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The HCG Diet: Does It Work?

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Dr. Kiefer reports no financial relationships relevant to this field of study.

WELCOME TO THE TIME OF THE NEW YEAR'S RESOLUTION. TOP OF THE list? Finally drop that 10-15 pounds and get back to the desired high school weight, or at least make an inroad into that recalcitrant body mass index (BMI) and associated health conditions such as hypertension, metabolic syndrome, or non-insulin-dependent diabetes. Weight loss is on a lot of people's minds,[1] and is big business; people spend $40 billion yearly on weight loss programs and products.[2] Also, about one-third of people in the United States will make a weight loss pledge for the new year. In addition, it may be a common question posed to one's health care provider: "I've tried everything. What else can I do?"

There are a plethora of diets and dietary supplements purported to be the magic bullet, though arguably one of the most trendy approaches is that encompassing human chorionic gonadotropin, or HCG (alternatively, in the scientific literature, it is abbreviated hCG). The 250,000 visits to the Dr. Oz discussion of this diet on YouTube may further support the popularity or, at the very least, the interest in this weight loss approach. Dr. Oz interviewed patients and doctors who attested to how they were able to lose 1 pound daily, on average, and were "never hungry" despite eating only 500 calories daily. The U.S. government recently became involved in this topic by expressing its opinion through an FDA and FTC lawsuit against some of the manufacturers of HCG products.[3]

To bring together the popular hype and medical research, this review will capture some of the results of clinical trials, comment on possible mechanisms of action, and discuss overall efficacy and safety of the HCG hormone and diet.

HCG Diet Components

The use of HCG in weight loss is often cited as originating with Dr. Albert T.W. Simeons in the 1950s.[4] His protocol involved HCG

injections (125 mcg intramuscularly 6 days per week for 6 weeks) and a variety of well-scripted dietary restrictions totaling only 500 calories daily. Since this initial use of HCG for weight loss, many variations on the protocol have surfaced, including the use of HCG drops (usually homeopathic) or a shorter treatment duration, for no less than 26 days (with 23 injections). Some companies support only pharmaceutical grade injections, while others criticize the unproven homeopathic drops favoring instead their particular formulation that includes a proprietary blend of amino acids. All have very convincing testimonials of success from health care practitioners and patients alike.

As mentioned in the January issue of *Alternative Medicine Alert*, HCG Diet Direct, HCG Platinum, and Nutri Fusion Systems are three of the companies listed in the FDA/FTC lawsuit.[5] These and other products contain statements such as "Appetite Control and Detox," and "Weight Loss Formula," and may have homeopathic HCG (dosed from 6X-60X), with or without amino acids, herbal medicines, and other nutraceutical ingredients.

Despite the diversity of marketing and specific proprietary blends, the weight loss claims are similar: less hunger; preferential weight loss (20-40 pounds over 40 days) from thighs, abdomen, and hips; and mental support for the emotional aspect of dieting.[4,6] One expert points out that the HCG component of these protocols may, in fact, be completely irrelevant, as most people on 500 calories daily would be expected to lose 1 pound daily with or without any supplemental nutrients or pharmaceuticals.[7]

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Please contact Executive Editor **Leslie Coplin**, at leslie.coplin@ahcmedia.com.

Entire books and volumes of information on the Internet are dedicated to the specifics about the actual food part of the HCG protocol. Many current HCG diets are variations of the original Simeons protocol: any food intake for the first 2 days of injections, then begin the 500 calorie per day diet involving weighed quantities of protein and specific amounts of fruits, vegetables, and carbohydrates, but no fat, in two meals daily.[8]

Physiology of HCG

HCG is a hormone with numerous functions in the placenta, uterus, and fetus during pregnancy, including the promotion of progesterone production from the corpus luteum via binding to a combined hCG/LH receptor.[9] There are two subunits (alpha and beta) in each HCG molecule, and four independent HCG variants (HCG, hyperglycosylated HCG, free beta subunit, and pituitary HCG); the beta subunit is conserved in these four variants, which are produced in different parts of the body and have different physiological effects.[9] The common marketing claim that HCG "helps the developing fetus to get the necessary nutrients" seems to be the branch point from which a case is made for how the body mobilizes fat stores during the weight loss protocol. Most experts document, however, that HCG helps with fetal growth and development by promoting adequate blood vessel development in the placenta and by signaling mechanisms and receptors in fetal organs;[9] there is no mention of a peripheral effect on maternal physiology that then leads to enhanced fetal nourishment.

