



**Order:** 999999-9999

**Client #:** 12345  
**Doctor:** Sample Doctor  
Doctor's Data, Inc.  
3755 Illinois Ave.  
St. Charles, IL 60174 U.S.A.

**Patient:** Sample Patient  
**Id:** 999999  
**Age:** 36  
**Sex:** Male  
Body Mass Index (BMI): 29

**Sample Collection**    **Date/Time**  
**Date Collected**    01/12/2020  
**Wake Up Time**        09:30  
**Collection Time**      10:00  
**Collection Period**    1st morning void  
**Date Received**        01/15/2020  
**Date Reported**        01/21/2020

Analyte	Result	Unit per Creatinine	L	WRI	H	Reference Interval
Serotonin	46.6	µg/g				50 – 98
Dopamine	139	µg/g				110 – 200
Norepinephrine	11.7	µg/g				18 – 42
Epinephrine	8.2	µg/g				1.3 – 7.3
Norepinephrine / Epinephrine ratio	1.4					< 13
Glutamate	23	µmol/g				9.0 – 40.0
Gamma-aminobutyrate (GABA)	5.7	µmol/g				1.6 – 3.5
Glycine	480	µmol/g				350 – 1500
Histamine	8.6	µg/g				12 – 30
Phenethylamine (PEA)	18	nmol/g				26 – 70
Creatinine	20.6	mg/dL				35 – 240



## Neurotransmitter Comments:

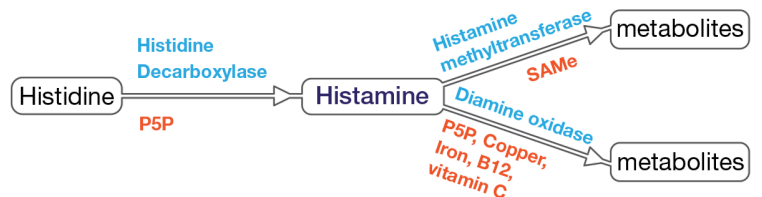
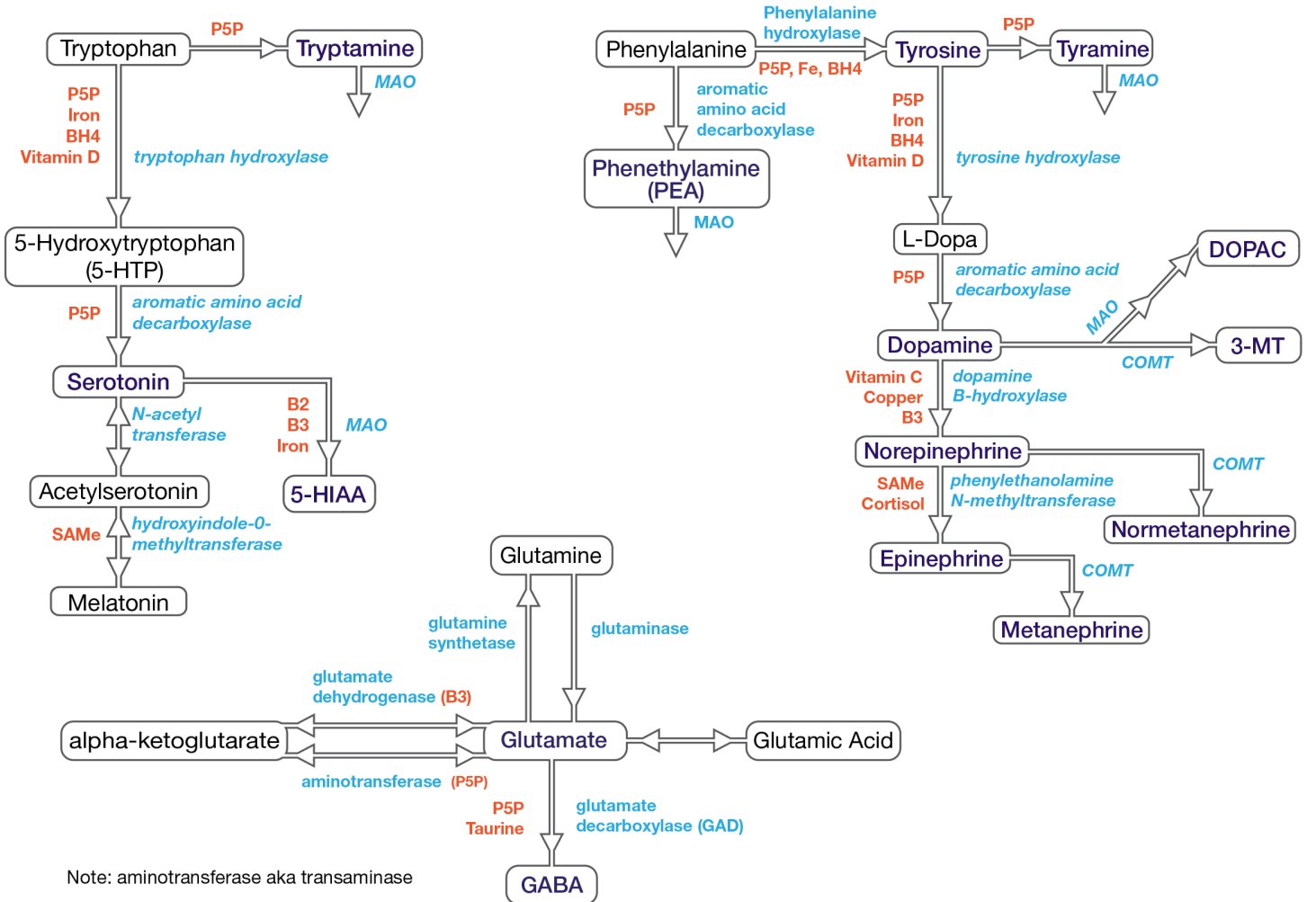
- Urinary neurotransmitter levels provide an overall assessment of the body's ability to make and break down neurotransmitters and are representative of whole body levels. Neurotransmitters are secreted all through the body, in neurons of both the central and peripheral nervous systems. The enzymes, cofactors and precursors in neurotransmitter metabolism in general are the same in the periphery and in the central nervous system. Therefore, alterations in urinary neurotransmitter levels assessed in urine provide important clinical information, and may be associated with many symptoms including cognitive and mood concerns, diminished drive, fatigue and sleep difficulties, cravings, addictions and pain.
- Low serotonin may contribute to mood concerns including anxiety, OCD, depression, anger and a sense of discontentment. Low serotonin may also be associated with poor sleep quality and appetite changes, as well as chronic fatigue, rheumatoid arthritis, and over-all lassitude. Failure to regenerate tetrahydrobiopterin [BH4], an essential cofactor for serotonin synthesis, may decrease serotonin levels, and could be reflected in urine. BH4 regeneration may be supported by folates, vitamin B3, C, molybdenum and zinc. Additionally, production of serotonin requires vitamin D, iron and vitamin B6. Tryptophan is the essential precursor of serotonin. 5-HTP may increase serotonin, and L-theanine may affect serotonin function.
- Low norepinephrine may be associated with depression and mood changes as well as fatigue, difficulty concentrating, decreased ability to stay focused on tasks and diminished sense of personal/professional drive. Norepinephrine is converted from dopamine requiring vitamin C, copper and B3, and L-tyrosine is an amino acid precursor. L-theanine and Mucuna pruriens may modulate norepinephrine effects.
- Elevated epinephrine may be associated with stress response and contributory to anxiety, agitation, irritability, insomnia and hypertension. Epinephrine levels may be elevated in patients in association with exercise prior to the urine collection. Metabolism of epinephrine requires vitamins B2, B3, SAME, magnesium, and iron. L-theanine may modulate epinephrine effects.
- Elevated GABA may contribute to difficulty concentrating, diminished memory, dampened mood and decreased cognitive processing as well as fatigue, decreased exercise endurance, sleepiness and an inability to feel alert. Elevated GABA levels may be compensatory in the presence of elevated excitatory neurotransmitters, and may result with gabapentin use. L-theanine may modulate the effects of elevated GABA levels. Elevated GABA levels may be associated with bacterial overgrowth (i.e. urinary tract infection or gastrointestinal dysbiosis).
- Low histamine may affect digestion and appetite control, learning, memory, and mood, and may result in drowsiness. Histamine has been noted to modulate neurotransmitter release from neurons. Histamine levels may be supported by consumption of high-protein foods and whole grains, as well as L-histidine supplementation. Vitamin B6 is a cofactor for histamine synthesis.
- Low phenethylamine (PEA) may be associated with depression, attention deficits and hyperactivity (ADHD), Parkinson's disease and bipolar disorder. Phenylalanine is the precursor amino acid to PEA, and vitamin B6 is a required co-factor in the conversion to this primary trace amine. Use of Reserpine can result in depletion of PEA.
- Considerations to address the demonstrated imbalances beyond the identified co-factors and amino acid precursors may include dosage adjustments if indicated, as well as nervine and adaptogenic herbs, methylation support, vitamin D, and gastrointestinal health optimization.

