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

Aimee E. van Dijk, MSC1
Margreet R. Olthof, PhD1
Joke C. Meeseus, MSC1
Elin Seebus, MD2
Rob J. Heine, MD, PhD2
Rob M. van Dam, PhD3,4

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.

Diabetes Care 32:1023–1025, 2009
Glucose and insulin concentrations during an OGTT following ingestion of chlorogenic acid, decaffeinated coffee, trigonelline, or placebo in 15 healthy overweight men

<table>
<thead>
<tr>
<th></th>
<th>Chlorogenic acid</th>
<th>Decaffeinated coffee</th>
<th>Trigonelline</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 min</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>30 min</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>60 min</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>120 min</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

AUC glucose (mmol/l/min) 120 min:

- Chlorogenic acid: 30 min = 5.7, 120 min = 3.7
- Decaffeinated coffee: 30 min = 5.7, 120 min = 3.7
- Trigonelline: 30 min = 5.7, 120 min = 3.7
- Placebo: 30 min = 5.7, 120 min = 3.7

AUC insulin (pmol/l/min) 120 min:

- Chlorogenic acid: 30 min = 5.7, 120 min = 3.7
- Decaffeinated coffee: 30 min = 5.7, 120 min = 3.7
- Trigonelline: 30 min = 5.7, 120 min = 3.7
- Placebo: 30 min = 5.7, 120 min = 3.7

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.

Acknowledgments — The research for this study was financially supported by the Dutch Diabetes Research Foundation (Stichting Diabetes Fonds Nederland Grant 2006 11 020). R J. Heine is currently employed at Eli Lilly and Company, Indianapolis, Indiana. No other potential conflicts of interest relevant to this article were reported.

We thank the participants of the Coffee Study for their participation and the Clinical Research Unit Internal Medicine of the VU University Medical Centre for use of the facilities. We are very grateful to Peter C. Hollman and Dini Venema (RIKILT, Institute of Food Safety, Wageningen, the Netherlands) for the careful measurement of chlorogenic acid and Sandy Slow (Centerbury Health Laboratories, Christchurch, New Zealand) for the careful measurement of trigonelline in the coffee supplement.

References

3. Clifford MN. Chlorogenic acids and other caffeinates: nature, occurrence and di-