

## Are You Using the Right Type of Maca?

By Peter Bablis D.C., N.D., LAc, Dip. Medical Herbalist, Homeopathy, Dip. Clinical Nutrition, PhD

*As a college lecturer, integrative functional doctor, and medical herbalist, I have used as well as keenly followed the research into maca (*Lepidium peruvianum*) over the past 15 years. In my practice, and in keeping with the research of the late nineties, my focus has always been maca's use for men in relation to fertility and energy. I used a standard maca powder for this application with fair success, but had never really seen strong or consistent results in women except for improved energy. However, over the last 10 years, the focus of my lectures and use of particular products has shifted as I have become aware that not all maca is the same.*

### About Maca

Maca is an adaptogenic herb cultivated in the central Peruvian Andes at 12-14,000 feet under harsh natural growing and weather conditions. Adaptogens are an extremely rare class of herb that modulates the body's response by supporting systems within the body to deal with stress, anxiety and fatigue. So rare in fact, that Russian researchers studying the mode of action of over 4000 plants found only 12 true adaptogens amongst them. Other common adaptogenic plants include ginseng, ashwagandha, eleuthero, Holy basil, licorice, rhodiola and schisandra. It is important to point out that much of the research appears to demonstrate that adaptogens only impact the adrenal glands, thus the increase in energy and improvement in dealing with stress, regulating cortisol as an example. However, at no point in the definition of an adaptogen do balancing hormones, increases in bone density, cardiovascular risk, sexual function or many other areas of health get mentioned. These statements have been added since, by companies trying to sell products, or mistakenly added to all adaptogens when in fact research into only one herb (which happens to be an adaptogen) may have demonstrated one of these particular benefits.

This is what makes adaptogens so interesting – while they all improve our body's ability to deal with stress, anxiety and fatigue, some have other benefits and maca appears to potentially do the most of all. Which is why many scientists and doctors were not surprised when research over the last fourteen years demonstrated that there are many different phenotypes of maca (Phenotype: the observable physical or biochemical characteristics of an organism, as determined by both genetic makeup and environmental influences) that have different physiological effects on the body.

Maca has a wide range of active constituents including amino acids, glucosinolates, phytosterols, and alkaloids. However research has demonstrated that there are in fact 13 different phenotypes within the species *Lepidium peruvianum* (maca) that exhibit different colors, different DNA, different analytical profiles and most importantly different physiological effects on the body.<sup>1</sup> Interestingly the differences don't stop there with the altitude that the product is cultivated also playing a part. Different cultivation elevations result in different concentrations and phytochemical profiles indicating that this may also impact therapeutic functionality.<sup>2</sup>

### The Importance of the Phenotypes of Maca

Dr. Gustavo F. Gonzales from the Universidad Peruana Cayetano Heredia in Lima, Peru has published some very interesting research regarding different maca phenotypes in relation to men's health.<sup>3</sup> As an example, his research has demonstrated that while the red maca phenotype will reduce the size of an enlarged prostate, other phenotypes won't, or may even increase the size. Red maca also proved to be the most effective in improving mood,<sup>4</sup> while black maca is considered the strongest in energy-promoting properties as well as the ability to reduce blood glucose levels.<sup>4,5,6</sup> In other studies black maca alone was also shown to improve sperm motility and count, while yellow or red maca did not.<sup>7,8</sup> Further discoveries by Dr. G.F. Gonzales' research group discovered in two different studies how black and red maca improve libido and bone health, but yellow did not and that black maca is best for influencing memory and learning.<sup>9,10</sup> A landmark study in regards to maca, published in 2005, demonstrated that yellow maca increased uterine weight and litter size while not impacting fetal weight when compared to other phenotypes, indicating that there are potentially different types of maca that are better suited to supporting fertility for men and others for women.<sup>11</sup> Uterine weight indicates volume of the uterus. Larger and heavier uteri are best for fertility. Differences in phenotype also lead to different types of protection to skin in topical studies.<sup>12</sup> Exploration of the differences of concentration of active constituents among the different phenotypes was performed by Clement and revealed that "Color type has to be considered in maca production, as color associates with variations in concentrations of distinct bioactive metabolites."<sup>13</sup>