One popular HCG website ventures into another hypothesized mechanism of action by stating that "The presence of HCG in the body signals the hypothalamus to release stored fats when low levels of calories are consumed."[10] It is true that HCG receptors have been found in the central nervous system, including the hypothalamus, a possible etiology for nausea and vomiting of pregnancy rather than appetite control as proposed by the aforementioned website.[9]

One clinical trial allows some extrapolation to the realm of the hypothesized effect of HCG on weight loss. This double-blind, placebo-controlled clinical trial shed some light into how HCG might be affecting muscle and fat. Addressing suspected hypothalamic-pituitary dysfunction in older men, recombinant HCG was administered, with the hopes of helping with symptoms of testosterone deficiency, including energy, libido, and mood changes.[11] Some of the thought for the use of HCG in this capacity comes from positive results for young men with gonadotropin deficiency or in idiopathic infertility, an FDA-approved indication for HCG therapy. In the above study, 250 mcg of HCG was self-administered subcutaneously twice weekly in 20 men for 3 months (and then the

group was followed for 1 additional month), and numerous parameters were followed, including lean body mass and fat mass. In the treatment group, lean body mass and body weight increased compared to the placebo group (approximately 6 pounds and 2 pounds, respectively), and calculated fat mass, primarily at the mid-thigh, decreased approximately 4 pounds, all at the 3-month time point. Adverse effects were statistically similar between the two groups, but three people in the HCG group developed nipple tenderness (though not gynecomastia). This would seem to indicate that HCG may cause a change in fat vs lean body mass at those dosages.

Clinical Trials

In the 1970s, there was a flurry of interest in the United States for the weight loss effects of HCG, followed by a few German articles in the 1980s, and then very little since. After mostly equivocal results, most recommendations were that the HCG protocol was not effective for weight loss and should not be used.

There has been one meta-analysis that encapsulates some of this scientific work.[12] The review examined 24 HCG weight loss studies published between 1966 and 1993, finding 14 randomized controlled trials, only one of which had conclusive data showing positive results (20-pound weight loss over 6 weeks for the HCG group, compared to 11 pounds for the placebo group). Subsequently, an effort to exactly duplicate the methodology of the reported positive study failed to find any difference between placebo and HCG injections.[13] All remaining trials detailed in the meta-analysis failed to find any benefit in weight loss or other measured parameters for HCG injections over placebo. Some of these trials are discussed below.

An example of one of the early clinical trials randomized 40 obese women ages 20-40 years to receive intramuscular HCG (no dose listed) or placebo 6 days weekly for 6 weeks; weight, hunger, localized fat reduction, and mood were measured.[4] Both groups followed a very low-calorie (approximately 500 calories) diet. Seven of the women were excluded from the final analysis, but intention-to-treat analysis was not done, compromising the final results. Both groups demonstrated the same loss of weight, and similarities were found in all other parameters measured.

Another study randomized 202 people to either HCG injections (125 mcg daily for 6 days of the week) or saline placebo injections for 6 weeks, while all were closely following the Simeons diet limited to 500 calories daily.[8] After this initial 6-week period, there was a 6-week "weight maintenance" phase, and then a 6-week crossover treatment period. Measurements were made for body weight and percentage body fat, neither of which was different between the two groups. For example, over 6 weeks, the average body weight loss was 6.8 kg for the HCG group and 7.0 kg for the placebo group. The dropout rates for the HCG and placebo groups were similar between the two (57 and 49, respectively); this is not an easy protocol to follow, presumably accounting for the high dropout rate.

Another research group addressed the difficulties in following this diet by studying hospitalized (and therefore more closely watched and diet-controlled) obese women — six on the HCG injection protocol and five on a placebo injection — for six weeks in a double-blind fashion (randomization not mentioned).[14] Both groups followed a 500 calorie per day diet. Numerous laboratory parameters, skinfold thickness, and circumference in several body areas were measured in the two groups. Results for the two groups for all of these categories were statistically similar; the weight loss was approximately 9 kg. Of note, urinary ketones and serum uric acid increased for both groups during the treatment periods, the latter possibly a concern for people with a history of, or at risk for, gout.

Sounding a bit like a broken record, a more recent study with a similar protocol except for a caloric intake just above 1000 calories daily (to address the blunted metabolic rate that can occur with severe calorie restriction) found no change in any of a myriad of laboratory and clinical measurements between placebo and HCG injections.[15]

The above-mentioned clinical trials all examined the original Simeons protocol using HCG injections for weight loss. More recently, the shift in the public's use of HCG has been to oral administration of HCG, primarily in a homeopathic form. Unfortunately, the medical literature is frustratingly mute on this version of the HCG protocol.

Dosing

There are numerous over-the-counter products with a variety of HCG dosages and forms. It is possible to purchase oral drops, pellets, and sprays, some with proprietary blends of other nutrients, such as amino acids. One product may dose the HCG at 10 drops three times daily, but its homeopathic strength of 6X would be difficult to compare to a 30X form mixed with several amino acids. Another propriety combination of HCG and amino acids (910 nanograms in 10 drops) is dosed 10 drops three times daily. The medical literature does not provide guidance about the most efficacious dosing for these over-the-counter formulations. The use of pharmaceutical-grade injectable HCG first proposed by Simeons and studied by the vast majority of clinical trials is 125 mcg intramuscularly or subcutaneously once daily 6 days per week. The use of recombinant alpha HCG for ovulation induction or assisted reproductive technology, as a comparison, is 250 mcg subcutaneously once daily for just one dose.

