Understanding the Discovery of the Ideal Amino Acid Pattern for Human Nutrition

A remarkable discovery has been made in the field of human nutrition.

Its implications are profound.

Although this research is new to North America, in Europe over 12,000 medical physicians have incorporated the results of this discovery into their practices.

It can be considered one of the most important nutritional discoveries of our time.

The following overview provides some background information to help facilitate the understanding of the significance of this development.

What do Life Processes Depend Upon?

Amino acids: the "building blocks" of life. When strung together like beads on a chain, they form the required proteins of the body.

After water, protein is the next most abundant substance in the body.

Protein is the major structural and functional component of all cells. In the body, proteins have incredibly diverse functions.

For example, they make up enzymes and polypeptide hormones that regulate metabolism. In bone, the protein collagen forms the framework on which the calcium phosphate crystals are deposited. In muscle, they make up the contractile proteins that permit movement. In the bloodstream, proteins such as plasma albumin and hemoglobin transport vital molecules, whereas immunoglobulins help provide protection from infectious bacteria and viruses.[1]

tial to maintain health, cellular integrity and function.

The Beginning

The scientific discoveries related to proteins and their constituent amino acids began about 1820 when the essential amino acid leucine was discovered.

In 1935, William C. Rose *(1887-1985)* completed the identification of the eight essential amino acids with the discovery of threonine.

By 1946, three important concepts had been recognized:

1. There are daily essential amino acid requirements.
2. The nutritional value or quality of a dietary protein depends on its amino acid profile.
3. For protein synthesis to occur, all eight essential amino acids must be available *simultaneously* at the sites of the body's protein synthesis. *(If one amino acid is missing, protein synthesis will not take place.)*

In 1946, Rose was the first to *estimate* the daily essential amino acid requirement for humans.

Unfortunately amino acid formulas based on this estimate had a poor nutritional effectiveness, and the adverse effect of the increased Blood Urea Nitrogen *(B.U.N.)* caused the medical community to become disillusioned.

The Nutritional Failure of Amino Acid Formulations

The nutritional failure of amino acid formulations generated, among the scientific community, even more discrepancies and confusion about basic questions, such as:

a. How many amino acids are essential for human nutrition?

b. What is the "ideal" combination of amino acids for human nutrition?

c. How can the daily requirement of amino acids be calculated?

d. Should an amino acid mixture provide only the essential amino acids or also the non-essential amino acids? *(And in what proportion?)*

Years later, these questions were finally answered and confirmed after approximately two decades of research. Shortcomings of the previous research methodologies were found and remedied. The result:

The discovery of the deal amino acid pattern for human nutrition.

This pattern is comprised of unique proportions of essential amino acids.

As a result, for the first time in medical history it is now possible to provide protein nutritional support that releases virtually no nitrogen waste or calories.

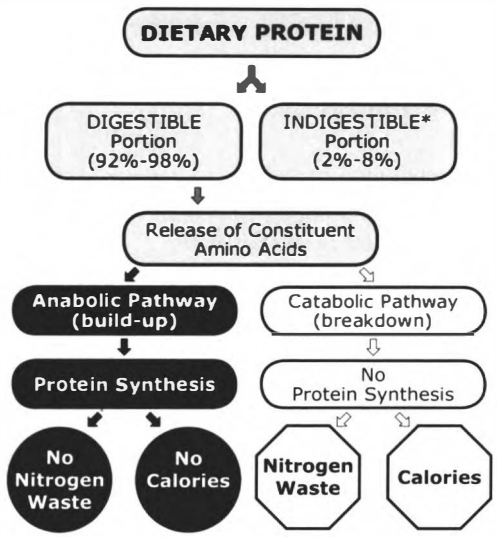
Understanding Protein Nutritional Values

From a nutritional point of view, the most important aspect of proteins is their amino acid composition.

[1] Champe P.C., Harvey R.A., "Lippincott's Illustrated Reviews: Biochemistry".— 2nd ed. page 1 J.B. Lippincott Company, Philadelphia 1994.

Amino acids from a dietary protein or an amino acid supplement are absorbed in the small intestine. Those amino acids then can follow either the anabolic pathway *(build-up)* or the catabolic pathway *(breakdown)*. To illustrate:

