPEUTIC INTERVENTIONS

Vitex

Neurotransmitters

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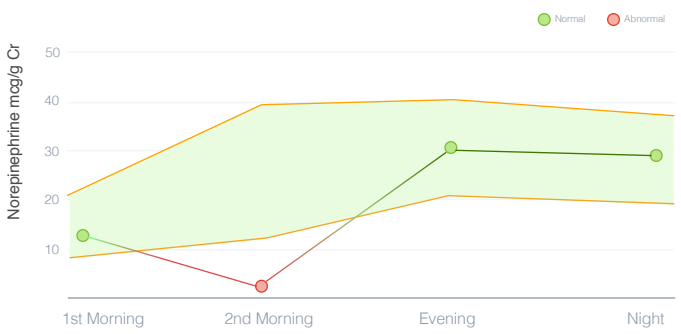
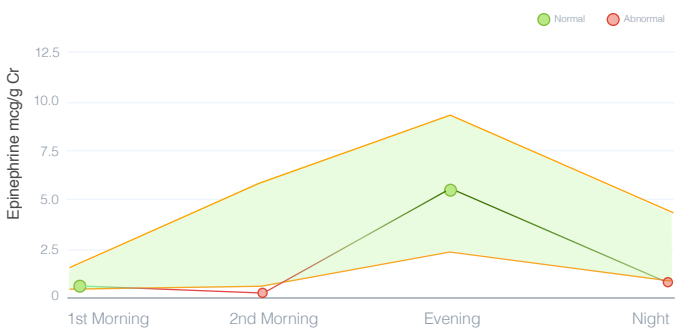
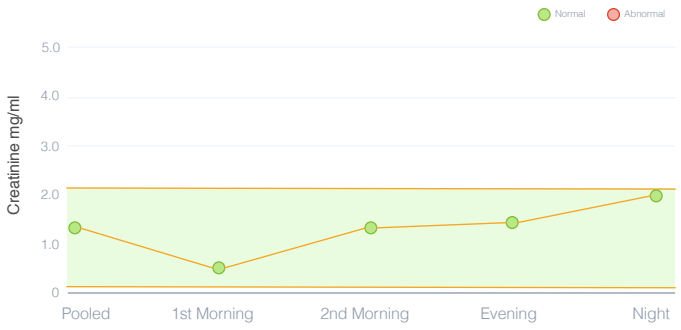
URINARY DIURNAL NOREPINEPHRINE



URINARY DIURNAL EPINEPHRINE



URINARY CREATININE



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Serotonin

Serotonin is a small molecule that functions both as a neurotransmitter in the central nervous system and as a hormone in the periphery. In the periphery, serotonin is present in enteric neurons, blood platelets and enterochromaffin cells of the gut. In brain, serotonin plays an important neuromodulatory role in physiological responses, for example behavioral arousal, circadian rhythmicity, neuroendocrine function, sexual behavior and feeding. Serotonin also plays an important role in mental processes, mood and cognition, and is implicated in many psychiatric disorders. Mild symptoms of high serotonin (serotonin syndrome) include agitation or restlessness, confusion, rapid heart rate and high blood pressure, Dilated pupils, Loss of muscle coordination or twitching muscles, Muscle rigidity, Heavy sweating, Diarrhea, headache, Shivering, Goose bumps. Severe serotonin syndrome can be life-threatening with symptoms including high fever, seizures, Irregular heartbeat, unconsciousness etc. Removal of the cause for the serotonin elevation, for example, drugs that causes serotonin elevation, is the most common remedy to reduce serotonin levels in serotonin syndrome. Deficiencies can be overcome by estrogen therapy, supplementation with vitamin B6, serotonin precursors (tryptophan/ 5-HTP), L-theanine, and probiotics. Nonpharmacological methods, such as lifestyle modifications including diet, mood induction, bright light, exercise are known to increase serotonin levels.[1] 5-HT appeared to be prevalent in Bananas, chicory, Chinese cabbage, coffee powders, green coffee bean, green onion, hazelnut, kiwi, lettuce, nettle, paprika, passion fruit, pawpaw, pepper, pineapple, plantain, plum, pomegranate, potato, spinach, strawberry, tomato, velvet bean, wild rice.[2]

5-HIAA

5-hydroxyindoleaceticacid (5-HIAA) is the principal metabolite of serotonin and the quantitative urinary excretion of 5-HIAA is the most useful way to diagnose serotonin overproduction. After the body uses serotonin, it is degraded in the liver and is broken down to its metabolites, including 5-HIAA, which is excreted in the urine.[3] Serotonin is a small molecule that functions both as a neurotransmitter in the central nervous system and as a hormone in the periphery. In brain, serotonin plays an important neuromodulatory role in physiological responses, for example behavioral arousal, circadian rhythmicity, neuroendocrine function, sexual behavior and feeding. Serotonin also plays an important role in mental processes, mood and cognition, and is implicated in many psychiatric disorders.

