

Pilot Trial

A Randomized, Controlled Prospective Trial Comparing a Soy Protein and Phytosterol Functional Food and a Low-Glycemic-Index Diet (LGID) with the AHA Step 1 Dietary Program

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INTRODUCTION

Cardiovascular disease (CVD) is a leading cause of death in postmenopausal women, and high blood lipids is a risk factor for CVD.¹ Diet and exercise are considered primary interventions for hyperlipidemia by both the National Cholesterol Education Program (NCEP) and the American Heart Association (AHA); however, the optimal dietary guidelines are controversial.^{2,3} Some studies suggest the glycemic load (GL) may be a major contributor to CVD.^{4,5} Recent discussions on the most efficacious lifestyle interventions, such as the Therapeutic Lifestyle Change (TLC) approach, suggest addition of soy protein and phytosterols may be necessary for successful intervention of high-risk patients with hyperlipidemia.⁶ Moreover, data indicate that although total cholesterol (tChol) and low-density cholesterol (LDL-C) are decreased on an AHA Step 1 diet, high-density cholesterol (HDL-C) is also decreased (by ~4-8%).^{7,8} Low HDL-C is a marker for increased risk to CVD. Research also has shown an association with a low-glycemic-index diet (LGID) and increased levels of HDL-C, low triglycerides (TG), and a decreased risk to CVD.^{4,9-13}

METHODS

We performed a randomized, prospective 12-week trial to compare a standard therapy for high cholesterol (the AHA Step 1 diet with exercise) with a test program of a LGID, a soy protein and phytosterol functional food, and exercise on parameters of CVD risk in postmenopausal women. Both programs incorporated weight management by setting caloric intake goals to result in weight loss of 1-2 lb per week. Fifty-nine postmenopausal women with BMI 27-39 kg/m² and LDL-C 130-200 mg/dL were randomly assigned to either *Arm 1*—a LGID with 2 servings of a functional food providing 15 g soy protein (with 17 mg isoflavones) and 2 g phytosterols per serve; or *Arm 2*—the AHA Step 1 dietary program.

RESULTS AND DISCUSSION

Fifty-three subjects completed the study. Compliance assessment showed that 22 of the 27 subjects who completed *Arm 1* did so in compliance with the diet and functional food. Of the 26 subjects who completed *Arm 2*, 20 were in compliance with the diet. Comparison of exercise assessments indicated that exercise was matched between the compliant *Arm 1* and compliant *Arm 2* subjects.

A significantly greater improvement was observed in CVD risk factors (tChol, LDL-C, and tChol/HDL-C ratio) with the soy protein and phytosterol functional food program than with the standard therapy (Figure 1). For example, LDL-C decreased 15.3% ($p < 0.005$) with the soy protein and phytosterol functional food program as compared to no significant change with the AHA Step 1 diet. In this study, the AHA Step 1 diet did not result in an appreciable decrease in LDL-C. Published data shows that the AHA Step 1 diet in postmenopausal obese women results in decreases of 6-9% decrease for LDL-C and tChol.^{14,15}

A significantly greater improvement was also seen in TG and TG/HDL-C ratio—markers of insulin resistance—with the soy protein and phytosterol functional food program as compared to the AHA Step 1 dietary approach (Figure 2). The soy protein and phytosterol functional food resulted in a 50% reduction of the TG/HDL-C ratio, from the initial 4.61 to 2.38 after 12 weeks ($p < 0.0001$). The TG and TG/HDL-C were improved on standard therapy, but the changes were not great enough to reach significance. Furthermore, although the AHA Step 1 diet has been reported to help with elevated tChol and LDL-C, published reports indicate it can lead to decreases in HDL-C of 2% to more than 6%, which are associated with increased risk of CVD.^{14,15}

Subjects on both Arm 1 and Arm 2 of this study showed an improvement in total body weight and BMI; however, the soy protein and phytosterol functional food with the LGID resulted in a greater decrease in fat mass (-10.7 lb) and an increase in relative body lean mass (+ 2.89%) compared to the AHA Step 1 dietary program (fat mass, -5.1 lb; relative lean mass, + 1.23%).

