

- Preuss, H.G., Rao, S.C.V., Garis, R.I., Bramble, J.D., Ohia, S.E., Bagchi, M., & Bagchi, D. (2004). An overview of the safety and efficacy of a novel, natural (–)-hydroxycitric acid extract (HCA-SX) for weight management. *Journal of Medicine*, 35(1–6), 33–48. [PubMed](#)
- Ray, S., Phadke, S., Patel, C., Hackman, R.M., & Stohs, S. (2005). Short-term and long-term in vivo exposure to an ephedra- and caffeine-containing metabolic nutrition system does not induce cardiotoxicity in B6 C3 F1 mice. *Archives of Toxicology*, 79, 330–340. [PubMed doi:10.1007/s00204-005-0672-6](#)
- Shara, M., Ohia, S.E., Schmidt, R.E., Yasmin, T., Zardetto-Smith, A., Kincaid, A., . . . Stohs, S.J. (2004). Physicochemical properties of a novel (–)-hydroxycitric acid extract and its effect on body weight, selected organ weights, hepatic lipid peroxidation and DNA fragmentation, hematology and clinical chemistry, and histopathological changes over a period of 90 days. *Molecular and Cellular Biochemistry*, 260, 171–186. [PubMed doi:10.1023/B:MCBI.0000026069.53960.75](#)
- Shara, M., Ohia, S.E., Yasmin, T., Zardetto-Smith, A., Kincaid, A., Bagchi, M., . . . Stohs, S.J. (2003). Dose- and time-dependent effects of a novel (–)-hydroxycitric acid extract on body weight, hepatic and testicular lipid peroxidation, DNA fragmentation and histopathological data over a period of 90 days. *Molecular and Cellular Biochemistry*, 254, 339–346. [PubMed doi:10.1023/A:1027358106407](#)
- Soni, M.G., Burdock, G.A., Preuss, H.G., Stohs, S.J., Ohia, S.E., & Bagchi, D. (2004). Safety assessment of (–)-hydroxycitric acid and Super CitriMax, a novel calcium/potassium salt. *Food and Chemical Toxicology*, 42, 1513–1529. [PubMed doi:10.1016/j.fct.2004.04.014](#)
- Stohs, S.J. (2009). Assessment of the adverse event reports associated with *Citrus aurantium* (bitter orange) from April 2004 to October 2009. *Journal of Functional Foods*, 2(4), 235–238. [doi:10.1016/j.jff.2010.10.003](#)
- Stohs, S.J., & Preuss, H.G. (2011). The safety of bitter orange (*Citrus aurantium*) and its primary protoalkaloid *p*-synephrine. *HerbalGram*, 89, 34–39.
- Stohs, S.J., Preuss, H.G., Ohia, S.E., Kaats, G.R., Keen, C.L., Williams, L.D., & Burdock, G.A. (2010). Safety and efficacy of hydroxycitric acid from *Garcinia cambogia*—A literature review. *HerbalGram*, 85, 58–63.
- Stohs, S.J., Preuss, H.G., & Shara, M. (2011a). Review of the receptor binding properties of *p*-synephrine as related to its pharmacological effects. *Oxidative Medicine and Cellular Longevity*, 2011, 482973. Epub August 1.
- Stohs, S.J., Preuss, H.G., & Shara, M. (2011b). The safety of *Citrus aurantium* (bitter orange) and its primary protoalkaloid *p*-synephrine. *Phytotherapy Research*, 25, 1421–1428. [PubMed doi:10.1002/ptr.3490](#)
- Stohs, S.J., & Shara, M. (2012). A review of the safety and efficacy of bitter orange (*Citrus aurantium*) and its primary protoalkaloid *p*-synephrine in weight management. In D. Bagchi & H. Preuss (Eds.), *Obesity: Epidemiology, Pathophysiology and Prevention* (2nd ed., pp. 535–554). Boca Raton, FL: CRC Press.
- Uckoo, R.M., Jayaprakasha, G.K., Nelson, D.S., & Patil, B.S. (2011). Rapid simultaneous determinations of amines and organic acids in citrus using high-performance liquid chromatography. *Talanta*, 83, 948–954. [PubMed doi:10.1016/j.talanta.2010.10.063](#)
- Wu, X., Xu, X., Shen, J., Perricone, N.V., & Preuss, H.G. (2010). Enhanced weight loss from a dietary supplement containing standardized *Phaseolus vulgaris* extract in overweight men and women. *Journal of Applied Research*, 10, 73–79.

Ephedra, Bitter Orange, and Hydroxycitric Acid as Effective Weight-Loss Supplements: Do We Recommend Them to Consumers?

In the preceding letter, Stohs et al., addressing bitter orange, ephedra, and hydroxycitric acid (HCA), argue that these products are safe and effective weight-loss supplements. They defend their claims with animal and human research that is more supportive of their position than that provided by my review article (Manore, 2012). Although some research does report statistically significant weight or body-fat losses with these products, the amount of weight or fat loss is low and there are numerous issues that need to be considered before a health professional can recommend these products to consumers. Some of these considerations are given below.

Regulation of Supplements. Over-the-counter weight-loss supplements are not regulated in many countries, so what is listed on the label may or may not be in the bottle. This makes it difficult for any health professional to recommend the supplement to a client, especially if the client is a competitive athlete who may be required to

undergo drug testing or an overweight or obese individual who may have other health issues such as cardiovascular disease, diabetes, or hypertension and may be using prescription medications.

