

Weight Management

By Heather Granato, Group Editor

Like Sisyphus endlessly pushing his rock, government health agencies continue to promote moderate exercise and a sensible diet as the keys to long-term weight management for an increasingly obese nation. Unfortunately, the rock these agencies are pushing is getting heavier and the slope steeper, as more than 130 million Americans are estimated to be overweight, with 60 million of those obese. It is more apparent than ever that it will take more than just calorie-controlled portions and sound advice to help consumers take control of their weight.

Overweight and *obesity* are generally defined in terms of body mass index (BMI), a formula of weight-to-height associated with body fat. Overweight is defined as a BMI from 25 to 29.9, with obesity at 30 or above, and extreme obesity greater than 40. While the National Institutes of Health (NIH) noted there was only a 2-percent rise in the prevalence of overweight adults in the United States from 1960 to 2000, the prevalence of obesity rose from 13.3 percent to 30.9 percent, and extreme obesity grew from 0.8 percent to 4.7 percent. Age-adjusted prevalence of obesity among racial/ethnic minorities tends to be higher among black and Hispanic men and women, according to NIH.

However, weight gain doesn't discriminate. A new study sponsored by NIH found more than 90 percent of men and 70 percent of women participating in a 30-year population study became overweight or obese—even if they were of normal weight at the start of the study.¹ Because only white men and women were included in the study, the researchers were unable to ascertain whether the results would apply to other ethnic groups. In addition, younger participants (those under 50 at study start) became overweight or obese at earlier ages than the older participants. The researchers noted, therefore, that the rate of becoming obese or overweight determined in this study may not apply to adults already in middle-age, possibly because they're already there.

"National surveys and other studies have told us that the United States has a major weight problem, but this study suggests that we could have an even more serious degree of overweight and obesity over the next few decades," said Elizabeth G. Nabel, M.D., director of NIH's National Heart, Lung and Blood Institute (NHLBI). "We hope these results will serve as a wake-up call to Americans of all ages. Even those who are now at a healthy weight need to be careful about maintaining energy balance to avoid gaining weight."

Overweight and obesity dramatically increase the risks of developing many types of degenerative health conditions, including cardiovascular disease, Type II diabetes, osteoarthritis and some types of cancer. In addition, increasing rates of obesity are putting a greater strain on health care costs. According to a study of national costs attributed to both overweight and obesity, medical expenses in 2003 were estimated to be \$75 billion, with approximately half of these costs were paid by Medicaid and Medicare.²

While the rate of obesity continues to rise, the number of consumers actively trying to lose weight is growing as well. Researchers from the Centers for Disease Control and Prevention (CDC) estimated

24 percent of men and 38 percent of women are actively trying to lose weight at any given time.³ These researchers found the most common strategies were eating fewer calories, eating less fat and exercising more; however, only one-third of those trying to lose weight reported both eating fewer calories and exercising more.

One of the current areas of scientific focus is **satiety**. This term refers to the feeling of fullness and disappearance of appetite after a meal; it is controlled by the hypothalamus and triggered by various hormones. For example, leptin levels increase when the stomach is full, while ghrelin levels increase when the stomach is empty, triggering the desire to eat.

The increased focus on satiety appears linked to the rationale behind the success of low-carb, high-protein diets. Researchers from Maastricht University, The Netherlands, attributed the role of **protein** in weight management to its ability to increase satiety by inducing thermogenesis and to positively impact body composition.⁴ In addition, a review from the University of Wisconsin-Madison suggested dietary protein increases satiety among persons following a hypocaloric diet, increasing compliance and the efficacy of the weight-loss program.⁵

Clinical studies support the hypotheses. Researchers at the University of Washington, Seattle, sequentially placed overweight subjects (n=19) on three different diets: two weeks weight-maintaining (15 percent protein, 35 percent fat, 50 percent carb); two weeks isocaloric (30 percent protein, 20 percent fat, 50 percent carb); and 12 weeks ad libitum with the same macronutrient percentages as the isocaloric diet.⁶ The isocaloric and ad libitum diets produced significantly increased satiety, with leptin decreases and ghrelin increases in plasma, possibly increasing the central nervous system's sensitivity to leptin and increasing the satiety index. Similar findings were reported by investigators at Virginia Polytechnic Institute, Blacksburg, who found women on a low-carb/high-protein diet had greater weight loss and less hunger perception compared to women on a high-carb/low-fat diet in a six-week intervention.⁷