Adverse Effects

When adverse effects were followed and detailed, and this was not always the case, most of the clinical trials reviewed above found no significant adverse effect rate differences between the HCG treatment and placebo groups. Notable exceptions are the report of nipple tenderness[11] and laboratory abnormalities (mentioned above), presumably due to the ketosis or rapid weight loss from severe calorie restriction. In addition, one review mentions adverse effects associated with HCG injections might include blood clots, headaches, restlessness, depression, and dizziness, although the source of this information is not listed; it is possible that these events were extrapolated from the use of HCG to treat infertility, given that the on-line drug reference Micromedex mentions thromboembolic disorders and ovarian hyperstimulation syndrome as possible adverse effects.[6] Although not an adverse effect per se, the literature mentions one case of a women with infertility who, upon beginning injections of HCG for weight loss, became pregnant.[15] There are, of course, dangers with rapid weight loss and severe calorie restriction, including the precipitation of gallstones and nutrient deficiencies.

Conclusion

Human chorionic gonadotrophin is a hormone most well-known for its supportive effect in pregnancy, with four different types of HCG having a wide range of effects on the fetus, placenta, and uterus. Less obvious is its relevance to overall adult physiology, in general, and weight loss, in specific, although one small clinical trial using HCG for men with testosterone deficiency did show an increase in lean body mass and body weight (so much for weight loss!) and a loss of body fat mass, supporting the claims of some of the HCG marketing machine. Most of the clinical trials were in the 1970s and 1980s, and followed the original Simeons method of 125 mcg intramuscular HCG administration combined with a 500-calorie diet. Minus one positive result that couldn't be corroborated, without exception, clinical trials failed to demonstrate a weight loss or physiological or psychological benefit to HCG over placebo. Adverse effects of HCG are rare, but may include the precipitation of gout, thromboemolobic events, and hyperstimulation of ovaries. A completely different set of adverse effects are possible when considering the totality of the HCG protocol, which involves a severely low calorie diet.

Recommendations

A risk-benefit approach to the analysis of the HCG diet protocol would dictate to not recommend this weight loss method. HCG injections have been examined and found to not be of use beyond the weight loss that would be expected with a 500-calorie a day diet. In addition, the use of HCG and such severe calorie restriction are not without risks. However, the homeopathic and liquid forms for sale and seemingly widely popular have not been subjected to any clinical trials, so it is difficult to say whether these forms would similarly be ineffective, even though the proposed HCG mechanism does not entirely make sense and would lead us to believe that even the oral HCG alternative to the Simeons protocol would also fail to lead to convincing weight loss. Obesity is on the rise, and many people are desperate for a kick start to lose weight and achieve health; this is the primary reason mentioned for the short-term use of the HCG protocol. Rather than involving HCG, perhaps the ideal approach for our patients does focus on a healthy diet, with calorie restriction in the short term and sustainable long-term changes in eating habits and lifestyle. ■

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Creatine and Age-Related Loss of Muscle Mass and Strength

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CREATINE REMAINS ONE OF THE MOST POPULAR SUPPLEMENTS for athletes, especially to enhance power and speed. A large body of research evidence supports claims that creatine enhances power output during short maximal bursts of exercise, such as power lifting or sprinting.[1] The benefits are noted particularly when short exertions are repeated intermittently in what is called interval training. However, some benefits also have been found for endurance exercise.

Although much of the focus on creatine has been on athletes, maintaining muscle mass and strength is also important for older adults. Aging is associated with loss of muscle mass and decreased strength, which can negatively impact activities of daily living and quality of life.[2] Such changes can increase the risk of falls, which can be a major problem with aging.

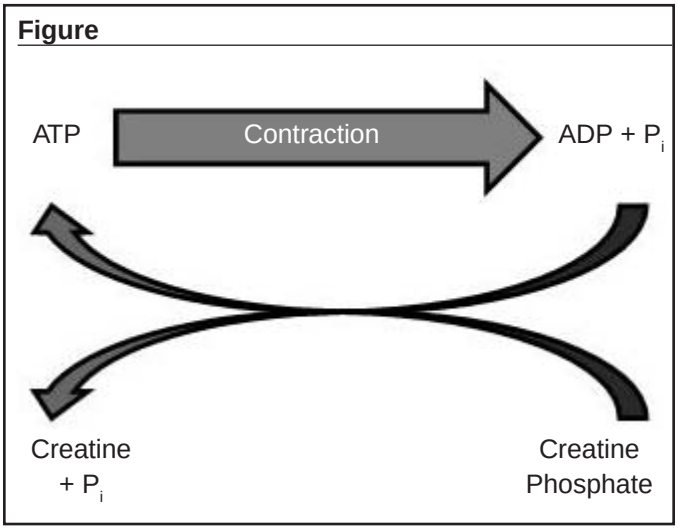
Sarcopenia refers to a condition that occurs when fat-free mass is more than two standard deviations below normal.[3] Approximately 25% of those older than 70 years of age have sarcopenia, increasing to nearly half of those over 80 years.[3] It has been estimated that a 10% reduction in the prevalence of sarcopenia in the United States could save more than $1 billion per year.[4] Resistance training is effective at counteracting sarcopenia, as is testosterone administration.[2] However, concerns about the latter's adverse effects have led to interest in other, safer interventions, with creatine supplementation of major interest. Given the prevalence of sarcopenia, and an aging population, this article will review the available evidence on creatine supplementation to reduce age-related loss of muscle mass and strength.

