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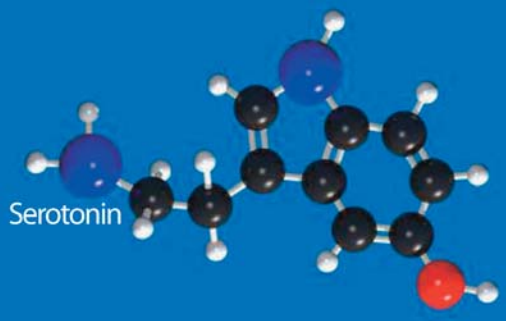


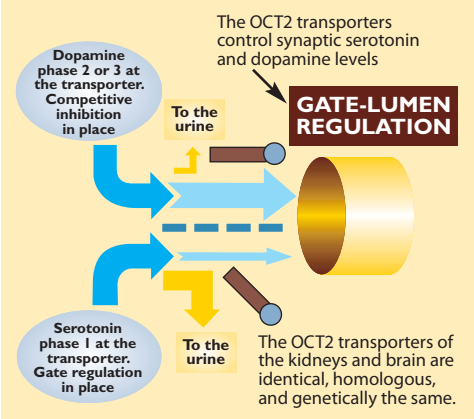
Monoamine Transporter Optimization™

Medical Conference presenting peer-reviewed science

NEW, laboratory application in the management of neurotransmitter related dysfunction.

"Nutrients are the source of these neurotransmitters when low or inadequate levels of are found a relative nutritional deficiency exists."™

Transporters are the primary controllers of neurotransmitter levels in the synapses, blood, urine, central nervous system and intercellular spaces.



The "dual gate lumen" organic cation transporter type-2 model of serotonin and/or dopamine transport is the foundation of MTO, published in 2009.

Determine the status of a transporter in one place in the body and you have just determined the status of all identical transporters throughout the body. When a compromise in the flow of electricity across the synapse or through the post-synaptic neurons occurs, a signal is sent throughout the body that configures the transporters to increase synaptic neurotransmitter levels high enough to restore the flow of electricity and control the associated symptoms.

"A **relative nutritional deficiency** exists when nutrient intake and systemic levels of nutrients is normal but a change occurs in the system that induces a nutrient intake requirement that cannot be supplied from diet alone."

The only practical way to increase the total number of serotonin and/or dopamine molecules in the brain are with administration of amino acid precursors. Whenever low or inadequate levels of neurotransmitters exist there is an associated relative nutritional deficiency since not enough nutrients are present to synthesize what is needed. When low or inadequate serotonin and/or dopamine levels are present, monoamine transporter optimization (MTO) can determine the amino acid dosing values required to restore optimal flow of electricity and resolve the symptoms related to the nutritional deficiency.

THE OCT2: When suboptimal synaptic neurotransmitter levels occur, a signal is sent throughout the body that encodes all of the OCT2 to conserve and regulate serotonin and dopamine in a manner that will compensate for the existing electrical problem. As a result, nutritional deficiency symptoms are relieved.

THE SCIENCE

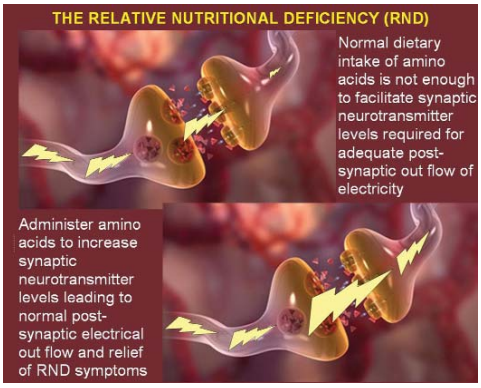
The Organic Cation Transporters Type-2 (OCT2) control and regulate synaptic levels of serotonin, dopamine, norepinephrine and epinephrine. This laboratory methodology allows for in situ determination of OCT2 status leading to establishment of synaptic neurotransmitter levels required to optimize post-synaptic electrical flow, this results in relief of symptoms associated with serotonin, dopamine, norepinephrine, and/or epinephrine.

Post-synaptic neuron damage leading to inadequate flow of electricity causes a regulatory signal to be sent to the pre-synaptic reuptake transporters.

When on a normal diet and synaptic neurotransmitter concentrations are low or are normal but not high enough to meet the electrical needs, a relative nutritional deficiency exists. This is due to the fact that the only practical way to increase the total number of neurotransmitter molecules in the brain is with administration of properly balanced nutrients (simultaneous administration of serotonin and dopamine amino acid precursors).

