

TEST NAME: Comprehensive Neurotransmitter Profile

Comprehensive Neurotransmitter; urine

Analyte	Result	Unit per Creatinine	L	WRI	H	Reference Interval
Phenethylamine (PEA)	254	nmol/g				32 – 84
Tyrosine	89	µmol/g				32 – 80
Tyramine	2.9	µmol/g				2.0 – 4.0
Dopamine	216	µg/g				125 – 250
3,4-Dihydroxyphenylacetic acid (DOPAC)	1198	µg/g				390 – 1500
3-Methoxytyramine (3-MT)	143	nmol/g				90 – 210
Norepinephrine	19.0	µg/g				22 – 50
Normetanephrine	223	µg/g				85 – 300
Epinephrine	1.2	µg/g				1.6 – 8.3
Metanephrine	72	µg/g				45 – 119
Norepinephrine / Epinephrine ratio	15.8					< 13
Tryptamine	0.31	µmol/g				0.20 – 0.90
Serotonin	96.4	µg/g				60 – 125
5-Hydroxyindoleacetic acid (5-HIAA)	3252	µg/g				2000 – 8000
Glutamate	23	µmol/g				12.0 – 45.0
Gamma-aminobutyrate (GABA)	3.7	µmol/g				2.0 – 5.6
Glycine	2388	µmol/g				450 – 2200
Histamine	74	µg/g				14 – 44
Taurine	327	µmol/g				320 – 1000
Creatinine	99.4	mg/dL				30 – 225



Neurotransmitter Comments:

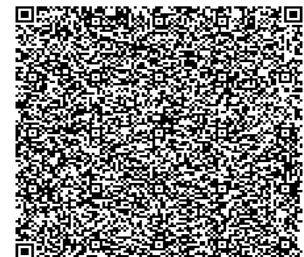
- Urinary neurotransmitter levels provide an overall assessment of the body's ability to make and break down neurotransmitters and are representative of whole body levels. Neurotransmitters are secreted all through the body, in neurons of both the central and peripheral nervous systems. The enzymes, 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.
- Elevated phenethylamine (PEA) may contribute to anxiety, with very high levels having amphetamine-like effects. Elevations in PEA may occur due to supplementation, use of monoamine oxidase inhibitors or antipsychotic medications, high protein diets, and production by protein-fermenting gut microbes. PEA and other trace amines are found in fermented foods (wine, cheese, chocolate, etc.). Elevated PEA levels may be associated with higher cortisol levels.