PROTEIN METABOLISM CHART

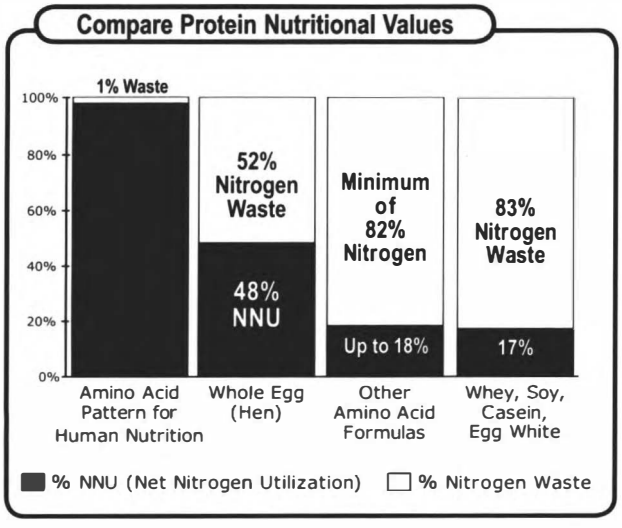


**Indigestable portion is eleiminated through feces and is therefore nutritionally useless.*

When dietary amino acids follow the *catabolic pathway*, they act only as a source of energy and not as "building blocks". Throughout the *catabolic pathway*, amino acids release unwanted nitrogen catabolites.

On the other hand, when dietary amino acids follow the *anabolic pathway*, they act as precursors or "building blocks" in the body's protein synthesis. Throughout the *anabolic pathway*, amino acids do not release any nitrogen catabolites *(metabolic waste)* or calories.

The *percentage* of the total amino acids in a dietary protein or amino acid formula that are **used as** "building blocks" represents the protein nutritional value and is known as **Net Nitrogen Utilization** *(NNU)*.



Net Nitrogen Utilization (NNU)

- NNU represents the nutritional value of a dietary protein or an amino acid formula.
- NNU is the percentage of the total amino acids that act as precursors or "building blocks" in the body's protein synthesis.

What Determines Which Pathway Amino Acids Follow?

Only essential amino acids available in the correct proportion follow the anabolic pathway.

This proportion is very specific. Even the slightest change in the proportion of the amino acids in a dietary protein or amino acid formula can affect its nutritional value.

Each species in the animal kingdom has its own specific nutritional amino acid pattern.

To better understand why a minimal change in an amino acid pattern can be significant, consider that a tree, bird, or human being are composed of amino acids. However, each is different in accordance with its own amino acid pattern.

The amount of the correct proportion is also important. There is no storage mechanism for amino acids analogous to that for lipids or carbohydrates. If the amino acids are not in the correct proportion or if there is an excess, then the amino acids are metabolized with their carbon skeletons converted to glucose or to fat, and their amino groups converted to ammonia.

Why is Understanding Protein Nutritional Value so Important?

A nutritional formula based on the ideal amino acid pattern for human nutrition if properly manufactured, has a 99% NNU.

This means that it would be safer and 400% to 500% more nutritionally effective than other amino acid formulas or protein isolates from whey, casein, or soy.

The "Nutritional Dilemma" Solved

As people age, inadequate nutrition in quantity or quality becomes more common and can compromise protein synthesis.

To date, many health disorders have been misinterpreted as "natural" consequences of the aging process. In reality, it is not the aging process itself but the inadequate nutrition associated with it that can cause many health challenges.

During the aging process, the lean-body mass *(the living-cell mass that makes up muscles, organs, skeleton, antibodies, enzymes, etc.)* usually decreases *(up to 25% in the average 70-year-old individual)*. During the same period, fat-body mass usually increases *(up to 100%)*.

Until now, achieving adequate nutrition during the aging process has been a nutritional dilemma.

During the aging process, kidney function decreases. As a result, average 70-year-old individuals may retain only 30% of their juvenile kidney function. Under these circumstances, even an adequate daily protein intake could be contraindicated because it could provoke an increase of nitrogen catabolites such as ammonia or Blood Urea Nitrogen *(B.U.N.)*.

It is now possible to provide protein nutritional support that releases virtually no nitrogen waste. As a result, individuals at any age can safely meet their daily protein requirements without stressing kidney and liver functions.

Maintaining Normal Protein Turnover Rates

Proteins in the body are not static *(they are synthesized and degraded continually)*.

The rate of turnover of proteins varies widely. For example, some proteins such as digestive enzymes and plasma proteins, are rapidly degraded, having half lives measured in hours or days. However, structural proteins, such as collagen, are metabolically stable and have half lives measured in months or years. The rate of turnover of proteins tends to follow their function in the body, i.e., proteins whose concentrations must be regulated *(e.g. enzymes)* or that act as signals *(e.g., peptide hormones)* have relatively high rates of synthesis and degradation as a means of regulating concentrations. On the other hand, structural proteins such as collagen and myofibrillar proteins or secreted plasma proteins have relatively long lifetimes.[2]

There must be an overall balance between synthesis and breakdown of proteins. *(Balance in healthy adults who are neither gaining nor losing weight means that the amount of nitrogen consumed as protein in the diet will match the amount of nitrogen lost in urine, feces, and other routes.)*[2]

Inadequate Protein Synthesis

Proteins are synthesized in all cells of the body from amino acids. Chains of amino acids fold in different ways to create the structure or shape of the different types of proteins that make up the body.

