

# MACA

(*Lepidium meyenii*)

## THE NUTRITIONAL SUPPLEMENT OF THE MILLENNIUM

MACA is a plant that grows only in the Peruvian mountains between 9,500 to 13,000 feet above sea level, in the coldest and roughest part of the central Andes.

MACA is a vegetable root or tuber has been used by the native Peruvians since before the time of the Incas for both its fabled sexual and nutritional properties. For centuries, MACA root has grown wild just below the glacial icecap, region of extreme weather conditions such as freezing temperatures, high winds, and intensive sunlight. No other food plant in the world can grow at so high an altitude and survive.

Native shepherds soon learned that as they grazed their herds in higher elevations, where MACA grows naturally, the herds became healthier, with more stamina and became much more sexually active. Soon, the Andean herders included this root in their own diets, both as a food and as a medicine and they found that MACA promoted increased energy and stamina.

Once in a decade, a plant used by native peoples for thousands of years comes to our attention and it seems so important to health that we wonder how we ever got along without it before. MACA is that kind of plant. Currently, the U.S, England, Germany, France, Russia, and Italy are all interested in MACA for its high nutritional values and amazing properties.

While the ability of MACA to increase sexual desire by an average of 180-200% in men and women is well documented, the primary effect of MACA is often overlooked. It is an **adaptogen**. It works to create harmony in the body, regulating levels of hormones and enzymes to create a state of homeostasis (*ho-me-o-sta-sis*: the ability or tendency of an organism or cell to maintain internal equilibrium by adjusting its physiological processes).

MACA's other primary benefits include: mental alertness, increased energy, an increase in libido, anti-depressive, anti-anxiety, and muscular development and toning.

## THE HISTORY OF MACA

In the plateau of Peruvian Andes can be found the remains of this intensive agriculture activity, at altitudes where there is no present cultivation. We can state, without a doubt, that this region was a center for domestication and cultivation of plants with particular characteristics, such as MACA. Their agricultural management style dates back to the oldest human use of the high Andean plateau, existing even before potato was domestically planted.

It is believed that around the years 1200 and 100 years B.C., wild primitive groups called "Pumpush " traveled to the riverbanks of lake Chinchaycocha and settled in that region, possibly looking for better lands for their subsistence. It is believed that this hardened race is the one who domesticated MACA.

This millenary root was widely used by the Incas, and eventually became one of the most mass produced and commercialized plants. It has been considered a valuable supplement for centuries and in ancient Peru, without any scientific evidence, its highly nutritional properties were very well known.

MACA occupied a very important place in the Inca`s economy. It provided the Incas with vitality and the necessary energy for combat. According to XVI and XVII century Spanish chronicles, the Inca troops were fed "MACA" because it was believed to give vitality and physical strength to the warriors. It is said that during the Inca period it was cultivated throughout the entire plateau, being sent to Cusco as a tribute for Gods.

When the Spaniards arrived in Peru, according to their chronicles, MACA turned out to be the most important product being produced, consumed and marketed by the inhabitants of the high plateau. After the fall of Inca Empire, MACA was in danger of extinction, but the first scientific discoveries in the 60`s brought the plant out of obscurity. The ancient Peruvians used this ancient knowledge, and fortunately modern Peruvians have brought this knowledge back to light for the benefit of all humanity.

Since the nineties, MACA has made a comeback, and laboratories and departments of sciences in Peruvian and international universities have again acknowledged its value.



## MACA AS A NUTRITIONAL SUPPLEMENT

MACA is once again assuming its rightful place as one of our planet's most valuable adaptogenic herbs. Its qualities are specific in that its effects are particular to the endocrine glands, and it is equally beneficial for both women and men.

It is recommended as a nutritional supplement due to its contents of minerals, chemical compounds, vitamins, proteins, carbohydrates, tannins, alkaloids, etc. It has been discovered that MACA favors the calcification process in the bones, stimulates the formation and maturation of the red blood cells, strengthens the immune system, stimulates the reproductive system for both men and women, relieves symptoms caused by PMS, acts as a hormone replacement, and can be utilized as a co-assistant for infirmities of malnutrition, osteoporosis, AIDS, tuberculosis, etc.

MACA contains the highest calcium concentration than any other plant of its type. For this reason it is a good nutritional supplement for those who are anemic, and convalescent people who are diagnosed with illnesses requiring the formation of red globules; it is also very effective for menopause.

MACA contains more proteins than any other tubercles. It is also abundant in phosphorus, iron, iodine, and calcium. Iodine is a great reconstructor of the endocrine glands, specially the thyroid. Calcium and phosphorus help with the bone formation of the body, and also contain carbohydrates that the body uses to maintain and replace energy.

One of the main attributes of MACA, is its reported ability to enhance fertility, due to its high content of iodine and zinc, amino acids and vitamin C. Although the fertility enhancement of MACA has not been substantiated scientifically it seems a reasonable choice for those wishing to conceive. The protein and calories in MACA are stable even after years of storage. It is also rich in complex carbohydrates and essential minerals such as calcium, magnesium, phosphorus, zinc, and iron. MACA is a source of glycoside steroids.

MACA is an **adaptogen** meaning it helps to restore balance or homeostasis to the body and improve the overall adaptability of the whole system. It has been used traditionally to increase energy and to promote improvement in both stamina and endurance in athletes.

Unlike caffeine, MACA is a healthy choice for increasing energy because it is not a stimulant. The steady enhancement of both physical and mental energy makes it an ideal supplement for students, professionals, writers, athletes and anyone who needs a lift.

## MACA CONTAINS...

- **Proteins:** An average of 11gr % in the dry root.
- **Fiber:** The Maca root contains cellulose and lignin, that is to say, an ample amount of fibers. The large amount of fiber diminishes the risk of cancer of the large intestine, stimulating the intestinal operation and helping the organism eliminate the nutritional remainders that body does not utilize.
- **Carbohydrates:** These are the principal source for human energy.
- **Starch:** Maca contains calcium and iron, forming chemical compounds that influence the nutrition and health of the consumer.
- **Fructose:** A sugar used by the seminal plasma for the production of spermatozoa.
- **Tannins:** Tannins are used internally helping in the treatment of diarrhea. Combined with other medicines, it has the utility of treating inflammatory processes of little chronic extension like ulcers, sores, etc.
- **Fatty acids:** Maca contains fatty acids like antiseptics, fungicides, and preservatives of foods.
- **Alkaloids:** Maca contains 4 alkaloids, Macaína 1, 2, 3 and 4. The alkaloids exert physiological action on the human organism. The alkaloid abstract of Maca is an innocuous chemical substance present in very small amounts, which stimulates the hormone regulators of the reproductive system located in the brain. The alkaloid extract found in the root also help growth and activate hormones that regulate the metabolism of calcium and phosphorus in the blood.
- **Macronutrients:** Maca root presents/displays essential vitamins and minerals for life, therefore its nutritive properties help patients who are diagnosed with tuberculosis, HIV, leukemia and anemia.
- **Calcium:** Higher concentrations of calcium are found in the MACA root, it is indispensable for the formation of the bones, teeth, skeleton, the operation of the heart, the nerves and the sanguineous system.
- **Phosphorus:** The phosphorus contained in Maca helps the structural functions that affect the skeleton, and regulates functions like the transmission of neuromuscular chemicals and electrical stimuli. It also plays an important role in the hemeostasis of calcium and in the reactions involving carbohydrates, lipids, and proteins.
- **Micronutrients:** This part of the plant contains many minerals found in small quantities, which together help with the production of antibodies.

- **Magnesium:** It is essential for the activities of muscles and nerves, protein synthesis, and many other reactions.
- **Potassium:** Potassium participates in the regulation of osmotic pressure; its activity is carried out inside the cells.
- **Iron:** Iron is a vital component of hemoglobin and also of certain respiratory enzymes. Increased iron needs occur during the growth period and pregnancy, and with excessive menses and other instances of blood loss.
- **Silicon:** Helps the connective tissues, including the aorta, trachea, tendons, bones, and skin, which contain almost all of the body's silicon.
- **Sodium:** Along with potassium, sodium reduces arterial pressure. Helps people with hypertension.
- **Copper:** Copper is a probable participant in the formation of hemoglobin. A lack of copper can greatly decrease the amount of essential enzymes for the organism.
- **Tin and Aluminum:** These elements form carbonates and silicates that take part in the formation of the bones.
- **Zinc:** Serves as a cofactor of dehydrogenases and carbonic anhydrase; its lack can cause skin rashes, taste disturbances, and mental lethargy.
- **Vitamins:** MACA root also contains vitamins B1, B2, and C. Vitamin B1 helps the body cells convert carbohydrates into energy. It is also essential for the functioning of the heart, muscles, and nervous system. B2 works with the other B vitamins. It is important for body growth and red cell production, and helps in releasing energy from carbohydrates. Vitamin C (ascorbic acid) is involved in oxidation-reduction reactions.

## **EFFECTS OF CONSUMPTION OF MACA**

### **HEMODYNAMIC ASPECTS**

- The consumption of maca produces a reducing effect of diastolic arterial pressure (low blood pressure).
- Maca does not modify neither heart frequency nor arterial saturation of oxygen.
- Hematocrit is not affected by maca, which an anti-anemic effect may exist.
- Improves the count of red blood cells, strengthens the hemoglobin and also the leukocytes, which are important to the immune system.

### **NUTRITIONAL ASPECTS**

- Maca has an important effect as an energizer. Energizer effect may be associated to the increase of serum levels of human growth hormone (HGH).
- It has effects over energy reserves acting over body fat.

- Due to the number of steroidal glycosides, maca is gaining popularity among weight lifters and body builders as a natural alternative to anabolic steroids.
- Has an anti-anemic effect (balanced blood iron levels).

### **STATE OF MIND**

- Maca improves the state of mind. Used for loss of memory, fatigue and mental weakness
- DHEA levels increased in a large proportion of the males treated with maca.
- Consumption of maca produce a “general sense of well being”.

### **ANXIETY**

- Placebo decreases anxiety
- Maca decreases anxiety from the two weeks of treatment.

### **STRESS**

- The treatment with maca decreases stress and the scale of mind renounce, favoring a better response to stress.
- Maca can help with chronic fatigue syndrome (CFS) and general fatigue brought on by aging, because it raises DHEA and cortisol levels.
- Most people with CFS have adrenal fatigue, and it is very effective for rebuilding exhausted adrenal glands.

### **SEXUAL AND REPRODUCTIVE FUNCTION**

- To aid in fertility is the main quality attributed to maca.
- It is an excellent invigorator, helping men and women afflicted with frigidity, sterility. Ideal for treating male impotence and erectile dysfunction.
- Maca improves the level of sexual desire by an average of 180% compared to the placebo group.
- Increase sexual energy and stamina.
- Maca treatment does not modify HL levels.
- It increases seminal fluid volume, doubles the count and mobility of spermatozooids.

### **HORMONAL ASPECTS**

- Beneficial for women in peri-menopause because it helps relieve the symptoms and has a balancing effect on the hormones.
- Maca helps to keep the endocrine system toned and healthy.
- It is a safe and completely drug-free alternative to using hormones, because with maca, the body naturally adjusts to producing its own hormones.
- Post-menopausal women raise hormone levels to a healthy state and will assist in preventing osteoporosis.

### **ENDOCRINE SYSTEM**

- Maca is a natural rich source of iodine, important for the endocrine system due to its effect on the thyroid.
- Along with selenium, magnesium, tyrosine, herbs like this are able to restore normal thyroid function. Maca rejuvenates the endocrine system for both men and women.