GABA

γ-amino butyric acid (GABA) is the major inhibitory neurotransmitter of the brain. Its major precursor is L-glutamate, which is converted to GABA via the enzyme glutamate decarboxylase (GAD). GABA has also been detected in other peripheral tissues including intestines, stomach, Fallopian tubes, uterus, ovaries, testes, kidneys, urinary bladder, the lungs and liver, albeit at much lower levels than in neurons or insulin-producing β-cells. Its principal role is reducing neuronal excitability throughout the nervous system. In humans, GABA is also directly responsible for the regulation of muscle tone. In addition, GABA controls the mood, sleep, blood pressure while preventing anxiety. High GABA levels in urine is seen in children diagnosed with infantile autism[4] while low levels were seen in patients with epileptic and Huntington disease.[5] GABA is sold as a dietary supplement. GABA is found ubiquitously among plants. GABA is prevalent in foods such as Adzuki bean, barley, broccoli, buckwheat, chestnut, common bean, kale, lupin, maypop, mouse-ear hawkweed, oat, pea, pokeroot, potato, rice, shiitake, soya bean, spinach, St John's wort, sweet potato, tea, tomato, valerian, wheat, wild celery.

Glycine

Glycine is the simplest amino acid in the body. It is not considered an "essential amino acid" because the body can make it from other chemicals. Glycine is an inhibitory neurotransmitter in the central nervous system, especially in the spinal cord, brainstem, and retina. It could cause spastic paralysis due to uninhibited muscle contraction if interrupted with its release within the spinal cord (such as during a Clostridium tetani infection). Glycine is a required as a co-agonist along with glutamate for NMDA receptors.[6]

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Glutamate

Glutamate is a non-essential amino acid and the most important excitatory neurotransmitter in the brain. It is the most abundant excitatory neurotransmitter in human nervous system. It is used by every major excitatory function in the brain, accounting in total for well over 90% of the synaptic connections in the human brain. Excitotoxicity due to excessive glutamate release and impaired uptake is associated with stroke, autism, some forms of intellectual disability, and diseases such as amyotrophic lateral sclerosis, lathyrism, and Alzheimer's disease. In contrast, decreased glutamate release is observed under conditions of classical phenylketonuria leading to developmental disruption of glutamate receptor expression. Glutamate is sold as a dietary supplement and prevalent in foods such as Caviar, cheese, crackling, chips, dried cod, fermented beans, fish sauces, gravies, instant coffee powder, meats, miso, mushrooms, noodle dishes, oyster sauce, Parmesan cheese, ready-to-eat meals, salami, savory snacks, seafood, seaweeds, soups, soy sauces, spinach, stews, tomato, tomato sauce.[2]

Histamine

Histamine is an NT that is present in mammalian hypothalamic neurons with widespread projections to nearly all regions of the brain mediating arousal, attention, and reactivity. Histamine is an organic nitrogenous compound involved in local immune responses, as well as regulating physiological function in the gut. Histamine is involved in the inflammatory response and has a central role as a mediator of itching. It is an integral part of the immune system, histamine may be involved in immune system disorders and allergies.[7] Foods rich in histamine includes Anchovy, beer, billfish, Champagne and Sherry, dandelion, fermented sausages, ham and other cured dry meat products, herring, ketchup, aged cheeses, nettle, red, white and dessert wines, sardine, sauerkraut, Scomberesocidae (for example, sauries), Scombridae (for example, tuna, mackerel, and bonitos), soybean food products (for example, soy, tempeh, soy sauce, soya bean milk, doenjang, doufuru, and nattō), sweet or sour cream, UHT, pasteurized, and fresh milk, yoghurt.[2]