Background

Creatine is synthesized in the body from the amino acids arginine, glycine, and methionine. Adults generally make 1-2 g of creatine daily, which is later broken down to creatinine and excreted at a rate of about 2 g per day.[2] To provide for additional needs, creatine can be obtained from the diet, especially from meat and seafood.[3]

After synthesis or ingestion, creatine is transported primarily to skeletal muscle where about 95% of the body's creatine is stored. About two-thirds of the creatine in skeletal muscle exists as creatine phosphate (CP), with the remainder found as free creatine.[1] As muscles work, CP is used to replenish adenosine triphosphate (ATP) (*see Figure*). ATP is the muscle's biochemical energy molecule and is converted to ADP as its energy is used. Muscles normally store enough ATP for only a few seconds of exertion, after which CP can provide fuel for an additional 4-6 seconds of intense exercise. This all depends on the muscle's free creatine concentration. Hence, it has been hypothesized that if supplementation increased the muscle's creatine levels, more energy would be available during exercise.

Figure



Table

Biomarker	% increase in subjects 18-36 years	% increase in subjects 52-79 years
Total creatine	21.7	14.9
CP	13.3	8.2
Free creatine	39.3	28.6
ATP	4.2	6.8

Mechanism of Action

Muscle mass and strength decrease by about 1-2% per year after age 50.[3] The number of muscle fibers decreases, but especially type II (or fast-twitch) fibers, which are replaced by intramuscular fat.[4] Type II fibers are particularly high in creatine and CP content. Thus, normal aging and muscle loss reduces stored creatine levels, leaving less energy available for exercise.

Creatine supplementation in older adults is thought to increase creatine and CP levels in muscles, allowing people to exercise longer and at higher intensities, thus stimulating growth in muscle mass and strength. Changes in these physiological parameters have been measured in several studies of both younger and older subjects after creatine supplementation. The results of a meta-analysis of such studies are presented in the Table showing how creatine supplementation impacts these biomarkers.[4]

Clinical Studies

Creatine was first identified in 1832 and its metabolism was studied extensively over the next century.[2] Subsequently, interest faded until the British sprinter, Linford Cristie, revealed in 1992 that he had taken creatine during the preparations that led up to his Olympic gold medal.[2] Shortly afterwards, studies demonstrated that creatine supplements did increase muscle creatine levels and exercise performance.[5] Since then, several hundred studies have been published on the topic.[2] Much of the interest in creatine for older adults is derived from extrapolations from the sports science research.

The first double-blind study to examine creatine use with resistance training in elderly, sedentary adults was published in 1998.[6] Thirty-two men and women (67-80 years old) were randomized into four groups: creatine with resistance training, placebo with training, creatine without training, and placebo without training. None of the participants did weight-lifting before the study, and all were sedentary-to-moderately active. Creatine dose was 20 g/day for 5 days, followed by 3 g/day for a total of 8 weeks. Resistance training was carried out three times a week. No significant changes in body mass or body fat were found in any group. Training groups had significantly increased strength and endurance compared to those not training ($P < 0.02$). Creatine supplementation did not provide any additional benefit.

Three reviews have recently been published and identified a total of 12 relevant trials.[2-4] All 12 studies were randomized, placebo-controlled, and double-blinded. They were similar in enrolling around 20-40 subjects older than age 65 years and either used a creatine protocol similar to that described above or gave subjects 5 g/day for a number of months. The longest study, which lasted 1 year, reported no significant differences between its groups.[7] Out of the 12 studies, seven found significant beneficial effects on fat-free muscle mass and/or strength, and five found no beneficial effects on muscle mass or strength.

The results of all these studies have not been combined into a meta-analysis. Most studies giving creatine supplements without exercise found beneficial effects on muscle mass and strength, but some found no benefits. About half the studies included resistance training programs, again with the majority showing significant benefits, but some not. All of the reviews concluded that creatine supplementation, particularly with resistance training, can have beneficial effects on muscle wasting in older men and women. However, the effects are not consistent, suggesting that other variables need to be considered. Since resistance training itself is known to have beneficial effects, most reviewers recommend combining creatine supplements with exercise.