## SCIENTIFIC STUDIES

MACA has been proven to contain high nutritional and biological values, since its chemical composition contains proteins, vitamin, fats, calcium, cellulose, starches, phosphorus, iodine, iron, complex B, vitamin C, etc. Although there are people who don't feel some change when consuming MACA, the positive effects on the organism are undeniable.

It is easy to find announcements related to MACA as the Peruvian Ginseng, because when consumed, people feel agile and are not sleepy during the day (similar to the effects of the Ginseng). People who are physically active, are more likely to feel the effects of MACA faster than those who are not, because it restores energy and makes them feel less tired.

MACA is 100% natural, and for this reason it is continually attracting athletes who wish to increase their performance and endurance in a safe and effective way. The results obtained from taking MACA are not as instant as taking banned substances such as anabolic steroids, as its results are gradual and do not cause harm to the organism.

While scientific studies continue to be performed and until results are presented, it is becoming more popular for doctors to refer to MACA as a natural substitute, in place of using the famous Viagra.®

Different from any other chemical product, which often have side effects, and so cannot be prescribed to all people indiscriminately, MACA is a completely natural product and does not contain any side effects known for more than forty years in which scientific and clinical investigations have been performed.

Most striking, in any way, is the fact that the MACA root contains natural substances, which stimulate the pituitary and hypothalamus. These glands in turn trigger the ovaries, adrenals, testes, thyroid, and pancreas to return to healthy functioning, thus producing normal amounts of hormones. This has been demonstrated with the sex hormones through the use of saliva hormone examine.

In addition, a number of people taking thyroid medication have also found that they can cut down or stop taking thyroid hormone. MACA is also described as having "powerful energizing and fertility affects." It can help couples that are trying to conceive a child, as it affects in both sex, increasing sperm count in a matter of days.

MACA is used and endorsed by prominent doctors such as Gabriel Cousens and Burton Goldberg. It is being prescribed by a number of doctors to treat Chronic Fatigue Syndrome, adrenal exhaustion, and to restore energy and vigor to the elderly. MACA is described as an aphrodisiac for both men and women, undoubtedly because of its effects on testosterone levels. Several prominent medical doctors, including Dr. Burton Goldberg, have publicly stated that it greatly improved their sexual functioning. No one product is effective for all women, but in most cases, MACA works very well.

One of the most recent studies was published in the April 2000 issue of *Urology*, the prestigious medical journal that first published the Viagra studies. This study scientifically demonstrated that Maca promotes libido, sexual potency and energy. In fact, the sexual activity of the test subjects nearly QUADRUPLED after taking the herb for 21 days! Dubbed "Peruvian Ginseng," the MACA plant is reputed to increase strength, sexual energy, stamina, libido and sexual function; a winning combination.

Gary F. Gordon, M.D., former president of the American College for the Advancement of Medicine, now Founder and President of the International College of Advanced Longevity Medicine, located in Chicago, Illinois, bases his appreciation of MACA on his own experience of it and states that MACA improves the quality of life in the area of sexuality.

Henry Camponile, M.D., of St. Petersburg, Florida states that his first menopausal patient "started to feel better four days after she began taking MACA", and finds that it promotes energy unlike any other herb he has used.

Dr. Richard Brown, M.D. author of *STOP DEPRESSION NOW*, says that Maca holds great promise for the health and well being of men and women.

Dr. Mark Smith, M.D. has said "I have noticed a significant level of more balanced energy, stamina & endurance markedly during cardio vascular workouts using MACA".

Dr. Hugo Malaspina, a cardiologist practicing complementary medicine in Lima, Peru, has been using Maca in his practice for more than ten years. Dr. Malaspina first found out about Maca through a group of sexually active older men who were taking the herb with good results. "One of these individuals in our group started taking Maca and found he was able to perform satisfactorily in a sexual relationship with a lady friend". Soon everyone in the group began drinking the powdered Maca as a beverage and enjoying the boost that the root was giving their hormonal functions. "I have several of these men as patients, and their improvement prompted me to find out more about MACA and begin recommending it to my other patients on a regular basis." Dr. Malaspina further notes that "Maca regulates the organs of internal secretion, such as the pituitary, the adrenal glands, and the pancreas".

The benefits of MACA are not limited to older adults. The herb supports hormonal functioning in younger adults as well, and athletes have been reporting increased energy and stamina in their workouts. Teenagers have also benefited from its effects on hormone-balancing and acne. Athletes have a much greater endurance when using MACA.

It is remarkable that NASA is using MACA as a nutritional supplement for its astronauts. MACA helps these astronauts maintain their physique and helps their lucidity and reflexes needed to fulfill important and risky missions.



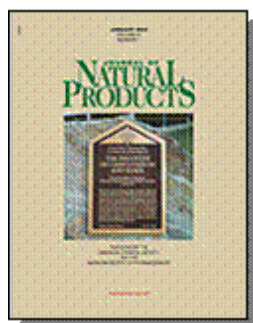
## References

1: J Vet Med Sci. 2003 Oct;65(10):1145-6.

**Effects of *Lepidium meyenii* Walp and *Jatropha macrantha* on blood levels of estradiol-17 beta, progesterone, testosterone and the rate of embryo implantation in mice.**

**Oshima M, Gu Y, Tsukada S.** Graduate School of Medical Imaging, Suzuka University of Medical Science, Suzuka-chi, Mie, Japan.

The effects of two Peruvian folk medicines, *Lepidium meyenii* Walp and *Jatropha macrantha*, on mouse sex steroid hormones and embryo implantation were investigated. Progesterone levels increased significantly in mice that received *L. meyenii* Walp, while testosterone levels increased significantly in mice that received *L. meyenii* Walp as well as in those that received both *L. meyenii* Walp and *J. macrantha*. However, there were no marked changes in blood levels of estradiol-17beta or the rate of embryo implantation.

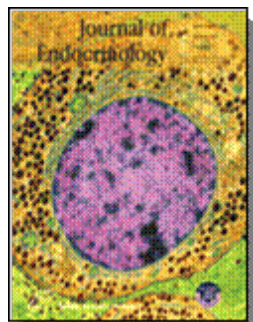


2: J Nat Prod. 2003 Aug;66(8):1101-3.

**Imidazole alkaloids from *Lepidium meyenii*.**

**Cui B, Zheng BL, He K.** PureWorld Botanicals, Inc., South Hackensack, NJ, USA .

Two new imidazole alkaloids (lepidiline A and lepidiline B) have been isolated from a root extract of *Lepidium meyenii* with the common name Maca and identified as 1,3-dibenzyl-4,5-dimethylimidazolium chloride (1) and 1,3-dibenzyl-2,4,5-trimethylimidazolium chloride (2), respectively. The structures of these two new compounds were determined by spectroscopic methods, as well as single-crystal X-ray diffraction performed on compound 1.



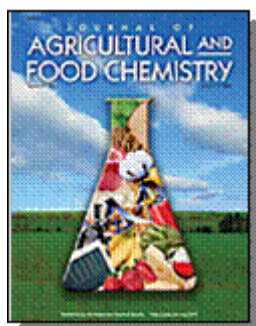
3: J Endocrinol. 2003 Jan;176(1):163-8.

**Effect of *Lepidium meyenii* (Maca), a root with aphrodisiac and fertility-enhancing properties, on serum reproductive hormone levels in adult healthy men**

**Gonzales GF, Cordova A, Vega K.** Instituto de Investigaciones de la Altura , and Department of Biological and Physiological Sciences (Faculty of Sciences and Philosophy), Universidad Peruana Cayetano Heredia, Lima, Peru.

*Lepidium meyenii* (Maca) is a Peruvian hypocotyl that grows exclusively between 4000 and 4500 m in the central Andes . Maca is traditionally employed in the Andean region for its supposed aphrodisiac and/or fertility-enhancing properties. This study was a 12-week double-blind, placebo-controlled, randomized, parallel trial in which active treatment with different doses of Maca Gelatinizada was compared with a placebo. The study aimed to test the hypothesis that Maca has no effect on serum reproductive hormone levels in apparently healthy men when administered in doses used for aphrodisiac and/or fertility-enhancing properties. Men aged between 21 and 56 Years received 1500 mg or 3000 mg Maca. Serum levels of luteinizing hormone, follicle-stimulating hormone, prolactin, 17-alpha hydroxyprogesterone, testosterone and 17-beta estradiol were measured before and at 2, 4, 8 and 12 weeks of treatment with placebo or Maca ( 1.5 g or 3.0 g per day). Data showed that compared with placebo Maca had no effect on any of the hormones studied nor did the hormones show any changes over time. Multiple regression analysis showed that serum testosterone levels were not affected by treatment with Maca at any of the times studied (P, not significant). In conclusion, treatment with Maca does not affect serum reproductive hormone levels.

Publication Types: Clinical Trial, Randomized Controlled Trial

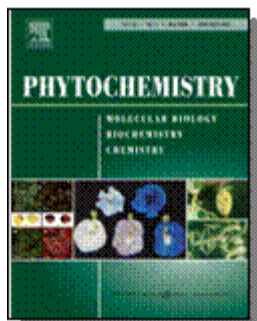


4: J Agric Food Chem. 2002 Sep 25;50(20):5621-5.

**Investigation of the tuber constituents of maca (*Lepidium meyenii* Walp.).**

**Piacente S, Carbone V, Plaza A.** Dipartimento di Scienze Farmaceutiche, Universita degli Studi di Salerno, Fisciano, Italy.

*Lepidium meyenii*, known in South America as maca, has received attention worldwide as a powerful energizer that improves physical and mental conditions and increases fertility. Because of these reports, we investigated the secondary metabolites of the tuber of maca. The methanol extract of the tuber of maca contained, in addition to free sugars and amino acids, the following: uridine, malic acid and its benzoyl derivative, and the glucosinolates, glucotropaeolin and m-methoxyglucotropaeolin. Because glucosinolates and their derived products have received increasing attention due to their biological activities, the occurrence of glucosinolate degradation products in the hexane extract was also investigated, and benzylisothiocyanate and its m-methoxy derivative were isolated. The two glucosinolates were semiquantified by HPLC, and benzylisothiocyanate was semiquantified by GC/MS. The methanol extract of maca tuber also contained (1R,3S)-1-methyltetrahydro-beta-carboline-3-carboxylic acid, a molecule which is reported to exert many activities on the central nervous system.



5: Phytochemistry. 2002 Sep;61(2):149-55.

**Composition of the essential oil of *Lepidium meyenii* (Walp).**

**Tellez MR, Khan IA , Kobaisy M.** Natural Products Utilization Research Unit, USDA-ARS, University , MS , USA .

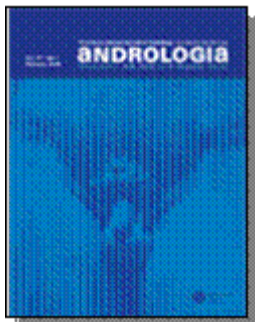
The essential oil profile of maca (*Lepidium meyenii*) obtained from Lima , Peru , was examined. Steam distillates of the aerial parts of *L. meyenii* were continuously extracted with pentane and the pentane extracts analyzed by GC/MS. Retention indices and mass spectral data were used to identify 53 oil components. Phenyl acetonitrile (85.9%), benzaldehyde (3.1%), and 3-methoxyphenylacetonitrile (2.1%) were the major components of the steam distilled oil. The oil of *L. meyenii* was tested for phytotoxic, cyanobactericidal, and antitermite activity. The oil was selectively toxic towards the cyanobacterium *Oscillatoria perornata* compared to the green alga *Selenastrum capricornutum*, with complete growth inhibition at 100 microg/ml. Mortality of the Formosan subterranean termite, *Coptotermes formosanus*, was numerically, but not significantly, higher when held on filter paper treated with maca oil. At 1% (w/w), maca oil also appeared to act as a feeding deterrent to termites. Several minor components of the essential oil of maca including 3-methoxyphenylacetonitrile and benzylthiocyanate were significantly active against the Formosan termite. This is the first report on the essential oil composition of *L. meyenii*.