Long-term results from a study at the Royal Veterinary and Agricultural University, Fredericksberg, Denmark, support these findings.⁸ Fifty overweight and obese subjects followed a six-month, controlled dietary intervention, a six- to 12-month counseling period, and a subsequent two-year follow up that compared ad libitum fat-reduced diets with high or medium protein levels. After six months, the high protein group had greater weight loss than the medium protein group, and after 12 months, there was significantly less dropout in the high protein group. At the 12-month follow up, there was equal weight loss between groups, but the high protein subjects had a greater reduction in abdominal fat; both groups maintained their weight loss over the 24-month follow up.

The type of protein consumed may also impact weight maintenance and other health factors. There has been a great deal of attention paid to **dairy** intake and weight management. Researchers at the University of Tennessee, Knoxville, randomized 32 obese adults to isocaloric diets with supplements of 500 mg/d or 800 mg/d calcium or a high-dairy diet providing 1,300 mg/d calcium with a placebo supplement.⁹ The higher calcium levels were linked with increased weight loss, with the high-dairy diet showing enhanced abdominal fat loss. Further work by the same researchers found isocaloric substitution of yogurt for other foods on a weight loss diet increased calcium intake and augmented weight and fat loss.¹⁰

Calcium itself may work by influencing adipocyte metabolism, inhibiting lipogenesis and stimulating lipolysis, according to a review from the University of Wisconsin, Madison.¹¹ Further, data from the HERITAGE Family Study found a significant association between low calcium intake and increased abdominal adiposity, particularly in men and Caucasian women.¹² Beyond these associations, calcium is a critical component in bone health; there has been concern that low calcium intake during weight-loss diets could adversely impact bone mineral density (BMD). To test the theory, researchers at Rutgers University, New Brunswick, N.J., assessed the influence of caloric restriction with varying levels of calcium intake in 66 overweight postmenopausal women for six months.¹³ At 1 g/d calcium intake, women on the weight-loss diet showed greater losses in BMD than women on a weight maintenance diet; increasing the calcium level to 1.7 g/d during the weight-loss diet mitigated the greater loss.

Soy protein has also been studied in the weight loss field. Researchers at the University of Kentucky, Lexington, compared the effect of milk-based or soy-based meal replacements on weight loss and lipoproteins in overweight or obese men and women.¹⁴ Both types of meal replacements showed benefits in weight loss (9.0 percent of initial body weight for soy, 7.9 percent for milk); however, the group using soy meal replacement showed significantly greater reductions in serum triglycerides, cholesterol and low-density lipoprotein (LDL) cholesterol than did those on the milk meal replacement. A study in 100 obese volunteers using a soy-based meal replacement or control found similar results, with soy formula supplementation associated with a greater weight loss and fat loss, and reductions in both total and LDL cholesterol.¹⁵ And researchers from University Hospital, Freiburg, Germany, found a high soy-protein diet was associated with greater weight and fat loss than lifestyle counseling alone.¹⁶

However, protein intake should be only part of a balanced diet, given studies that have shown the benefits of **fiber** in weight management and satiety. A review from the University of Minnesota, St. Paul, noted there is strong epidemiologic support that fiber intake can prevent obesity; among the suggested mechanisms of action are promoting satiety, decreasing absorption of other macronutrients, such as fat, and altering secretion of gut hormones.¹⁷ A recent position statement from the American Dietetic Association further advised adults should consume between 20 and 35 g/d of dietary fibers from plants to promote health and reduce the risk of disease, reporting fiber's link to preventing obesity lies in its ability to promote earlier satiety.¹⁸

One specific dietary fiber studied for its impact on obesity is **glucomannan**. A review from the Universidad de Leon, Spain, noted glucomannan has the highest molecular weight and viscosity of any known dietary fiber, with consumption creating a sensation of satiety.¹⁹ Administration of glucomannan with meals also appears to also slow carbohydrate absorption and postprandial glucose response by up to 50 percent.²⁰ Researchers at the University of Tromsø, Norway, compared the effect of glucomannan alone, or in combination with guar gum and alginate, on weight loss in 176 overweight men and women.²¹ Adding the fiber supplements to an isocaloric diet significantly increased weight loss compared to the diet alone; however, there was no additional benefit to combining other fibers with glucomannan.