Some studies have examined the timing of creatine ingestion and suggested that this may be more important than the actual dose of creatine.[8] Exercise stimulates muscle protein degradation and synthesis. Synthesis predominates when protein or amino acids are ingested shortly before or after exercise, hence the current popularity of protein shakes being consumed by athletes immediately after workouts. Part of the reason for these effects is increased blood flow to muscles after exercise. This has been hypothesized as a way to more efficiently transport ingested creatine to muscles. A small number of studies have found that ingesting creatine immediately before and after exercise leads to greater gains in muscle mass than when creatine is ingested in the morning and evening, away from training times.[3]

Adverse Effects

Creatine supplementation among athletes frequently leads to a 1-3 kg weight gain, probably due to intramuscular water retention.[9] Concerns often are raised about cramping when creatine is taken in conjunction with exercise, although this has not been supported by studies.[1] Anecdotal reports claim creatine supplementation can

cause gastrointestinal problems, though these are not frequently reported in studies. One study with older men found significantly more reports of loose stools during creatine loading than with placebo, and during maintenance dosing, more muscle cramping and strains with creatine.[10] Occasional case reports report more serious adverse affects, in particular involving renal and hepatic function, but evidence to support these have not been found in studies.[11] However, those with renal disease or at risk of renal dysfunction are usually recommended to avoid creatine supplementation or monitor renal function carefully if creatine is taken.[1]

Drug Interactions

No drug interactions are known, although concerns about the potential for renal toxicity raise issues about drugs metabolized through the kidneys.

Formulation

Creatine is readily available from meat and fish (containing roughly 4-5 g/kg), and therefore, is classified as a dietary supplement, not a drug. As a supplement, it is most commonly available as a monohydrate in powder, candy, gum, and liquid. Many synthetic derivatives are available, including creatine malate, creatine pyruvate, creatine citrate, creatine-magnesium chelate, creatine ethyl ester, and many more. Claims that any one of these is more effective than another have not been supported in the few independent assessments available.[1] Numerous products combine creatine with vitamins, nutrients, and other supplements, but clinical studies of these were not identified. Athletes usually "load" with 20-25 g creatine per day for 5-7 days (usually 5 g qid), followed by one 2 g daily dose. Studies with older people have used this regimen, or they were given 2-5 g per day.

Conclusion

Numerous studies of creatine supplementation by athletes have demonstrated beneficial effects on muscle mass and strength after high-intensity exercise. Such research with older adults is less extensive. Most, but not all, studies support a beneficial effect on muscle mass and strength either with or without resistance exercise. It remains unclear whether muscle creatine storage decreases with age, or whether this is a function of reduced activity and dietary creatine intake. If it is the latter, this may explain some of the variability obtained in the studies conducted to date.

Recommendation

Resistance training is beneficial in preventing or reversing the loss of muscle mass and strength that occurs with aging. Creatine supplementation alone or in addition to exercise may enhance these effects. Adequate hydration is important to avoid cramping problems. In addition, preliminary results suggest that creatine may have other beneficial effects during aging, particularly a slowing of cognitive decline.[2] However, the equivocal nature of the results to date suggest either that only some people benefit from creatine supplementation, or that more needs to be understood about how creatine is administered. It appears that taking creatine immediately before or after exercise may be more important than how much is taken. While creatine supplements are safe, similar benefits may be obtained from dietary creatine, such as by eating a meal with red meat or seafood immediately before or after exercise. ■

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Sweat Your Heart? Sauna for CHF

ABSTRACT & COMMENTARY

By Russell H. Greenfield, MD, Editor

Synopsis: *The prevalence of chronic heart failure has steadily increased with improvements in survival rates for cardiac patients; however, heart failure remains a disorder whose typically progressive course worsens quality of life, and thus far has defied most conventional medical approaches. New ideas leading to new treatments are needed. The researchers behind this small intervention trial examined the effect of repeated sauna therapy on exercise tolerance in people with congestive heart failure — and found significant benefits.*

Source: Ohori T, et al. Effect of repeated sauna treatment on exercise tolerance and endothelial function in patients with chronic heart failure. *Am J Cardiol* 2012;109:100-104.

The researchers behind this clinical intervention trial sought to assess the impact of Waon therapy (repeated sauna therapy) on exercise tolerance in people with congestive heart failure (CHF). Subjects had to have stable, compensated NYHA functional class II heart failure and/or previous hospitalization for worsening failure to be included in the trial; a total of 41 subjects entered into the protocol (mean age 68 years). Participants underwent Waon therapy with a far-infrared dry sauna (temperature maintained at 60° C) daily on weekdays for 3 weeks (n = 15 sessions) while continuing to receive conventional medical care for CHF. Treatment consisted of the subjects initially sitting in the sauna for 15 minutes, followed by bed rest for 30 minutes while covered with a blanket to maintain warmth. Assessments completed before and after the 3 weeks of intervention included body weight, 6-minute walk distance (6MWD), cardiopulmonary exercise testing in those physically able to pump the pedals of an ergometer (n = 20), and symptom-limited cardiopulmonary exercise testing using expired gas analysis. Vascular endothelial function was evaluated through determination of flow-mediated dilation (FMD) of the brachial artery. Echocardiography was performed, as was measurement of neurohumoral factors and the number of circulating CD34+ cells. Subjects were weighed before and after the therapy and drank water to compensate for the weight loss.