6: Chem Pharm Bull ( Tokyo ). 2002 Jul;50(7):988-91.

**Chemical profiling and standardization of *Lepidium meyenii* (Maca) by reversed phase high performance liquid chromatography.**

**Ganzera M, Zhao J, Muhammad I.** National Center for Natural Products Research, Research Institute of Pharmaceutical Sciences, University of Mississippi, University, USA.

*Lepidium meyenii* (Maca) is one of the few plants that can be cultivated in the harsh climate of the Andes . Its nutritious hypocotyl is traditionally used as food and medicine, and Maca products are increasingly becoming popular in the western world as tonics. This paper describes the first analytical method allowing the determination of the main macamides and macaenes, the marker compounds of *L. meyenii*. A separation within 35 min was possible by using a C-12 stationary phase, an acidic mobile phase comprising of acetonitrile and water, and raising the column temperature to 40 degrees C. By monitoring the separation at 210 and 280 nm, the markers were detectable as low as 0.40 microg/ml. In order to validate the method, accuracy, precision, linearity, limit of detection and intra/inter day repeatability were determined. The analysis of several commercially available Maca products showed a similar qualitative pattern but significant differences in the quantitative composition. The percentage of total markers in the preparations varied from 0.15 to 0.84%, resulting in daily intakes for the consumer from 1.52 to 14.88 mg, respectively.

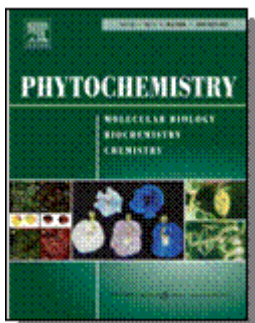


7: Andrologia. 2002 Jun;34(3):177-9.

**Hexanic Maca extract improves rat sexual performance more effectively than methanolic and chloroformic Maca extracts.**

**Cicero AF, Piacente S, Plaza A.** Biomedical Sciences Department, Pharmacology Section, University of Modena and Reggio nell'Emilia, Italy.

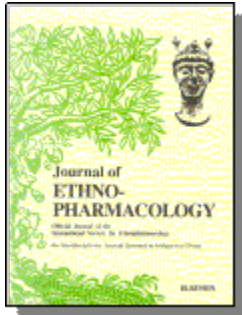
*Lepidium meyenii* (Maca) is traditionally employed in the Andean region for its supposed properties in improving fertility. The aim of this study was to determine the effect of subacute oral administration of hexanic, methanolic and chloroformic extracts of Maca root on sexual performance in inexperienced male rats. The following sexual performance parameters were evaluated: 1st mount, 1st intromission, ejaculation and post-ejaculatory latencies, intercopulatory interval and copulatory efficacy. All the tested fractions significantly decreased intromission latency and intercopulatory interval and increased intromission frequency and copulatory efficacy ( $P < 0.05$ ) as compared to controls. Hexanic and methanolic extracts were able to increase mount frequency (MF), while only hexanic fraction significantly improved mount latency (ML) ( $P=0.038$ ). Globally, only the hexanic fraction significantly improved the majority of the sexual parameters measured. Sub-acute oral administration of hexanic Maca extract improved sexual performance parameters in sexually inexperienced male rats most effectively.



8: Phytochemistry. 2002 Jan;59(1):105-10.

**Constituents of *Lepidium meyenii* 'maca'.**

**Muhammad I, Zhao J, Dunbar DC.** National Center for Natural Products Research, Research Institute of Pharmaceutical Sciences, School of Pharmacy, University of Mississippi, MS 38677. The tubers of *Lepidium meyenii* contain the benzylated derivative of 1,2-dihydro-N-hydroxypyridine, named macaridine, together with the benzylated alkamides (macamides), N-benzyl-5-oxo-6E,8E-octadecadienamamide and N-benzylhexadecanamamide, as well as the acyclic keto acid, 5-oxo-6E,8E-octadecadienoic acid. The structure elucidation of the isolated compounds was based primarily on 1D and 2D NMR spectroscopic analyses, including 1H-1H COSY, 1H-13C HMQC, 1H-13C HMBC and 1H-1H NOESY experiments, as well as from 1H-15N NMR HMBC correlations for macaridine and N-benzylhexadecanamamide.



9: J Ethnopharmacol. 2001 May;75(2-3):225-9.

**Lepidium meyenii Walp. improves sexual behaviour in male rats independently from its action on spontaneous locomotor activity.**

**Cicero AF, Bandieri E, Arletti R.** Biomedical Sciences Department, Pharmacology Section, University of Modena and Reggio nell'Emilia, Via G. Campi, 287, 41100, Modena, Italy. *Lepidium meyenii* Walpers (Maca) is traditionally employed in the Andean region for its supposed properties to improve energy and fertility. The aim of this study was to evaluate the effect of acute and chronic Maca pulverised root oral administration on rat sexual behaviour. Sixty male sexually experienced rats (20 group) were daily treated for 15 days with Maca 15 mg kg<sup>-1</sup>, Maca 75 mg kg<sup>-1</sup> or saline 0.5 ml kg<sup>-1</sup>. The following sexual performance parameters were evaluated at first and last day of treatment: 1st mount (ML), 1st intromission (IL), ejaculation (EL) and postejaculatory (PEL) latencies, intercopulatory interval (ICI) and copulatory efficacy (CE). An activity cage test was carried out to evaluate if Maca-induced locomotion changes could indirectly improve rat sexual performances. It was observed that both lower and higher Maca doses acutely decreased ML, IL and ICI in a significant way ( $P < 0.05$ ), while only the 75 mg kg<sup>-1</sup> dose decreased the PEL ( $T = 29$ ,  $P < 0.05$ ). This effect seems to be the only one dose-dependent. After 15 days of treatment, both doses are able to significantly decrease ML, IL, EL and PEL, while the 75 mg kg<sup>-1</sup> dose decreased the ICI ( $T = 40$ ,  $P < 0.05$ ) too. IL, EL and PEL variations seem to be dose-related after chronic treatment. Moreover, chronic Maca treatment induced an apparently not dose-related increase in rat locomotion, during the second 10-min period of observation in the activity cage. The late in Maca-induced locomotion modification excludes that improvement of tested sexual performance parameters is related to an increase in rat aspecific activity. Thus, it was concluded that both acute and chronic Maca oral administration significantly improve sexual performance parameters in male rats.

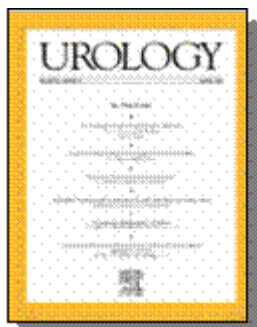
10: Arch Latinoam Nutr. 2000 Jun;50(2):126-33.

**Nutritional evaluation of *Lepidium meyenii* (MACA) in albino mice and their descendants**

**Canales M, Aguilar J, Prada A.** Instituto de Medicina Tropical Alexander von Humboldt, Lima.

The Maca (*Lepidium meyenii*) is a Peruvian hypocotyl that grows exclusively between the 3700 and 4500 masl at the Peruvian Andes. Traditionally it is attributed nutritional, energizing, fertilizing properties among others. With the purpose of evaluate scientifically the nutritional property of Maca, we carried out a controlled study in two generations of albino Swiss mice (parents and breeding). The parents were aleatorily assigned to one of three nutritional schedules. The food of each group was prepared based on powder from a commercial balanced food (CBF) of which 30% was replaced by raw or cooked Maca according to the corresponding group or pure CBF in the control group. The groups were this way: 1) Raw Maca Group; 2) Cooked Maca Group; and, 3) Control Group. The results showed that the curves of growth were similar and adequate for the three groups. However, the cooked Maca group showed the best curve. These data were better

observable in the second generation of animals, with significant statistical difference ( $p < 0.05$ ). The CBF group had a better growth than raw Maca group. No signs of malnutrition nor overweight were observed in none of the groups. The serum values of total proteins and albumin were statistically superior for the mice group eating cooked Maca than that of the raw Maca and CBF groups. This study demonstrates, in a scientific evaluation, one of the traditionally attributed properties of Maca, the nutritional capability.



11: Urology. 2000 Apr;55(4):598-602.

**Effect of a lipidic extract from *lepidium meyenii* on sexual behavior in mice and rats.**

**Zheng BL, He K, Kim CH.** Pure World Botanicals, Inc., South Hackensack , New Jersey , USA .

**OBJECTIVES:** To determine the effect of oral administration of a purified lipidic extract from *Lepidium meyenii* (MacaPure M-01 and M-02) on the number of complete intromissions and mating in normal mice, and on the latent period of erection (LPE) in rats with erectile dysfunction.

**METHODS:** Mice and rats were randomly divided into several experimental and control groups. A 10% ethanol suspension of M-01 and M-02 was orally administered for 22 days to the experimental groups according to the dosage specified by the experimental design. On day 22, 30 minutes after the dose was administered to the male mice, 2 virgin female mice were placed with 1 male mouse. The number of complete intromissions of each male mouse in 3 hours was recorded. In an assessment of 1 day of mating, each male mouse was cohabited with 5 estrous female mice overnight. The number of sperm-positive females was recorded. The LPE was measured to assess the sexual function in rats with erectile dysfunction. By using a YSD-4G multifunction instrument, an electric pulse at 20 V was applied to stimulate the rat's penis, and the duration from the start of the stimulus to full erection was measured in seconds as the LPE.

**RESULTS:** In the normal male mice, the number of complete intromissions during the 3-hour period was 16.33 +/- 1.78, 46.67 +/- 2.39, and 67.01 +/- 2.55 for the control group, M-01 group, and M-02 group, respectively. In the assessment of mating, the number of sperm-positive females increased from 0.6 +/- 0.7 in the control group to 1.5 +/- 0.5 in the M-01 experimental group. The LPE of male rats with erectile dysfunction was 112 +/- 13 seconds with a regular diet (control group). The oral administration of M-01 at a dose of 180 or 1800 mg/kg body weight and M-02 at a dose of 45, 180, or 1800 mg/kg body weight reduced the LPE to 54 +/- 12 seconds, 54 +/- 13 seconds, 71 +/- 12 seconds, 73 +/- 12 seconds, and 41 +/- 13 seconds, respectively. The LPE of the surgical rats treated with M-01 at the lowest dose (45 mg/kg) was 121 +/- 12 seconds; thus, the change was not significant.

**CONCLUSIONS:** Oral administration of M-01 and M-02 enhanced the sexual function of the mice and rats, as evidenced by an increase in the number of complete intromissions and the number of sperm-positive females in normal mice, and a decrease in the LPE in male rats with erectile dysfunction. The present study reveals for the first time an aphrodisiac activity of *L. meyenii*, an Andean Mountain herb.