With increased brain neurotransmitter concentrations the amount of neurotransmitters available for synaptic use also increases.

Increasing neurotransmitter levels with nutrient administration is analogous to turning up the voltage. This causes more electricity to flow through the remaining viable structures. Once adequate electrical outflow from the post-synaptic neurons is established RND symptoms are controlled.



The OCT2 are encoded to establish optimal synaptic neurotransmitter levels.

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THE MONOAMINE-ASSOCIATED RELATIVE NUTRITIONAL DEFICIENCY

A relative nutritional deficiency exists when nutrient intake and systemic levels of nutrients are normal, but a systemic change occurs that induces a nutrient intake requirement that cannot be supplied from diet alone.

Significant and permanent damage to the postsynaptic neurons of the serotonin and catecholamine systems may theoretically have numerous etiologies. The most common are (in order of frequency of occurrence):

- neurotoxin-induced
- trauma-related
- biology-related
- genetic predisposition.

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Neurotransmitter dysfunction states with the primary neurotransmitter(s) associated with relative nutritional deficiency symptoms for each.

	5-HT	DA	NE	EPI
Adrenal fatigue or burnout				x
Addiction	x	x	x	x
Alzheimer's disease	x	x	x	x
Anorexia	x		x	
Anxiety[1]	x	x		
Attention Deficit Disorder (ADD)	x		x	
Attention Deficit Hyperactivity Disorder (ADHD)	x		x	
Autism	x	x	x	x
Bulimia	x		x	
Coronary artery disease, serotonin driven	x			
Chronic pain	x	x	x	x
Chronic stress	x	x	x	x
Cognitive deterioration	x	x	x	x
Cortisol dysfunction			x	
Crohn's disease	x	x		
DARPP-32	x	x		
Dementia	x	x	x	x
Depersonalization disorder	x	x	x	
Depression	x	x	x	x
Fibromyalgia	x	x	x	x
GABA dysfunction[1]	x	x		
Glutamate regulation	x	x		
Hormone dysfunction			x	
Hyperactivity	x	x	x	
Impulsivity	x	x	x	
Inappropriate aggression	x	x	x	
Insomnia	x		x	
Irritable Bowel Syndrome	x	x		
Migraine Headaches	x			
Nocturnal myoclonus (Restless Leg Syndrome)		x		
Obesity	x		x	
Obsessionality	x	x	x	
Obsessive Compulsive Disorder	x	x	x	
Organ system dysfunction	x	x	x	x
Panic Attacks[1]	x	x		
Parkinson's disease	x	x	x	x
Phobias	x	x		
Post-traumatic stress disorder (PTSD)	x	x	x	x
Premenstrual Syndrome (PMS)			x	
Psychotic Illness	x	x	x	x
Schizophrenia	x	x	X	
Seasonal Affective Disorder	x	x	x	
Social anxiety disorder	x	x	x	
Tension Headaches	x	x	x	x
Tourette's syndrome	x	x	x	x
Traumatic brain injury	x	x	x	x
Trichotillomania	x	x	x	
Ulcerative Colitis	x	x		

5-HTP = Serotonin, DA = Dopamine, NE = norepinephrine, EPI = Epinephrine

[1]By way of serotonin and/or dopamine signaling dopamine and serotonin control GABA and glutamate in the competitive inhibition state

SYMPTOMS OF RELATIVE NUTRITIONAL DEFICIENCY VERSUS OTHER ETIOLOGIES

Whenever low or inadequate levels of serotonin, dopamine, norepinephrine, and/or epinephrine exist there is an associated relative nutritional deficiency.

The site of post-synaptic neuron damage in the brain dictates the relative nutritional deficiency symptoms that display. Damage to the post-synaptic dopamine neurons of the substantia nigra may lead to Parkinson's disease-associated relative nutritional deficiency symptoms.

Damage to post-synaptic neurons in the area of the brain (post-synaptic serotonin, dopamine, norepinephrine and/or epinephrine neurons) which control mood and affect may induce a chronic depression.

Damage to post-synaptic serotonin, melatonin, and/or norepinephrine neurons may lead to chronic insomnia.

Why is this nutritional deficiency?