By the end of the 3-week study significant improvements with Waon therapy had been identified, including an increase in left ventricular ejection fraction from 30.4% to 32.5% ($P = 0.023$), an improvement in peak oxygen uptake, slight improvement in left ventricular ejection fraction, a reduction in plasma norepinephrine levels from 400 to 300 pg/mL ($P = 0.015$), a decrease in brain natriuretic peptide from 550-416 pg/mL ($P = 0.035$), improvement in FMD from 3.5%-5.5% ($P < 0.001$), and an increase in 6MWD from 337-379 m ($P < 0.001$). There was also an increase in the number of circulating CD34+ cells ($P = 0.025$). A multivariate analysis revealed that change in FMD was the only independent determinant of change in 6MWD. Findings did not vary according to severity of heart failure or subject age.

The authors concluded that repeated sauna therapy in people with chronic heart failure may improve exercise tolerance in association with improvement in endothelial function.

■ COMMENTARY

The findings from this small study are startling, though perhaps they shouldn't be, as the researchers reference five prior studies suggesting that significant cardiovascular benefits could be expected from repeated sauna therapy. Compelling, however, are the conclusions that three weeks of Waon therapy in people with CHF not only improves exercise tolerance and ejection fraction, but also curtails neurohumoral activation and enhances endothelial function; this in the setting of a disease whose progression typically is deemed inexorable, in large part due to persistent deterioration in endothelial and cardiac function associated with neurohumoral activation and cardiac remodeling. The theory currently holding sway regarding potential mechanistic actions of Waon therapy and its cardiovascular health benefits is that such treatment may increase nitric oxide bioavailability, thus creating a direct

benefit to endothelial function, but not a direct impact on cardiac function.

There is at least one other interesting finding noted by the study authors, that being the effect of Waon therapy on the number of circulating CD34+ cells. These cells are considered to be precursors of endothelial progenitor cells (EPCs), which since being identified in the late 1990s have been used alternately as biomarkers for cardiovascular disease or actual angiogenic therapies that might promote repair of damaged vascular endothelium.[1] This therapeutic approach is in its relative infancy, but interest in it has spawned a large number of research studies in recent years.

It is important to keep in mind that the current study has major limitations, not the least of which are the small sample size, the brief duration of treatment, the lack of a control group, and the short follow-up period. Nonetheless, findings such as these have the potential to leave us with a sense of wonder in the face of complex issues such as heart failure — could it be that a straightforward, inexpensive treatment that raises core body temperature by 1.0-1.2° C is sufficient to help improve cardiovascular fitness in people with CHF? It is too early to say, but there is ample reason for excitement as we await the findings of future studies on the topic that must surely be forthcoming. Sometimes the simple, elegant approach to problems yields important answers — it would be good news for those experiencing CHF, indeed, if such were the case here. ■

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The Portfolio Diet: A Menu for Hyperlipidemia Treatment

ABSTRACT AND COMMENTARY

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Dr. Marcolina reports no financial relationships relevant to this field of study.

Synopsis: *TCVShe cholesterol-lowering foods specified in the portfiolo diet of Jenkins et al are effective treatments for elevated LDL-C levels under real world living conditions. Not surprisingly, overall compliance with dietary instructions regarding portions of the four principal portfolio diet components (tree nuts, soy protein, soluble fiber, and plant sterols and stanols) was significantly associated with percentage reduction of LDL-C in participants completing the study.*

Source: Jenkins DJA, et al. Effect of a dietary portfolio of cholesterol-lowering foods given at 2 levels of intensity of dietary advice on serum lipids in hyperlipidemia. A randomized controlled trial. *JAMA* 2011;306:831-839.

THE PORTFOLIO DIET EFFECTIVELY DECREASES ELEVATED CHOlesterol levels under metabolically controlled conditions and its components (tree nuts, soy protein, soluble fiber, and plant sterols and stanols) are all FDA-approved foods that can claim heart-healthy benefits. This prospective single-blind, controlled, parallel-design study conducted across four Canadian medical centers evaluated the effects of two intensities of portfolio dietary counseling (intensive, consisting of seven total face-to-face counseling sessions, vs routine counseling with only two clinical counseling sessions over the 6-month study interval) compared to a control diet (dietary counseling focused on low fat dairy products, fruit, vegetables and whole grains, excluding specific portfolio components) on 345 hyperlipemic participants (62% female). Inclusion criteria specified men and postmenopausal women in the low (0-10%) and intermediate (10-19%) Framingham 10-year risk categories with LDL-C values ranging from 135-205 mg/dL and 116-178 mg/dL, respectively.

During the 6-month study period, dietitians counseled participants to follow weight-maintenance vegetarian diets from foods purchased in grocery and health food stores. Dietitian counseling sessions were 1 hour in duration for the initial visit and 30-40 minutes at subsequent ones. For the dietary portfolio interventions, dietitians incorporated the specific study foods into the 7-day food diaries of participants. To further facilitate the daily incorporation of the correct portions of each of the portfolio components, participants received a 7-day food checklist with an illustrated reference booklet (*See Table 1*). Consumption of peas, beans, and lentils also were encouraged. All participants received measuring utensils to facilitate portion control compliance. None of the participants took lipid-lowering medications during the study and all lost similar amounts of weight (average loss of 1.2 kg, 1.7 kg, and 1.5 kg for the intensive portfolio, routine portfolio and control diets, respectively). Adherence to the four portfolio components was estimated from 7-day food records kept by each participant, and mean adherence was found to be 46.4% for the intensive and 40.6% for the routine portfolio diets. Lipoprotein profiles and high sensitivity C-reactive protein (hsCRP) levels were obtained at weeks 0 and 24 after dietary treatments.

