Backpacking Normalizes Lipids without Medication: A Case Study on the Appalachian Trail

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ABSTRACT

DeVoe D, Lipsey T, Womack C. Backpacking Normalizes Lipids without Medication: A Case Study on the Appalachian Trail. JEPonline 2014;17(4):10-14. The purpose of this case study was to determine if the physical activity associated with a long distance backpacking trip has a favorable influence on the blood lipid profile relative to future risk of coronary heart disease. The subject was a 56-yr-old male who backpacked 112 days on the Appalachian Trail. Assessment of body fat (%) by dual-energy X-ray absorptiometry and blood work after a standard 12-hr fast were determined pre-hike, during the hike, and post-hike. Pre-hike to day 60 differences showed decreases in body weight from 89.4 kg to 75.1 kg and percent body fat from 32% to 18%. The post-hike body weight of 71.2 kg demonstrated a continuing but slower reduction than pre-hike to day 60 and a body fat (18%) that stabilizes during the 112-day hike. Pre-hike to day 60 differences showed a decrease in fat mass (-54%) and a slight increase in lean muscle mass of +1.5%. Fat mass stabilized during the expedition while lean mass decreased -6.5% from day 60 to post-hike. Pre-hike to day 60 resulted in an 85% decrease in triglycerides, a 38% decrease in total cholesterol, a 54% increase in high density lipoprotein, a 49% decrease in low density lipoprotein, a 67% decrease in the LDL/HDL ratio, and a 60% decrease in the cholesterol/HDL ratio. Between Day 60 and post-hike, there were no further decreases in blood lipids and lipoproteins. These findings indicate that backpacking has a positive impact on body composition and weight, which in turn clinically normalized the subject’s blood lipids and lipoproteins without medication.

Key Words: Backpacking Trip, Physical Activity, Lipids, Lipoproteins
INTRODUCTION

An estimated 82.6 million American adults (>1 in 3) have 1 or more types of cardiovascular disease. Of these diseases, 40.4 million are estimated to be >60 yrs of age (1). Many of these older Americans have less than optimal lipid and lipoprotein levels that are known risk factors (e.g., physical inactivity and sedentary lifestyle). In fact, a consensus exists that health is a primary reason American adults engage in outdoor physical activity. Backpacking, in particular, has a rapidly growing group of participants interested in regular activity (8). Hiking and backpacking are popular, low-cost, relatively safe forms of activity that are associated with a lower risk of injury when compared to activities such as running and sport participation, and both are available to the vast majority of the general public. Hiking and backpacking are among many outdoor activities are the most popular and fastest growing outdoor recreational activities in the United States.

In 2002, 73 million (34.5%) people in the United States hiked, and 24 million (11.5%) backpackers spent an average 17 days a year in the wilderness (8). The Appalachian Trail is a continental-scale wilderness pathway set aside by the Congress and the National Park Service for foot-travel only, lying within a day's drive of 67% of America's population. The Appalachian Trail Conservancy (1) estimates that 3 to 4 million visitors hike a portion of the Appalachian Trail each year with almost 3,000 yearly reported long distance backpackers. Most of these reported long distance backpackers are less than 25 or greater than 45 yrs of age. As one might expect for activities that require significant physical exertion, participation is greatest for the young and decreases with age, but people over 50 are well represented with 1.6 million backpackers (8). In addition, with the increasing number of 78 million baby boomers reaching retirement age, a growing number of older people are regularly loading up their backpacks and heading into the wilderness.

Limited studies utilizing different durations and intensities of hiking activity have shown in general a moderate positive effect on metabolic and cardiovascular risk factors. Due to confounding variables that were noted in the studies surveyed, the data inconsistently results in an improvement in blood lipid profiles. Faber et al. (5) reported in 1992 that a 6-wk hike resulted in a decrease in total cholesterol (TC) that was due to a decrease in low density lipoprotein (LDL-C). More recently, in 2006, Greig and colleagues (7) found that hiking for 3 wks at both moderate and low altitude decreased body weight, body fat, waist-circumference, fasting glucose, TC, low density lipoprotein (LDL-C), plasma fibrinogen, resting systolic and diastolic blood pressure while high density lipoprotein (HDL-C) and triglycerides (TG) remained unchanged.

Neumayr et al. (9) concluded that the cardiovascular benefits achieved following 3 wks of hiking are more likely to be the result of regular physical activity than the altitude-specific effect of a mountain environment. A 9-month mountain hiking program of a single weekly hiking session at moderate-intensity activity only during weekends did not improve cardiovascular risk factors in elderly persons with a relatively normal cardiovascular risk profile (6). The effect of prolonged exercise training via backpacking on blood lipids is not well characterized, but the data from an initial investigation (4) demonstrate a marked shift toward a less atherogenic profile after prolonged moderate intensity activity. The observed changes in blood lipids and lipoproteins were considerably more striking than the moderate positive effects found in previous published studies on hiking activity alone.

Backpacking is an activity whereby the sustained moderate intensity of high participation makes it an attractive alternative to other activities to promote cardiovascular health. The purpose of this study was to determine if the physical activity associated with a long distance backpacking trip has a favorable influence on the blood lipids and lipoproteins relative to future risk of coronary heart disease. On the basis of preliminary data (4), it is postulated that the increase in physical activity is
expected to result in favorable changes in body composition and weight, which in turn will decrease TC, LDL-C, TG, and increase HDL-C.

