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Natural Products: Creatine to Deer Velvet

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Goals. The goals of this lesson are to present information on the claims, mechanisms of action, typical dosages used and other items of interest on natural products and nutraceuticals alphabetically from creatine to deer velvet, and to provide background information for assisting others on their proper selection and use.

Objectives. At the conclusion of this lesson, successful participants should be able to:

1. identify claims, mechanisms of action, and typical dosages for natural products and nutraceuticals presented;
2. select from a list, the synonyms for these products; and



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3. describe popular uses of products discussed.

CREATINE, also known as N-amidininosarcosine and N-(aminoiminomethyl)-N methyl glycine, is a non-protein amino acid constituent of muscle tissue. It occurs naturally in meat, fish and other animal products, with trace amounts in dairy products and some plants. The body synthesizes 1 to 2 grams of creatine per day from arginine, glycine and methionine. This is done primarily in the liver, pancreas and kidney for transport via the blood to other tissues in the body. Dietary sources supply an additional 1 to 2 grams daily.

Study of the influence of creatine on exercise performance began in the 1990s. In 1992, a study was published that reported human muscle mass increased as much as 20 percent after creatine supplementation.

There is some laboratory evidence that supplemental creatine is potentially a lean body mass builder. However, most clinical evidence reportedly supports increased water retention in muscle cells as being the primary cause of creatine-induced muscle gain. The muscular enlargement due to increased water retention is short-term when compared to that

resulting from strength training. The latter results in an increase in contractile and structural muscle proteins while the former does not.

Creatine is found in the body in skeletal muscle, brain, heart, retinal and testicular tissue and the blood, with most (95 percent) stored in muscle tissue. About 40 percent exists as free creatine with approximately 60 percent being phosphorylated via the enzyme creatine kinase into a substance called phosphocreatine.

Creatine, converted to its phosphate form, is the body's storage form of high energy phosphate that is used for rapid regeneration of adenosine triphosphate (ATP).

Creatine is used to recycle adenosine diphosphate (ADP) to ATP, which is stored in the mitochondria of muscle cells and produces energy when converted back to ADP. Muscle fatigue occurs when the supply of ATP runs low. Supplementation with creatine helps the body convert ADP to ATP, providing more energy to the muscles. This allows muscles to do more work and be less susceptible to fatigue.

People who have lower total body creatine, such as vegetarians and vegans, are more likely to respond to creatine supplements. On the other hand, individuals with high endogenous production of creatine may not respond at all.

Skeletal muscle reportedly has a saturation point beyond which additional supplemental creatine will not increase intracellular levels. Exogenous creatine supplementation also appears to reduce endogenous production. However, whether this has any clinical significance or

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Table 1
Representative Sources for Information on Natural Products*

American Botanical Council	www.herbalgram.org
Facts and Comparisons	www.factsandcomparisons.com
Food and Drug Administration	www.fda.gov (<i>click on Food</i>)
National Center for Complementary and Alternative Medicine of the National Institutes of Health	www.nccam.nih.gov
PDR for Herbal Remedies PDR for Nutritional Supplements	www.pdr.net
Pharmacist's Letter	www.naturaldatabase.com

*Some websites require subscription.

negative effect on metabolic regulation within the liver is unknown at this time.

Creatine is used orally to improve exercise performance and increase muscle mass in athletes, body builders and geriatric patients. It is also used for congestive heart failure (CHF), gyrate atrophy of the ocular choroid and retina (an inherited metabolic disease in which phosphocreatine is depleted in these tissues resulting in impaired vision), hyperlipidemia, muscular dystrophy, neuromuscular disease, rheumatoid arthritis and to slow the progression of amyotrophic lateral sclerosis (ALS/Lou Gehrig's disease). Creatine is injected intravenously in cardiac surgery and for treatment of CHF.