**12:** Phytother Res. 2004 Jun;18(6):471-4.

**Lepidium peruvianum chacon restores homeostasis impaired by restraint stress.**

**Lopez-Fando A, Gomez-Serranillos MP, Iglesias I.** Dpto Farmacologia, Facultad de Farmacia, Universidad Complutense, Madrid, Spain.

*Lepidium peruvianum* root has been traditionally utilized by native Peruvians, since before the time of the Incas, for both nutritional and putative medicinal purposes as an adaptogen and also to enhance fertility in humans and animals. The present research was conducted to evaluate the anti-stress activity of the methanolic extract of *Lepidium peruvianum*. The drug is capable of attenuating or even eliminating variations in homeostasis produced by stress since it reduces or abolishes stress-induced ulcers, elevated corticosterone levels, the reduction of glucose and the increase in the weight of adrenal glands produced by stress. It also eliminates the decrease in free fatty-acids (FFA) in plasma produced by stress and we obtain a positive result in the forced-swimming test. Thus, it did not appear to affect restraint stress-induced immunosuppression.

**13:** Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2003 Dec;147(2):119-30.

**Smallanthus sonchifolius and Lepidium meyenii - prospective Andean crops for the prevention of chronic diseases.**

**Valentova K, Ulrichova J.** Institute of Medical Chemistry and Biochemistry, Faculty of Medicine, Palacky University, Hnevotinska 3, Olomouc, 775 15, Czech Republic.

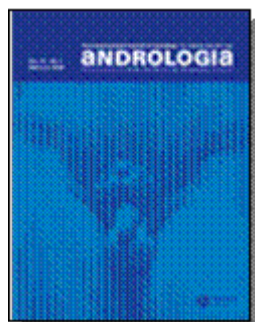
*Smallanthus sonchifolius* (yacon) and *Lepidium meyenii* (maca) were the traditional crops of the original population of Peru where they are also still used in folk medicine. These plants are little known in Europe and Northern America although at least yacon can be cultivated in the climatic conditions of these regions. This article deals with the botany and the composition, the structure of main constituents, biological activity of these plants and the cultivation of yacon in the Czech Republic. The potential of yacon tubers to treat hyperglycemia, kidney problems and for skin rejuvenation and the antihyperglycemic and cytoprotective activity of its leaves seems to be related mostly to its oligofructan and phenolic content, respectively. Maca alkaloids, steroids, glucosinolates, isothiocyanates and macamides are probably responsible for its aptitude to act as a fertility enhancer, aphrodisiac, adaptogen, immunostimulant, anabolic and to influence hormonal balance. Yacon and maca are already on the European market as prospective functional foods and dietary supplements, mainly for use in certain risk groups of the population, e.g. seniors, diabetics, postmenopausal women etc.

**14:** Reprod Biol Endocrinol. 2005 Jan 20;3(1):5

## **Red maca (*Lepidium meyenii*) reduced prostate size in rats.**

**Gonzales GF, Miranda S, Nieto J.**

**BACKGROUND:** Epidemiological studies have found that consumption of cruciferous vegetables is associated with a reduced risk of prostate cancer. This effect seems to be due to aromatic glucosinolate content. Glucosinolates are known for have both antiproliferative and proapoptotic actions. Maca is a cruciferous cultivated in the highlands of Peru. The absolute content of glucosinolates in Maca hypocotyls is relatively higher than that reported in other cruciferous crops. Therefore, Maca may have proapoptotic and anti-proliferative effects in the prostate. **METHODS:** Male rats treated with or without aqueous extracts of three ecotypes of Maca (Yellow, Black and Red) were analyzed to determine the effect on ventral prostate weight, epithelial height and duct luminal area. Effects on serum testosterone (T) and estradiol (E2) levels were also assessed. Besides, the effect of Red Maca on prostate was analyzed in rats treated with testosterone enanthate (TE). **RESULTS:** Red Maca but neither Yellow nor Black Maca reduced significantly ventral prostate size in rats. Serum T or E2 levels were not affected by any of the ecotypes of Maca assessed. Red Maca also prevented the prostate weight increase induced by TE treatment. Red Maca administered for 42 days reduced ventral prostatic epithelial height. TE increased ventral prostatic epithelial height and duct luminal area. These increases by TE were reduced after treatment with Red Maca for 42 days. Histology pictures in rats treated with Red Maca plus TE were similar to controls. Phytochemical screening showed that aqueous extract of Red Maca has alkaloids, steroids, tannins, saponins, and cardiogenic glycosides. The IR spectra of the three ecotypes of Maca in 3800-650 cm<sup>-1</sup> region had 7 peaks representing 7 functional chemical groups. Highest peak values were observed for Red Maca, intermediate values for Yellow Maca and low values for Black Maca. These functional groups correspond among others to benzyl glucosinolate. **CONCLUSIONS:** Red Maca, a cruciferous plant from the highland of Peru, reduced ventral prostate size in normal and TE treated rats.



**15:** Andrologia. 2002 Dec;34(6):367-72.

## **Effect of *Lepidium meyenii* (MACA) on sexual desire and its absent relationship with serum testosterone levels in adult healthy men.**

**Gonzales GF, Cordova A, Vega K.** Instituto de Investigaciones de la Altura, Universidad Peruana Cayetano Heredia, Lima, Peru.

This study was a 12-week double blind placebo-controlled, randomized, parallel trial in which active treatment with different doses of Maca Gelatinizada was compared with placebo. The study aimed to demonstrate if effect of Maca on subjective report of sexual desire was because of effect on mood or serum testosterone levels. Men aged 21-56 years received Maca in one of two doses: 1,500 mg or 3,000 mg or placebo. Self-perception on sexual desire, score for Hamilton test for depression, and Hamilton test for anxiety were measured at 4, 8 and 12 weeks of treatment. An improvement in sexual desire was observed with Maca since 8 weeks of treatment. Serum



testosterone and oestradiol levels were not different in men treated with Maca and in those treated with placebo (P:NS). Logistic regression analysis showed that Maca has an independent effect on sexual desire at 8 and 12 weeks of treatment, and this effect is not because of changes in either Hamilton scores for depression or anxiety or serum testosterone and oestradiol levels. In conclusion, treatment with Maca improved sexual desire.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial



16: Asian J Androl. 2001 Dec;3(4):301-3.

**Lepidium meyenii (Maca) improved semen parameters in adult men.**

**Gonzales GF, Cordova A, Gonzales C.** Department of Physiological Sciences, Faculty of Sciences and Philosophy and Instituto de Investigaciones de la Altura, Universidad Peruana Cayetano Heredia, Lima, Peru.

AIM: The present study was designed to determine the effect of a 4-month oral treatment with tablets of *Lepidium meyenii* (Maca) on seminal analysis in nine adult normal men aged 24-44 years old. METHODS: Nine men received tablets of Maca (1500 or 3000 mg/day) for 4 months. Seminal analysis was performed according to guidelines of the World Health Organization (WHO). Serum luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL), testosterone (T) and estradiol (E2) were measured before and after treatment. RESULTS: Treatment with Maca resulted in increased seminal volume, sperm count per ejaculum, motile sperm count, and sperm motility. Serum hormone levels were not modified with Maca treatment. Increase of sperm count was not related to dose of Maca. CONCLUSION: Maca improved sperm production and sperm motility by mechanisms not related to LH, FSH, PRL, T and E2.



Maca and antler for augmenting testosterone levels

**DeLuca , et al.**

Testosterone levels in men are increased by the oral administration of powdered maca and antler.



## Treatment of sexual dysfunction with an extract of *Lepidium meyenii* roots

### **Zheng , et al.**

An isolated composition obtained by extracting *Lepidium meyenii* roots is provided. The composition is substantially free of cellulose and comprises between about 5% and about 9% of benzyl isothiocyanate, between about 1% and about 3% of *Lepidium* sterol component, between about 20% and about 30% of *Lepidium* fatty acid component, and about 10% or more of macamide component. The composition is prepared by a process which comprises contacting *Lepidium meyenii* roots with a first aqueous solvent of about 90% vol-% or more water, then separating the residual *Lepidium meyenii* root material from the first contacted aqueous solvent, then contacting the residual *Lepidium meyenii* root material with a second aqueous solvent which comprises a mixture of an alcohol and water having about 90 vol-% alcohol or more to form a liquor, and then finally concentrating the liquor to obtain the composition. The composition can be used for treating cancer and sexual dysfunction.

*More references can be found in:*

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- (8) Department of Physiological Sciences, Faculty of Sciences and Philosophy and Instituto de la Altura. Cayetano Heredia University, Lima, Peru

# **CULTIVATION, PRODUCTION AND QUALITY CONTROL OF MACA**

## **REQUIREMENTS FOR CULTIVATION**

- . Precipitation: 900 - 1,100 mm/year
- . Climate: frigid
- . Altitude: 3,500 to 4,500 m.
- . Floor: high Andean area (Puna)
- . Temperature: -6°C up to 4°C
- . Floor type: deep, franc, neuter and fertile
- . Rain time: October - April
- . Dry time: May - September
- . Dear yield: 8 TM / there are of fresh bruise and 2.4 TM / there is of dry bruise

They are harvested after 6 to 7 months of being sowed that is to say between the months of May and July. The roots are cleaned and then dry off to be dehydrated exposed in the sun, except the reserved ones for seeds, all the roots are harvested.

## **POST CROP**

- The MACA is gathered in sacks or jute sacks for its transfer to the selection and drying.
- Then they are washed with current water to eliminate the mud stuck them.
- For a homogeneous drying the roots are classified in three sizes (big, medium and small)
- The drying is carried out exposing the products in the sun during 90 to 100 days, in uniform layers and are constantly removing to reduce the humidity up to a 10 to 15% This operation has as purpose to improve the flavor of the product starting from the production of sugars reducers. The dehydrated roots can be stored per years.
- The unsightly products, dives with decomposition signs or that they have suffered damage for the intense cold are separated.

This plant is not treated genetically and until the moment they have not registered studies in this matter.

## **RAW MATERIAL RECEPTION**

The dry Maca is classified in according to our specifications is carried to the process sections. The first step is to weight them and then they are stored in handbarrows in a free areas of high temperatures owing to that conditions is the best environment for the growth of insects and besides under this condition the time of life for the raw material decrease.

It is important to maintain low humidity of the environment to avoid the re-hydration of the product, for that reason this raw material stay at fortieth zone. Then, in order to identify the authenticity of the raw material, we proceed to make the following analysis:

- Color, texture and taste.
- Botanic and phyto - chemical inspection

After that we proceed to make the bacteriological analysis. Once it is approved these controls, the raw material is stored in special drums in order to protect them against the light.

## **BOTANIC ANALYSIS**

It has as purpose to certificate again the authenticity of the raw material received

## **PULVERIZATION**

It is made by a mill of hammer conditioned for a mesh number 60 and the purpose is to facilitate the drying process. The heat produced by the friction eliminate 3% of the water containing in the Maca. The pulverization is as homogeneous as the raw material permit.

## **STERILIZATION**

This process consist first in washing the raw material with NaClO 250 ppm in solution and then sterilize it under the following model:

- Water vapor: 70 °C
- Time : 6 to 10 minutes
- Pressure : 1500 psi

## **DRYING**

This process is made in an electric stove and in according to the following steps:

- Temperature : 60 °C
- Air speed : 3 m/s
- Maxim ended humidity : less than 8%
- Time : 8 hours

## **GRANULATED**

In this part, the purpose is to get mesh number 100, it is used the same machine as in pulverization.