PEA

Phenethylamine (PEA) is an excitatory neurotransmitter replete with its own receptors that acts as a central nervous system stimulant in humans. In the brain, phenethylamine regulates monoamine neurotransmission, but to a lesser extent, it also acts as a neurotransmitter in the human central nervous system. It amplifies the activity of major neurotransmitters such as dopamine, norepinephrine, acetylcholine, and serotonin. In addition to its presence in mammals, phenethylamine is found in many other organisms and foods, such as chocolate, especially after microbial fermentation. Phenethylamine is sold as a dietary supplement for purported mood and weight loss-related therapeutic benefits. Abnormally low levels of PEA are found in patients with attention deficit hyperactivity disorder (ADHD). In treatment-responsive individuals, amphetamine and methylphenidate greatly increase urinary phenethylamine concentration. In addition, thirty minutes of moderate- to high-intensity physical exercise has been shown to induce an increase in urinary phenylacetic acid, the primary metabolite of phenethylamine.[8]

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Dopamine

Dopamine (3,4-dihydroxyphenethylamine) is a major excitatory neurotransmitter that functions both as a hormone and a neurotransmitter and plays several important roles in the brain and body. It is synthesized in the brain and kidneys. In the brain, dopamine functions as a neurotransmitter that acts on several distinct dopamine pathways, one of which plays a major role in the motivational component of reward-motivated behavior. Other brain dopamine pathways are involved in motor control and in controlling the release of various hormones. Outside the central nervous system, dopamine functions primarily as a local paracrine messenger. In blood vessels, it inhibits norepinephrine release and acts as a vasodilator (at normal concentrations); in the kidneys, it increases sodium excretion and urine output; in the pancreas, it reduces insulin production; in the digestive system, it reduces gastrointestinal motility and protects intestinal mucosa; and in the immune system, it reduces the activity of lymphocytes. Low dopamine levels are seen in Alzheimer's disease, multiple sclerosis, Parkinson's disease, anxiety, depression, anorexia nervosa, fibromyalgia.[9-11] Symptoms of low dopamine includes apathy, cravings, fatigue, impulse control issues, increased sensitivity to pain, low libido, low mood, memory issues, sleep disturbances, and weight control issues. Dopamine can be elevated by supplementation with precursors (tyrosine or L-DOPA) and/or cofactors (iron, vitamin B6, tetrahydrofolate). Consumption of dopamine rich foods such as egg plants, avocado, banana, common bean, apple, orange, pea, plantain, spinach, tomato, velvet may also be beneficial to increase the levels.[2]

DOPAC

3,4-Dihydroxyphenylacetic acid (DOPAC) is the major metabolite of the neurotransmitter dopamine.[12] Dopamine can be metabolized into one of three substances. One such substance is DOPAC. Dopamine is a major excitatory neurotransmitter that functions both as a hormone and a neurotransmitter and plays several important roles in the brain and body. In the brain, dopamine functions as a neurotransmitter that acts on several distinct dopamine pathways, one of which plays a major role in the motivational component of reward-motivated behavior. Other brain dopamine pathways are involved in motor control and in controlling the release of various hormones. Low dopamine levels are seen in Alzheimer's disease, multiple sclerosis, Parkinson's disease, anxiety, depression, anorexia nervosa, fibromyalgia.

HVA

Homovanillic acid (HVA) is a major catecholamine metabolite that is produced by a consecutive action of monoamine oxidase and catechol-O-methyltransferase on dopamine. HVA is associated with dopamine levels in the brain. Dopamine (3,4-dihydroxyphenethylamine) is a major excitatory neurotransmitter that functions both as a hormone and a neurotransmitter and plays several important roles in the brain and body. It is synthesized in the brain and kidneys. In the brain, dopamine functions as a neurotransmitter that acts on several distinct dopamine pathways, one of which plays a major role in the motivational component of reward-motivated behavior.

3-Methoxytyramine (3-MT)

3-Methoxytyramine (3-MT), also known as 3-methoxy-4-hydroxyphenethylamine, is a trace amine that occurs as a metabolite of the neurotransmitter dopamine. 3-MT can be further metabolized by the enzyme monoamine oxidase (MAO) to form homovanillic acid (HVA), which is then typically excreted in the urine. Determination of 3-MT provides insights into diseases such as parkinsonism, heart failure, myocardial infarction, and mental stress.[13]

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L-DOPA

L-DOPA, also known as levodopa and l-3,4-dihydroxyphenylalanine, is an amino acid that is made and used as part of the normal biology of humans. L-DOPA is biosynthesized from the amino acid l-tyrosine. L-DOPA is the precursor to the neurotransmitters dopamine, norepinephrine (noradrenaline), and epinephrine (adrenaline), which are collectively known as catecholamines. Furthermore, L-DOPA itself mediates neurotrophic factor release by the brain and CNS. L-dopa is used to increase dopamine concentrations in the treatment of Parkinson's disease and dopamine-responsive dystonia.[14]