In addition, Dr. Henry Meissner (Director of Research and Development at Symphony Natural Health) has published some potentially ground breaking papers on specific, concentrated maca phenotype combinations. Known as Maca-GO® (or commercially as Femmenessence), these concentrated combinations specifically affect hormone levels in peri and postmenopausal women and are to date the only clinical

trials on any maca product to demonstrate statistically significant effects on hormones.<sup>14,15</sup> In fact all other studies by Brooks, Oshima, and Mazarro-Costa on normal maca powders or gelatinized maca have shown no statistically significant effect on hormones in peri or postmenopausal women or models.<sup>16,17,18</sup> In the double blind, placebo crossover human trials conducted by Meissner, he found that specific phenotype combinations and concentrated levels of all the active ingredients are critical to ensuring actual, measurable physiological effects on hormones, lipids and bone density.<sup>19,20</sup>

Meissner's research has further evolved this concept of different phenotypes by introducing three concentrated phenotype combination products for women depending on their stage of life. The Femmenessence MacaPause<sup>®</sup> phenotype combination is designed to improve a postmenopausal women's hormone production. This combination has resulted in statistically significant increases in estradiol ( $P < 0.001$ ), increases in progesterone and reductions in FSH ( $P < 0.05$ ), with highly significant reductions in menopausal symptoms as well as increases in HDL "good cholesterol", reductions in LDL "bad cholesterol", triglycerides and body weight as well as increases in bone density.<sup>21</sup> The Femmenessence MacaLife<sup>®</sup> concentrated phenotype combination is designed to reduce menopausal symptoms and modulate mood associated with peri menopause and the fluctuation of hormones during this stage of life and Femmenessence MacaHarmony<sup>®</sup> is for younger women to address hormone imbalance around a wide variety of conditions as well as PMS and fertility.<sup>22,23,24,25</sup>

## My Clinical Experience

In my clinic, I have seen first-hand the effect of using specific maca phenotypes for specific populations. As opposed to just "feeling better", my female patients have experienced actual physiological changes in hormone levels after using the different Femmenessence phenotype combinations. Addressing conditions ranging from PCOS, amenorrhea, PMS and adrenal fatigue to menopausal symptoms and heart and bone health.<sup>15</sup> It is within this range of benefits, derived from combining individual phenotypes in specific ratios and concentrating the full spectrum of active constituents, that I have found surpasses normal adaptogenic maca products, which are generally random combinations of the different phenotypes mixed together. Furthermore, they are not concentrated, which may be beneficial for general wellbeing and energy but not for specific clinical uses. Alternatively, I have also used different phenotype combinations in men from Symphony Natural Health to reduce prostate size and another combination called Revolution Macalibrium<sup>®</sup> to counter low testosterone and adrenal fatigue.<sup>5</sup>

## Quality Matters

Another factor in relation to maca is the bioavailability and concentration of the active ingredients required to elicit physiological effects.<sup>10,11,26</sup> Quality of seed sources, soil content, organic growing strategies and drying methods, all play a part in maximizing the quality of all active constituents. Interestingly, the higher elevation, region-specific quality soil (not necessarily from certain regions of the depleted Junin Plateau), and traditional sun-drying the crop at elevation over a period of three months (not in tobacco dryers in Lima), have all been shown to contribute to the highest quality raw material. For example, published evidence suggests planting site is a major determining factor with regards to constituents of maca.<sup>27</sup> In relation to manufacturing, maca is a tuber and is naturally hard to digest raw. For that reason the native Peruvians traditionally cooked maca the same way we would a potato. Scientifically this process of improving bioavailability has been addressed through gelatinization, with Meissner (Symphony Natural Health) and La Molina University being the leaders in developing their own processes. Raw maca has a natural water solubility of 68% with Gelatinized macas ranging from 87-97% while Meissner has perfected the process to such a degree that Maca-GO<sup>®</sup> (Femmenessence) is 99% water soluble.<sup>14</sup>

As the natural products industry continues to evolve, it is critical that we combine the best of traditional knowledge, organic sustainable farming practices with the highest levels of science, manufacturing and quality control. All herbs are not created equal therefore it is important to investigate them in detail, support their use with pharmacology, toxicology and human placebo controlled clinical trials and use efficacious products with therapeutic levels that elicit real health benefits.