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

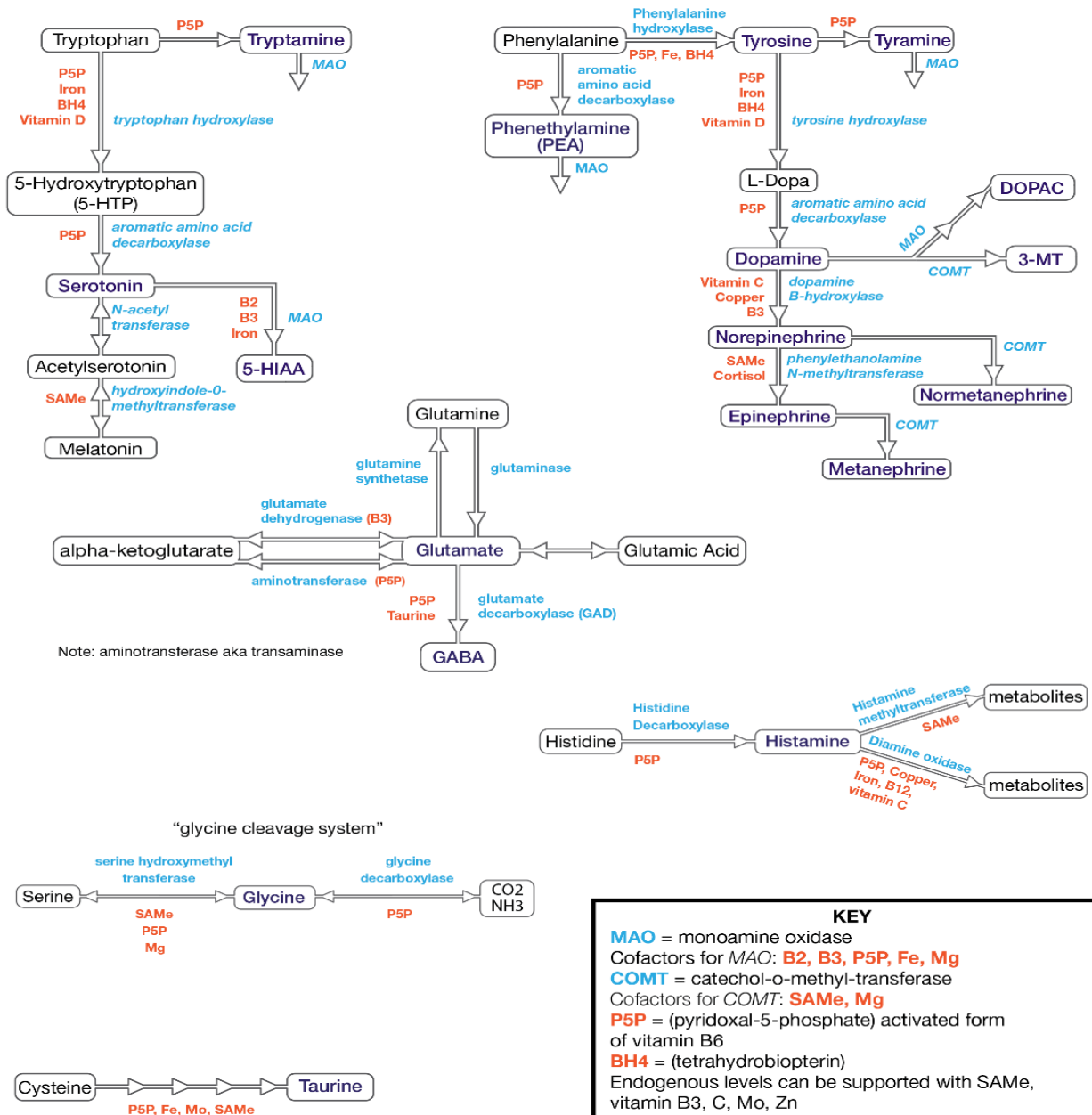
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- Tyrosine is the non-essential amino acid precursor for dopamine, norepinephrine and epinephrine. Increased tyrosine may exacerbate migraine headaches and hyperthyroid conditions. Elevated tyrosine levels may occur due to supplementation (phenylalanine or tyrosine), heritable enzyme defects, or liver disease. Tyrosine hydroxylase converts tyrosine into the dopamine precursor L-DOPA; BH4, Vitamin D and iron are cofactors for that enzymatic activity.
- Low norepinephrine and low epinephrine 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 niacin (B3). L-tyrosine, L-theanine and Mucuna pruriens influence this pathway.
- Elevated N/E ratio is consistent with poor conversion of norepinephrine to epinephrine. This conversion is driven by the phenylethanolamine N-methyltransferase (PNMT) enzyme that requires SAME, magnesium and cortisol (adequate HPA axis function) as cofactors. Suggest interpretation in context of cortisol levels/HPA axis function, with subsequent optimization of HPA axis function when clinically warranted.
- Glycine is a non-essential amino acid that acts as an inhibitory neurotransmitter in the central nervous system. Elevated glycine levels may be associated with compromised cognitive processing. Elevated levels may be seen with glycine supplementation. Glycine may be given in conjunction with pharmaceutical agents when supporting schizophrenia or psychosis. Lipoic acid may enhance glycine break down. Break down of glycine requires vitamin B6 and tetrahydrofolate as cofactors. Note: High levels of glycine may interact with clozapine and decrease its clinical efficacy.
- Elevated histamine may be associated with allergy-like symptoms, gastro-intestinal concerns, skin itch/inflammation (pruritis), increased wakefulness and insomnia, and has been demonstrated in gastrointestinal blastocystis infections. Levels may be elevated due to use of histamine-releasing medications, consumption of allergenic and sulfite-rich foods and/or histamine-rich foods, dysbiotic bacterial production in the intestine and zinc deficiency. High urine (and blood) histamine levels have been associated with cluster and cyclic headaches. Break down of histamine requires SAME and copper.
- 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.



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NT Neurotransmitter Pathways



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 = ■