Amino Acid Nutrition + Testing

Nutrition-based pathology testing to match your requirements for supplementation

Improving General Health & Wellbeing through Testing and matching Amino Acid Supplementation

This program aims to improve an individual's general health, wellbeing and vitality by determining key nutrient deficiencies through examination of urine and providing a program of nutrient supplementation specifically designed for specific health and lifestyle requirements.

The urine analysis determines whether the excretion of amino acids was representative of

1. normal functioning of the body
2. long term impacts on health
   - *associated with long term chronic illness or*
   - *extensive and prolonged physical exertion*
   - *extensive overwork and prolonged tiredness*
3. short term impacts from recent events such as
   - *recovery from acute infections*
   - *responses to stresses*
   - *recovery from muscle and body injuries*

Although numerous nutritional supplements are commercially available, the current program is distinctive as it:

- Takes into account the unique nutritional requirements of people as a result of differing combinations of general health, lifestyle and nutritional issues.
- Allows for rapid nutrient uptake and dispersal throughout the body.
- The supplements have been scientifically designed to optimise uptake and maximise utilisation by the body.
- A range of the amino acid supplements have been designed to match the 3 major categories of health determined by the urine assay and aligned with either
  - Workload demands
  - Physical exercise demands
  - Support of illness and injury recovery

Clean Nutrient Support for Athletes.

- Coordination
- Anticipation
- Muscle fatigue
- Muscle pain
- Bone & cartilage

Identify YOUR nutrient requirements to

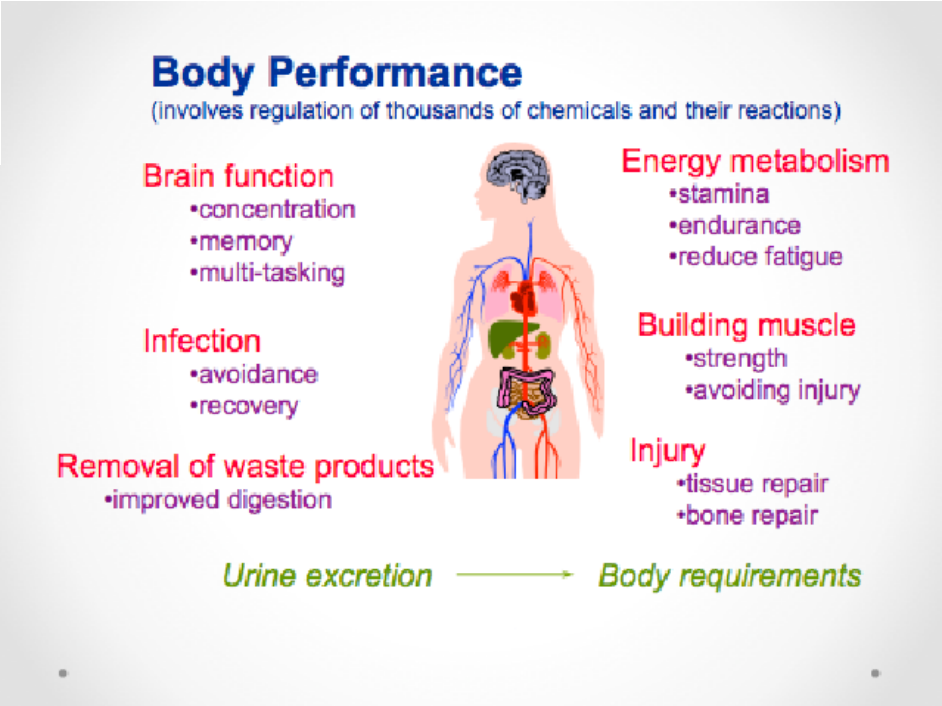
- Support muscle metabolism
- Optimize brain function
- Improve immune function
- Build muscle and strength
- Improve recovery

If you are in heavy training, then your body will require certain types of amino acids, vitamins and nutrients to support the functions associated with the sport. These functions range from nerve firing for coordination, to specific nutrients required for supporting energy metabolism and building muscle proteins. The needs of today's athlete often extend beyond the "normal" dietary intake and therefore appropriate supplementation could lead to greater performance benefit. Tailoring your specific nutrient intake to YOUR own sports and genetic requirements could lead to a more efficient training program with greater performance achievement. The only way to identify YOUR sporting nutritional requirements is to have a urine . This will enable us to compile your tailor-made nutrient support system.