There are several dietary ingredients that also appear to work on satiety, in conjunction with other benefits to weight management. One of the best known botanical compounds in this area is **Garcinia cambogia**; the extract **(-)-hydroxycitric acid (HCA)** has been studied for its role in appetite

suppression and fat loss. HCA appears to reduce food consumption by diverting carbohydrates away from fat synthesis and toward stored glycogen, thereby signaling satiety,²² and stimulating serotonin release to balance mood.²³ A gene study conducted at Ohio State University Medical Center, Columbus, found HCA (as Super CitriMax®, from InterHealth Nutraceuticals) upregulated an entire family of genes involved in serotonin signaling.²⁴ And most recently, a study presented at the Experimental Biology 2005 conference indicated HCA (as Super CitriMax) could reduce levels of a neuropeptide in the hypothalamus that is linked to increased appetite.²⁵

HCA also works to impact fat oxidation. Japanese researchers found ingestion of 500 mg/d of HCA in untrained men significantly increased fat oxidation during endurance exercise.²⁶ Similar results were reported by Korean researchers, who gave 250 mg/d of HCA to untrained women for five days; supplementation significantly increased exercise time to exhaustion as well as fat metabolism.²⁷ And in trained athletes, short term administration of HCA enhances endurance performance by increasing fat oxidation, sparing glycogen utilization.²⁸

InterHealth researchers noted in a recent publication the structural characteristics of Super CitriMax (as a Ca(2+)/K(+) bound HCA salt) make the compound water-soluble and bioavailable, and supply additional compounds of interest in weight management.²⁹ Among these are calcium, which is associated with increased lipid metabolism, and **potassium**, which increases energy and muscle strength. In addition, Super CitriMax has been found safe in both in vitro and clinical trials employing up to 2,800 mg/d HCA.³⁰

One of the newer botanical players in the satiety arena is *Hoodia gordonii*, a South African plant reportedly consumed by natives of the Kalahari Desert to suppress appetite and thirst. A recent study from Brown Medical School in Providence, R.I., found a glycoside from hoodia appeared to increase adenosine triphosphate (ATP) content in hypothalamic neurons, with significant reduction in food intake by animals given the extract.³¹ The scientists also found injection of the hoodia extract prevented a 50-percent decline in hypothalamus ATP levels in animals fed a low calorie diet, compared to the animals only on the reduced calorie diet

Another new compound in the satiety area is a combination of **oat** and **palm oils** (patented as Fabulesse™, from DSM Food Ingredients). Polar lipids from the oat oil extract enclose palm oil droplets, preventing digestion of the palm oil until it reaches the small intestine. When the palm oil reaches the ileum, it is interpreted as undigested fat, which signals the brain to trigger satiety hormones. A series of studies at the University of Ulster, Northern Ireland, examined the effects of this patented fat emulsion on energy and macronutrient intakes in non-obese subjects. In the first double blind, placebo-controlled study, 59 normal-weight subjects received 200 g of yogurt with 6 g milk fat or 1 g milk fat plus 5 g Fabulesse.³² At four hours post-consumption, participants were given ad libitum access to a range of foods; calorie and fat intakes were significantly lower following ingestion of the test yogurt, suggesting increased satiety at four hours. In the second study, intake of the same yogurt formula increased satiety in non-overweight, overweight and obese individuals (n=60) at eight hours post-ingestion.³³ Finally, in a study of 50 non-overweight subjects, researchers provided a 200 g portion of yogurt with 0, 2, 4 or 6 g of the test compound; relative to the control yogurt, there was a dose-dependent decrease in total calorie, fat, protein and carbohydrate intake over 36 hours.³⁴

Another new ingredient in the appetite suppression area is **pinolenic acid**, extracted from the Korean pine-nut. Unpublished research on the compound (as PinnoThin™, from Lipid Nutrition) found 3 g of pinolenic acid the release of the hunger-suppressing hormone cholecystokinin (CCK).

Burning Fat, Building Muscle

Even as there is a growing interest in satiety-promoting ingredients, the majority of compounds of interest in the weight management category are those that help "burn" fat and increase lean muscle mass. The concept of "thermogenesis"—increasing the metabolic rate to burn more fat—remains appealing as most adults' resting metabolic rate decreases with age and higher percentages of body fat.