When damage occurs which compromises electrical outflow increased synaptic levels of dopamine are required to increase post-synaptic electrical outflow, high enough to compensate for the defect. The only practical way that dopamine concentrations in the brain can be increased is with administration of properly balanced serotonin and dopamine nutrients in the form of 5-HTP, L-dopa, and L-tyrosine which cross the blood brain-barrier then are synthesized into new dopamine molecules in the brain.

The organic cation transporters Type-2 (OCT2) of the pre-synaptic neurons control synaptic levels of serotonin, dopamine, norepinephrine, and/or epinephrine. Inadequate post-synaptic electrical output signals the OCT2 to increase synaptic neurotransmitter levels, but on a normal diet levels are not high enough to get the job done. This is the basis for relative nutritional deficiency symptoms.

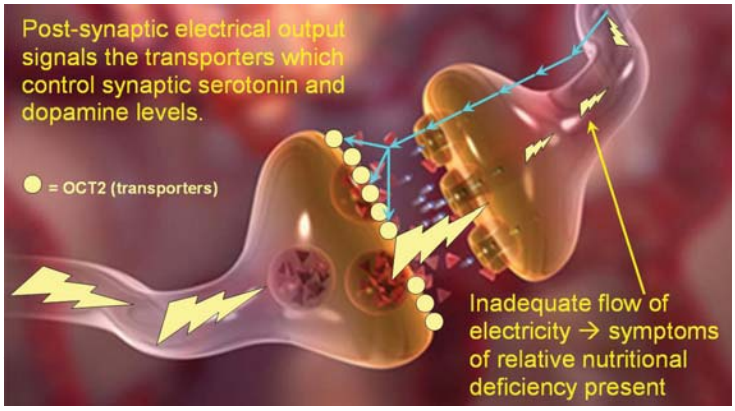
This research is based on clinical MD research started in 1997. Our central database contains over 2.6 million patient-days of amino acid experience.

THE PROPER PERSPECTIVE: Balance — not how high!

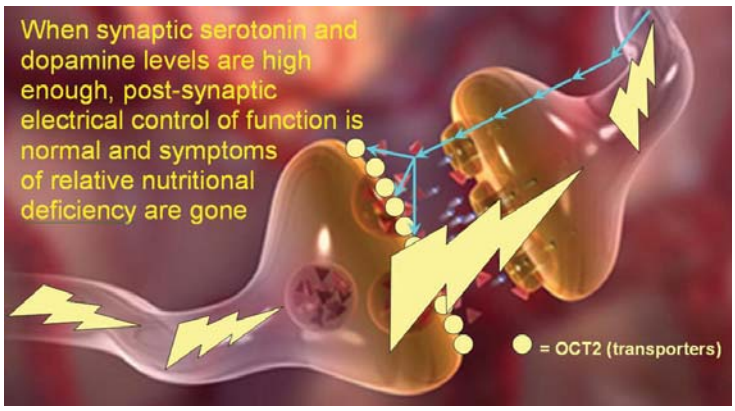
Review of the chemical properties of the immediate monoamine precursors, L-dopa and 5-HTP, shows that they hold tremendous and extraordinary potential in the management of relative nutritional deficiencies. L-dopa and 5-HTP are freely synthesized to dopamine and serotonin, respectively, without biochemical feedback inhibition. Each freely crosses the blood–brain barrier. It is possible to achieve any required level of serotonin and dopamine to optimize synaptic monoamine levels in the brain with these nutrients. MTO reveals that it is not the concentration of these neurotransmitters that is critical for optimal results; it is the balance between serotonin and dopamine in the competitive inhibition state, as defined by MTO, that is most critical in re-establishing and optimizing the postsynaptic flow of electricity leading to relief of symptoms.

Monoamine Transporter Signaling

When the outflow of post-synaptic electricity is not adequate for control and regulation of symptoms and/or function, a signal is generated which regulates the pre-synaptic transports of serotonin and dopamine. If there are not enough neurotransmitters in the system, adequate synaptic levels of neurotransmitters cannot be achieved. An increase in the total number of neurotransmitter molecules in the synapse is needed. The only practical way to increase the total number of serotonin and dopamine neurotransmitter molecules in the brain is with administration of their amino acid precursors in proper balance. Therefore, when neurotransmitter levels are not adequate a relative nutritional deficiency exists.



Signaling encodes the pre-synaptic transporters with the information required to establish optimal synaptic neurotransmitter levels. Determination of the functional status of the OCT2 transporters defines the serotonin and dopamine amino acid precursor dosing values required to reestablish optimal electrical flow and relieve symptoms.