Optimum Performance

All tissues and organs are affected by rigorous exercise. Biochemical testing can help you to maximise your performance by;

- Identifying your specific nutrient requirements,
- Assessing levels of tissue damage,
- Assisting you to select the best supplements required by your body.



Amino acids are required for:

- Protein synthesis
- Recovery from illness
- Brain function
- Hormone production
- Energy metabolism

Amino acids have many metabolic roles in the body including brain and nerve function, hormone synthesis as well as representing the building blocks of protein. Throughout the day, the body continuously manufactures millions of proteins associated with muscle structure and function. Amino acids are thus vital for good body performance.

Urine analysis testing is used to identify metabolic imbalances which may assist in clinical diagnosis and provide a baseline of individual biochemistry for planning, implementing and tracking patient management. Amino acid deficits can arise from prolonged illness, poor diet, extensive exercise regimes as well as aging processes and may contribute towards a poor health status..

Tailoring a specific amino acid intake to a patient's individual requirements can lead to better health and quality of life for the general population and, in the case of athletes, improved performance. Individual requirements are different as a result of a myriad of factors including age, lifestyle, genetics, food and medicinal intake, sleep patterns and training schedules.

For example, amino acid depletion is a significant problem in chronic pain and fatigue disorders. Falls in amino acid levels are associated with increased symptom severity in chronic illnesses and increasing duration of the illness is associated with a progressive loss of amino acids in the urine.

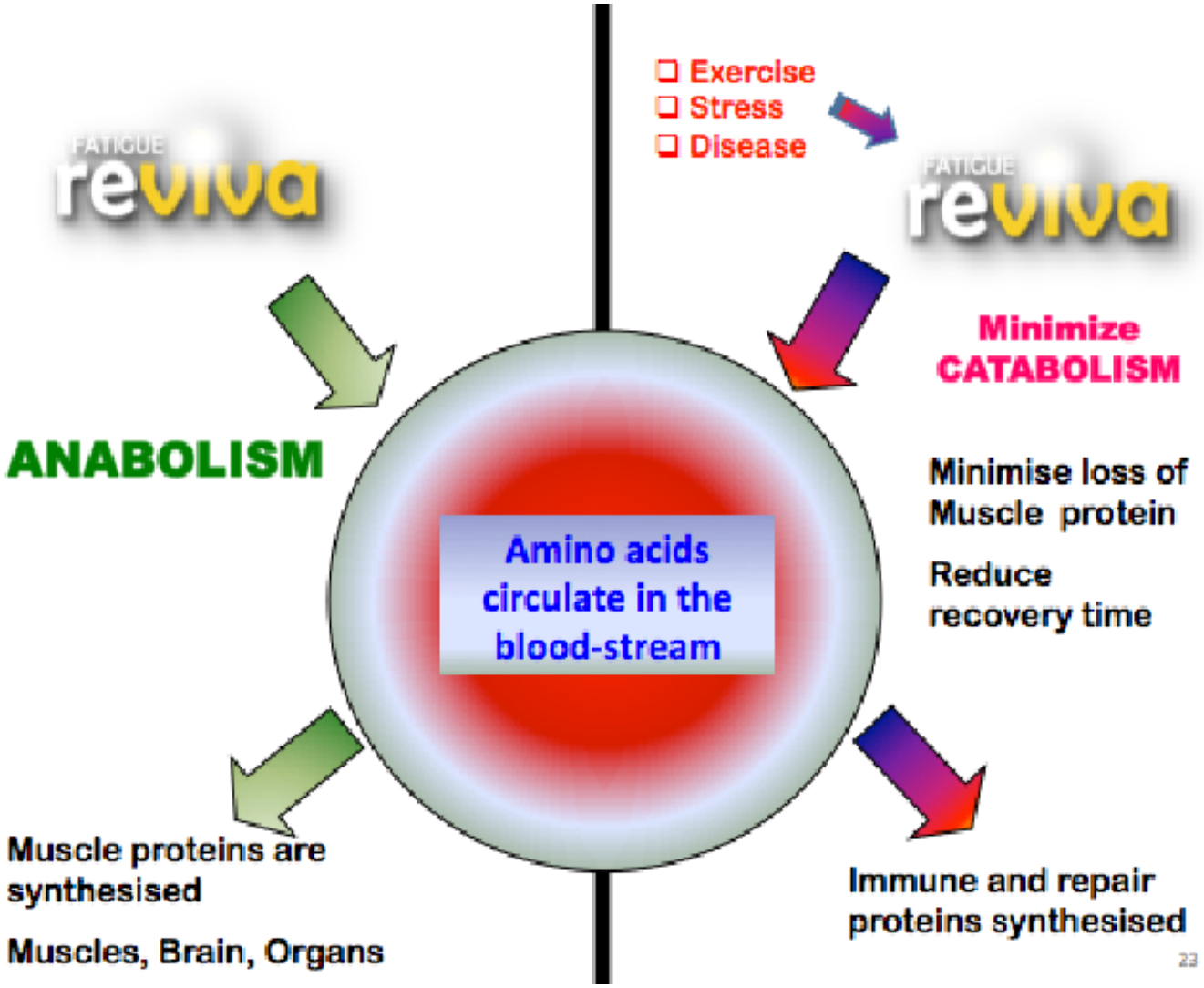
Alterations in amino acid metabolism can be identified with urine analysis and a comprehensive, accurate supplementation program can be implemented. Providing a patient with nutritional support based on laboratory tests provides the best possible approach to clinical nutritional management.