## **CAPSULES FILLING**

For this part of the process it is used a filling capsules machine and they are filled with the weight specifications. We use capsule number "0".

## **BOTTLE FILLING**

This part is made using a flask filling machine that is calibrated in concordance with the quantity of capsules per bottle. Bottles are white color and have push down covers.

## **LABELING**

Labels are put on bottles manually, then they are re-covered by a special plastic tape.

## **CONTROLS OF QUALITY**

The controls are continuous, it means that it is given in the entire process. The three more important points are:

### **A.- Raw material control**

1. inspection and control of the impurities
2. Verification of the exact weight
3. Humidity control
4. Botanic analysis
5. Bacteriological control
6. Phytochemical analysis

### **B.- Control of products in process**

1. Verification and determination of the chlorine concentration in the water
2. Temperature and final humidity control during drying
3. Granumetric control of the final product
4. Weights controls
5. Verification of the capsules lustrated
6. Crude and neat weight control
7. Verification of the flasks cleanliness

### **C.- Final product control**

- 1.- Bacteriological analysis
- 2.- Humidity determination
- 3.- Control of nonconformities of the final products.

## **OTHER CONTROLS**

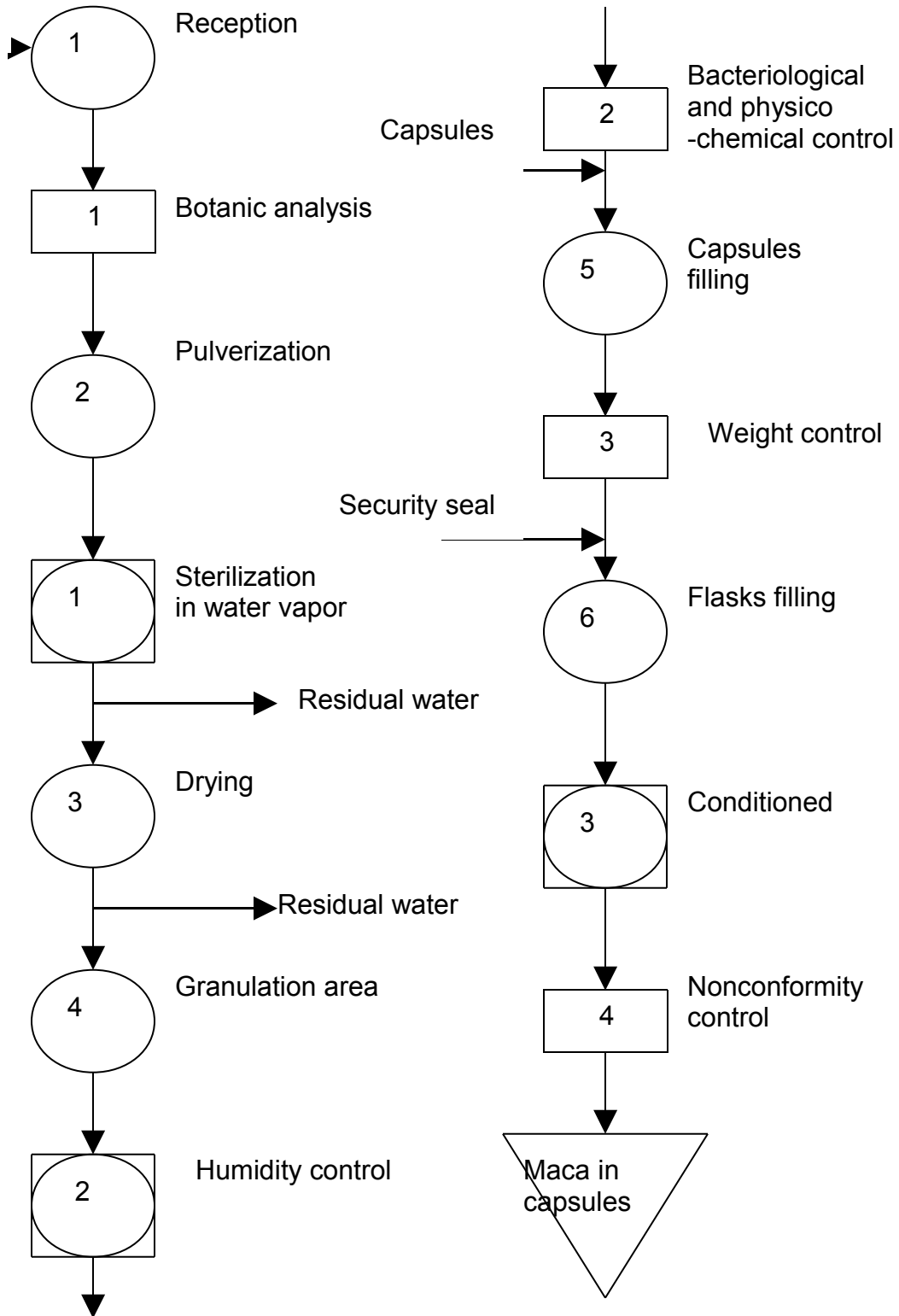
There are another controls before, during and after the production process that are very important in order to guarantee the quality of our products, these are:

1.- Verification of completion of the personal sanitation practice in order to avoid the contamination of the productions areas. For that reason all our workers have to obey with code of good personal sanitary practice VN-IHP version 1

2.- Verification of general sanitary (VN-PLDME, version 1: Hygiene and cleanness are the most important aspect in an sanitary program; having as objective to offer products innocuos and healthful for the consumption of our people.

## DIAGRAM OF FLOW FOR MACA PROCESS

Maca



In summary, the Peruvian Andes offers MACA as one of the best natural revitalizing and invigorating substances that exist; for this reason it is called an Andean Ginseng. In general, MACA can overcome energy wear and tear caused by the modern accelerated way of life, poor nutrition and inadequate social and hygienic environment.

<b>Nutrition Chart (sample of 100g)</b>		
<b>Sample</b>	<b>Results</b>	<b>Tolerance</b>
01 humidity	4.70	5.10
02 fats	1.02	1.50
03 carbohydrates	76.20	76.80
04 energy (in Kcal)	370.78	370.4
05 residues (15% humidity)	3.46	3.4
06 acids	0.62	0.50
07 phosphor	128.85	128.35
08 iron	7.85	8.0
09 calcium	379.41	390.41
10 vitamin C	13.24	13.98
11 niacin	8.44	8.79
12 proteins	14.20	14.15
13 fibers	3.22	3.97
14 degree of gelatinized.	98.10	92.98
15 starches	15.70	15.18

## **The Importance of Maca in the History of Peru**

Maca's cultivation goes back perhaps five millennia. It was an integral part of the diet and commerce of the high Andes region. When they controlled that certain South American region, the Incas found maca so potent that they restricted its use to their Royalty's court. Upon overrunning the Inca people, conquering Spaniards became aware of this plant's value and collected tribute in maca roots for export to Spain.

Maca was used as an energy enhancer and for nutrition by the Spanish Royalty as well. But eventually knowledge of maca's special qualities died out, being preserved only in a few remote Peruvian communities. In the 1960s and later in the 1980s, German and North American scientists researching botanicals in Peru, rekindled interest in maca through nutritional analyses of what was designated as 'the lost crops of the Andes.' The publication of a book by that name introduced maca.

## **Maca: Peruvian Ginseng**

This so called "Peruvian Ginseng" is from South America and is rapidly gaining attention in the United States for its success in supporting energy, stamina, libido and with hormone balancing for men and women. In traditional Andean culture, maca is used for male impotence, menopausal symptoms, menstrual disorders and as an aphrodisiac. In Inca society, maca was used, like ginseng, to impart kalpa, or strength. It acts as an energizer and anti-stress agent.

## **Maca: Female Viagra**

In Scotland, a natural aphrodisiac being touted as the Female Viagra is being supplied. Maca is said to be of benefit in boosting the libido of both sexes but of particular value to females. Harvested 13,000 feet up in the central Andes, the herb was considered so potent that the Incas confined its use to their royal family. After almost becoming extinct, the plant's properties to improve sex lives and fertility are again being seized on in the wake of the world-wide Viagra craze.

From only a few acres of the crop in 1995, there are now 1500 acres with plans to plant a further 5000 acres. Maca, "fully unlocks the potential of what the Incas called their superfood", say Herbal proponents in Europe, "It's very hot stuff and it's going to be very big as it does not have any side-effects".

Apart from increasing sexual stamina and Fertility, its other uses include hormone replacement therapy and the easing of pre-menstrual tension.

Sharon T. from New York says, "Before taking Maca I was thinking that my sex life was over. Within a few days of taking Maca, my libido returned".

## **Benefits for Women**

"Thousands have said goodbye to PMS, Hot Flashes, Night Sweats, Fatigue, Memory Problems, Dry Skin and Low Libido." Discover how they did it.

More than 40 million women are menopausal in America. A hundred years ago, most women did not live past menopause. Medicine has extended life expectancy by 30 years, but for many, longer life means poor health and disability. The rate of hormonally related diseases, such as heart disease, lung and breast cancer are escalating, including the very uncomfortable symptoms experienced during menopause.

Maca adapts to the body's needs and supports menopausal health. It works through the hypothalamus and pituitary to bring about healthy, balanced hormone levels in the body. Black Cohosh, licorice root, don quai and soy products all contain weak plant hormones, phytoestrogen. Many women cannot manage symptoms with these herbs.



It is not a hormone but a staple food like our broccoli. Its dense nutrients go right to the source of the hormonal problem and fuel the body so it can once again produce healthy levels of hormones. Taking Peruvian Maca, is like eating right for the first time in your life.

Maca contains large amounts of vitamins and minerals. The herb was originally studied because of its ability to ward off malnutrition in the poorer regions of Peru. Properly grown Maca is especially high in calcium and magnesium and has proven to be successful in promoting healthy bone formation. It is therefore an herb of great benefit to those with osteoporosis or those at risk of osteoporosis (white, smokers, thin women of European heritage and women with a family history of osteoporosis).

Many doctors in the US believe Maca is a good choice of alternative therapy for menopause as it allows a woman to produce her own hormones. The best source of progesterone and estrogen is you.

Maca is safe, 100% naturally grown without pesticides, artificial fertilizers or chemicals, producing wonderful results in your body, naturally. It is naturally sun dried with no oven, alcohol or artificial heating used. South American women who have had Maca in their diet remain fertile and productive well into late life. They have immense stamina and do not experience menopausal symptoms such as hot flashes, vaginal dryness, and memory problems.

Thousands of women around the world have been using Maca for hot flashes, vaginal dryness, fatigue, loss of libido and other menopausal symptoms.

## **PMS – Perimenopause**

Women experiencing the irregular menses associated with PMS and perimenopause take Maca to reduce cramps, bleeding, insomnia and fatigue. These beneficial effects accumulate with prolonged use of Maca. Women report a decrease in the problems associated with PMS. While many women wait until they are suffering from menopausal hot flashes, fatigue and night sweats to use Maca, this herb can be used at any age to ease the symptoms of hormonal imbalance. Dr. Hugo Malispina, MD, the Peruvian cardiologist who practices complementary medicine, believes the earlier, the better when it comes to adding Maca to a woman's diet. South American children are fed Maca beginning at age three.