These data show that the clinical program with the soy protein and phytosterol functional food and the LGID was more effective for management of lipids and altered body composition in postmenopausal women than the standard therapy.

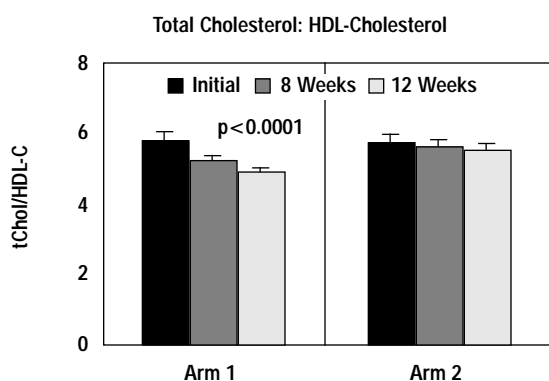


Figure 1. Mean (\pm sem) **Total cholesterol-to-HDL-Cholesterol Ratio (tChol/HDL-C)** initially (solid bars) and after 8 and 12 weeks (dotted and slashed bars, respectively) for the 22 subjects on the Soy Protein and Phytosterol Functional Food and LGID (Arm 1), or the 20 subjects on the AHA Step 1 Diet (Arm 2). The tChol/HDL-C ratio decreased significantly on Arm 1 (-1.2; $p < 0.0001$), but only showed minimal change on Arm 2 (change -0.2; ns). The change in the tChol/HDL-C for Arm 1 subjects was influenced by both a decrease in tChol and an increase in HDL-C. A significant decrease of 43 mg/dL in tChol was observed with Arm 1 (-15.8%; $p < 0.0001$), but not Arm 2 (2.6 mg/dL change; -1.0%) after 12 weeks. And, a significant increase of 2.8 mg/dL in HDL-C with Arm 1 (+5.8%; $p = 0.05$, $n = 22$), but not with Arm 2 (0.5 mg/dL change, $n = 22$) after 12 weeks. Note: Comparing matched sets of data for Arm 1 and Arm 2 also showed the change in tChol observed with the Arm 1 subjects was significantly greater than changes observed with Arm 2 ($p = 0.03$).

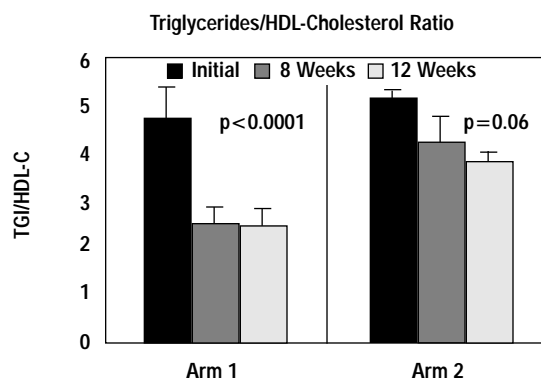


Figure 2. Mean (\pm sem) **Triglyceride-to-HDL-Cholesterol Ratio (TG/HDL-C)** for subjects initially (solid bars) and after 8 and 12 weeks (dotted and slashed bars, respectively) on the Soy Protein and Phytosterol Functional Food and LGID (Arm 1) or the AHA Step 1 Diet (Arm 2). Triglycerides (TG) were similar for subjects on Arm 1 ($N = 22$) and Arm 2 ($N = 20$) at initiation of the trial (212 ± 27 mg/dL and 207 ± 37 mg/dL, respectively), as was the TG/HDL-C ratio (4.61 ± 0.7 and 5.11 ± 0.25 , respectively). After 12 weeks, the subjects on Arm 1 showed a significant 44.8% decrease in TG (95 mg/dL; $p = 0.0001$) and in TG/HDL-C of 2.23 ($p = 0.0001$). The Arm 2 subjects showed a less substantial decrease of 23.7% TG that neared, but did not reach significance (49 mg/dL; $p = 0.06$), which translated to a smaller decrease in TG/HDL-C (1.56, ns). A TG/HDL-C > 4.0 is indicative of high risk to insulin resistance/metabolic syndrome.

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