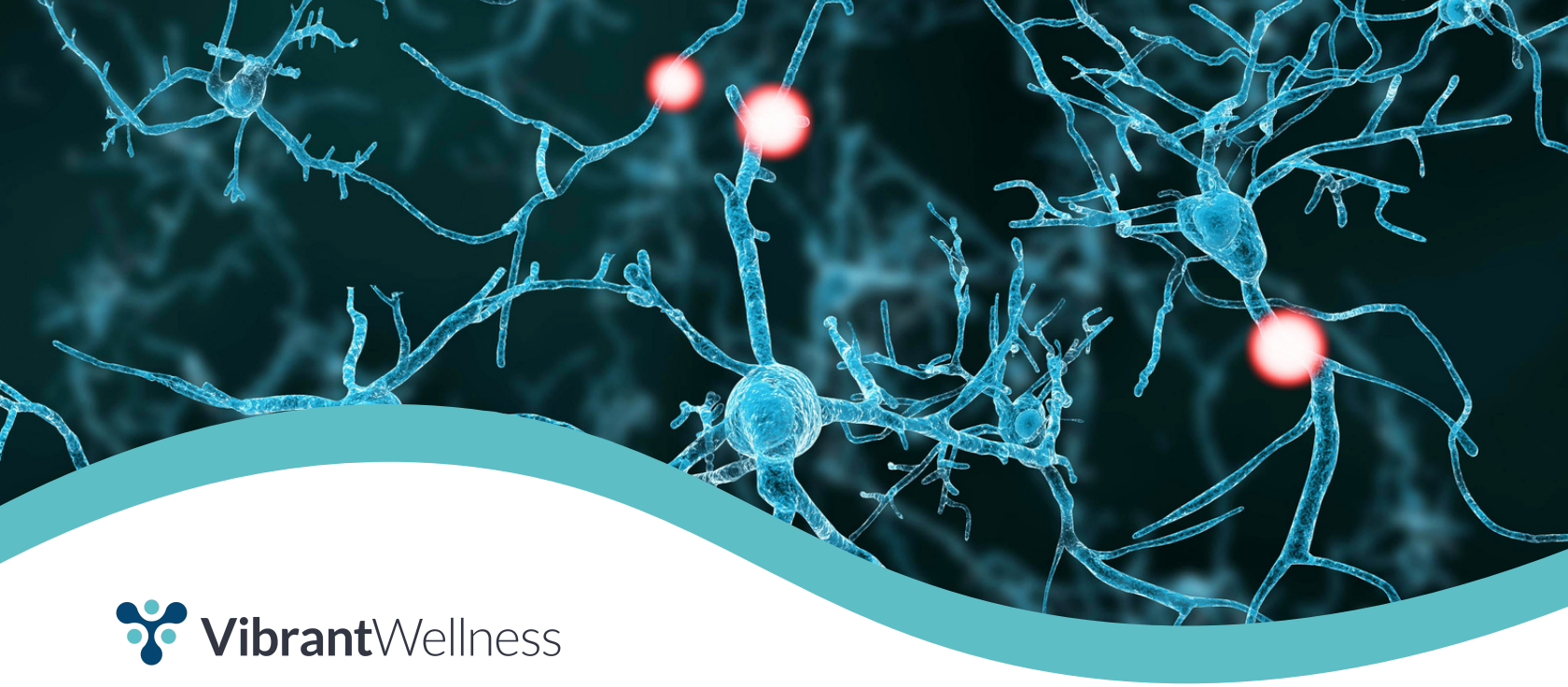


VibrantWellness

Neurotransmitters

Key Clinical Messages

What is the Neurotransmitter Test?

Vibrant's Neurotransmitter Test is a urine-based test that measures individual neurotransmitter levels. The neurotransmitter test includes 30 different markers, four neurotransmitter ratios, and three diurnal rhythms, which include amino acids, intermediates along the neurotransmitter pathways, neurotransmitter levels, and metabolites of neurotransmitters.

What are Neurotransmitters?