## **Maca: What can it do for you?**

The popularity of maca worldwide is growing at an enormous rate. In August of 2001, results of the first major clinical trial conducted on the effects of maca consumption were released.

What does Maca do?

has a reducing effect on diastolic arterial pressure (lowered blood pressure)

has an anti-anemic effect (balanced blood iron levels)

has an important effect as energizer, possibly due to its effect of causing an increase in the serum levels of human growth hormone (HGH)

affects blood sugar energy reserves (hemoglucose) acting over body fat (promotes the use of glucose in the bloodstream for energy rather than being processed into fat storage)

maca was found to produce a "general sense of well-being"

DHEA level increases significantly in a majority of the males treated with maca

decreases anxiety within the first two weeks of treatment

treatment with maca decreases stress

maca improves the level of sexual desire (libido) by an average of 180%

increases seminal volume, count of mobile spermatozoids and mobility of spermatozoids (average sperm count increase in the maca group vs. the placebo control group was 200%)

maca increases adrenal androgens (adrenalin)

For centuries, the Maca root has grown wild in the Peruvian Andes just below the glacial icecap. The only area where this particular species of maca is found is a region of extreme weather conditions such as freezing, high winds, and intensive sunlight.

No other food plant exists in the world which will grow at so high an altitude and survive.

Native shepherds soon learned that as they grazed their herds in higher elevations, where Maca grows naturally, the herds became healthier, with more stamina and became much more sexually active. Soon, the Andean Herd People included Maca in their diets, and found Maca could help promote increased energy and stamina for themselves.

The rich soil located at these high plateaus of Peru where it is very cold and oxygen poor may account for the high levels of trace minerals found in maca root. Some Peruvian Indians of today still grow it in the same traditional way without pesticides or chemicals.

The healing qualities of maca have helped the local native population thrive in this oxygen-poor plateau where they live. Maca root contains significant amounts of amino acids, complex carbohydrates, vitamins B1, B2, B12, C and E and minerals, including calcium, phosphorus, zinc, magnesium and iron.

This herb has been traditionally used as an aphrodisiac for both men and women, to increase energy, vitality, stamina and endurance in athletes, promote mental clarity, for fertility and to increase male seminal fluid volume, sperm count and sperm motility, for treating male impotence and erectile dysfunction, and for female menstrual irregularities and hormone imbalances, including menopause and perimenopause.

Women with menstrual irregularities have experienced greater consistency, while women with hot flashes, mood swings and most associated perimenopause and menopause symptoms have diminished dramatically. Due to the number of steroidal glycosides present in Maca root it is gaining popularity among weight lifters and body builders as a natural alternative to anabolic steroids.

## **Maca for Fitness Training**

Maca has been used for energy, stamina, athletic performance, impotence and to increase testosterone levels. The natural sterols in Maca root help build muscle especially when used in conjunction with exercise. Maca elevates mood and improves mental ability (concentration), and physical endurance.

Maca has no harmful stimulant activity such as that from caffeine or ephedra. Ideal for marathoners, martial arts enthusiasts, weary travelers, and those who maintain intense work schedules.

## **Maca: help for male impotence**

Nearly half of the male population by age 50 experience lethargy, decreased libido, depression, irritability and mood swings, hot flashes, insomnia, weakness, loss of bone mass and muscle tone, and sexual difficulties.

Supplements to improve male impotence are sold throughout the world. But there are questions about their safety and benefits. Do they really work? Do they have any side effects? The recent fixation on the pill Viagra™ emphasizes the role of sex in our lives.

Many are turning to alternative and safer, natural herbs that also demonstrate aphrodisiac properties, nourishing the areas of the body that directly contribute to healthy hormone levels which in turn contribute to healthy sexual function.

Doctors are now looking at alternative care and many are using maca for themselves and their patients. An article in Nature magazine called "How Desire Dies," discussed prescribed drugs, such as beta-blockers and anti-depressants, and their effects on sexual function. Sedatives, tranquilizers and alcohol can have an adverse effect.

Recently a study showed 51% of normal, healthy males aged 40 - 70 experience some degree of impotence. This is not due to the aging process alone, since 40% of males remain sexually active at 70 plus years. Contributing to these symptoms are hormone deficiencies, excessive alcohol consumption, smoking, hypertension, prescription and non-

prescription medications, poor diet, lack of exercise, poor circulation, and psychological problems.

Men in countries, such as China, South America and Africa cannot afford medicines and have learned to use food and herbs as such. In the Peruvian Andes men remain productive well into their 80's. These men suffer far less from heart disease and prostate cancer than men in the United States. They have learned that using Maca increases their strength and vitality and sexual function.

## **Maca as a food**

To the Andean Indians, Maca is a valuable commodity. Because so little else grows in the region, Maca is often traded with communities at lower elevations for other staples like rice, corn, and beans. The dried roots can be stored for up to seven years. Native Peruvians have used Maca since before the time of the Inca's for both nutritional and medicinal purposes.

## **Maca as a medicine**

MACA has been used medicinally for centuries to enhance fertility in humans and animals. Soon after the Spanish Conquest in South America, the Spanish found that their livestock were reproducing poorly in the highlands. The local Indians recommended feeding the animals MACA and the results were so remarkable that the Spanish chroniclers wrote in-depth reports about MACA. Even Colonial records of some 200 years ago indicate that payments of about 9 tons of MACA were demanded from one Andean area for this purpose.

In 1961 important scientific questions about MACA were answered. Studies found that MACA contains important amounts of fatty acids including linoleic, palmitic and oleic acids. MACA is rich in sterols and has a high mineral content as well. In addition to its rich supply of essential nutrients, MACA contains alkaloids, tannins and saponins. A chemical analysis shows the presence of biologically active aromatic isothiocyanates, especially p-methoxybenzyl isothiocyanate, which have reputed aphrodisiac properties.

Analysis of MACA indicates that the effects on fertility are a result of glucosinolates. Dr. Chacon, a Peruvian biologist, discovered the four alkaloids present in MACA that are responsible for MACA's reputed positive effect on hormonal issues such as hot flashes, memory problems, fatigue, and male and female sexual dysfunction more than forty years ago.

## **MACA as dietary supplement**

MACA has been shown to improve the mental and physical functioning of the older adult. This action is due to the presence of large amounts of naturally occurring nutrients and the adaptogenic qualities of MACA. The hormonal action of MACA minimizes the body's reaction to stress and allergies. Stress on the body - from the air, food, relationships and

other sources - is the leading cause of illness and debilitation in the world today. Stress accelerates the aging process. MACA promotes the body's ability to adapt to and handle these stresses.

In order to meet the growing worldwide demand for MACA some of the traditional farming and drying methods of this important plant are being bypassed or done in ways that can alter the medicinal and nutritional properties of MACA. While it is important to consider that this severely economically depressed region of Peru benefits from the income being produced by the sale of this plant, it is also wise to question the farming and processing techniques being used by exporters and suppliers of MACA.

MACA is best processed if it is sun-dried. This process takes about 4-6 months. The cooking method of drying MACA can change its therapeutic properties.

## **NOTES ON THE SEXUAL PERFORMANCE ENHANCING PROPERTIES OF MACA ROOT**

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**Article: Female Viagra!** (Published with permission from the Scottish Herbal News Med.)

In Scotland, a natural aphrodisiac being touted as the Female Viagra is being supplied. The plant is said to be of benefit in boosting the libido of both sexes but of particular value to females. Harvested 13,000 feet up in the central Andes, the herb was considered so potent that the Incas confined its use to their royal family. After almost becoming extinct, the plant's properties to improve sex lives and fertility are again being seized on in the wake of the world-wide Viagra craze.

From only a few acres of the crop in 1995, there are now 1500 acres with plans to plant a further 5000 acres. The MACA *"fully unlocks the potential of what the Incas called their superfood"*, say Herbal proponents in Europe, *"It's very hot stuff and it's going to be very big as it does not have any side-effects"*. Apart from increasing sexual stamina and Fertility, its other uses include hormone re-placement therapy and the easing of pre-menstrual tension. While some companies are seeking patents on the products derived from MACA, others consider it a gift to the world and offer it without a patent.

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### **Chinese Maca Lab Study and Report:**

(© 2000, Elsevier Science Inc., Published with permission from the Journal of Urology, volume #55, 2000)

**Effects of *Lepidium Meyenii* on sexual behavior in Mice and Rats.** This study reveals for the first time an aphrodisiac activity of *L. Meyenii*, an Andean mountain herb.

### **ABSTRACT OBJECTIVES:**

To determine the effect of oral administration of a purified lipidic extract from *lepidium meyenii/peruvianum* (M-01 M-02) on the number of complete intromissions and mating in

normal mice and on the latent period of erection (LPE) in rats with erectile dysfunction.

**METHODS:** Mice and rats were randomly divided into several experimental and control groups. A 10% ethanol suspension of M-01 and M-02 was orally administered for 22 days to the experimental groups according to the dosage specified by the experimental design. On day 22, 30 minutes after the dose was administered to the male mice, 2 virgin female mice were placed with 1 male mouse. The number of complete intromissions of each male mouse in 3 hours was recorded. In an assessment of 1 day of mating, each male mouse was cohabited with 5 estrous female mice overnight. The number of sperm-positive females was recorded. The LPE was measured to assess the sexual function in rats with erectile dysfunction. By using a YSD-4G multifunction instrument, an electric pulse at 20 V was applied to stimulate the rat's penis, and the duration from the start to the stimulus to full erection was measured in seconds as the LPE.

**RESULTS:** In the normal male mice, the number of complete intromissions during the 3-hour period was  $16.33 \pm 1.78$ ,  $46.67 \pm 2.39$ , and  $67.01 \pm 2.55$  for the control group, M-01 group, and M-02 group, respectively. In the assessment of mating, the number of sperm-positive females increased from  $0.6 \pm 0.7$  in the control group to  $1.5 \pm 0.5$  in the M-01 experimental group. LPE of male rats with erectile dysfunction was  $112 \pm 13$  seconds with a regular diet (control group). The oral administration of M-01 at a dose of 180 or 1800 mg/kg body weight and M-02 at a dose of 45, 180, 1800 mg/kg body weight reduced the LPE to  $54 \pm 12$  seconds,  $54 \pm 13$  seconds,  $71 \pm 12$  seconds,  $73 \pm$  seconds, and  $41 \pm 13$  seconds, respectively. The LPE of the surgical rats treated with M-01 at the lowest dose (45 mg/kg) was  $121 \pm 12$  seconds; thus, the change was not significant.

**CONCLUSIONS:** Oral administration of M-01 and M-02 enhanced the sexual function of the mice and rats, as evidenced by an increase in the number of complete intromissions and the number of sperm-positive females in normal mice, and decrease in the LPE in male rats with erectile dysfunction.

**This study was conducted by:** Bo Lin Zheng, Kan he, Calvin Hyungchan Kim, Lingling Rogers, Yu Shao, Zhen yen Huang, Yang lu, Sui jun Yan, Lu cheng Qien, and Qun yi Zheng at the Shenyang Medical College & Liaoning College of Traditional Chinese Medicine in Shenyang China, and also at the Chinese Academy of Preventive Medicine, Beijing, People's Republic of China.