METHODS

Subjects
This study consisted of 1 male subject 56 yrs of age with experience in backpacking [8]. Previously, the subject had completed a long distance hike on the Appalachian Trail of 112 days during which 104 days were spent hiking a distance of 2669 km. The subject began the hike in Georgia on January 5th and finished in the White Mountains of New Hampshire on April 26th. While backpacking during this time period, the subject experienced a wide assortment of environmental conditions and terrain.

Procedures
Baseline measures were conducted 2 days before the start of the hike and post-hike assessments were conducted 2 days after completion of the hike. Assessment of body fat (%) by dual-energy X-ray absorptiometry (Hologic Bone Densitometer Discovery Model) was determined pre-hike, during hiking, and post-hike. Standard fasting (12 hrs) blood work for pre-hike was drawn by Poudre Valley Hospital (Fort Collins, CO), while blood work during the hike and post-hike were drawn at off-site contract laboratories (Harrisonburg, VA and Newton, MA); analyzed by LabCorp (Raritan, NJ).

RESULTS

Pre-hike to day 60 differences showed decreases in body weight from 89.4 kg to 75.1 kg and percent body fat from 32% to 18%. The post-hike body weight of 71.2 kg demonstrated a continuing but slower reduction than pre-hike to day 60 and a body fat (18%) that stabilizes during the 112-day hike. Pre-hike to day 60 differences showed a decrease in fat mass (-54%) and a slight increase in lean muscle mass of +1.5%. Fat mass stabilized during the expedition while lean mass decreased -6.5% from day 60 to post-hike. Pre-hike to day 60 resulted in an 85% decrease in triglycerides, a 38% decrease in total cholesterol, a 54% increase in high density lipoprotein, a 49% decrease in low density lipoprotein, a 67% decrease in the LDL/HDL ratio, and a 60% decrease in the cholesterol/HDL ratio. Between Day 60 and post-hike, there were no further decreases in blood lipids and lipoproteins. These findings indicate that backpacking has a positive impact on body composition and weight, which in turn clinically normalized the subject’s blood lipids and lipoproteins without medication.

Table 1. Blood Lipid Profile of a Long Distance Backpacker.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre</th>
<th>Day 60</th>
<th>Pre-Day 60 Difference (% Change)</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides (mg·dl⁻¹)</td>
<td>484</td>
<td>73</td>
<td>-411 (-85%)</td>
<td>80</td>
</tr>
<tr>
<td>Total Cholesterol (mg·dl⁻¹)</td>
<td>287</td>
<td>177</td>
<td>-110 (-38%)</td>
<td>196</td>
</tr>
<tr>
<td>High Density Lipoprotein (HDL, mg·dl⁻¹)</td>
<td>46</td>
<td>71</td>
<td>+25 (+54%)</td>
<td>70</td>
</tr>
<tr>
<td>Low Density Lipoprotein (LDL, mg·dl⁻¹)</td>
<td>177</td>
<td>91</td>
<td>-86 (-49%)</td>
<td>110</td>
</tr>
<tr>
<td>LDL/HDL Ratio</td>
<td>3.85</td>
<td>1.28</td>
<td>-2.57 (-67%)</td>
<td>1.57</td>
</tr>
<tr>
<td>Total Cholesterol/HDL Ratio</td>
<td>6.24</td>
<td>2.49</td>
<td>-3.75 (-60%)</td>
<td>2.80</td>
</tr>
</tbody>
</table>
DISCUSSION

This investigation found large decreases in LDL-C, TG, TC, LDL-C/HDL-C ratio, TC/HDL-C ratio, and a corresponding increase in HDL-C. Of note, the increase in HDL-C was high enough to classify it as a negative risk factor or a protective factor against cardiovascular disease. Physical activity associated with an extended backpacking adventure can positively impact body composition and weight which in turn can significantly reduce and clinically normalize blood lipids and lipoproteins without medication.

Despite the prevalence of backpacking, there has been modest assessment of the health needs of long distance backpackers (2,3,10). Surprisingly, except for the 2009 investigation of a long duration (118 days) backpacking trip (4), no other scientific documentation of the metabolic and physiologic benefits of backpacking long distances over an extended period of time on the cardiovascular disease risk factors (such as dyslipidemia, elevated blood pressure, and high abdominal adiposity) exist in the literature.

The long-term goal of this case study is to determine the efficacy and effectiveness of prolonged walking on lipids and lipoproteins in middle-aged and older adults. The real world efficacy is to counteract the low levels of physical activity that are a pervasive feature of modern lifestyles of the middle-aged and older adult population and promote sustained moderate intensity outdoor activities to attenuate cardiovascular disease risk factors.

CONCLUSIONS

Lowering LDL-C is currently the primary target of therapy for reducing the risk of coronary heart disease in adults. This investigation confirms long distance backpacking can lead to decreases in LDL-C, TG, TC, LDL-C/HDL-C ratio, and TC/HDL-C ratio with a corresponding increase in HDL-C. These findings indicate that the increased physical activity and weight loss (fat mass) resulted in substantial changes in blood lipids and lipoproteins, and that a further reduction in blood lipids and lipoproteins do not continue after the fat mass stabilizes.

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