EPA prevents insulin resistance and glucose intolerance in mice fed a high fat-high sucrose diet
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EPA PREVENTS INSULIN RESISTANCE AND GLUCOSE INTOLERANCE IN MICE FED A HIGH FAT-HIGH SUCROSE DIET

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Introduction:
Insulin resistance (IR) is a key feature of obesity. IR favors the progression of metabolic syndrome (MetS), increases the risk of type 2 diabetes and cardiovascular diseases. IR results from metabolic dysfunctions caused by ectopic fat depots in the liver and skeletal muscle when adipose tissue storage capacity is exceeded. Nutritional strategies using n-3 PUFA were proposed to prevent IR and MetS associated to obesity by unclear mechanisms.

Objectives:
The aim of the present work was to compare the effect of ALA, EPA and DHA on insulin resistance and metabolic dysfunctions during a high fat (HF)-high sucrose (HS) challenge.

Materials & Methods:
C57BL6 and Ob/Ob mice were fed a HF (45% energy)-HS (17% energy) diet without or with 1% energy replaced by ALA, EPA or DHA for 16 and 6 weeks respectively. IR was evaluated by intraperitoneal (ip) injection of insulin followed by monitoring of glycaemia over 2 hours. Glucose tolerance was similarly assessed using glucose injection. Fatty acid composition of tissues was determined by gas chromatography.

Results:

Table 1. Plasma concentration of cholesterol (Chol) and non esterified fatty acids (NEFA)

<table>
<thead>
<tr>
<th></th>
<th>CTRL</th>
<th>HF</th>
<th>ALA</th>
<th>EPA</th>
<th>DHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chol (g/L)</td>
<td>0.72±0.03c</td>
<td>0.92±0.04a</td>
<td>0.83±0.08ab</td>
<td>0.73±0.04c</td>
<td>0.74±0.02bc</td>
</tr>
<tr>
<td>NEFA (g/L)</td>
<td>0.30±0.01ab</td>
<td>0.27±0.01bc</td>
<td>0.37±0.03a</td>
<td>0.22±0.01c</td>
<td>0.31±0.01ab</td>
</tr>
</tbody>
</table>

Table 2. n-3 PUFA incorporation into plasma (% of total fatty acids)

<table>
<thead>
<tr>
<th></th>
<th>CTRL</th>
<th>HF</th>
<th>ALA</th>
<th>EPA</th>
<th>DHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>C18:3 n-3</td>
<td>0.45±0.05a</td>
<td>0.31±0.05c</td>
<td>0.63±0.03b</td>
<td>0.31±0.04c</td>
<td>0.32±0.04c</td>
</tr>
<tr>
<td>C20:5 n-3</td>
<td>0.37±0.02a</td>
<td>0.39±0.05a</td>
<td>0.77±0.06a</td>
<td>4.84±0.26b</td>
<td>2.84±0.36c</td>
</tr>
<tr>
<td>C22:5 n-3</td>
<td>0.24±0.01a</td>
<td>0.26±0.02a</td>
<td>0.35±0.01b</td>
<td>0.82±0.04c</td>
<td>0.23±0.01a</td>
</tr>
<tr>
<td>C22:6 n-3</td>
<td>5.19±0.17a</td>
<td>6.00±0.27a</td>
<td>6.95±0.19b</td>
<td>8.07±0.31c</td>
<td>11.65±0.51d</td>
</tr>
</tbody>
</table>

Conclusion:
Long chain omega 3 fatty acids have distinct effects on IR and glucose tolerance. By contrast with ALA and DHA, EPA has interesting protective effect against several key parameters of MetS.