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**Peruvian Maca Lab Study and Report:** (© Dr. Gloria Chacon, Lima- Peru)  
**Effects of Maca on the Endocrine Glands.**

Dr. Gloria Chacon isolated four alkaloids from the MACA root and carried out animal studies with male and female rats given either powdered MACA root or alkaloids isolated from the roots. In comparison with the animal control groups, those receiving either root powder or alkaloids showed multiple egg follicle maturation in females and, in males, significantly higher sperm production and motility rates than control groups. Dr. Chacon established that it was the alkaloids in the MACA root, not its plant hormones that produced fertility effects on the ovaries and testes of the rats. These effects are measurable within 72 hours of dosing the animals.

Through the experiments, she deduced that the alkaloids were acting on the hypothalamus-pituitary gland, which explains why both male and female rats were afflicted in a gender-appropriate manner. This also explains why the effects in humans are not limited to ovaries and testes, but also act on the adrenals, giving a feeling of greater energy and vitality, and on the pancreas and thyroid as well.

Implications of Dr. Chacon's discovery of the pituitary stimulating effects of maca are enormous. What it appears to mean is that hormone replacement therapy, even the natural varieties, will no longer be the gold standard for optimising a holistic point of view.

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**Article: (Physicians Note)**

**"Natural Viagra"** (Notes from doctors Malaspina, Muller, and Chacon.)

Doctors Malaspina, Muller and Chacon, as well as doctors from the USA and Canada, have good news for men who are suffering age-related sexual dysfunction. They can forget expensive, possibly dangerous Viagra. MACA works extremely well and safely.

Dr. Jorge Aguila Calderon, Dean of the Faculty of Human Medicine at the National University of FedericoVillareal in Lima, prescribes MACA for a wide variety of conditions, including osteoporosis and the healing of bone fractures in the very elderly. He says, *"MACA has a lot of easily absorbable calcium in it, plus magnesium, and a fair amount of silica, which we are finding very useful in treating decalcification of bones in children and adults."*

Dr. Calderon has also helped patients overcome male impotence, male sterility, and female sterility by employing MACA therapy. Additional problems he treats with MACA are rickets, various forms of anemia, menopausal symptoms such as hot flashes and night sweats, climacteric and erectile difficulties in men, premature ageing, and general states of weakness, such as chronic fatigue.

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**Article: (Physicians testimonial and Note)**

Burton Goldberg, President of Alternative Medicine Publishing in Tiburon, California, whose latest book is "An Alternative Medicine Definitive Guide to Cancer" is another enthusiast of MACA. He says that when he tried MACA he was very pleased with the results and began taking it regularly. *"I'm a 72 year old man and this MACA has taken 25 years off my aging sex life"* declares Burton Goldberg. *'That's pretty important to me!'*

Dr. Garry Gordon is concerned about reproductive problems in today's world. *"Society faces a huge problem of dropping sperm counts and sex hormone difficulties. But MACA promises a nontoxic solution with no downside effects. It's a therapy that appears to offer men and women the chance for hormonal rejuvenation,"* concludes Dr. Gordon. *"We currently live in an era in which almost everyone will be doing something to deal with the hormonal consequences of aging and MACA is now readily available."*

## **NOTES ON HORMONE REPLACEMENT (THERAPY) PROPERTIES OF MACA ROOT**

### **Articles, studies, facts, and more...**

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**Article:** (Source unknown)

#### **Effects of Peruvian Maca on Hormonal Functions.**

Whether discussions today are about estrogen replacement therapy, increasing male potency or improving other hormonal functions, the solutions mentioned are generally drugs currently on the market. Lately, however, we've been hearing marvelous reports about a hearty plant root cultivated high in the Andes of Peru. Known as "MACA," this ancient nutritional source and efficacious endocrine system remedy is being dispensed by health professionals as a safe and natural substitute for drugs.

Now women have an alternative to hormone replacement therapy [HRT]. MACA works in an entirely different and more satisfactory way for most women than the phytoestrogenic herbs like black cohosh and licorice root. These herbs have become popular with menopausal women who refuse to take the drugs of HRT. And men, too, find in maca an herb that will counteract the difficulties they may experience in maintaining good sexual relationships as they age, due to a general slowing down in the output of the endocrine glands.

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**Article:** (Reprinted from Nature & Health Magazine, December 1999/ January 2000)

#### **Maca: Discover how this new phytonutrient can ease menopausal symptoms**

Rather than hormone replacement therapy (HRT), millions of women are putting their faith in a remedy which has been used for 10,000 years, which is safe and amazingly effective: a cruciferous root vegetable from Peru called MACA. Anthropologist Dr. Viana Muller has brought this extraordinary remedy to the attention of the Western world. *"Once in a decade a remedy used by native peoples for thousands of years comes to our attention and it seems so important to health that we wonder how we ever got along without it,"* Dr. Muller says. *"MACA is that kind of supplement. Now women have an alternative to hormone replacement therapy drugs. MACA works in an entirely different and more satisfactory way for most women than phytoestrogen herbs like black cohosh and licorice root."*

And men, too, find that MACA can counteract the difficulties they may experience in maintaining good sexual relationships as they age, due to a general slowing down in the output of the endocrine glands. The scientist responsible for much of the current knowledge of the MACA root is Dr. Gloria Chacon de Popivici, a biologist trained at the University of San Marcos, in Lima, Peru.

Dr. Chacon says that MACA root works in a fundamentally different way than HRT, promoting optimal functioning of the hypothalamus and the pituitary, thereby improving the functioning of all the endocrine glands. Dr. Chacon has done the most important scientific work to date on the MACA plant.



Alternative to HRT: It is important to remember that MACA does not itself contain any hormones, but its action on the body jogs the pituitary into producing the precursor hormones which ultimately end up raising oestrogen, progesterone and testosterone levels, as well as helping to balance the adrenal glands, the thyroid and the pancreas. But this occurs naturally, not with time-bomb drugs which throw the entire body into a dangerous state of confusion.

Dr Jorge Malaspina, a respected cardiologist, has been using MACA in his practice in Lima, Peru, practice for over a decade. He says, "*MACA does not cause the ovaries in women to atrophy, as conventional hormone replacement therapy does.*" This means that MACA may be discontinued at any time without danger. He adds, "*Different medicinal plants work on the ovaries by stimulating them. With maca, though, we should say that it 'regulates' the ovarian function.*" Dr Malaspina reiterates what Dr. Chacon says about the way MACA regulates the organs of internal secretion, such as the pituitary, the adrenal glands, and the pancreas. He has also found MACA to be effective even on women who have undergone complete hysterectomies. He describes one patient who had a serum oestradiol level of 15, which is very low. After two months on maca it went up to 75. He says that a level above 60 is an adequate postmenopausal level. "*MACA enables the adrenals to make sufficient hormones to avoid symptoms*", he says.

Dr. Malaspina adamantly prefers MACA therapy to HRT. "*The presence of outside hormones circulating in the system sends a message to the pituitary and the hypothalamus that there is a sufficient quantity of hormones in the body, and so they stop producing them. When menopause arrives, then, the ovaries are atrophied and do not produce the oestrogen and progesterone which the body requires minimally to function. For this reason, I encourage women to start with MACA before menopause. It seems to help the endocrine system to stay in balance.*"

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**Article:** (Source: Dr. Hugo Malaspina, MD and cardiologist- Lima- Peru)

### **Maca regulates sexual functions for both males and females**

Hugo Malaspina, MD, works with MACA now practicing complementary medicine with an emphasis on the use of medicinal herbs. He is one of the earliest modern pioneers in the therapeutic use of this ancient herb for an urban population. A respected cardiologist in Lima, Dr. Malaspina has been using the MACA root in his practice for a decade and makes the following observations: "*There are different medicinal plants that work on the ovaries by stimulating them. With MACA, though, we should say that it 'regulates' the ovarian function.*"

Dr. Malaspina, who uses MACA therapy for both his male and female patients, recalls that he first heard about this extraordinary herb through a group of elderly gentlemen who, while well along in years were still lively and interested in enjoying sexual activities. One of this group, (they were all over 70), started taking MACA and found he was able to perform satisfactorily in a sexual relationship with a lady friend. Soon everyone in the group began drinking the powered MACA as a beverage and enjoying the boost that the root was giving their hormonal functions. "*I have several of these men as patients, and their improvement prompted me to find out more about MACA and begin recommending it to my other patients,*" Dr. Malaspina stated.

What makes MACA so effective, according to Dr. Malaspina, is that rather than introducing hormones from outside the body, MACA encourages the ovaries and other glands to produce the needed hormones. The cardiologist-turned-wholistic physician said, *"MACA regulates the organs of internal secretion, such as the pituitary, the adrenal glands, the pancreas, etc. I have had perhaps 200 female patients whose perimenopausal and postmenopausal symptoms are alleviated by taking MACA."*

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**Article:** (Source: Dr. Hugo Malaspina, MD and cardiologist- Lima- Peru)  
**Maca Provides benefit following hysterectomy.**

Dr. Malaspina has even found MACA to be effective for women with hysterectomies. He discussed a 49-year old woman who had a hysterectomy eight years ago, although she still retained her ovaries. *"The woman was beginning to get menopausal symptoms - hot flashes, cold feet, depression, tachycardia, some constipation and some bone loss. Because she had breast implants, usual hormone replacement therapy was not an option for her,"* explained Dr. Malaspina. *"I started her on MACA and within three months the depression, constipation, and hot flashes cleared up. Based on my experience with some other patients, I expect that her bone density will improve as well, but that will take longer."*

He has also dispensed MACA to women who have undergone complete hysterectomies. One patient who had her ovaries removed was on HRT. *"But she didn't feel well taking the HRT so she stopped. When I examined her the blood serum estradiol level was 15 which is very low and she was experiencing hot flashes. Two months after she began taking MACA I retested her and the woman had a level of 75. Anything above 60 is probably an adequate postmenopausal level. MACA enabled the adrenals to make sufficient hormones to avoid symptoms,"* he said. Dr. Malaspina adamantly prefers MACA therapy to HRT. *"Presence of the outside hormone circulating in the system sends a message to the pituitary and the hypothalamus that there is a sufficient quantity of hormones in the body, and so they stop producing them. When menopause arrives, then, the ovaries are atrophied and do not produce the estrogen and progesterone which the body requires minimally to function. For this reason, I encourage women to start with MACA before menopause. It seems to help the endocrine system to stay in balance."*

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**Article: (Nurse Practitioner's notes and testimonial):** (Source: Stephanie Sulger-Smith, RN, MS)

### **Results for a nurse practitioner and her patients**

From her White Plains, New York, clinic, nurse-practitioner Stephanie Sulger-Smith, RN, MS, says that she read an article about postmenopausal health which discussed MACA. At her clinic she offers nutritional counselling for a variety of conditions. *"I had been prescribing black cohosh, dong quai, oil of evening primrose, vitamin E and other natural remedies to women with perimenopausal symptoms. But when I began using these remedies to help with my own hot flashes and other symptoms of approaching menopause, I didn't get the relief I needed. So I acquired a supply of MACA capsules and took it as advised. Almost immediately, my hot flashes disappeared and my energy level*

went up. My response to MACA was surprising to my gynecologist, who insisted that I undergo a series of laboratory studies, including estrogen levels, uterine monograms and others. They all turned out normal," says nurse Sulger-Smith. "I haven't had a hot flash since the beginning of November 1997 and I feel fabulous. When I told my patients about MACA, they tried it and found freedom from their perimenopausal and menopausal symptoms."

"One patient who has been taking MACA for over a year had a series of bone density studies done that showed increased density in the spine," says Nurse Sulger-Smith.