The investigators noted statistically significant aver-

Table 1. The Portfolio Diet Components for Lowering LDL Cholesterol Levels

Component	Amount	Comments
Nuts	22.5 g/1000 kcal	Can use tree nuts or peanuts (legumes) almonds* — ~19 almonds; calorically dense
Plant sterols	0.94 g/1000 kcal	Available in enriched spreads (Benecol™); equivalent to 2 tablespoon serving size
Soluble fiber	9.8 g/1000 kcal	Viscous fiber available from barley, oats, oatmeal, psyllium (Smart Bran™), okra, eggplant, beans, peas, lentils encouraged
Soy protein	22.5 g/1000 kcal	Soy milk, edamame, soy meat analogues such as tempeh
Other	5-10 servings of fruit and vegetables; limit dairy, meat; use egg substitutes or whites	strawberries** kiwis***

*almonds used in portfolio diet

**supply antioxidants as well as soluble fiber

***reduce triglyceride levels

Adapted from: Jenkins DJ, et al. Effects of a dietary portfolio of cholesterol-lowering foods vs lovastatin on serum lipids and C-reactive protein. *JAMA* 2003;290:502-519.

age reductions in LDL-C levels of 13.1% ($P < 0.001$) and 13.8% ($P < 0.001$) for the routine and intensive portfolio diets, respectively from baseline compared to a 3.0% ($P = 0.06$) reduction in the control diet. The percentage LDL-C reductions for each dietary portfolio arm were significantly greater than the control diet with $P < 0.001$, for both. There were no significant changes in triglycerides or high-density lipoprotein cholesterol (HDL-C) levels. These results were comparable to LDL-C reductions obtained with a combination of a diet low in saturated fat and cholesterol plus first-generation statin therapy with lovastatin.[1] The LDL-C decrements were accompanied by statistically significant decreases in the TC:HDL-C ratios of 8.2% and 6.6% for the routine and intensive dietary portfolio interventions, respectively. There were no significant differences between the dietary portfolio intensities on the lipoprotein profiles. None of the treatments significantly altered C-reactive protein (CRP) levels. The intensive dietary portfolio significantly reduced diastolic blood pressure an average of 2.1 mm compared to the control diet, but did not significantly reduce systolic blood pressure.

The authors concluded that hyperlipidemic patients could significantly lower their LDL-C with the portfolio diet and two sessions of dietary guidance and support over a 6-month period. Given that the patients bought and prepared their own foods during this time, the results demonstrate that this dietary intervention is both feasible for use in the outpatient primary care setting and produces important measurable improvements in LDL-C, an important risk factor for coronary artery disease. Since the patients in this study were predominantly white (79%), with low to intermediate cardiovascular risk, the findings cannot be generalized to other, more diverse, higher risk populations.

■ COMMENTARY

Reducing cardiovascular morbidity and mortality is the objective for hyperlipidemia treatment and generally statins are the drugs best proven to accomplish this, particularly in patients with established cardiovascular disease ([CVD], secondary prevention), diabetes, and in patients without established CVD but at high risk for cardiovascular events (Framingham 10-year risk estimate > 20%). However, for patients at lower risk, as in this study, or for patients who have had adverse effects from or wish to avoid pharmacotherapy, counseling for diet and physical activity modification is the foundation for primary CVD prevention, since dietary approaches can lower total cholesterol, LDL-C, and triglyceride levels, and regular exercise can raise HDL-C levels and lower triglycerides. Thus, both approaches combine to improve the atherogenic lipoprotein profile as well as overall physical and cardiovascular fitness.[2] Since this was not a clinical outcomes study, however, further evaluation is necessary to determine whether cholesterol reduction through the ad-

dition of portfolio foods to daily menus will be associated with a reduction in CVD events.

Nonpharmacologic treatment of hyperlipidemia with the Therapeutic Lifestyle Changes approach has been a recommended initial treatment by the Adult Treatment Panel III of the National Cholesterol Education Program (NCEP) for more than a decade based upon its review of the available evidence in 1999.[3] The Mediterranean diet also has been recognized as a heart-healthy diet that emphasizes intake of tree nuts, monounsaturated fats (such as olive oil), fish, fresh fruit, and vegetables; limited intake of red meat and poultry; and moderate consumption of red wine.