With ephedra off the market, manufacturers who are interested in thermogenic compounds are increasingly turning to **bitter orange** (*Citrus aurantium*). In a review from Georgetown University Medical Center, researchers noted bitter orange appears to increase weight loss and fat loss in dieting individuals and concluded it may be "the best thermogenic substitute for ephedra."³⁵ The active agents in *C. aurantium* are its alkaloids, including synephrine, hordenine, octopamine, tyramine and N-methyltyramine. There has been some question as to whether *C. aurantium* contains both the p- and m-isomers of synephrine;³⁶ however, independent lab testing conducted by Chromadex on the patented *C. aurantium* extract Advantra Z® (distributed by Nutratech) found that patented extract does not contain the potentially harmful compound m-synephrine but contains p-synephrine.

There have been several recent studies using *C. aurantium* that underscore the usefulness of the compound in weight loss. In a study conducted at Greenwich Hospital, Connecticut, researchers examined the effect of bitter orange, caffeine and St. John's wort on body fat loss, lipid levels and mood states in overweight healthy adults.³⁷ The treatment group received 975 mg/d of *C. aurantium* (as Advantra Z), 528 mg/d of caffeine and 900 mg/d of St. John's wort. At the end of the study period, the treatment group exhibited a significant loss of body weight and fat compared with placebo and control groups.

In another clinical trial, researchers at the McGill Nutrition and Food Science Centre at Royal Victoria Hospital in Montreal found thermic response to bitter orange (as Advantra Z) increased metabolic rate in men and women, with men showing a higher response when the supplement was taken without food and women's rate increasing when taken concurrent with a meal.³⁸ There was no effect on blood pressure. These findings confirmed earlier unpublished work from the same researchers, in which obese women taking bitter orange (as Advantra Z) showed a significantly greater thermogenic response to meals, with no increase in heart rate or blood pressure.

This is an important note, as a great deal of the concern with ephedra centered on its possible adverse impacts on cardiovascular function and blood pressure. However, a new study published in the *American Journal of Medicine* and conducted at the University of California, San Francisco, examined the impact of *C. aurantium* alone or in a formula on blood pressure.³⁹ Ten healthy adults took single doses of 46.9 mg *C. aurantium* (as Advantra Z), a multi-component formulation including 5.5 mg *C. aurantium* (as Xenadrine EFX, from Cytodyne), and placebo, with one-week washout periods between treatments. Xenadrine EFX supplementation produced increases in systolic and

diastolic blood pressure—possibly due to caffeine and other stimulants in the formulation—while treatment with straight *C. aurantium* at an eight-fold higher dose did not affect blood pressure.

There is also growing interest in the use of **green tea** for its thermogenic properties. In mice, green tea has been found to decrease leptin levels and suppress adipose tissue development and food intake.⁴⁰ It also appears to modulate the glucose uptake system in adipose tissue while suppressing expression of certain transcription factors.⁴¹ And while some studies have suggested a good degree of green tea's benefit in weight management is the impact of its caffeine content on fat oxidation and thermogenesis,⁴² others found a there is a greater degree of brown adipose tissue thermogenesis with green tea consumption than could be solely attributed to caffeine.⁴³

The synergy includes not only the caffeine content, but also the polyphenol catechins, including epigallocatechin gallate (**EGCG**) and amino acids such as **theanine**. In fact, Japanese researchers found caffeine and theanine (as Suntheanine®, from Taiyo International) helped suppress weight increases, with catechins showing synergistic abilities.⁴⁴

EGCG has also been investigated on its own for its contribution to weight management. In vitro studies suggest EGCG can reduce preadipocyte growth⁴⁵ and induce apoptosis of mature adipocytes.⁴⁶ In an animal study, researchers at the German Institute of Human Nutrition, Potsdam, examined the impact of 500 mg/kg orally administered EGCG (as TEAVIGO®, from DSM Nutritional Products) on body fat accumulation and energy expenditure.⁴⁷ EGCG dose-dependently reduced body fat accumulation, possibly through a combination of increased fat oxidation and decreased fat digestibility. In another study, conducted by DSM researchers, administration of EGCG to rats prevented diet-induced increases in body weight, and decreased both subcutaneous and epididymal adipose tissue weights.⁴⁸