With administration of proper levels of balanced serotonin and dopamine precursors guided by MTO the pre-synaptic receptors are able to establish synaptic neurotransmitter levels high enough to facilitate the post-synaptic electrical flow needed for relief of relative nutritional deficiency symptoms. Increasing synaptic neurotransmitter levels is analogous to turning up the voltage causing more electricity to flow through damaged post-synaptic neuron bundles.

Integrating Monoamine Transporter Optimization (MTO) into clinical practice

ICD-9-CM 269.9 **unspecified nutrition deficiency** CPT codes / **Serotonin** 84260 / **Dopamine** 82384 / **Creatinine** 82570

The standard differential diagnosis of depression includes 1) depression 2) hypothyroidism 3) iron deficiency anemia.

The diagnosis of depression has been referred to as a "garbage can diagnosis." Once the components of the differential diagnosis with objectively verifiable causes are ruled out, all that is left is a state where the exact etiology is not known and the mechanism of action of most effective management approaches is not known. Some of the common drugs used in the treatment of depression, such as fluoxetine and bupropion lists, "mechanism of action unknown."

Prior to management of monoamine relative nutritional deficiency, the amount of nutrients entering the brain is normal but it is not high enough to facilitate synthesis of monoamines at the levels needed to allow the OCT to function up to the required flow potentials encoded in the transporter.

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Depression is a diagnosis of exclusion: when hypothyroidism, iron deficiency anemia, and monoamine associated relative nutritional deficiency are ruled out the diagnosis of depression is made.

Monoamine-associated relative nutritional deficiency is confirmed or ruled out by the response to monoamine transporter optimization (MTO). Nutrients are indicated for the primary management of a nutritional deficiency, not drugs.

The workup of the differential diagnosis of depression.
1. Obtain a TSH
2. Obtain a hemoglobin
3. Conduct an empirical trial of MTO

A normal TSH, normal hemoglobin and negative MTO response lead to the diagnosis of depression by exclusion.

When the symptoms suggest any of the diseases found in the left column of page 2 "monoamine-related nutritional deficiency" (monoamine RND) needs to be included in the differential diagnosis.

It is postulated that over 80% of humans suffer from symptoms relating to a serotonin and/or catecholamine (monoamine) relative nutritional deficiency.

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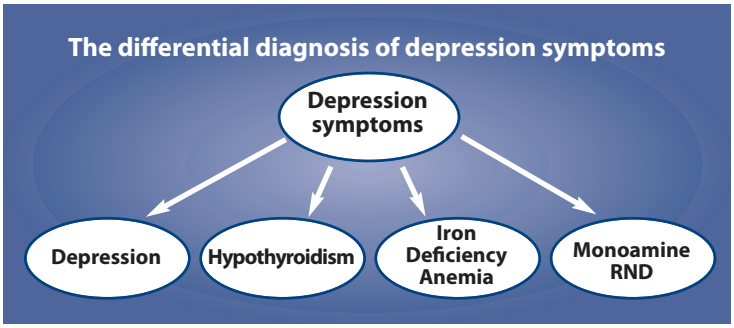


Monoamine-Related Relative Nutritional Deficiencies:

1. Display symptoms that need to be included in the differential diagnosis of states found in the left column of page 2.
2. May be induced by neurotransmitter depletion due to reuptake inhibitor drugs.
3. May be induced by amino acids, (see below).

AMINO ACID-INDUCED RELATIVE NUTRITIONAL DEFICIENCIES

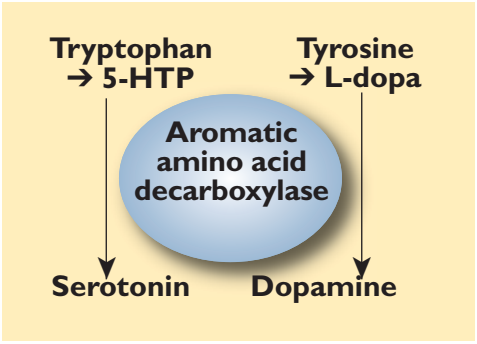
Improperly balanced amino acid precursors deplete centrally acting monoamine neurotransmitters

Monoamine neurotransmitters and their amino acid precursors exist in two distinctly different physiological states:

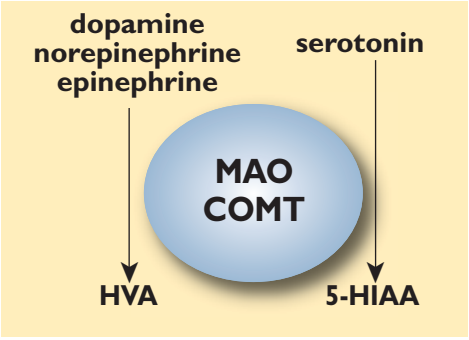
- **THE ENDOGENOUS STATE** found when no amino acid precursors are being administered.
- **THE COMPETITIVE INHIBITION STATE** found when significant amounts of serotonin and dopamine amino acid precursors are being administered simultaneously.

