Appetite 113 (2017) 264–273

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Effects of twelve weeks of capsaicinoid supplementation on body composition, appetite and self-reported caloric intake in overweight individuals

Stacie L. Urbina [a], Michael D. Roberts [b], Wesley C. Kephart [b], Katelyn B. Villa [a], Emily N. Santos [a], Alyssa M. Olivencia [a], Haley M. Bennett [a], Marissa D. Lara [a], Cliffa A. Foster [a], Martin Purpura [c], Ralf Jäger [c], Lem W. Taylor [a], Colin D. Wilborn [a, *]

[a] Human Performance Laboratory, University of Mary Hardin-Baylor, Belton, TX 76513, United States
[b] Auburn University, Auburn, AL 36849, United States
[c] Increnovo LLC, 2138 E Lafayette Pl, Milwaukee, WI 53202, United States

ARTICLE INFO

Article history:
Received 5 August 2016
Received in revised form
17 January 2017
Accepted 18 February 2017
Available online 21 February 2017

Keywords:
Capsaicinoids
Waist circumference
Appetite
Metabolic health

ABSTRACT

We examined if 12 weeks of capsaicinoid (CAP) supplementation affected appetite, body composition and metabolic health markers. Seventy seven healthy male and female volunteers (30 ± 1 y, 171.2 ± 9.8 cm, 81.0 ± 2.2 kg, 27.5 ± 0.6 kg/m^2) were randomly assigned to ingest either low-dose CAP (2 mg/d; L-CAP, n = 27), high-dose CAP (4 mg/d; H-CAP, n = 22) from Capsimax or placebo (corn starch; PLA, n = 28) for 12 weeks. At baseline (0 WK), 6 weeks (6 WK) and 12 weeks (12 WK) waist: hip ratio, body composition via dual energy x-ray absorptiometry (DEXA, 0 WK and 12 WK only), self-reported Calorie intakes, appetite levels via Council on Nutrition Appetite Questionnaire (CNAQ) and serum metabolic health markers (0 WK and 12 WK only) were analyzed. Moreover, an oral glucose tolerance test (OGTT) was administered at 0 WK and 12 WK, and serum glucose and insulin responses were examined 30–120 min post test-drink consumption. Waist: hip ratio significantly decreased in L-CAP from 0 WK to 6 WK ($p < 0.05$), although supplementation did not significantly affect body composition. H-CAP consumed less kcal/d compared to PLA at 12 WK (difference = 257 kcal/d, $p < 0.05$) and L-CAP participants at 12 WK (difference = 247, $p < 0.05$). Twenty-three percent (9/39) of the originally-enrolled H-CAP participants reported GI distress, although no participants in the L-CAP group reported such adverse events. Interestingly, H-CAP participants presented significant increases in serum insulin as well as significant decreases in serum HDL cholesterol levels from WK0 to WK12. However, supplementation did not affect the insulin response to the administered OGTT and/or other indices of insulin sensitivity. These data suggest that H-CAP supplementation reduces self-reported energy intake after 12 weeks of supplementation, and L-CAP supplementation also reduces waist: hip ratio. Longer-term effects of capsaicinoid supplementation on basal insulin and cholesterol levels warrant further investigation.

1. Introduction

Capsaicinoids are 9–11-carbon bioactive vanillylamides isolated from chili peppers (Aza-Gonzalez, Nunez-Palenius, & Ochoa-Alejo, 2011). While numerous capsaicinoid compounds exist, it has been estimated that capsaicin and dihydrocapsaicin make up over 80% of the capsaicinoid species in *Capsicum* plants (Aza-Gonzalez et al., 2011). Dietary supplementation with capsaicinoids has been reported to exhibit a myriad of physiological effects. In particular, studies have reported that acute capsaicinoid ingestion can acutely reduce appetite (Janssens, Hursel, & Westerterp-Plantenga, 2014;

* Corresponding author. Human Performance Laboratory, University of Mary Hardin-Baylor UMHB, Box 8010, Belton, TX 76513, United States.
E-mail addresses: surbina@umhb.edu (S.L. Urbina), mdr0024@auburn.edu (M.D. Roberts), wck0007@auburn.edu (W.C. Kephart), kbeth.villa@gmail.com (K.B. Villa), ensantos@mail.umhb.edu (E.N. Santos), alyssaolivencia@gmail.com (A.M. Olivencia), hmbennett@mail.umhb.edu (H.M. Bennett), mdlara@mail.umhb.edu (M.D. Lara), cfoster@umhb.edu (C.A. Foster), martin.pupura@increnovo.com (M. Purpura), ralf.jaeger@increnovo.com (R. Jäger), ltaylor@umhb.edu (L.W. Taylor), cwilborn@umhb.edu (C.D. Wilborn).

http://dx.doi.org/10.1016/j.appet.2017.02.025

Reinbach, Smeets, Martinussen, Moller, & Westerterp-Plantenga, 2009) and increase thermogenesis and metabolism (Saito, 2015), while long-term supplementation facilitates body weight maintenance in obese participants (Lejeune, Kovacs, & Westerterp-Plantenga, 2003; Whiting, Derbyshire, & Tiwari, 2012). Although the anti-obesegenic mechanisms of capsaicinoids are poorly understood, recent *in vitro* evidence reported that capsaicinoids activate transient receptor potential cation channel subfamily V member 1 (TRVP1) receptors in preadipocytes; an effect which increased intracellular calcium flux and promoted lipolysis (Chen et al., 2015). Other *in vitro* research has reported that low dose capsaicinoid treatments inhibit adipogenesis in preadipocytes as well as induce the expression of brown fat cell and anti-adipogenic genes (Baboota et al., 2014a). Regarding anorectic mechanisms, capsaicinoid supplementation in rodents has been reported to induce a hypothalamic gene expression signature that is associated with satiety (Baboota et al., 2014b). Thus, these reports collectively suggest that capsaicinoid supplementation is a viable strategy for weight management.

