Acute Effects of Decaffeinated Coffee and the Major Coffee Components Chlorogenic Acid and Trigonelline on Glucose Tolerance

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OBJECTIVE — Coffee consumption has been associated with lower risk of type 2 diabetes. We evaluated the acute effects of decaffeinated coffee and the major coffee components chlorogenic acid and trigonelline on glucose tolerance.

RESEARCH DESIGN AND METHODS — We conducted a randomized crossover trial of the effects of 12 g decaffeinated coffee, 1 g chlorogenic acid, 500 mg trigonelline, and placebo (1 g mannitol) on glucose and insulin concentrations during a 2-h oral glucose tolerance test (OGTT) in 15 overweight men.

RESULTS — Chlorogenic acid and trigonelline ingestion significantly reduced glucose (−0.7 mmol/l, \( P = 0.007 \), and −0.5 mmol/l, \( P = 0.024 \), respectively) and insulin (−73 pmol/l, \( P = 0.038 \), and −117 pmol/l, \( P = 0.007 \)) concentrations 15 min following an OGTT compared with placebo. None of the treatments affected insulin or glucose area under the curve values during the OGTT compared with placebo.

CONCLUSIONS — Chlorogenic acid and trigonelline reduced early glucose and insulin responses during an OGTT.
Coffee components and glucose tolerance

Glucose and insulin concentrations during an OGTT following ingestion of chlorogenic acid, decaffeinated coffee, trigonelline, or placebo in 15 healthy overweight men

Table 1—

<table>
<thead>
<tr>
<th>Component</th>
<th>Placebo</th>
<th>Chlorogenic acid</th>
<th>Decaffeinated coffee</th>
<th>Trigonelline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mmol/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 0</td>
<td>7.1 ± 0.8</td>
<td>6.8 ± 0.7</td>
<td>6.9 ± 0.7</td>
<td>7.2 ± 0.7</td>
</tr>
<tr>
<td>15 min</td>
<td>8.0 ± 0.9</td>
<td>7.6 ± 0.8</td>
<td>7.7 ± 0.8</td>
<td>8.1 ± 0.8</td>
</tr>
<tr>
<td>30 min</td>
<td>8.9 ± 0.9</td>
<td>8.5 ± 0.8</td>
<td>8.7 ± 0.8</td>
<td>9.1 ± 0.8</td>
</tr>
<tr>
<td>60 min</td>
<td>9.8 ± 1.0</td>
<td>9.4 ± 0.9</td>
<td>9.7 ± 0.9</td>
<td>10.2 ± 1.0</td>
</tr>
<tr>
<td>90 min</td>
<td>10.6 ± 1.1</td>
<td>10.1 ± 1.0</td>
<td>10.9 ± 1.0</td>
<td>11.4 ± 1.1</td>
</tr>
<tr>
<td>120 min</td>
<td>11.4 ± 1.1</td>
<td>10.9 ± 1.0</td>
<td>11.2 ± 1.0</td>
<td>11.7 ± 1.1</td>
</tr>
</tbody>
</table>

Data are means ± SE unless otherwise indicated. Baseline values are fasting concentrations and were determined right before supplement ingestion; Time 0 was half an hour after supplement ingestion and right before the start of the OGTT. *P values compared with the placebo value. AUC, area under the curve.

CONCLUSIONS — In this randomized crossover trial in healthy men, chlorogenic acid and trigonelline ingestion led to significantly lower glucose and insulin concentrations 15 min after an oral glucose load but did not significantly reduce the OGTT insulin and glucose areas under the curve compared with placebo.

Trigonelline also resulted in significantly lower glucose (−0.51 mmol/L [95% CI −0.95 to −0.08]; P = 0.024) and insulin (−11.70 pmol/L [−196.5 to −37.4]; P = 0.007) concentrations at 15 min after the start of the OGTT compared with placebo. Decaffeinated coffee did not significantly change mean glucose or insulin concentrations at any of the time points following the OGTT, although the insulin concentration tended to be lower at 15 min. None of the treatments significantly changed the insulin or glucose area under the curve values (Table 1).

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References
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