Disruption of the capacity to produce new proteins can have significant impact on body performance and function. Many amino acids which are not deemed essential to receive from the diet (ie the body can manufacture them) can become "Conditionally Essential Nutrients" during illness or injury when the host response, or repair mechanisms, may result in unusual metabolic demands on the body which must be met to continue normal functioning.

Selected protein foods, fruits and vegetables could potentially be used to provide the additional demands of various amino acids and this could form the basis of nutritional support. The difficulty is to match the patient's specific requirements to the appropriate plant/animal extract. **In addition, digestive capacity is often reduced in the aging individual as well as under times of intense exercise, stress or prolonged illness.** This impact on the stomach can lead to inadequate protein digestion and thus may render the food supplement approach ineffective.

Fatigue Reviva is designed to be rapidly absorbed, by-passing the need for digestion.

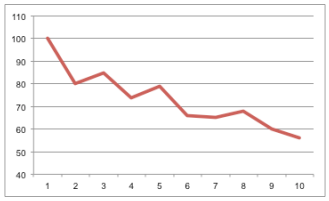
The most effective clinical approach is to directly identify the nutrient deficits and provide scientifically designed formulations which can be absorbed by the body without requiring active digestion. This can be done in conjunction with considering the patient's clinical status and diagnosis into account.



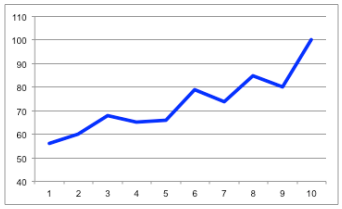
Introducing the Urine Test

The urine testing procedure can

- identify anomalies in the excretion of amino
- identify deficits in amino acid homeostasis and suggest corresponding amino acid formulations



- Low levels of amino acids in the urine can reflect deficits in the body



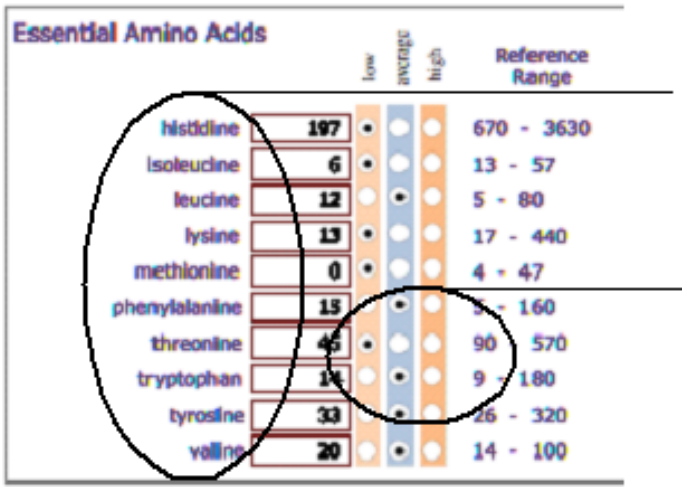
- High levels of amino acids in the urine can reflect either specific high dietary intakes (supplements) or periods of excessive losses via catabolic responses

- The benefit of amino acid supplementation has been noted in several published studies

FATIGUE reviva

- The advantages of amino acid support are well documented for critically ill patients
- Amino acid support can enhance recovery for athletes

Introducing the Report:



The urine analysis can be used to assist in determining whether the excretion of amino acids was representative of

1. normal functioning of the body
2. long term impacts on health
   - *associated with long term chronic illness*
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   - *extensive overwork*
   - *prolonged tiredness*
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Report Comments:
The report provides 3 sections of automated comments which respond to levels of amino acids in the urine sample:

Essential Amino Acids: Leucine and Isoleucine are important amino acids that help regulate amino acid homeostasis in the body. If these are low, then this is usually associated with a net deficit in essential amino acids.