Neurotransmitters are endogenous chemical messengers that are responsible for communication in the nervous system. They are secreted by neurons in response to an electrical signal and cross a synapse to communicate with other cells, such as neurons, glands, or muscle cells.

Neurotransmitters are involved in many physiological processes in the central nervous system and in the periphery, including regulating mood, heart rate, sleep regulation, digestion, appetite, muscle movements, breathing, learning, memory, motivation, pain, and many more functions.

Neurotransmitters are classified as either excitatory, inhibitory, or neuromodulatory. Many neurotransmitters function both as excitatory and inhibitory depending on the location and circumstances.

Inhibitory Neurotransmitters: Acts as the "brakes" or "off switch" by decreasing/inhibiting action potentials. The following neurotransmitters are classified as inhibitory:

- GABA, Serotonin, Glycine, Taurine

Excitatory Neurotransmitters: Act as the "accelerator" or "on switch" by firing off action potentials. The following neurotransmitters are classified as excitatory:

- Glutamate, Epinephrine, Norepinephrine, Dopamine, Acetylcholine

Why Order the Neurotransmitters Test?

The neurotransmitter test is a non-invasive test that provides a snapshot of an individual's specific neurotransmitter levels. This test provides insight into how the nervous system is communicating.

Many treatment recommendations used with neurological or mental conditions are currently guided by a general diagnosis or a "trial and error" approach. The neurotransmitter test can provide clinically useful data to help guide you when monitoring and treating neurological or mental health conditions. It can also be used to assess medication efficacy and responsiveness or help wean medications or supplements.

Neurotransmitter imbalances can be caused by a host of factors. The neurotransmitter test allows you to assess all aspects of neurotransmitter synthesis and metabolism, highlighting where issues occur on the neurotransmitter pathways so interventions can be tailor-made.

Which Patients Benefit from This Test?

- ADHD/ADD
- Addictive behaviors
- Alzheimer's disease
- Altered pain response
- Anger
- Anxiety
- Appetite (poor/excess)
- Autism spectrum disorder
- Autoimmune diseases
- Autonomic nervous system disorders
- Bipolar disorder
- Brain fog
- Cancer
- Cardiovascular disease
- Chronic fatigue
- Constipation/ diarrhea
- Compulsive behaviors
- Dementia
- Depression
- Developmental disorders
- Difficulty concentrating
- Diabetes
- Dysmotility
- Eating disorders
- Epilepsy/seizure disorders
- Fatigue
- Fibromyalgia
- Gastroesophageal reflux disease
- Headaches/migraines
- Hormonal Imbalances
- Hyperactivity
- Huntington's disease
- Irritable bowel syndrome (IBS)
- Insomnia
- Irritable bowel disease (IBD)
- Irritability
- Low libido
- Low motivation
- Medication adjustments
- Memory impairments
- Mood disorders
- Movement disorders/ Motor dysfunction
- Multiple sclerosis
- Muscle twitching/spasms
- Obsessive compulsive disorder
- Panic attacks
- Parkinson's disease
- Schizophrenia
- Sensory processing disorders
- Tremors
- Weight imbalances
- Vomiting

Which Tests Pair Well with the Neurotransmitter Test?

- **Micronutrient test:** many enzymatic reactions for neurotransmitter synthesis require nutrient cofactors, therefore, it's extremely helpful to have information on nutrient levels when interpreting the neurotransmitter test. The most important micronutrients involved in neurotransmitter pathways include:
  - Vitamin B1, B2, B3, B5, B6, folate, choline, iron, magnesium, copper, vitamin C, vitamin D, amino acids
- **Gut Zoomer:** to assess for impaired digestion and absorption, which could lead to decreased amino acids and nutrients required for neurotransmitter synthesis.
- **Neural Zoomer Plus:** to assess for antibodies to different neurotransmitter receptors.
- **Methylation Panel:** to assess for impairments in the methylation cycle affecting neurotransmitter synthesis. This is important since many neurotransmitters rely on methylation support for either synthesis or degradation.
- **Total Tox Burden:** to assess for toxins that may interfere with neurotransmitter synthesis, receptor function, and neurotransmitter metabolism.
- **Hormone tests:** to assess for hormone imbalances since hormones can influence many neurotransmitter levels.
- **Wheat Zoomer:** to assess for gluten sensitivity that may affect the glutamic acid decarboxylase (GAD) enzyme, affecting glutamate and GABA levels.

