The effect of a moderate fat diet with and without avocados on lipoprotein particle number, size and subclasses in overweight and obese adults – a randomized, controlled trial

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STUDY OVERVIEW

The study, “The effect of a moderate fat diet with and without avocados on lipoprotein particle number, size and subclasses in overweight and obese adults – a randomized, controlled trial” conducted by The Pennsylvania State University and funded by the Hass Avocado Board (HAB) was published in The Journal of American Heart Association.¹ The randomized, cross-over, controlled feeding trial on 45 healthy overweight and obese men and women investigated how including one fresh avocado in a moderate fat diet (AV) would affect cholesterol levels, compared to an energy-matched moderate fat (MF) or low fat (LF) diet without avocado.

Researchers found that overweight and obese men and women who followed the AV diet experienced a reduction in the ratio of low density lipoprotein cholesterol to high density lipoprotein cholesterol (LDL-C/HDL-C) and the ratio of total cholesterol (TC) to HDL-C compared to the MF or LF diet without avocado (a reduction in either of these ratios signifies improvements in cholesterol levels). The AV diet also reduced TC and LDL-C more than an energy-matched MF or LF diet without avocado.

KEY FINDINGS

- Following the AV diet (34% fat) compared to a MF (34% fat) or LF (24% fat) diet without avocado significantly:
  - Reduced TC/HDL-C. A smaller value is preferable.
  - Reduced LDL-C/HDL-C. A smaller value is preferable.

- Following the AV diet reduced TC and LDL-C significantly more than a MF or LF diet without avocado.

- Compared to the AV or MF diets, eating a LF diet significantly increased triglycerides (TG) and (TG/HDL-C) (a smaller value indicates lower risk), and decreased HDL-C levels significantly more than the other diets.
STUDY DIET DETAILS:

Participants consumed a typical American diet (34% fat, 51% carbohydrate and 17% protein) for two weeks prior to their baseline blood draw and randomization into one of three diets for five weeks each. Participants followed their normal eating pattern for two to three weeks in between each five week dietary intervention.

- **LF** diet composition: 6-7% of saturated fat energy from the typical American diet was replaced with complex carbohydrates mainly from grains.
- **MF** diet composition: 6-7% of saturated fat energy from the typical American diet was replaced with monounsaturated fat mainly from high oleic acid oils (sunflower oil and canola oil).
- **AV** diet composition: similar to MF diet, but replaced 6-7% of saturated fat energy with monounsaturated fat mainly from one fresh avocado daily (~ 136 g, without skin and seeds).
- Subjects were provided menus (6-day rotating) to meet energy and nutritional requirements.
- The MF and AV diets were matched for calories and macronutrients, but not for fiber, phytosterols, carotenoids or other bioactives.

RESULTS

Summary of Results of AV Diet: Lipids and Lipoprotein Cholesterol

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Significant Difference from Baseline</th>
<th>Significant Difference Compared to LF (●) and/or MF (♦) Test Meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>✓</td>
<td>●</td>
</tr>
<tr>
<td>LDL-C</td>
<td>✓</td>
<td>●</td>
</tr>
<tr>
<td>HDL-C</td>
<td>✓</td>
<td>●</td>
</tr>
<tr>
<td>TG</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>TC:HDL-C</td>
<td>✓</td>
<td>●</td>
</tr>
<tr>
<td>LDL:HDL-C</td>
<td>✓</td>
<td>●</td>
</tr>
<tr>
<td>TG:HDL-C</td>
<td></td>
<td>●</td>
</tr>
</tbody>
</table>
Figure 1: Ratio of Total to HDL-Cholesterol
The AV diet significantly reduced TC/HDL-C (-4.9%) blood levels compared to the MF and LF diets.

Figure 2: Ratio of LDL to HDL-Cholesterol
The AV diet significantly reduced LDL-C/HDL-C (-6.6%) blood levels compared to the MF and LF diets.
Figure 3: Total Cholesterol
The AV diet significantly reduced TC (-8%) more than the LF (-4%) and MF (-4.7%) diets.

Figure 4: LDL-Cholesterol
The AV diet significantly reduced LDL-C (-10%) more than the LF (-5.3%) and MF (-5.8%) diets.
AVOCADOS AND CHOLESTEROL

Based on these findings, researchers concluded that the inclusion of a food source rich in monounsaturated fats and dietary bioactives, such as fiber and phytosterols found in avocados, confers greater cardiovascular health benefits compared to a MF diet matched in monounsaturated fat content. It is worth noting that the diet that included avocado provided 35 percent more fiber than the diets without avocado. Additionally, the test diet included a whole avocado each day; more research is needed to determine whether the results could be replicated with consumption of a single serving, 1/5 of a Hass avocado. While the conclusions drawn are from a single study that cannot be generalized to all populations, the study does provide further insights on the effects of avocados on CVD biomarkers, such as LDL-C, in healthy overweight and obese adults.

To view the abstract or the published study, click here.
HASS AVOCADO BOARD SUPPORTS NUTRITION RESEARCH

HAB has a science research pipeline of ongoing clinical studies investigating the relationship between fresh avocado consumption and risk factors for cardiovascular disease, avocado’s potential positive role in weight management and diabetes, and the ability to enhance nutrient absorption when avocados are eaten with other foods. And, based on their nutrition and phytochemical components, emerging research suggests that fresh avocados may play a positive role in many emerging areas including skin, eye, joint and cellular health.

For more information on avocado nutrition and avocado research, visit LoveOneToday.com/Research

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