Another compound investigated for its impact on thermogenesis is a metabolite of dehydroepiandrosterone (DHEA), 3-acetyl-7-oxodehydroepiandrosterone (**7-oxo-DHEA**, patented as 7-Keto®, from Humanetics Corp.). Multiple clinical studies have investigated the ability of 7-Keto to support weight loss. In a double blind, placebo-controlled trial of 30 obese adults found compared to placebo, 100 mg twice daily of 7-Keto significantly increased the amount of body weight lost and tripled the amount of fat reduction.⁴⁹ Further research using a specialty formula (Naturalean™, from Humanetics) that included 7-Keto plus L-tyrosine, asparagus root extract, choline, inositol, copper, manganese and potassium also found the formula helped obese patients lose more weight and reduce BMI over an eight-week period.⁵⁰ In addition, 7-Keto was shown in a recent study to increase the resting metabolic rate (RMR) in overweight subjects during a period of calorie restriction, whereas subjects taking placebo showed an expected decline in RMR.⁵¹

Conjugated linoleic acid (CLA) has been extensively studied for its ability to maintain lean muscle mass and promote fat loss.⁵² Researchers from North Carolina State University, Raleigh, noted CLA's mechanisms of action are still largely unknown, although it appears to modulate energy expenditure, fatty acid oxidation, lipolysis and lipogenesis.⁵³

A review from Utrecht University, Netherlands, noted animal studies have consistently shown CLA reduces body fat; however, results of human studies have not been as positive.⁵⁴ The review stated CLA may have a tendency to increase lean body mass, but the effect appears to be considerably less

than that anticipated from animal studies. Another review from the University of Reading, Whiteknights campus, Reading, England, echoed those findings, and noted there is marked variation among studies of CLA in humans, with some isomer-dependent influences on the outcomes.⁵⁵

However, intervention studies using proprietary CLA compounds have shown both short-term and long-term benefits to the use of CLA on body fat mass. In a four-week trial, men taking 4.2 g/d of CLA (as Tonalin®, from Cognis Nutrition & Health) showed a significant decrease in abdominal diameter.⁵⁶ Similar results were seen in a 12-week intervention in 60 overweight or obese subjects, who received 1.7, 3.4, 5.1 or 6.8 g/d of CLA (as Tonalin).⁵⁷ There was a significantly higher reduction in body fat mass in the CLA groups compared to placebo, with a significant reductions reported in the 3.4 and 6.8 g/d groups.

Results from a one-year study using CLA (as Tonalin) were published in the *American Journal of Clinical Nutrition* in early 2004.⁵⁸ The double blind, placebo-controlled study randomized 180 men and women with a BMI of 25 to 30 into three groups to receive a placebo or 4.5 g/d of CLA (as Tonalin) in free fatty acid or triglyceride form. Researchers found a significant decrease in body fat mass in both CLA groups by as much as 9 percent; the CLA free fatty acid group also had an increase in lean body mass compared to placebo. The results were not attributable to changes in diet or exercise, and no adverse events were reported. And in an open-label, one-year continuation of that study, researchers reported CLA supplementation helped maintain fat loss and lean body mass.⁵⁹ Interestingly, at the end of the two-year period, CLA was also found to lower levels of leptin, promoting better sensitivity to the hormone and helping satiety.

Another botanical compound, *Coleus forskohlii*, and its root extract, **forskolin**, have been studied for their impact on weight management. Sabinsa, which supplies the branded ingredient ForsLean®, holds a patent on the use of forskolin for its ability to reduce fat and support lean muscle mass. In an eight-week study, 500 mg/d of forskolin (as ForsLean) significantly decreased body weight and fat content, but increased lean body mass in six overweight women.⁶⁰ In a larger study, 23 females received 250 mg/d twice daily (as ForsLean) or a placebo for 12 weeks; supplementation was found to stabilize body mass while increasing perception of satiety, mitigating weight gain in the study population.⁶¹ More recently, Japanese researchers found administration of a forskolin extract to obese rats reduced body weight, food intake and fat accumulation.⁶²

Another important compound in the lean muscle arena is **L-carnitine**, an amino acid that works in the body to transport fatty acids into the mitochondria for energy production and may also influence glucose metabolic rate in skeletal muscle, benefiting lean body mass.⁶³ Researchers from the University of Rostock, Germany, examined the ability of L-carnitine to impact fatty acid oxidation.⁶⁴ In 12 slightly overweight adults, 3 g/d of L-carnitine (as L-Carnipure®, from Lonza) for 10 days significantly increased fat oxidation without adversely impacting protein catabolism. The findings were similar to those in earlier research, in which L-carnitine (as L-Carnipure) stimulated fatty acid metabolism.⁶⁵