Why Vibrant?

Vibrant is a **CLIA-certified lab** that utilizes reliable, high-quality methodologies to measure individual neurotransmitter levels.

Methodology

The Neurotransmitter test uses liquid chromatography with tandem mass spectrometry (LC-MS/MS). The analyte results are expressed by normalizing to the quantity of creatinine measured to account for urine dilution variations.

Test Prep

Collection: Four (4) urine specimen tubes.

- Requires four (4) urine collection samples to be collected throughout the day: first-morning urine, 2 hours after waking, evening (before dinner), night (before bed)
- For pediatric patients, a pediatric urine collection bag may be used
- ·Does not need to be refrigerated or frozen

Hydration: Do not drink more than 8 oz water 1 hour prior to each urine collection. Samples may be rejected if the urine is too dilute.

Fasting: Not required.

Diet: It's important to avoid certain foods because they can be a source of neurotransmitters that can artificially skew the results. The following foods must be avoided for 48 hours before collection:

- Bananas, pineapple, nuts, alcohol, protein powder, protein shakes

Medication Restrictions: None.

Dietary Supplement Restrictions: None.

Contraindications: Renal disease or other kidney abnormalities.

Reference ranges were established using a sample cohort comprising of 192 relatively healthy samples to determine the reference interval, and the results are used for determining the cut-off ranges (2.5% to 97.5% percentile range is reported). A result is high when >97.5% percentile range and low when <2.5% percentile range.

There are different reference ranges for the following age groups:

- <10yo
- 11-14yo
- >15yo

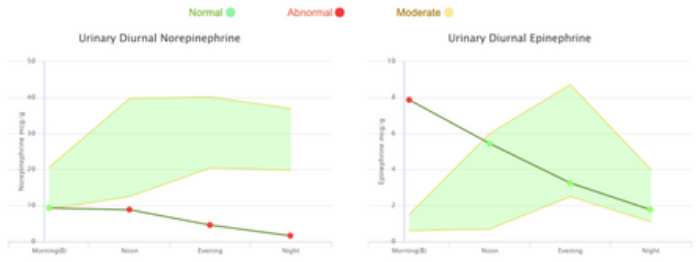
Vibrant has a comprehensive interpretive guide for the Neurotransmitters Test to aid providers in the interpretation of their patient's results.

Neurotransmitters Summary

NEUROTRANSMITTERS SUMMARY HIGH/LOW

Test name	Current Result	Previous	Reference Range
Serotonin	362.83		51.20–127.90 mcg/g
VMA	7925.04		2411.20–5047.80 mcg/g
Epinephrine (2nd Morning)	6.52		0.70–6.00 mcg/g
Norepinephrine/Epinephrine	5.97		6.70–12.80 mcg/g
HVA/VMA Ratio	0.49		0.74–1.88
HVA/DOPAC Ratio	2.55		2.60–8.30
Quinolinic acid/5-HIAA Ratio	0.30		0.32–1.10

Graph data



What Markers Are Included on the Neurotransmitter Test?