## Reference

1. Meissner HO, Mscisz A, Piatkowska E, et al. Peruvian Maca (*Lepidium peruvianum*) - II: Phytochemical Profiles of Four Prime Maca Phenotypes Grown in Two Geographically-Distance Locations. *Int J Biomed Sci.* 2016;12(1):9-24.
2. Meissner HO, Mscisz A, Baraniak M, et al. Peruvian Maca (*Lepidium peruvianum*) - III: The Effects of Cultivation Altitude on Phytochemical and Genetic Differences in the Four Prime Maca Phenotypes. *Int J Biomed Sci.* 2017;13(2):58-73.
3. Winston D, et al. Adaptogens. Herbs for Strength, Stamina, and Stress Relief. Healing Arts Press 2007
4. Gonzales-arimborgo C, Yupanqui I, Montero E, et al. Acceptability, Safety, and Efficacy of Oral Administration of Extracts of Black or Red Maca (*Lepidium meyenii*) in Adult Human Subjects: A Randomized, Double-Blind, Placebo-Controlled Study. *Pharmaceuticals (Basel).* 2016;9(3)
5. Gonzales GF, et al. Red Maca (*Lepidium meyenii*) reduced prostate size in rats. *Reproductive Biology and Endocrinology* 2005, 3(5) 14
6. Skyfield Tropical: Free Online Botanical Encyclopedia Maca (*Lepidium peruvianum*): Botanical Characteristics
7. Gonzales C, Rubio J, Gasco M, Nieto J, Yucra S, Gonzales GF. Effect of short-term and long-term treatments with three ecotypes of *Lepidium meyenii* (MACA) on spermatogenesis in rats. *J Ethnopharmacol.* 2006 Feb 20;103(3):448-54. Epub 2005 Sep 19.
8. Yucra S, Gasco M, Rubio J, Nieto J, Gonzales GF. Effect of different fractions from hydroalcoholic extract of Black Maca (*Lepidium meyenii*) on testicular function in adult male rats. *Fertil Steril.* 2008 May;89(5 Suppl):1461-7. Epub 2007 Jul 31.
9. Gonzales C, Cárdenas-Valencia I, Leiva-Revilla J, Anza-Ramírez C, Rubio J, Gonzales GF. Effects of different varieties of Maca (*Lepidium meyenii*) on bone structure in ovariectomized rats. *Forsch Komplementmed.* 2010;17(3):137-43. Epub 2010 Jun 16.
10. Rubio J, Caldas M, Dávila S, Gasco M, Gonzales GF. Effect of three different cultivars of *Lepidium meyenii* (Maca) on learning and depression in ovariectomized mice. *BMC Complement Altern Med.* 2006 Jun 23;6:23.
11. Ruiz-Luna AC, Salazar S, Aspajo NJ, Rubio J, Gasco M, Gonzales GF. *Lepidium meyenii* (Maca) increases litter size in normal adult female mice. *Reprod Biol Endocrinol.* 2005 May 3;3:16.
12. Gonzales-Castañeda C, Rivera V, Chirinos AL, Evelson P, Gonzales GF. Photoprotection against the UVB-induced oxidative stress and epidermal damage in mice using leaves of three different varieties of *Lepidium meyenii* (maca). *Int J Dermatol.* 2011 Aug;50(8):928-38. doi: 10.1111/j.1365-4632.2010.04793.x.
13. Clément C, Diaz Grados DA, Avula B, Khan IA, Mayer AC, Ponce Aguirre DD, Manrique I, Kreuzer M. Influence of colour type and previous cultivation on secondary metabolites in hypocotyls and leaves of maca (*Lepidium meyenii* Walpers). *J Sci Food Agric.* 2010 Apr 15;90(5):861-9.