There is some evidence that supplemental creatine may enhance performance in a limited number of high-intensity, short-term physical activities. Creatine seems to be more beneficial for increasing performance in healthy young males during repeated, short, maximal energy bursts than for longer-event endeavors. Many variables seem to determine the effect of creatine on performance, such as the person's age, diet and training status, the type of sport being tested and the dosage regimen of creatine.

The consensus of references used to prepare this article, including those that promote the use of natural products, is that no

ergogenic effect has been convincingly demonstrated outside of laboratory settings, and that adequate safety data for high doses and prolonged use of creatine are lacking.

There are reports that orally administered creatine may improve exercise tolerance in patients with CHF, but it does not affect ejection fraction. However, intravenously administered creatine improves cardiac function, including ejection fraction, even when used in conjunction with conventional pharmacologic therapy.

Oral creatine supplementation seems to slow visual deterioration in patients with gyrate atrophy. It may improve muscle strength and daily life activity, short-term, in patients with some types of muscular dystrophy.

Adverse events associated with creatine supplements are gastrointestinal pain, indigestion, nausea, vomiting and diarrhea. Muscle cramping and straining are relatively common. There is a theoretical increase in the risk of dehydration due to intracellular fluid shifts, which has led manufacturers / distributors to place a caution about the need for adequate hydration in the labeling of creatine supplements.

Reports of other adverse events sent to the FDA include rash, shortness of breath, nervousness, anxiety, migraine, fatigue,

myopathy, seizures and atrial fibrillation.

Persons with kidney disease, or a high risk thereof (such as patients with diabetes), should be advised to seek medical supervision before using creatine supplements since renal failure has been reported in persons taking them.

Also, there are reports of elevated serum creatinine levels in some individuals who have taken creatine supplements. Creatinine is a metabolite of creatine and the amount excreted in urine is a marker of kidney function. Excess formation and urinary excretion of creatinine resulting from creatine supplements can interfere with the accuracy of creatinine clearance tests.

Creatine supplements should be avoided in children, younger adolescents, pregnant women and nursing mothers. There is inadequate information concerning the benefits and potential for adverse effects in these groups of people.

The bottom line on the potential benefits of creatine supplementation at this time seems to be that there is evidence creatine may enhance performance in high-intensity, short-duration exercise or athletic events in otherwise healthy adults, but it has no proven usefulness in endurance sports.

It is of some interest that the use of creatine is allowed by the International Olympic Committee (IOC), National Collegiate Athletic Association (NCAA), and professional sports. However, the NCAA does not allow member colleges or universities to supply creatine to their students with school funds. Instead, student-athletes are permitted to buy it on their own. Monitoring their use is a moot point anyway, since detection of supplemental creatine is not possible with current testing methods.

Typical recommendations for dosing creatine for improving physical performance include 20

grams per day for two to five days followed by a maintenance dose of 2 or more grams daily. Other suggestions include a loading dose of 9 grams daily for six days, as well as 3 grams daily with no loading dose. Proponents of the latter claim it provides the same benefits but reduces the occurrence of gastrointestinal side effects. Daily fluid intake of at least 64 ounces during creatine supplementation is recommended.

A report has been published that supplementation with 5 grams of creatine with 93 grams of simple carbohydrates taken four times a day for five days, further increased muscle creatine levels (as much as 60 percent) more than creatine alone. This has led to simple carbohydrate plus creatine sports drinks becoming quite popular.

For heart failure, the recommended dose of creatine is 20 grams daily for five to 10 days. For gyrate atrophy, 1.5 grams daily has been used. With muscular dystrophy, 10 grams daily has been used in adults, and 5 grams daily in children.

DAMIANA (*Turnera diffusa*, *T. aphrodisiaca*, *T. microphylla*, *Damiana aphrodisiaca*), also known as herba de la pastora, mizibcoc, old woman's broom and rosemary (not the spice), is a Mexican shrub also found throughout the southern United States and many parts of South America.

The first reported use of damiana goes back to the Mayan Indians, who called the plant mizibcoc and used it to treat giddiness and loss of balance. The Spanish missionaries reported that the Mexican Indians made a drink of its leaves, mixed with sugar for use as an aphrodisiac.