Herein, we sought to examine the effects of 12 weeks of low- and high-dose capsaicinoid supplementation on appetite and body composition in apparently healthy men and women. A secondary aim of this study was to assess if supplementation affected serum health markers. Given the aforementioned clinical trials and mechanistic research, we hypothesized that both supplementation regimens would promote decreases in appetite and improvements in body composition. Moreover, we posited that the high-dose regimen would elicit the most beneficial effects.

2. Methods

2.1. Participants

All experimental protocols were approved by the University of Mary Hardin-Baylor Institutional Review Board prior to the initiation of research activities (ISRCTN registry #10458693). Participants were recruited on the basis of the following inclusion criteria: a) male or female, b) between the ages of 18–56 years; c) apparently healthy and free from disease; d) have not taken any ergogenic supplements in the last 6 months; e) able to do everything required in the study; f) agree to not do strenuous activity 24–48 h before appointment g) agree to not smoke or use caffeine and tobacco for 12-h before appointment; h) not eat or drink anything for 12-h before appointment; i) agree to not drink alcohol 24-h before appointment; j) a BMI between 24.5 and 29.5 or a body composition that was in moderate or better body classification based on gender and age; k) provided written and dated informed consent to participate in the study. 77 healthy males and females (30 ± 1 y, 171.2 ± 9.8 cm, 81.0 ± 2.2 kg, 27.5 ± 0.6 kg/m^2) volunteers completed the research protocol and a consort flow diagram in Fig. 1 illustrates study attrition below.

2.2. Testing sessions

There were three testing sessions and these included a week 0 baseline visit (0 WK), a 6-week mid-point testing session (6 WK), and a 12-week post-study testing session (12 WK) (Fig. 2).

The following describes each sequence of tests performed for each testing session. First, participants arrived to the laboratory in the morning in a 12-h fasted state and 24–48 h of no strenuous physical activity. Body mass (and height during 0 WK only) was assessed and participants then received a whole-body dual x-ray absorptiometry (DEXA) scan for body composition assessment (for 0 WK and 12 WK only) (Hologic Wi; Hologic Inc., Bedford, MA). Waist and hip measurements were then obtained via measuring tape and recorded in centimeters. Participants then had venous blood drawn from their arm via standard phlebotomy techniques at 0 WK and 12 WK only, and a panel of blood health markers (metabolic health markers and complete blood counts) were assessed by sending samples to a commercial laboratory (Quest Diagnostics, Irving, TX). A subset of participants from each group (PLA, n = 16; L-CAP, n = 16; H-CAP, n = 19) then performed an oral glucose tolerance test (OGTT) at 0 W K and 12 WK whereby they consumed a test drink (Trutol 75 g glucose tolerance beverage suspended in 10 fl. oz. water; NERL Diagnostics, New York, NY) and had serum drawn 30 min, 60 min, 90 min, and 120 min after the test drink consumption; of note, participants were not allowed to drink water or any other fluids during this monitoring period. Serum glucose and insulin was also assessed by sending samples to a commercial laboratory (Quest Diagnostics). Finally, participants completed an adjusted Council on Nutrition Appetite Questionnaire (CNAQ) to assess appetite levels which has been previously validated (Wilson et al., 2005). The CNAQ study questionnaire is provided in Table 1.

2.3. Supplementation and dietary protocols

Following 0 WK testing, participants were randomly assigned to

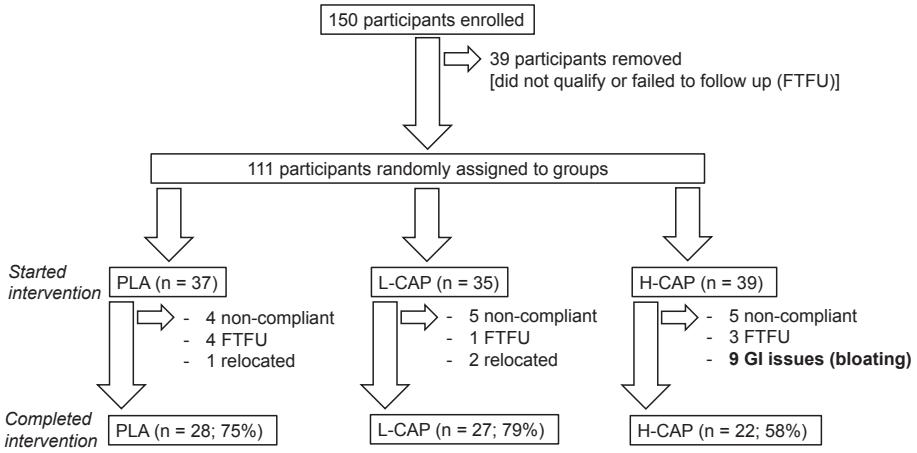

Fig. 1. Consort flow diagram.