14. Meissner H.O., Mrozkiewicz P.M., Bobkiewicz-Kozłowska T. et al. Hormone-balancing effect of pre-gelatinised organic Maca (*Lepidium peruvianum* Chacon): (I) Biochemical and pharmacodynamic study on Maca using clinical laboratory model on ovariectomised rats. *J. J. B. S., 2006; 2: 260*
15. Meissner H.O., Kapczynski W., Mscisz A. et al. Use of Gelatinized Maca (*Lepidium peruvianum*) in Early--Postmenopausal Women - a Pilot Study. *J. J. B. S., 2005; 1: 33*
16. Brooks NA, Wilcox G, Walker KZ, Ashton JF, Cox MB, Stojanovska L. Beneficial effects of *Lepidium meyenii* (Maca) on psychological symptoms and measures of sexual dysfunction in postmenopausal women are not related to estrogen or androgen content. *Menopause.* 2008 Nov-Dec;15(6):1157-62.
17. Oshima M, Gu Y, Tsukada S. 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. *J Vet Med Sci.* 2003 Oct;65(10):1145-6.
18. Mazarro-Costa R, Andersen ML, Hachul H, Tufik S. Medicinal plants as alternative treatments for female sexual dysfunction: utopian vision or possible treatment in climacteric women? *J Sex Med.* 2010 Nov;7(11):3695-714. doi: 10.1111/j.1743-6109.2010.01987.x. Epub 2010 Aug 16.
19. Carter R. Clinical Effects of a Proprietary, Standardized, Concentrated, Organic *Lepidium Peruvianum* Formulation (Maca-GO<sup>®</sup>) as an Alternative to HRT 2007
20. Meissner HO, et al. Use of Gelatinized Maca (*Lepidium peruvianum*) in Early Postmenopausal Women—a Pilot Study. *IJBS* 2005, 1(1):33-45
21. Meissner HO, et al. Hormone-Balancing Effect of Pre-Gelatinized Organic Maca (*Lepidium peruvianum* Chacon): (II) Physiological and Symptomatic Responses of Earlypostmenopausal Women to Standardized Doses of Maca in Double Blind, Randomized, Placebo-Controlled, Multi-Centre Clinical Study. *IJBS* 2006, 2(4):360-374
22. Gonzales GF, Cordova A, Gonzales C, et al. *Lepidium meyenii* (Maca) improved semen parameters in adult men. *Asian J Androl* 2001, 3(4):301
23. Obregon LV. "Maca" Planta Medicinal y Nutritiva del Peru. 1 Edition Lima: Instituto de Fitoterapia Americano. 2001, 1-182
24. Chacon de Popovici, Gloria. Maca (*Lepidium peruvianum* Chacon), Millenarian Peruvian Food Plant, With Highly Nutritional and Medicinal Properties. 1st Edition. Universidad Nacional Mayor de San Marcos. Lima, Peru. 2001, 1-337
25. Chacon G. Phytochemical study on *Lepidium meyenii*. PhD Thesis. Universidad Nacional Mayor de San Marcos. Lima, Peru. 1961, 1-46
26. Meissner H.O., Kedzia B., Mrozkiewicz P.M., et al. Short- and Long- Term Physiological responses of Male and Female Rats to Two Dietary Levels of Pre-Gelatinised Maca (*Lepidium peruvianum* Chacon). *J.J.B.S., 2006; 2: 15*
27. Zhao J, Avula B, Chan M, Clément C, Kreuzer M, Khan IA. Metabolomic Differentiation of Maca (*Lepidium meyenii*) Accessions Cultivated under Different Conditions Using NMR and Chemometric Analysis. *Planta Med.* 2011 Aug 19. [Epub ahead of print]