In the late 1800s, damiana was included in the first edition of the *National Formulary* (N.F.) as a crude drug (the leaves), an elixir and a fluidextract. Damiana was listed in the N.F. until 1947 after which it was removed.

During the 1960s and 1970s, there was a resurgence of the use of

damiana. Commercial tinctures were imported from Mexico and advertised as a powerful aphrodisiac, to improve sexual ability and to provide increased activity to all pelvic functions.

Currently, damiana is available in the U.S. in some herbal products as an aphrodisiac. Its leaves are boiled in water and the vapors inhaled for relief of headache. It is used as a tea to control bedwetting. Damiana is also used to treat constipation, depression, upset stomach, for strength and stimulation during exertion, for boosting and maintaining mental health and physical capacity, and for treatment of sexual disturbances. It is also smoked for a subtle "legal" high.

No active pharmacologic component has been found in damiana leaves to support the claimed aphrodisiac effects. It is purported to contain caffeine, which may account for a stimulatory sensation, and a volatile oil that gives the plant its characteristic taste and odor. Some believe it is this volatile oil that irritates the urethral mucous membranes sufficiently to provide an aphrodisiac effect.

Typically, damiana is taken in doses of 2 to 4 grams of dried leaf, three times a day. Alternately, a tea is prepared by adding 2 to 4 grams of dried leaf to 150 mL of boiling water for five to 10 minutes, straining and on cooling, drinking the tea three times a day. The traditional dose of the fluidextract is 2 to 4 mL, three times a day.

DANDELION (*Taraxacum officinale*, *Leontodon taracum*, *L. taraxacum*), also known as blowball, cankerwort, lion's tooth, pissenlit, priest's crown, swine snout, taraxacum and wild endive, grows in nearly every part of the world.

The use of dandelion as a medicine was reported in the 10th century by Arab physicians. While native to Europe and Asia, the plant was naturalized to North America

and now grows as a weed in nearly all temperate climates. Europeans continue to cultivate dandelions and more than 100 specialized varieties have been developed.

As a food, dandelion leaves are used raw in salads and cooked like spinach. They are used in winemaking. Dandelion root is roasted and used to brew a coffee-like beverage that reportedly does not have the stimulatory activity of the caffeine present in coffee.

In traditional medicine, dandelion has been used to treat diabetes, eczema, gout, heartburn, muscle and joint pain, liver and gallbladder disorders and rheumatism.

The German Commission E (a European agency that oversees the promotion and use of natural products) approves its use for dyspeptic complaints, infections of the urinary tract, liver and gallbladder complaints and loss of appetite.

In Chinese medicine, dandelion is used to treat breast cancer and urinary disorders. In Indian medicine, it is used for biliary stones, chronic ulcers, colic, flatulence, gout, jaundice, kidney disease and tuberculosis.

Dandelion is reportedly one of the richest green vegetable sources of beta carotene, containing more of this precursor to vitamin A per gram than carrots. It is also considered to be a good source of fiber, calcium, iron, magnesium, phosphorus, potassium, riboflavin and thiamine. Dozens of amino acids, fatty acids, organic acids, glycosides, gums, resins, terpenes, sterols and sugars have been extracted from dandelion leaves and roots as well.

One of its ingredients, taraxacin, (also known as eudesmanolide) has been identified as giving dandelion its bitter taste. It is considered to be an appetite stimulant as well as a substance that increases bile flow. Another extract has demonstrated diuretic and hypoglycemic effects in animal, but not in human studies.

While no overt toxic effects from ingesting dandelion in recommended doses have been found, there is a chance that it might cause gastritis and hyperacidity due to its gastric secretion stimulating effects. There are reports of contact dermatitis with topical use of dandelion, and it is known to cause allergic reactions in persons hypersensitive to the Asteraceae/Compositae families of plants. These include chrysanthemums, daisies, marigolds, ragweed and many other plants.