Norepinephrine

Norepinephrine (NE), also called noradrenaline (NA) or noradrenalin, is an organic chemical in the catecholamine family that functions in the brain and body as a hormone and neurotransmitter. The general function of norepinephrine is to mobilize the brain and body for action. Norepinephrine release is lowest during sleep, rises during wakefulness, and reaches much higher levels during situations of stress or danger, in the so-called fight-or-flight response. In the brain, norepinephrine increases arousal and alertness, promotes vigilance, enhances formation and retrieval of memory, and focuses attention; it also increases restlessness and anxiety. In the rest of the body, norepinephrine increases heart rate and blood pressure, triggers the release of glucose from energy stores, increases blood flow to skeletal muscle, reduces blood flow to the gastrointestinal system, and inhibits voiding of the bladder and gastrointestinal motility.[15] Outside the brain, norepinephrine is used as a neurotransmitter by sympathetic ganglia located near the spinal cord or in the abdomen, and it is also released directly into the bloodstream by the adrenal glands. Low levels of norepinephrine are implicated in Alzheimer's disease, depression, fatigue, hypotension, anorexia, ADHD, low mood, memory issues, slow pulse rate, and weight issues. Norepinephrine may be elevated by supplementing with tyrosine or phenylalanine, or cofactor support with ascorbic acid, iron, tetrahydrofolate, and vitamin B6.

Normetanephrine

Normetanephrine is a metabolite of norepinephrine created by action of catechol-O-methyl transferase on norepinephrine. It is excreted in the urine and found in certain tissues. Norepinephrine is an organic chemical in the catecholamine family that functions in the brain and body as a hormone and neurotransmitter. Norepinephrine reaches higher levels during situations of stress or danger, in the so-called fight-or-flight response. The general function of norepinephrine is to mobilize the brain and body for action.

Epinephrine

Epinephrine, also known as Adrenaline, is a hormone and neurotransmitter. Epinephrine is normally produced by both the adrenal glands and a small number of neurons in the medulla oblongata where it acts as a neurotransmitter involved in regulating visceral functions (e.g., respiration). It plays an important role in the fight-or-flight response by increasing blood flow to muscles, output of the heart, pupil dilation response, and blood sugar level. As a medication, it is used to treat a number of conditions including anaphylaxis, cardiac arrest, and superficial bleeding. Increased adrenaline secretion is observed in pheochromocytoma, hypoglycemia, myocardial. A general increase in sympathetic neural activity is usually accompanied by increased adrenaline secretion. Low, or absent, concentrations of adrenaline can be seen in autonomic neuropathy, Alzheimer's disease, and metabolic syndrome. Low epinephrine levels may cause impaired attention problems, depression, dizziness, memory issues, chronic fatigue, low mood and libido.[16]

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Metanephrine

Metanephrine (metadrenaline) is a metabolite of epinephrine created by action of catechol-O-methyl transferase on epinephrine. Epinephrine, also known as adrenaline, is a hormone and neurotransmitter which is normally produced by both the adrenal glands and a small number of neurons in the medulla oblongata where it acts as a neurotransmitter involved in regulating visceral functions (e.g., respiration). It plays an important role in the fight-or-flight response by increasing blood flow to muscles, output of the heart, pupil dilation response, and blood sugar level.[17]

Cortisol

Cortisol is a steroid hormone, in the glucocorticoid class of hormones. It is increased in response to stress and low blood-glucose concentration. It functions to increase blood glucose levels through gluconeogenesis, to suppress the immune system, and to aid in the metabolism of fat, protein, and carbohydrates. It also decreases bone formation. Cortisol prevents the release of substances in the body that cause inflammation.[18]

Cortisone

Cortisone is a pregnane steroid hormone closely related to cortisol. It is one of the main hormones released by the adrenal gland in response to stress. Cortisone suppresses the immune system, thus reducing inflammation and attendant pain and swelling at the site of the injury. Risks exist, in particular in the long-term use of cortisone. Cortisone, a glucocorticoid, and epinephrine (adrenaline) are the main substances released by the body as a reaction to stress. They elevate blood pressure and prepare the body for a fight or flight response.[19]