Monoamine Neurotransmitters and their Amino Acid Precursors Exist in Two Distinctively Different Physiological States: Br J Pharmacol. 1996 March; 117(6):1187-92.

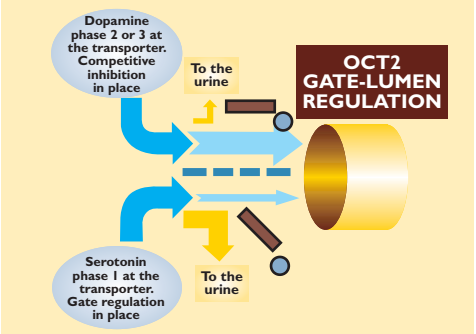
Improperly balanced amino acids deplete monoamine neurotransmitters



SYNTHESIS IN COMPETITIVE INHIBITION
The same enzyme, L-aromatic amino acid decarboxylase (AAAD), is responsible for synthesis of serotonin and dopamine. If an environment is created in the competitive inhibition state where the amino acid precursors of one system dominate the AAAD, this leads to decreased synthesis and depletion of the non-dominant system with an associated relative nutritional deficiency of amino acid precursors.



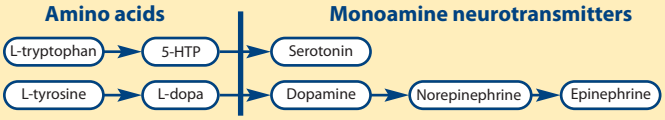
METABOLISM IN COMPETITIVE INHIBITION
Both serotonin and dopamine are metabolized by the monoamine oxidase (MAO) enzyme system. A significant increase in levels of one system increases MAO activity causing domination of the enzyme, leading to increased metabolism and depletion of the non-dominant system with an associated relative nutritional deficiency of amino acid precursors.



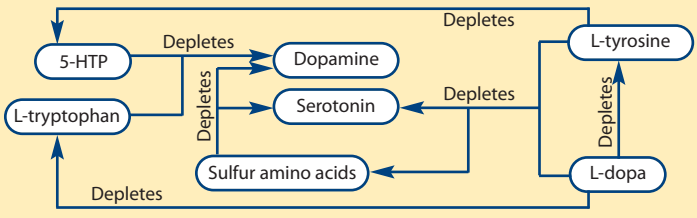
TRANSPORT IN COMPETITIVE INHIBITION
Serotonin, dopamine, and their amino acid precursors compete for transport by the organic cation transporters. Significant increases in one will decrease monoamine and precursor transport of the non-dominant system and induce a relative nutritional deficiency since transport of precursors into the cells is required for synthesis to take place.

Solving the challenge

Low or inadequate levels of serotonin and dopamine are caused by a relative nutritional deficiency that may not be corrected by diet or drugs; supplemental nutrients are needed.



Improperly balanced amino acid precursors deplete neurotransmitters and other amino acids. Only MTO™ can define the proper balance of serotonin and dopamine precursors required by the transporters in order to prevent depletion by amino acids.



Depletion means, "You may make your patient worse"™

WARNING! With administration of only 5-HTP, only L-dopa, or improperly balanced serotonin and dopamine amino acid precursors:

- 5-HTP may deplete dopamine
- L-tryptophan may deplete dopamine
- L-dopa may deplete serotonin
- L-dopa may deplete L-tryptophan
- L-dopa may deplete L-tyrosine
- L-dopa may deplete sulfur amino acids
- L-tyrosine may deplete serotonin
- L-tyrosine may deplete 5-HTP
- L-tyrosine may deplete sulfur amino acids
- Sulfur amino acids may deplete dopamine, norepinephrine, and epinephrine
- Sulfur amino acids may deplete serotonin

Serotonin and dopamine amino acid precursors need to be administered in proper balance.

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