The typical dose for dandelion leaf is 4 to 10 grams of the dried leaf three times a day. Alternately, a tea is prepared by steeping 4 to 10 grams of dried leaf in 150 mL of boiling water for five to 10 minutes. This is strained, cooled to a comfortable temperature and then ingested three times a day. The usual dose of liquid dandelion extract (prepared in a 1 to 1 ratio in 25 percent alcohol) is 4 to 10 mL, three times a day.

The typical dose for dandelion root is 2 to 8 grams of the ground root, ingested three times a day, either as a dry powder or as a tea prepared in the same manner as explained above using 2 to 8 grams of the root. The usual dose of dandelion root tincture (prepared in a 1 to 5 ratio in 45 percent alcohol) is 5 to 10 mL, three times a day.

A tea can also be prepared using the whole plant. The recommended dose for this is 3 to 4 grams of powdered whole plant, steeped in 150 mL of boiling water for five to 10 minutes, strained and then ingested three times a day after it has sufficiently cooled.

DEER VELVET (*Cervus nippon*, *C. elaphus*, *C. parvum*), also known as deer antler, deer antler velvet, hairy young horn, horns of gold, lu rong, nokyong, rokujo, velvet antler and velvet of young deer horn, is the epidermis covering the inner structure of the growing bone and cartilage which develops into antlers in almost all members of the deer family.

In the U.S., this tissue grows each spring in male North American elk and red deer. Its medicinal value depends on several factors including when and how it is harvested, the presence of parasites and whether the tissue has been injured.

The growth of deer antler is extremely rapid (reportedly 1 cm/day) with a full set of hard antlers weighing 20 pounds or more being completed within 120 days. After about 60 days, the antler cartilage begins its calcification process and the velvet covering is shed leaving the mature, bony antlers. Therefore, the ideal harvesting time is the midpoint of the growing cycle (55 to 65 days). The entire living antler tissue is considered antler velvet, not the hairy covering which is removed and discarded.

After proper removal of the deer velvet by a veterinarian or certified farmer or hunter, it is collected and then frozen or dried prior to its conversion into various dosage forms including capsules, extracts, powders, tablets and teas.

The claimed benefits of deer velvet cover a wide range of conditions and uses. These include the treatment of acne, anemia, asthma, arthritis, kidney and liver disorders, indigestion, sexual dysfunction, muscle pain, menstrual problems, menopausal symptoms, migraine and skin disorders. It is used to increase estrogen or testosterone production, red blood cell production, blood circulation to the brain and mental acuity.

Deer velvet is claimed to lower blood cholesterol levels, to reduce elevated blood pressure and to reduce the dosage of hormone replacement therapy. It is used as an aphrodisiac, for anti-aging effects, to boost strength and endurance, for bone and tissue rejuvenation, to improve eyesight and hearing, for improvement of immune system function and to promote rapid recovery from illness.

In Chinese and Korean medicine, deer velvet is used to treat

impotence, increase blood flow to the extremities, for treatment of soreness and weakness in the lower back and knees, uterine bleeding, chronic ulcers and frequent urination. It is also used in children for mental retardation, to improve growth and learning capacity and for treating skeletal deformities such as rickets.

The chemical composition of growing antlers has been extensively studied with many constituents being identified. These include numerous amino acids, fatty acids, lipids, proteins, minerals such as calcium, iron, magnesium and phosphorus, as well as vitamin A and precursors of vitamin D.

The antlers also contain collagen, gelatin, glycosaminoglycans (such as chondroitin and glucosamine), polysaccharides, prostaglandins, proteoglycans, epidermal growth factor and insulin-like growth factor.

Looking at the large number of pharmacologically active components of deer velvet and the rapid growth of antlers, it should not be surprising that it is one of the most studied natural products.

The typical dose of deer velvet powder for prophylactic use is 400 to 600 mg. Typically, 900 mg to 2.4 grams is used for treatment.