Catabolism Marker: A high level of Tyrosine in the urine can be indicative of an ongoing catabolic response in the body as result of an infection or recovery from intense exercise.

Soft Tissue Damage: Proline and hydroxy-proline are abundant components of connective tissues. Damage to these tissues is often reflected with the excretion of these amino acids.

The report provides the concentrations of amino acids measured in the urine samples provided. The concentrations are provided in universally accepted standard format of □moles (micromoles) per liter.

The amino acids and related metabolites are listed on the left and the concentrations in □moles L^{-1} are provided in the adjacent boxes.

The buttons indicate whether the patient results are "average" or relatively low or high compared to the healthy subjects.

The reference ranges of values are provided to the right of the button displays to show the variance associated with the values for urinary concentrations.

The urinary metabolites have been grouped into 4 types of excretory products:

Essential Amino Acids — these are amino acids that cannot be synthesized by the human body and must be derived from the diet.

Non-essential Amino Acids —these can be made by the body from ingested food substrates. Some of the amino acids may become “conditionally essential” under certain conditions such as prolonged illness or exercise stress when the body’s capacity to synthesis these amino acids cannot keep up with demand.

Amino Acid Derivatives — these compounds represent precursor or breakdown products of the amino acids and can sometimes provide valuable insight for anomalies in homeostasis.

Dipeptides — these represent 2 amino acids joined together which can sometimes have specific functions within the body. This is growing field of interest.

Amino Acids - Selected Functions - Clinical Guide

NEUROLOGICAL: Vital functions in neurotransmission

BCAAs (**leucine**, **isoleucine** & **valine**): role in neurotransmission as a result of BCAAs' role in brain glutamate and glutamine synthesis. BCAAs, in particular leucine, are believed to act as nitrogen donors for glutamine and glutamate synthesis within the CNS.
Methionine: within brain synthesis of S-adenosylmethionine (SAM).
Phenylalanine: precursor of tyrosine & catecholamines (DOPA, dopamine, norepinephrine, epinephrine); precursor of phenylethylamine which has neuropharmacological effects; elevated levels toxic to neurological systems resulting in defective cognitive abilities/learning disabilities.
Histidine: precursor of brain histamine which is a neurotransmitter
Tryptophan: synthesis of serotonin & melatonin.
Asparagine: precursor of aspartate.

Aspartic acid: excitatory neurotransmitter.
Glutamic acid: excitatory neurotransmitter; glutamatergic neurons are involved in brain functions including learning and memory; glutamate precursor of the inhibitory neurotransmitter GABA.
Glycine: inhibitory neurotransmitter.
Ornithine: urea cycle intermediate thus involved in removal of highly toxic ammonia. Inherited defects in urea cycle enzymes can result in brain damage.
Serine: involved in phospholipid production – present in cell membranes as a constituent of the phospholipid phosphatidylserine which is the precursor to phosphatidylethanolamine.
Tyrosine: precursor of catecholamines (DOPA, dopamine, norepinephrine, epinephrine); may reduce effects of stress/fatigue on cognitive performance.

IMMUNE: Energy, regulation and recovery

Leucine: promotes wound healing.
Phenylalanine: increased excretion may accompany infection & trauma.
Histidine: precursor of histamine which mediates inflammatory & allergic reactions; antiinflammatory action.

Methionine: reduction of histamine levels.
Threonine: formation of glycoproteins; may be required by thymus gland.
Glutamine: may be conditionally essential during injury & infection – acts as immunomodulator.

GASTROINTESTINAL: Immune protection, energy and regulation

BCAAs (**leucine**, **isoleucine** & **valine**): involved in synthesis of glutamine required for intestinal nutrition.
Histidine: role in gastrointestinal function as a precursor of histamine which stimulates release of HCl; enhances absorption of zinc..

Tryptophan: synthesis of picolinic acid.
Glutamine: required for intestinal nutrition as energy source for gastrointestinal enterocytes.
Glycine: formation of bile salts.

MUSCULOSKELETAL: Energy, growth, regulation

BCAAs (**leucine**, **isoleucine** & **valine**): constituents of tissue proteins; involved in regulation of protein metabolism; components of collagen.
Leucine: involved in protein synthesis & regulation of protein catabolism; alternate to glucose as source of energy for muscles; may promote muscle anabolism in aging.