The shape of a protein determines its biological activity or function. On the basis of their three-dimensional structure, proteins can be classified as fibrous proteins *(long, linear, pleated sheets)* or globular proteins *(roughly spherical shaped)*.

Inadequate protein synthesis can affect any of the types of proteins or the structures they form, for example:

FIBROUS PROTEINS:

a. Structural

- Collagen:
  - Type I – skin, bone, tendon, blood vessels, cornea
  - Type II – cartilage, intervertebral disk, vitreous body
  - Type III – blood vessels, fetal skin
  - Type IV – basement membrane
- Elastin: trachea, lungs, large blood vessels, elastic ligaments and joints
- Keratin: skin, hair, nails

b. Movement

- Actin & Myosin - muscle cells
- Microtubules - cilia *(respiratory tract, fallopian tubes)*

GLOBULAR PROTEINS:

a. Enzymes

digestive enzymes *(amylase, protease, peptidase)*, anti-oxidant enzymes *(peroxidase; e.g. glutathione peroxidase used in detoxification)*

b. Transport Molecules

hemoglobin, K^+ Channel

c. Hormones

insulin, growth hormone, calcitonin, glucagon, luteinizing hormone, thyrotropin-releasing hormone, antidiuritic hormone, oxytocin, ACTH, gastrin, angiotensin I & II

d. Neurotransmitters

endorphins, enkephalins

e. Immune Cells

antibodies, complement proteins

f. pH Buffer Proteins

albumin, hemoglobin

The Protein Buffer System

For proteins to function properly, stable pH and temperature are required. The delicate shapes of proteins can be affected *(or denatured)* by excessive fever or excessive pH *(to acidic or basic)*.

Amino acids can accept or donate hydrogen ions, making them excellent buffers.

Since proteins are made up of amino acids, proteins themselves can act as buffers. *(Amino acids have a central carbon group with four groups attached:*

a. a carboxyl group (COOH)
b. an amino group (NH2)
c. a hydrogen atom
d. an R group

The carboxyl group and amino groups are what enable proteins to act as buffers.)

Proteins are found in very high concentration in intracellular solutions and in blood and of the three important buffering systems in the body:

1. bicarbonate buffer system,
2. phosphate buffer system and
3. protein buffer system,

the protein buffering system is considered the most powerful.

[2]Matthews Dwight E., in "Modern Nutrition In Health and Disease" Shils, M.E., Olson, J.A. [et al.].— 9th ed.(Eds), page 21-2, Lippincott Williams & Wilkins, Philadelphia 1999.

Maintaining Normal Protein Synthesis

Proteins play a role in all physiological processes, and all process can be affected by inadequate protein synthesis.

After the discovery of the ideal amino acid pattern for human nutrition, for the first time all individuals, regardless of age or health status, can safely meet their protein requirements without stressing kidney and liver functions. Individuals can now safely, easily, and more effectively maintain normal protein synthesis, especially as they age.

The loss of lean-tissue begins around the age of 25 and usually becomes noticeable by the age or 45. This process can occur even in the absence of weight loss or illness. *(Muscle is the major source of protein for functions such as antibody production, wound healing, and white blood cell production during illness. If the body's protein reserves are already depleted, there is less to mobilize for illness.)*[3]

The degree of the loss of lean-tissue will vary among individuals and its effects can range from a mild loss of tissue firmness, skin elasticity and stamina to a significant loss of tissue integrity and function.

A loss of body protein
means a loss of function

It is important to help individuals understand the relationship between inadequate protein synthesis and a diminishing quality of life.

Adequate protein synthesis helps support:

- immune function
- heart and bone cell turnover rates
- red blood cell production
- muscle tone
- pH and fluid balance, etc.

The value of maintaining normal
protein synthesis cannot be overstated
for anyone at any age.

In clinical practice, it is extremely common to see individuals who, for various reasons, are not meeting their daily protein/amino acid requirements.

A formula that contains the ideal amino acid pattern for human nutrition is the safest most effective protein nutritional support. Thus, it can be used to help individuals of any age meet their daily protein/amino acid requirements. ◆

Additional information and references are available from *drminkoff@optimumhealthreport.com*

[3]Roubenoff B, Castaneda C. Sarcopenia—Understanding the Dynamics of Aging Muscle JAMA.2001; 286: 1230.

YOU MAY ALSO FIND THE SOURCE FOR THE FINE PRODUCTS MENTIONED IN THE ABOVE ARTICLE IN AN ADDITIONAL ADVERTISEMENT ON PAGE XX OF THIS ISSUE.