However, additional animal studies have not found significant benefits to L-carnitine supplementation on fat loss. A study in trained rats given L-carnitine (28 mg x kg(-1)) for two weeks before sacrifice found no difference in fat mass loss between the supplemented rats and those that did not receive

L-carnitine.⁶⁶ And a study in rats given an energy-reduced diet found no benefit to fat loss in those animals given L-carnitine compared to control rats.⁶⁷

The botanical compound **banaba** (*Lagerstroemia speciosa* L.) also has effects in weight management, as its ellagitannins appear able to increase glucose uptake by adipocytes, lowering blood glucose levels.⁶⁸ In addition, banaba extract may increase the expression of PPAR-gamma, a transcription factor that regulates the development of adipocytes.⁶⁹ Studies on a specialized banaba extract (as GlucoTrim®, from OptiPure/Soft Gel Technologies) support this mechanism theory, noting the absence of adipocyte differentiation activity and inhibition of that activity suggests the compound may prevent obesity in Type II diabetics.⁷⁰ In fact, in a study of genetically diabetic female mice, administration of banaba extract was found to attenuate weight gain and adipose tissue weight.⁷¹

While many compounds serve a thermogenic role in the body or impact glucose maintenance, another category of compounds is designed to block the body's uptake of certain nutrients, reducing caloric absorption. The best known "carb blocker" ingredient is an extract of **white kidney bean** (*Phaseolus vulgaris*). The purified extract binds with alpha-amylase, the enzyme responsible for digesting starch, decreasing caloric impact. A study at the Rowett Research Institute in Aberdeen, Scotland, tested the impact of different levels of white kidney bean in the diet of obese rats.⁷² Inclusion of the compound reduced weight gain, even when lipid content of the diet was significantly increased. Spanish researchers reported similar results in an animal study, with acute administration of white kidney bean extract together with a starch load reducing blood glucose levels, caloric intake and body weight gain.⁷³

A recent clinical study investigated the effects of white kidney bean extract (as Phase 2®, from Pharmachem Laboratories) or placebo in 50 obese adults for eight weeks.⁷⁴ Researchers saw a greater weight loss (an average of 3.79 pounds) in the group receiving Phase 2 compared to the control group (an average of 1.65 pounds). The kidney bean extract also lowered triglyceride levels by an average of 26 mg/dL—more than three times the reduction observed in the placebo group. The researchers concluded Phase 2 may be a potential adjunct therapy in treating obesity and hypertriglyceridemia, although further studies with larger numbers of subjects are warranted to conclusively demonstrate effectiveness.

On the fat-binding side, the best known ingredient is **chitosan**, an extract of shellfish that reportedly works by binding to fat in the gastrointestinal tract, blocking its uptake. Studies, however, have been inconclusive. One study in 50 obese women found consumption of 1,500 mg of chitosan before each main meal significantly improved weight loss over a placebo.⁷⁵ But another study in 250 obese men and women taking 3 g/d of chitosan found no significant impact.⁷⁶ A 2005 *Cochrane Database Review* examined 14 different studies and concluded there is some evidence that chitosan is more effective than placebo in the short-term treatment of overweight and obesity; many trials reviewed were of poor quality, yet the data from higher-quality trials suggests chitosan's impact on weight management may be negligible.⁷⁷

A more recent addition to the fat-binder category in the United States is **prickly pear (nopal) cactus**, the leaves of which have been traditionally consumed in Mexico for heart health and weight management. Clinical studies on a standardized prickly pear extract (NeOpuntia®, from BioSerai Laboratories) support the observational findings. In a pilot clinical study, 10 healthy volunteers

received 1.6 g of NeOpuntia per meal or a placebo.⁷⁸ The quantity of fat content excreted versus the quantity ingested increased by 27 percent in the treatment group compared to the placebo group. An earlier study investigating the mechanism of action in a gastrointestinal (GI) model found 2 g of NeOpuntia prevented the absorption of 2.7 g of fatty acids during a four-hour GI exposure.⁷⁹

With continued attention being paid to the health costs of excess weight, consumers certainly will continue to turn to natural products for their weight management endeavors. Providing scientifically-substantiated ingredients in safe and efficacious formulas can provide these consumers the added support they need to take control of their weight and long-term well-being.

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