Lysine: connective tissue constituent – collagen & elastin.
Methionine: connective tissue component.
Hydroxyproline & Proline: constituents of connective tissue proteins.

Implications of Altered Excretion

Cytokine mediated responses to trauma, stress and infection lead to proteolysis and **increased** amino acid excretion. Activation of the immune system during infection results in a catabolic state with muscle tissue breakdown and release of amino acids for production of defence molecules. This response is evidenced by typical sickness behaviour. If the catabolic state becomes "chronic", eg during a long-term persistent infection, continual activation of the immune system may result in cellular malnutrition, a decrease in the pool of available amino acids and **decreased** urinary amino acid levels. In order to maintain the body's protein stores during stress, dietary amino acid requirements may increase. Altered amino acid metabolism may result in muscle protein loss and eventually in malnutrition if amino acid stores do not meet the body's needs. In various conditions including stress, prolonged fatigue, pathogenic challenge and strenuous exercise **digestive function** may also be adversely affected reducing protein absorption. Amino acid supplementation circumvents reduced digestive capacity as amino acids are readily absorbed.
Altered excretion of total amino acid levels may indicate problems with kidney function. Aminoaciduria may occur despite normal plasma amino acid levels due to perturbed renal reabsorption.
NOTE: Altered urinary amino acid levels may not reflect plasma/tissue levels. Due to body's ability to sustain amino acid homeostasis, circulating plasma levels of many amino acids may be maintained during periods of stress etc.

Implications of Altered Excretion

Essential & non-essential amino acids

- Cytokine mediated responses to trauma, stress and infection lead to proteolysis and an **increase** in amino acid excretion. As a consequence of the activation of the immune system during infection a catabolic state occurs, resulting in a breakdown of muscle tissue to release amino acids for use in the construction of defence molecules. This response is evidenced by typical sickness behaviour (fever, loss of appetite etc). If the catabolic state becomes "chronic", such as in the case of a long-term persistent infection, the continual activation of the immune system may result in cellular malnutrition and a decrease in the pool of available amino acids. This will be evidenced by a **decrease** in urinary amino acid levels.
- Under stress higher nutritional input of amino acids may be required to maintain the body's protein stores. Changes in amino acid metabolism associated with stress may result in muscle protein loss and eventually in malnutrition if amino acid stores do not meet the body's requirements.
- Higher free radical production occurs in response to stress. Glutathione provides peroxidative protection and requires precursor amino acids cysteine, glutamate/glutamine and glycine.
- Altered excretion of total amino acid levels may indicate problems with kidney function. Aminoaciduria may occur despite normal plasma amino acid levels due to perturbed renal reabsorption.
- Within the brain and muscle toxic ammonia is converted to nontoxic glutamine. Glutamine is synthesized from glutamate and ammonia. Glutamine in the kidney supplies majority of excreted ammonia.

Branched-chain amino acids

- Following **stress, infection, trauma, cytokine-mediated events**, BCAAs are released from the tissues. The BCAAs released from tissue proteins are deaminated providing an energy source as well as amino groups which allow for the synthesis of glucogenic alanine, glutamine and glutamate.
- Perturbation of energy metabolism may occur as a result of a reduction in amino acids available for TCA cycle oxidation or gluconeogenesis affecting cellular energy production.
- Altered brain function/neurotransmission as a result of BCAAs role in brain glutamate and glutamine synthesis. BCAAs, in particular leucine, are believed to act as nitrogen donors for glutamine and glutamate synthesis within the CNS. Glutamatergic neurons are involved in numerous brain functions including learning and memory.
- During **exercise** a transient catabolic state occurs which is reversed during recovery. During exercise protein degradation increases whilst protein synthesis decreases and this results in an increase in the available store of amino acids to be utilized to provide energy for working muscles. The BCAAs are the main amino acids which are oxidized by skeletal muscle.
- Poor nutrition may result in an increase in the catabolism of BCAAs.
- In severe catabolic states BCAA nutrition may play a beneficial role - some studies have shown maintenance of plasma amino acid levels, increased skeletal muscle protein synthesis and decreased catabolism.

NOTE: Changes in the urinary levels of amino acids may not reflect plasma or tissue levels. Due to the body's ability to sustain amino acid homeostasis, circulating plasma levels of many amino acids may be maintained during periods of stress etc.

Abbreviations: BBB – blood-brain-barrier; BCAA – branched-chain amino acid; GABA – gamma-aminobutyric acid; TCA – tricarboxylic acid.

Testing for amino acid requirements

- DRBiolab Specialized Amino Acid support
- Fatigue Reviva

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