Melatonin

Melatonin is a ubiquitous natural neurotransmitter-like compound produced primarily by the pineal gland. It is a hormone that mainly regulates the sleep–wake cycle. In humans, melatonin is involved in synchronizing the circadian rhythm including sleep–wake timing, blood pressure regulation, and seasonal reproduction. Many of its effects are through activation of the melatonin receptors, while others are due to its role as an antioxidant. Melatonin has been shown to modify immunity, the stress response, and certain aspects of the aging process; some studies have demonstrated improvements in sleep disturbances and "sundowning" in patients with Alzheimer's disease. Melatonin is also present in various foods such as tart cherries, bananas, grapes, rice, cereals, herbs, plums, olive oil, wine, beer and is also sold over the counter as a dietary supplement.[20]

Tryptamine

Tryptamine is a monoamine alkaloid with an indole ring structure and is structurally similar to the amino acid tryptophan. Its importance as the neurotransmitter, neuromodulator and as psychedelic drugs is well known because of its presence in mammalian brain in trace amounts. The regional distribution of 5-hydroxytryptamine (5-HT) a well-known neurotransmitter helps in regulation of alcoholism in humans as well as mood, sleep and anxiety in humans. Neuromodulator function to attenuate or amplify information at synaptic junctions transferred by neurotransmitter and central effects of 5HT can be modified by tryptamine in both positive and negative directions. Neuropsychiatric manifestations arises due to the disturbance in synthesis and metabolism of tryptamine and urinary output of tryptamine is correlated with increasing severity of psychosis as Schizophrenic, Parkinsonian and depressed patients has disturbed urinary output of tryptamine.[21]

Neurotransmitters

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Tyrosine

Tyrosine (4-hydroxyphenylalanine) is a non-essential amino acid and a precursor to neurotransmitters that increases plasma neurotransmitter levels (particularly dopamine and norepinephrine). In dopaminergic cells in the brain, tyrosine is converted to L-DOPA by the enzyme tyrosine hydroxylase (TH). TH is the rate-limiting enzyme involved in the synthesis of the neurotransmitter dopamine. Dopamine can then be converted into other catecholamines, such as norepinephrine (noradrenaline) and epinephrine (adrenaline). The thyroid hormones triiodothyronine (T3) and thyroxine (T4) in the colloid of the thyroid also are derived from tyrosine. Tyrosine does not seem to have any significant effect on cognitive or physical performance in normal circumstances but does help sustain working memory better during multitasking.[22]

Tyramine

Tyramine is a naturally occurring trace amine derived from the amino acid tyrosine. Tyramine acts as a catecholamine releasing agent notably adrenaline, noradrenaline and dopamine. It promotes blood pressure elevation, resulting in pain. Tyramine also leads to cerebral vasoconstriction and subsequent rebound vasodilatation that causes migraine attacks in susceptible persons. Episodes can be accompanied by nausea and visual abnormalities. Tyramine is found in a number of foodstuffs, most notably aged and fermented foods and beverages. Cheeses (especially Camembert, Cheddar, Parmesan, and Emmental), overripe bananas, avocado, canned figs, peanuts, pickled herring, dried and fermented meat products and alcoholic beverages (wine, beer) are known to contain tyramine.[23]

Taurine

Taurine, 2-amino-ethanesulfonic acid, is one of the most abundant amino acids in mammals. Taurine demonstrates multiple cellular functions including a central role as a neurotransmitter, as a trophic factor in CNS development, in maintaining the structural integrity of the membrane, in regulating calcium transport and homeostasis, as an osmolyte, as a neuromodulator and as a neuroprotectant. The neurotransmitter properties of taurine are demonstrated by its ability to elicit neuronal hyperpolarization, the presence of specific taurine synthesizing enzyme and receptors in the CNS and the presence of a taurine transporter system. Taurine exerts its neuroprotective functions against the glutamate induced excitotoxicity by reducing the glutamate-induced increase of intracellular calcium levels.[24]

Acetylcholine

Acetylcholine is the neurotransmitter used at the neuromuscular junction where it is released from the motor neurons of the nervous system in order to activate muscles. Acetylcholine functions in both the central nervous system (CNS) and the peripheral nervous system (PNS). In the CNS, cholinergic projections from the basal forebrain to the cerebral cortex and hippocampus support the cognitive functions of those target areas. In the PNS, acetylcholine activates muscles and is a major neurotransmitter in the autonomic nervous system. Acetylcholine has been implicated in learning and memory in several ways. In animals, disruption of the supply of acetylcholine impairs the learning of simple discrimination tasks.[25] Acetylcholine is rich in food sources such as eggplant, bitter orange, common bean, foxglove, mistletoe, mung bean, nettle species, pea, radish, spinach, squash, wild strawberry.[2]

Aspartate

Aspartate is a nonessential amino acid that functions as an excitatory neurotransmitter. It is also considered as a selective NMDA receptor agonist.