How Weight or Fat Loss Is Reported. As mentioned earlier, the amount of weight loss observed, above that seen in the placebo group, is not large (<5 kg) and typically in the 2- to 3-kg range. This level of weight loss is much lower than most consumers are expecting and desire. Although the amount of weight or fat loss with the supplement may appear to be substantial, it is always important to observe the weight and fat loss in the placebo group, as well. For example, Hackman et al. (2006) reported their treatment group receiving ephedra and caffeine lost 7.18 kg, but the placebo group also lost weight (2.25 kg), so the difference between the groups was 4.9 kg. The fat loss was no more dramatic; subjects in the treatment group lost 4.3 kg more than the controls.

Incidentally, in that particular study, body composition was measured using bioelectrical impedance, which can have significant error associated with its use if hydration status is not verified. In any case, does this level of weight or fat loss over a 9-month period warrant recommendations for the use of the supplement, which is banned for use in sport or for sale in some countries?

Another example comes from the chitosan research mentioned by Stohs et al and done by Kaats, Michalek, and Preuss (2006). They fed 3,000 mg/day of chitosan for 60 days and found a 1.6-kg greater weight loss and 1.1-kg greater fat loss in the treatment group than in the placebo group. These results were statistically significant, yet the question is whether the increased weight and fat loss outweigh the cost (~\$40–45) and the gastrointestinal distress that may occur. In addition, if the benefit of chitosan is attributed to its fiber action, and not its fat-binding capacity, are there other dietary fibers we could encourage individuals to consume that would be cheaper and have fewer side effects, yet with equal or better benefits? Because chitosan is derived from shellfish, individuals who have allergies to shellfish cannot use this product.

Finally, Stohs et al also mention the work of Wu, Xu, Shen, Perricone, and Preuss (2010) showing positive weight loss with *Phaseolus vulgaris* (a starch blocker) when giving 1,000 mg before each meal. Although the treatment group had significant weight loss, they had only lost 1.5 kg more than the placebo group after 60 days. No assessment of body-fat loss was done. As I mentioned in my review, these products can produce statistically significant weight loss (1–2 kg), but can they produce long-term weight loss that lowers health risks for a low cost and few risks?

The Context in Which a Weight-Loss Supplement Is Used. Most weight-loss supplements are tested in the context of a reduced-energy-intake diet, with or without physical activity. However, this is not how the consumer may use the product, initially or in the long term.

Combined Weight-Loss Supplements. s indicated by both Stohs et al. and myself most weight-loss supplements are sold in combination with other products, making it almost impossible to determine which particular ingredient is contributing to the weight loss or the adverse effects of the product.

Adverse Events. Overall, the research literature is equivocal when reporting negative side effects associated with weight-loss supplements. Some researchers report negative effects, while others do not. In the case of ephedra, the supplement is banned due to these adverse effects. For HCA the reports are mixed. For example, Onakpoya, Hung, Perry, Wider, and Ernst (2011) critically reviewed the efficacy of HCA and found a 0.88-kg greater weight loss with supplementation than with placebo. They also found that most studies, but not all, reported adverse events, with adverse gastrointestinal events being most common. Overall, their review concluded that

“randomized clinical trials (RCTs) suggest that HCA can cause short-term weight loss. The magnitude of the effect is small, and the clinical relevance is uncertain. Future trials should be more rigorous and better reported.”

Length of Testing. The length of the research studies testing weight-loss supplements is typically <16 weeks and more frequently 10–12 weeks, with few studies last longer than 3 months. None follows the use of the product long term. Thus, long-term use of weight-loss supplements for continued weight loss or weight maintenance still needs to be addressed.

Summary. In summary, my review article was designed to give an overview of the weight-loss-supplement research literature and not a detailed review of each potential weight-loss supplement, many of which could merit their own review. Thus, not every research article could be cited and discussed. Furthermore, MEDLINE was the primary database searched for human studies; Stohs et al. cite animal research and other references not found in MEDLINE. Overall, without government oversight to ensure that products are tested for purity and safety, there is little reason to recommend the products, especially when the total weight loss and cost do not merit the risk. It is always reasonable for health professionals and consumers to ask the question, Do the costs and expected outcome (e.g., weight or fat loss) outweigh the risk? This provides more realistic information with which to make a decision.

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References

- Hackman, R.M., Havel, P.J., Schwartz, H.J., Rutledge, J.C., Watnik, M.R., Noceti, E.M., . . . Keen, C.L. (2006). Multinutrient supplement containing ephedra and caffeine causes weight loss and improves metabolic risk factors in obese women: a randomized controlled trial. *International Journal of Obesity (London)*, 30(10), 1545–1556.
- Kaats, G.R., Michalek, J.E., & Preuss, H.G. (2006). Evaluating efficacy of a chitosan product using a double-blinded, placebo-controlled protocol. *Journal of the American College of Nutrition*, 25(5), 389–394.
- Manore, M.M. (2012). Dietary supplements for improving body composition and reducing body weight: Where is the evidence? *International Journal of Sport Nutrition and Exercise Metabolism*, 22(2), 139–154.
- Onakpoya, I., Hung, S.K., Perry, R., Wider, B., & Ernst, E. (2011). The use of garcinia extract (hydroxycitric acid) as a weight loss supplement: A systematic review and meta-analysis of randomised clinical trials. *Journal of Obesity*, 509038. Epub December 14, 2010.
- Wu, X., Xu, X., Shen, J., Perricone, N., & Preuss, H. (2010). Enhanced weight loss from a dietary supplement containing standardized *Phaseolus vulgaris* extract in overweight men and women. *Journal of Applied Research*, 10(2), 73–79.

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