The portfolio diet of Jenkins et al provides a multifaceted approach to improving lipoprotein profiles that offers patients the option to adopt a few or all of the components, depending upon their motivation, food tolerances, underlying cardiovascular risk factors, and lipoprotein levels. The four food elements of this diet contribute toward lipid-lowering effects. Tree nuts have an FDA-approved health claim for decreasing risk of heart disease if eaten as part of a diet low in saturated fat and cholesterol. Since they are calorically dense, a 22.5 g serving most days of the week should be incorporated isocalorically. Almonds are used in the portfolio diet, but walnuts or pecans consumed isocalorically as a 1.5 ounce serving are also FDA approved for the primary prevention of heart disease. Brazil nuts, macademia nuts, cashews, and some types of pine nuts, however, are excluded because of their high saturated fat content.[4]

Plant sterols or phytosterols have a chemical structure similar to cholesterol and compete for absorption in the digestive tract. Intake of 2 g of plant sterols reduces LDL cholesterol by approximately 10%, while higher doses do not further augment cholesterol-lowering effects. They are available commercially in the form of spreads such as Promise and Benecol.[5]

Soy protein promotes enhanced insulin sensitivity in addition to its beneficial effects on lipoprotein profiles.[6]

Other foods recommended in the portfolio diet, such as fruits and legumes, are low glycemic index foods and rich sources of antioxidants and soluble fiber.

In a separate randomized, controlled, 1-month crossover study separated by a 2-week washout, Jenkins et al evaluated the effects of the daily addition of 454 g of strawberries (112 kcal) in place of sweets or an isocaloric portion of oat bran bread to the portfolio diets of hyperlipidemic subjects.[7] The strawberry supplementation reduced oxidative damage to LDL-C, measured as thiobarbituric acid-reactive substances, while maintaining the reductions of LDL-C and TC/HDL-C from the portfolio diet and enhancing its palatability.[8,9]

Another specific fruit enhancement to the portfolio diet is the addition of kiwis, particularly if triglyceride levels are not at NCEP goal. In a small Norwegian randomized, crossover study, consumption of 2 kiwi fruit/day for 28 days reduced triglyceride levels by 15% and platelet aggregation by collagen by 18% compared to the control group.[10]

The present study demonstrated that two moderately short counseling sessions over a 6-month period on the portfolio diet (routine portfolio counseling) are suitable in the ambulatory setting and produce measurable, statistically significant lowering of LDL-C levels and salutary effects on HDL-C in free living (and eating) adults. The study subjects did not have any serious adverse reactions to the prescribed diet, although soy and tree nut allergies are valid reasons for eliminating one or more elements of the diet. Only two study subjects experienced skin rashes, one from soy and one from almonds, and both had positive skin tests that required them to discontinue study participation.

The portfolio diet offers versatile ways in which hyperlipidemic individuals can use daily food choices as opportunities to improve their LDL-C numbers and possibly their CVD risk. Testing the portfolio diet in more diverse patients with clinical outcomes may clarify the use of these specific foods for cardiac risk reduction. ■

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CME Objectives

After completing the program, physicians will be able to:

a. present evidence-based clinical analyses of commonly used alternative therapies;

b. make informed, evidence-based recommendations to clinicians about whether to consider using such therapies in practice; and

c. describe and critique the objectives, methods, results and conclusions of useful, current, peer-reviewed clinical studies in alternative medicine as published in the scientific literature.

CME Instructions

To earn credit for this activity, follow these instructions.

1. Read and study the activity, using the provided references for further research.
2. Log on to www.cmecity.com to take a post-test; tests can be taken after each issue or collectively at the end of the semester. First-time users will have to register on the site using the 8-digit subscriber number printed on their mailing label, invoice or renewal notice.
3. Pass the online tests with a score of 100%; you will be allowed to answer the questions as many times as needed to achieve a score of 100%.
4. After successfully completing the last test of the semester, your browser will be automatically directed to the activity evaluation form, which you will submit online.
5. Once the completed evaluation is received, a credit letter will be e-mailed to you instantly.

CME Questions

1. The original HCG diet and protocol, which was subject to several clinical trials, involves:
a. oral homeopathic HCG and no carbohydrates.
b. 125 mcg intramuscular HCG daily with a 500-calorie diet.
c. weekly 125 mcg HCG injections and 1000-calorie diet.
d. oral homeopathic HCG and no fat diet.

2. Possible adverse effects of the HCG protocol include all of the following *EXCEPT*:
a. ovarian hyperstimulation.
b. precipitation of gallstones.
c. thromboembolic disorders.
d. increased girth and fat mass centrally.
e. nipple tenderness.

3. Creatine is believed to increase muscle mass and strength, thus:
a. preventing muscle injuries.
b. facilitating the transport of oxygen to muscles.
c. increasing the availability of biochemical energy for muscle function.
d. hastening the repair of muscle.

4. Creatine is available in supplements, but is also found in:
a. most vegetables.
b. meat and seafood.
c. fruit.
d. All of the above

5. The beneficial effects of creatine supplementation in older adults may be augmented by:
a. resistance training.
b. taking it immediately before exercise.
c. taking it immediately after exercise.
d. All of the above

6. Components of the portfolio diet include:
a. soluble fiber.
b. soy.
c. nuts.
d. plant sterols.
e. All of the above

7. Intensive dietary counseling for the portfolio diet was found to be superior to routine dietary counseling to lower LDL-C levels.
a. True
b. False

8. Soy protein can enhance insulin sensitivity.
a. True
b. False

In Future Issues:

Yoga for Low Back Pain

Probiotics for Genitourinary Infections