

# Nutirents for the mind: The utility of amino acids in psychiatric care‡

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**Amino acids serve familiar nutritional roles that sustain every aspect of health. As instructed by the genetic code, these vital molecules join together to form proteins, which constitute the cellular architecture that sustains life. However, a fraction of dietary amino acid intake is directed toward unique functional roles as signals that allow cells to communicate.**

**Of all the organ-systems, the brain is the most illustrative and magnificent spectacle of the faculties of amino acids as chemical messengers. In addition to serving as building blocks of the brain's proteins, amino acids are the most basic rudiments of a language that enables 100 billion neurons to coordinate emotional, cognitive and behavioral health.**

*Neurotransmitters and neuropeptides*, which are derivatives and polymers of amino acids, respectively, comprise this language. In a process known as neurotransmission, these molecules carry information from one neuron to the next to organize feelings, thoughts, decisions, behaviors, learning and memory. Over 50 years of research in neuropsychiatry has asserted that the magnitude and finesse of neurotransmission is the deepest underpinning of mental, emotional and behavioral health.

## Neurotransmitters

**While researchers have yet to fully decode the mind's vernacular, the nutritional prerequisite of amino acids remains self-evident. L-tryptophan and L-tyrosine are precursors of serotonin and dopamine, respectively, which are critical for positive mood and behavioral health (Table 1).<sup>1-3</sup> Glycine and glutamate are neurotransmitters themselves, and are critical for relaxation and learning, respectively.<sup>1,4,5</sup> Arginine is a precursor of nitric oxide, a neurotransmitter that modulates the release of other messengers.<sup>6</sup> Studies that deplete single amino acids from the diet have demonstrated commensurate reductions in their cognate neurotransmitters, with decrements in mood**

and emotional homeostasis.<sup>7,8</sup> Accordingly, subsequent repletion effectively reverses the deficit and restores homeostasis.<sup>2,7,8</sup>

Amino acid	Neurotransmitter	Roles in mental health
Phenylalanine/ Tyrosine	Dopamine Norepinephrine	Alertness, cognitive performance, positive mood <sup>‡</sup>
Tryptophan	Serotonin	Relaxation, positive mood, healthy eating behavior <sup>‡</sup>
Glycine	Glycine	Sleep, relaxation <sup>‡</sup>
Glutamic acid	Glutamate	Learning, memory <sup>‡</sup>
Arginine	Nitric oxide	Modulation of other neurotransmitters <sup>‡</sup>

*Table 1. Examples of dietary amino acids that serve as neurotransmitters or their precursors.*

### Neuropeptides

The majority of signaling molecules in the brain are neuropeptides, chains of amino acids that convey more specific messages from one neuron to the next. These molecules play specialized roles, such as the regulation of appetite, metabolism and social behavior. While functionally disparate, their unifying attribute is a compositional demand for amino acids. Phenylalanine, threonine, methionine, lysine, and the branched chain amino acids are examples of neuropeptide constituents that must be obtained through the diet.<sup>1-3</sup>

### Repletion with free-form amino acids

Adequacy of total amino acid intake through dietary protein is a fundamental point of general neuropsychiatric assessment.<sup>2,3</sup> However, even if intake is sufficient, the proficiency of protein digestion remains an imperative consideration. The release of amino acids requires adequate gastric hydrochloric acid (HCl), pepsin and other proteolytic enzymes.<sup>2,3,9</sup> Among the many factors that affect gastric acidity, the inverse correlation with age is well-established. A 40% reduction can occur between one's teens and thirties, and another decline of 50% can occur by age 70.<sup>2,9</sup>

All digestive and enzymatic shortcomings can be circumvented by supplying free-form amino acids, which are not bound together as proteins. Thus, they are readily absorbed

and utilized without the requirement for HCl or digestive enzymes. Amino Replete, which will be available in June, is a hypo-allergenic, free-form amino acid powder delivering a comprehensive blend of amino acids in the ratios found naturally in high biological value (BV) protein sources. This provides a simple solution for sensitive patients that is not contingent upon digestive competence. Depending on the individual's needs, these amino acids can serve multiple functions in the brain and throughout the body, extending to many dimensions of health and wellness.‡ The majority of signaling molecules in the brain are neuropeptides, chains of amino acids that convey more specific messages from one neuron to the next. These molecules play specialized roles, such as the regulation of appetite, metabolism and social behavior. While functionally disparate, their unifying attribute is a compositional demand for amino acids. Phenylalanine, threonine, methionine, lysine, and the branched chain amino acids are examples of neuropeptide constituents that must be obtained through the diet.‡<sup>1-3</sup>

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