### Notes:

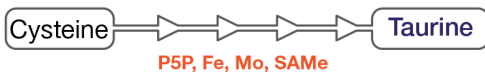
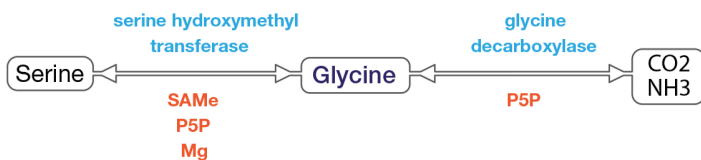
Results are creatinine corrected to account for urine dilution variations. Creatinine is not meant to be used as an indicator of renal function.  
RI= Reference Interval, L (blue)= Low (below RI), WRI (green)= Within RI (optimal), WRI (yellow)= Within RI (not optimal), H (red)= High (above RI)  
Methodology: LCMS QQQ, Creatinine by Jaffe Reaction



# NT Neurotransmitter Pathways



"glycine cleavage system"



## KEY

**MAO** = monoamine oxidase

Cofactors for **MAO**: **B2, B3, P5P, Fe, Mg**

**COMT** = catechol-o-methyl-transferase

Cofactors for **COMT**: **SAmE, Mg**

**P5P** = (pyridoxal-5-phosphate) activated form of vitamin B6

**BH4** = (tetrahydrobiopterin)

Endogenous levels can be supported with SAmE, vitamin B3, C, Mo, Zn

**MTHF** = (methyltetrahydrofolate) active form of folate.

**SAmE** = endogenous levels can be supported with Mg, MTHF, and methylcobalamin supplementation.

Cofactors = ■

Enzymes = ■