Amino Acids	Serotonin Pathway	Kynurenine Pathway	Catecholamine Pathway	
Tryptophan	5-Hydroxytryptophan (5-HTP)	Kynurenic acid	L-DOPA	Normetanephrine
Tyrosine	Serotonin	Xanthurenic acid	Dopamine	Epinephrine
Taurine	5-Hydroxyindoleacetic acid (5-HIAA)	Quinolinic acid	DOPAC	Metanephrine
Glycine			3-Methoxytyramine (3-MT)	Vanillylmandelic acid (VMA)
Serine			Homovanillic acid (HVA)	
Aspartate			Norepinephrine	

Trace Monoamines	Other	Ratios	Diurnal Rhythms
Tryptamine	Glutamate	Quinolinic acid/5-HIAA	Norepinephrine
Tyramine	GABA	HVA/VMA	Epinephrine
Phenylethylamine (PEA)	Histamine	Norepinephrine/Epinephrine	Creatinine
	Acetylcholine	HVA/DOPAC	
	Oxytocin		

Neurotransmitter Cascade

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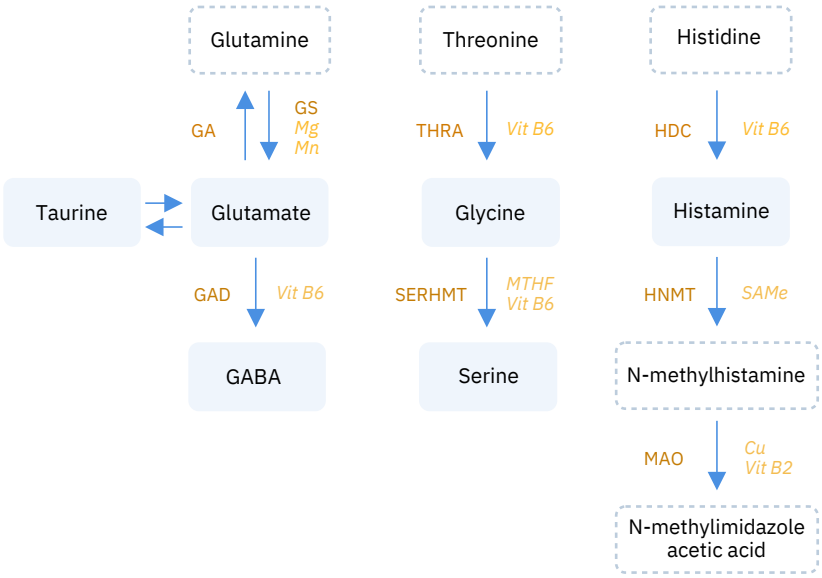
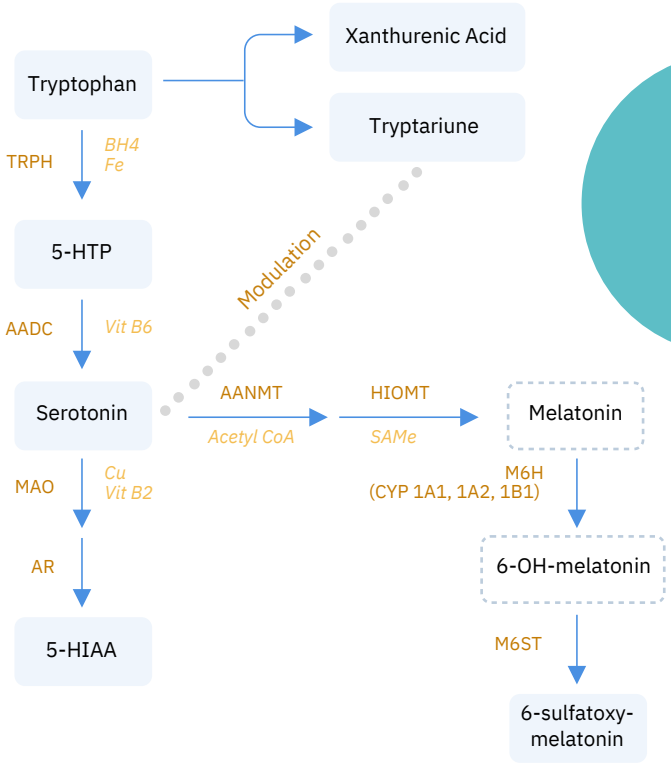
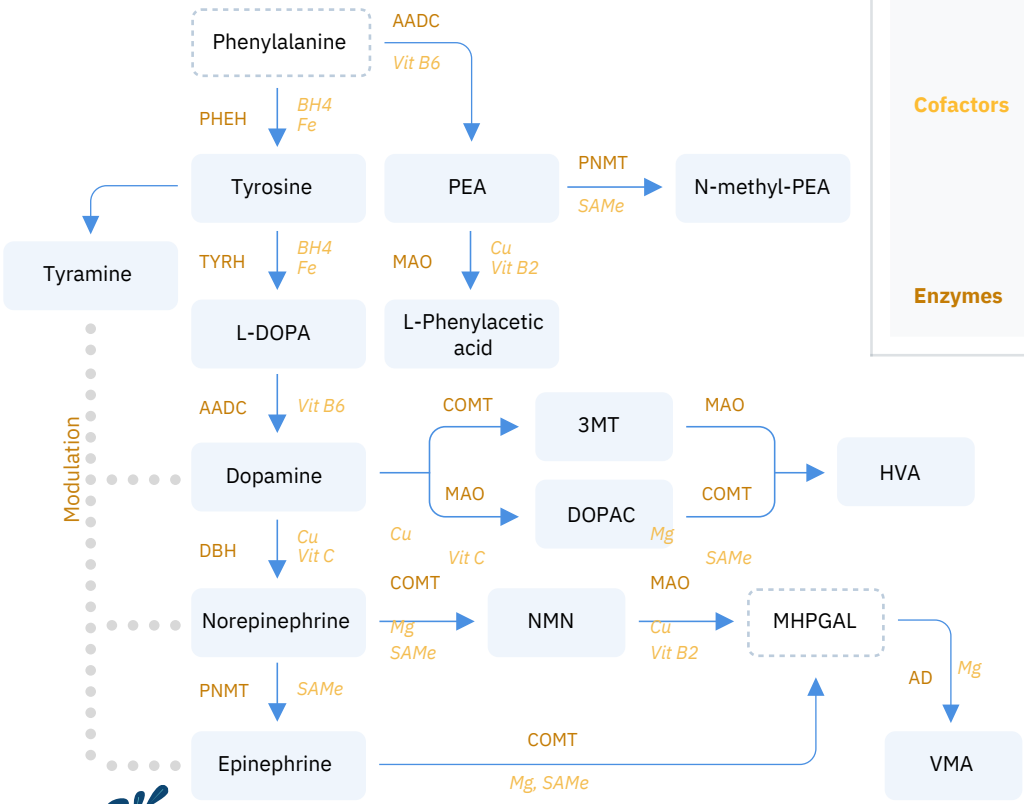
Glutamate/GABA, Glycine & Histamine



