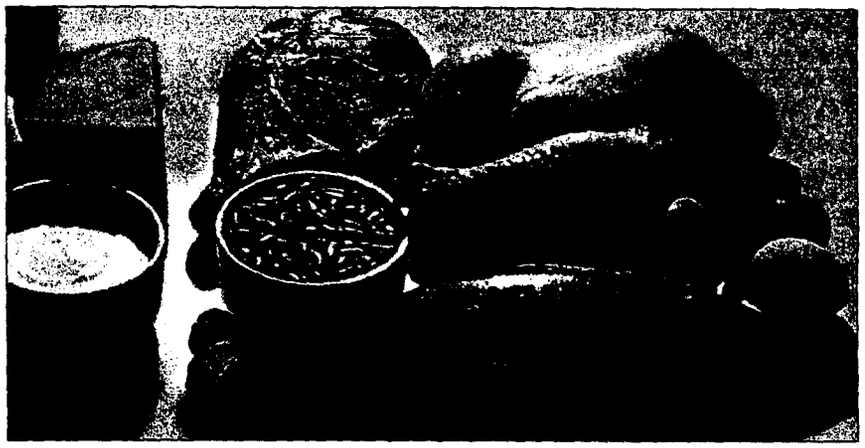
AMINO ACIDS AND DIET
in Chronic Pain Management

This first installment of a multi-part series on amino acids and diet outlines their critical importance in pain practice.



By Julia Ross, MA, MFT and Forest Tennant, MD, DPH

Pain management can be significantly assisted by the optimization of the body's own analgesic system. The body's three primary pain modulators appear to be the neurotransmitters endorphin, serotonin, and GABA (gamma amino butyric acid). Each of these potent pain fighters is produced from very specific nutrients called amino acids. These amino acids are derived from high protein foods. They can also be given in the form of quick-acting, free-form supplements.

Research and practice have found that increased intake of the amino acid substrates of the three key pain modulating neurotransmitters can often provide noticeable benefits within a few days.[1,2] These precursor amino acids have also been shown to potentiate pain medications, thus sometimes reducing the amount of opiate needed.[3,4] Seymour Ehrenpreis, PhD, pharmacology professor at Chicago Medical School did original research substantiating the benefit of d-phenylalanine, an endorphinase inhibiting amino acid in postoperative, cancer, and other kinds of severe pain.[5] This reportedly allowed the medical school hospital to significantly reduce the amounts of opiate medication administered.

So important are amino acids to pain practitioners, this journal is publishing a multi-part series on amino acids and diet for the pain practitioner. This first article outlines the basics of amino acids and diet in pain practice and subsequent articles will give more detailed protocols and guidelines for the use of pain-targeted amino acids and dietary therapies.

TABLE 1. ß-Endorphin and ACTH 20-chain Amino Acid Compositions

ACTH	**Asp-Ser-Gly-Pro-Tyr-Lys-Met-Glu-His-Phe-Arg-Trp-Gly-Ser-Pro-Pro-Lys-Asp-Lys-Arg**
ß-Endorphin	**Tyr-Gly-Gly-Phe-Met-Thr-Ser-Glu-Lys-Ser-Gln-Thr-Pro-Leu-Val-Thr-Leu-Phe-Lys-Asn**

What Are Amino Acids?

Chemically speaking, an amino acid is a nitrogen molecule attached to hydrogen. The body utilizes about 20 different amino acids. Nine are classified as "essential" since they can be metabolized into all of the others with the possible exception of carnitine. Dietary protein is simply a matrix of amino acids and protein derived from animals, milk, eggs, fish, plants, or nuts. Foods vary widely in amino acid make-up.

Amino acids are required for the production and maintenance of almost every function and tissue in the body. Their critical roles as the building blocks of muscle, bone, and hormones are well known. Less well known, but more crucial in terms of pain management, is the fact that endorphin, serotonin, and GABA—

Table 2. Primary Pain-modulating Neurotransmitters

Neurotransmitter	Amino Acid Source	Pain Type
Endorphin: Potent group of endogenous opioids·	• d-phenylalanine • a 20 amino acid chain	Very broad analgesic effects
Serotonin: Inhibitory (soothing), sleep-promoting	• 5-hydroxytrytophen • l-tryptophan	Fibromyalgia, migraine, general analgesia
Gamma Amino Butyric Acid (GABA): Inhibitory, neutralizes stress response, endogenous benzodiazepine, inhibits nerve conduction[7]	• l-glutamine • glutamine acid • taurine	Muscle tension, spasm, neuropathic

Table 3. Foods That Contain Protein

Over 50%
Poultry
Seafood
Beef
Pork
Lamb
Eggs
Cottage Cheese

Between 20 and 30%
Green vegetables
Beans
Nuts

our primary pain modulating neurotransmitters—are produced almost exclusively by specific amino acids.