"Other case histories exhibit similar positive results from taking MACA. In fact, most of the women taking the root powder report that they feel less fatigue, greater energy, are less susceptible to stress, and do not experience hot flashes or night sweats. There are always a few individuals who will show an allergic reaction or who fall into a group of women or men for whom a pituitary stimulator such as MACA is contraindicated in the absence of studies that prove its safety. These groups include men with a high PSA level or a history of prostate cancer. Men using MACA on a regular basis should undergo periodic PSA tests. Women with a history of breast cancer or other types of hormone-related cancer also fall into this group."

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#### **Article: (Physician's Note)**

(Source: Dr. Gabriel Cousens, MD)

#### **Maca provides an answer to the effects of aging on the endocrine system**

American Physician Gabriel Cousens, MD, believes this herb has the potential of a balanced answer to the effects of aging on the endocrine system. Many who have tried phytoestrogens and/or precursor hormones such as DHEA or pregnenolone, or even natural hormone replacement therapy and have been dissatisfied, are getting excellent results from their use of MACA root.

Gabriel Cousens, MD, practicing internal medicine in Patagonia, Arizona, says, "Whenever possible, I prefer to use MACA therapy rather than hormone replacement therapy because HRT actually ages the body diminishing the hormone producing capability of the glands. MACA has proven to be very effective with menopausal patients in eliminating hot flashes and depression and in increasing energy levels. They find the right dosage level, sometimes I have started the patient on MACA treatment with a half a teaspoon of powder or three capsules a day. In some cases I have raised the dosage to a teaspoon or six capsules a day for full effectiveness."

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#### **Article: (Physician's Note and Testimonial) (Source: Dr. Henry Campanile, MD)**

#### **Doctor offers Maca as an Adrenal balancing root**

Henry Campanile, M.D., offers Adrenal balancing MACA root to his patients. In keeping with its mode of acting through the hypothalamus and pituitary, MACA has a balancing and nourishing effect on the adrenal glands. Henry Campanile, MD, a 50-year old specialist in internal and family/complementary medicine practicing in St. Petersburg, Florida, relates:

*"I happen to have been born with one adrenal gland just like my father. I started taking cortisone in my late twenties to relieve the fatigue which I was already feeling. Knowing the dangers of long term cortisone use, I looked around for an alternative, and this circumstance is what got me interested in complementary medicine. I started using pregnenolone about 10 years ago and it has been fairly satisfactory. But one of my patients told me about MACA, and I started taking it about a month ago. It is phenomenal! I haven't felt this good since I was 20 years old. I have so much energy and look so well, my patients have remarked on it and told me how rested I seem. I've got so much energy now have started an exercise program."*

After trying it out on himself, Dr. Campanile began using MACA with his patients. *"My first patient to take the MACA capsules was experiencing hot flashes and other menopausal symptoms. She started feeling much better after using this herb for only four days. I'm also employing it with patients who have low adrenal function."*

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**Article: (Physician's Note)**

(Source: Dr. Jorge A Calderon, MD)

**Peruvian pioneer prescribes Maca**

Another Peruvian pioneer in the therapeutic application of MACA integrated into a modern medical practice is Jorge Aguila Calderon, MD. An internist, Dr. Aguila Calderon is former Chief of the Department of Biological Sciences and Dean of the Faculty of Human Medicine at the National University of Federico Villarreal in Lima.

Like Dr. Malaspina and others, he prescribes MACA for a wide variety of conditions including osteoporosis and the healing of bone fractures in the very elderly. *"MACA has a lot of easily absorbable calcium in it, plus magnesium, and a fair amount of allies which we are finding very useful in treating the decalcification of bones in children and adults."*

Along with prescribing an excellent diet and certain lifestyle changes, Dr. Aguila Calderon has helped patients with male impotence, male sterility, and female sterility by employing MACA therapy. Additional problems he treats with MACA are rickets, various forms of anemia, menopausal symptoms such as hot flashes and night sweats, climacteric and erectile difficulties in men, premature aging, and general states of weakness such as chronic fatigue.

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**Article: (Physician's Note)**

(Source: Dr. Harold Clark, MD)

**Harold Clark, MD, makes Maca a key remedy**

Another American doctor who has recently began to use MACA therapeutically for some patients is from New Rochelle, New York. Dr. Clark, who utilizes chelation therapy and ozone therapy in addition to herbs, vitamins and minerals in his practice stated, *"I'm amazed at how fast MACA worked on two patients that I have been concerned about for*

*some time."*

He described one patient as 55 year-old Mary T, a postmenopausal, woman. Mary T was possessed of numerous health problems, including somewhat elevated blood sugar, hypertension, atrial fibrillation, and hypomagnesemia. She had been acutely ill for two months with osteomyelitis and generalized sepsis. Unable to work, she was suffering from great fatigue and depression and feeling 'worse and worse' over the last five years. *"Within just four days of taking the MACA capsules, Mary T went through an enormous turnaround,"* said Dr. Clark. *"She has gone out to shop in the stores; she's cleaning her house; she feels strong and vigorous; and her depression is gone."*

**Lepidium Meyenii (Maca) improved semen parameters in adult men  
Study made by Gustavo F. Gonzales, Amanda Cordova, Carla Gonzales, Arturo Chung, Karla Vega and Arturo Villena.**

Department of Physiological Sciences, Faculty of Sciences and Philosophy and Instituto de Investigaciones de la Altura. Universidad Peruana Cayetano Heredia, Lima, Peru  
Asian J Androl 2001 Dec; 3: 301-303

**Aim:** The present study was designed to determine the effect of a 4 month oral treatment with tablets of *Lepidium meyenii* (MACA) on seminal analysis in nine adult normal men aged 24-44 years old.

**Methods:** Nine men received tablets of MACA (1500 or 3000 mg/day) for 4 months. Seminal analysis was performed according to guidelines of the World Health Organization (WHO). Serum luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL), testosterone (T) and estradiol (E2) were measured before and after treatment.

**Results:** Treatment with MACA resulted in increased seminal volume, sperm count per ejaculum, motile sperm count, and sperm motility. Serum hormone levels were not modified with MACA treatment. Increase of sperm count was not related to dose of MACA.

**Conclusion:** MACA improved sperm production and sperm motility by mechanisms not related to LH, FSH, PRL, T and E2.

## 1 Introduction

MACA is the root of a Peruvian plant *Lepidium meyenii*, growing in the Central Andean Region of Peru between 4000 and 4500 m altitude, mainly in Junin and Cerro de Pasco. This species is described in the catalogue of the flowering plants and gymnosperms of Peru[1]. MACA is traditionally employed, among others, to improve sexuality and fertility. Oral administration of MACA significantly improved the sexual behavior in male rats and mice[2,3]. More recently, it has been demonstrated that MACA improves spermatogenesis

in male rats[4], however, its effect on sperm production in men has not been assessed. The present investigation was designed to study the effect of oral administration of MACA on the semen parameters and serum luteinizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL), testosterone (T) and estradiol (E2) levels in normal male volunteers.

## 2 Materials and methods

### 2.1 MACA

MACA (Maca Gelatinizada La Molina). Each tablet contains 500 mg of the root. This product could be purchased in the pharmacy as a nutrient.

### 2.2 Subjects and treatment

Twelve healthy men, 24-44 years of age, were recruited in the study, but 3 dropped out due to personal reasons during the 4 month treatment period. They had not received any kind of medical treatment for at least 3 months before the study. All the subjects gave written consent to participate in the study after being informed of the purpose, benefit and possible risks of the study. Among the 9 men with complete data, 6 were married and 3, single. Semen samples were collected by masturbation after a 3 day abstinence and fasting blood samples obtained between 08.00-09.00 h before and at the end of the treatment. Sera were kept frozen until hormone assay. Six subjects received 1500 mg/day, whereas 3, 3000 mg/day of MACA for 4 months. The study was approved by the Institutional Review Board of the Scientific Research Office, at the Universidad Peruana Cayetano Heredia.

### 2.3 Semen analysis

The ejaculate volume, semen consistency, sperm motility, sperm morphology and sperm concentration were assessed according to the WHO manual[5]. Spermatozoa were graded "a" (rapid progressive motility), "b" (slow or sluggish progressive motility), "c" (nonprogressive motility), or "d" (immotility) as recommended by the manual.

### 2.4 Hormone assay

LH, FSH, and PRL were measured by immunoradiometric assay (IRMA), whereas T and E2 were measured by radioimmunoassay using commercial kits (Diagnostic Product Co, California).

### 2.5 Statistical analysis

Data were expressed in mean $\pm$ SEM, if applicable. Statistical analysis was performed by the Student's t-test. The difference was considered significant when  $P < 0.05$ .

## 3 Results

Data on semen analysis are presented in Table 1. The semen volume, total sperm count, motile sperm count, and sperm motility (Grades a+b) were significantly increased after treatment with MACA ( $P < 0.05$ ). Motility Grade a sperm was also increased, but statistically insignificant. There were no significant differences between the two dosage levels of MACA used.

MACA treatment did not significantly change the levels of the hormones assayed (Table 2).

Table 1. Semen variables before and 4 month after Maca treatment.

Semen variable	Pre-Maca (n=9)	Post-Maca (n=9)	P value
Volume (mL)	2.23±0.28	2.91±0.28	<0.05
pH	7.47±0.09	7.44±0.07	NS
Sperm count (10 <sup>6</sup> /mL)	67.06±18.61	90.33±20.46	NS
Total sperm count(10 <sup>6</sup> /mL)	140.95±31.05	259.29±68.17	<0.05
Motile sperm count (10 <sup>6</sup> /mL)	87.72±19.87	183.16±47.84	<0.05
Sperm motility grade a (%)	29.00±5.44	33.65±3.05	NS
Sperm motility grade a+b (%)	62.11±3.64	71.02±2.86	<0.05
Normal sperm morphology (%)	75.50±2.02	76.90±1.23	NS

Table 2. Hormonal levels before and 4 month after Maca treatment.

Hormones	Pre-Maca (n=9)	Post-Maca (n=9)	P value
FSH (mIU/mL)	4.30±1.00	3.51±0.83	NS
LH (mIU/mL)	6.05±0.69	4.76±0.68	NS
PRL (ng/mL)	14.41±2.74	13.00±1.51	NS
T (ng/mL)	6.53±0.81	5.34±0.38	NS
E2 (pg/mL)	32.63±4.46	41.53±6.52	NS

#### 4 Discussion

Semen volume resulted from the contributions of seminal vesicles (60%), prostate (30%) and epididymis(10%)[6]. All these glands are androgen dependent[7]. Sperm motility was also androgen dependent[6]. MACA treatment was able to increase both the semen volume and sperm motility. However, we failed to find any increase in serum testosterone levels during MACA treatment, which may suggest that either bioavailable testosterone or testosterone receptor binding might be augmented.

Another possibility is that MACA may act without the participation of androgen mechanism. This seems to be supported by the fact that the weight of seminal vesicle, a target for androgen action, was not influenced by MACA in adult male rats[4].

In adult male rats, MACA has been shown to be beneficial to spermatogenesis[4]. In the present study, sperm count was increased by MACA without affecting the FSH level. It is possible that MACA may improve the response of Sertoli cells to FSH. We have demonstrated in women that oral administration of MACA for 2 weeks resulted in an increase in the size of the dominant follicles (unpublished data), which also suggested that MACA may improve the response to FSH. Further studies will be required to clarify this issue. In conclusion, MACA administration as tablets may improve sperm production and sperm motility.