Serotonin & Metabolites



Catecholamines & Metabolites



Neurotransmitters & Metabolites

HVA	Homovanillic acid
NMN	Normetanephrine
PEA	Phenethylamine
VMA	Vanillylmandelic acid
5-HIAA	5-hydroxyindole 3-acetic acid

Cofactors

BH4	Tetrahydrobiopterine
Cu	Copper
Fe	Iron
Mg	Magnesium
Mn	Manganese
MTHF	Methyltetrahydrofolate
SAMe	S-adenosyl methionine

Enzymes

AADC	Aromatic L-amino acid decarboxylase
AANMT	Arylalkylamine N-methyltransferase
AD	Aldehyde dehydrogenase
AR	Aldehyde reductase
COMT	Catechol-O-methyltransferase
DBH	Dopamine beta hydroxylase
GA	Glutaminase
GAD	Glutamate decarboxylase
GS	Glutamine synthetase
HDC	Histidine decarboxylase
HIOMT	Hydroxyindole-O-methyltransferase
HNMT	Histamine N-methyltransferase
MAO	Monoamine oxidase
M6H	Melatonin 6 hydroxylase
M6ST	Melatonin 6 sulfotransferase
PHEH	Phenylalanine hydroxylase
PNMT	Phenylethanalamine N-methyltransferase
SERHMT	Serine hydroxymethyltransferase
THRA	Threonine aldolase
TRPH	Tryptophan hydroxylase
TYRH	Tyrosine hydroxylase

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