Neurotransmitters

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Serine

Serine, an unusual d-amino acid present in mammalian brain, is recently been recognized as a neurotransmitter that acts as a physiological ligand of the NMDAR co-agonist site, mediating several NMDAR-dependent processes. Serine is present at very high levels in the mammalian brain and at a much lower concentration in the peripheral tissues. serine signaling dysregulation might be involved in the NMDAR dysfunction that occurs in several pathologies, including neuro-psychiatric and neurodegenerative diseases.[26]

5-HTP

5-Hydroxytryptophan (5-HTP), also known as oxitriptan, is a naturally occurring amino acid and chemical precursor as well as a metabolic intermediate in the biosynthesis of the neurotransmitter serotonin. 5-HTP is produced from the amino acid tryptophan through the action of the enzyme tryptophan hydroxylase. 5-HTP is normally rapidly converted to 5-HT by amino acid decarboxylase.5-HTP is sold over the counter as a dietary supplement for use as an antidepressant, appetite suppressant, and sleep aid. Oral 5-HTP results in an increase in urinary 5-HIAA, a serotonin metabolite, indicating that 5-HTP is peripherally metabolized to serotonin, which is then metabolized.[27]

Oxytocin

Oxytocin is a peptide hormone and a neuropeptide. Oxytocin is normally produced in the hypothalamus and released by the posterior pituitary. It plays a role in social bonding, sexual reproduction, childbirth, and the period after childbirth. It is sometimes referred to as the "love hormone," because levels of oxytocin increase during hugging and orgasm. It may also have benefits as a treatment for a number of conditions, including depression, anxiety, and intestinal problems. Females usually have higher levels than males.[28]

Xanthurenic acid

Xanthurenic acid is a tryptophan metabolite. Subjects with Down's syndrome (DS) exhibit defects in tryptophan metabolism, characterized primarily as a diminished urinary excretion of this tryptophan metabolite xanthurenic acid.[29] In vitamin B6-deficient subjects, the urinary excretion of xanthurenic acid shows a marked increase following an l-tryptophan load, and this is the basis of the tryptophan load test. This is relatively easy to perform and has been widely used, but interpretation of the results requires caution as there are a number of other factors that can affect tryptophan metabolism.[30]

VMA

Vanillylmandelic acid (VMA) is an end stage metabolite of is an end-stage metabolite of the catecholamines dopamine, epinephrine, and norepinephrine formed via the actions of monoamine oxidase, catechol-O-methyl transferase (COMT), and aldehyde dehydrogenase. VMA is found in the urine, along with other catecholamine metabolites, including homovanillic acid (HVA), metanephrine, and normetanephrine.[31]

Neurotransmitters

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Tryptophan

Tryptophan is an α-amino acid that is used in the biosynthesis of proteins. Tryptophan is also a precursor to the neurotransmitter serotonin, synthesized by tryptophan hydroxylase. In addition, Niacin, also known as vitamin B3, is synthesized from tryptophan via kynurenine and quinolinic acids. The disorder fructose malabsorption causes improper absorption of tryptophan in the intestine that could reduce levels of tryptophan in the body. Tryptophan is present in most protein-based foods or dietary proteins.[32,33]

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Risk and Limitations

This test has been developed and its performance characteristics determined by Vibrant America Clinical Laboratory, a CLIA certified lab. These assays have not been cleared or approved by the U.S. Food and Drug Administration.

Vibrant Neurotransmitters panel does not demonstrate absolute positive and negative predictive values for any condition. Its clinical utility has not been fully established. Clinical history and current symptoms of the individual must be considered by the healthcare provider prior to any interventions. Test results should be used as one component of a physician's clinical assessment.

Neurotransmitters testing is performed at Vibrant America, a CLIA certified laboratory and utilizes ISO-13485 developed technology. Vibrant America has effective procedures in place to protect against technical and operational problems. However, such problems may still occur. Examples include failure to obtain the result for a specific antibody due to circumstances beyond Vibrant's control. Vibrant may re-test a sample in order to obtain these results but upon re-testing the results may still not be obtained. As with all medical laboratory testing, there is a small chance that the laboratory could report incorrect results. A tested individual may wish to pursue further testing to verify any results.

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