Endorphins and ACTH Chains of Amino Acids

Nothing should pique the interest of a pain practitioner more than a glance at the chemical structure of ß-endorphins and adrenal corticotrophin hormone (ACTH). Both are composed of very long chains of amino acids. Both are made side-by-side in the pituitary gland. One molecule of each is secreted simultaneously from the pituitary. When a noxious pain signal arrives at this anatomic site, endorphin and ACTH are simultaneously secreted and explains why elevated adrenal secretion occurs with attendant tachycardia and hypertension at the same time endorphin is attempting pain amelioration. This makes for a potent trauma team. Unfortunately, individuals with genetically inadequate endorphin production and/or whose production has been exhausted by the demands of chronic pain and dietary protein deficiency, can run low in this most critical storage of pain-modulating neurotransmitters. The production of one molecule of endorphin requires up to 20 amino acids (see Table 1).

The Protein Requirements of a Pain Management Diet

Not only do amino acids produce critical pain modulating neurochemicals and hormones, they are essential for muscle, bone, and soft tissue building and maintenance. Muscle wasting is a well-known occurrence in chronic pain and postoperative patients. While many foods contain protein, we recommend that pain practitioners know the foods that, by weight, are 50% protein (see Table 3). Pain patients tend to eat foods that are high in sugars and starches (carbohydrates) or fats. They often consume too little protein to raise and maintain levels of endorphin, serotonin, and GABA. Chronic pain patients must, therefore, be repeatedly counseled to eat protein on a daily basis.

Table 4. Sample calorie and protein contents of various hospital diets[8]

Type of diet	Kcal/day	Grams protein/day
Regular	2600	100
Clear liquid	1300	27
Soft	2300	90
Full liquid	1600	53
Pureed	1500	90

By conservative estimate, postoperative and chronic pain patients can only prevent significant muscle-wasting and neurotransmitter level depletion by consuming 90-100 grams of protein per day. What would this look like? Breakfast–eggs and ham; lunch–a large turkey or beef sandwich; dinner–a salmon steak. By contrast, the protein content of a hospital diet—depending on the type of diet—may not meet this minimum (see Table 4). Protein powders in liquid may augment protein needs, as can the taking of an IV-administered complete blend of 20 free-form amino acids or oral tablets of the same complete aminos.

Pain Relief from Amino Acids

Simply stated, the entire natural and continuing pain relief system of the human body is fueled by amino acids. Without adequate physiologic body levels of some specific amino acids—and the neurochemicals and hormones they produce—good pain control is not consistently possible. It is for this reason that pain practitioners should master knowledge and use of select amino acids and dietary counseling.

When protein is eaten and enters the small intestine, it is disintegrated by enzymes into individual "free" amino acids, which pass directly into the blood to the liver which begins to immediately metabolize them into secondary amino acids or other compounds that become:

Table 5. Recommended Dosing with Amino Acid Supplements.[9]

Amino Acid	Dosage
To raise endorphin levels:	
• D-phenylalanine (DPA)	500mg Tid
• Plus a complete amino acid blend	700mg Tid
To raise serotonin levels:	
• 5-HTP	50mg (1-3) mid afternoon and bedtime
• or, l-tryptophan	500mg (1-3) mid afternoon and bedtime
To raise GABA levels:	
• GABA	250-500mg, midmorning, mid-afternoon, and bedtime
• or, l-glutamine	500mg (2-3) midmorning, mid-afternoon, and bedtime

the primary building blocks of neurochemicals, muscle, bone, enzymes, hormones, and more.

Administration of Amino Acid Supplements

Modern day chemical manufacturing has produced techniques that allow amino acids to be singularly made in physiologic or even supra-physiologic doses. When singular amino acids are given, it is called "precursor therapy" because the goal of therapy is to provide a substrate that will raise the body's levels of one or more of the targeted pain-killing neurochemicals that are listed in Table 2.

Individual amino acids are commercially available as tablets, capsules, powders, or administered by I.V. pain practitioners will want to identify the single amino acids that will best benefit particular patients. All amino acids are classified by the U.S. Food and Drug Administration as dietary supplements, so they are widely available at reasonable prices in health food stores, pharmacies, catalogs, and on the internet.

Amino acid blends are widely sold in drinks or powders, and advertised or labeled for "energy," "brain power," or "body building." The dosages in most of these products, however, are usually too low to be of much benefit to chronic pain patients. We therefore recommend that practitioners use concentrates of the specific amino acids indicated in Table 2, along with a high quality, free-form amino acid blend containing all 20 amino acids.

The common mistake when recommending amino acids to patients is rooted in the misunderstanding that amino acids, unlike the usual prescription tablet or capsule, is highly soluble in food. In fact, the protein content of a meal will compete with supplemental amino acids for entry into the brain. It is best, therefore, to take amino acids between or before meals. The cardinal rule in the use of amino acids: take on an empty stomach with cold fluids. Recommended dosing with amino acid supplements are summarized in Table 5.

Where To Start?

We recommend that you start by taking a one minute dietary history from chronic pain patients to determine how much protein is consumed on a daily basis. Our guess is that you will be as shocked as we have been to see how little protein is consumed by chronic pain patients. Next, give them a copy of the major protein foods (Table 3), and inform them of the necessity of increasing protein. While the diabetologist may champion the low sugar diet and the cardiologist the low fat diet, pain practitioners must preach the "high protein" diet.

Summary

Little attention has been paid to diet and amino acid needs in our relatively new pain treatment field. The key to nutritional counseling in chronic pain patients is to appreciate the critical contribution of dietary protein and amino acid supplementation.■

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