Sex differences in the pubertal response to high-fat diet

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BACKGROUND

It is well known that ingestion of a high fat diet (HFD) can induce rapid weight gain and metabolic imbalances. However, males and females are not equally susceptible to these effects. Furthermore, an individual may be more prone to gain weight during specific developmental periods.

OBJECTIVE

We aimed to analyze the response to the acute exposure to a high fat diet during the pubertal/adolescent period and to determine whether males and females respond differently.

METHODS

C57BL/6 MICE

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<table>
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<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
<th>DAY 6</th>
<th>DAY 7</th>
<th>DAY 8</th>
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<tr>
<td>Glycemia</td>
<td>Fat weight</td>
<td>Inflammation markers</td>
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<tr>
<td>Body weight</td>
<td>Food intake</td>
<td>Hypothalamic markers</td>
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<td>Brain weight</td>
<td>Serum hormone levels</td>
<td>Neuropeptides</td>
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GROUPS

HFD | LFD

Sacrifice

- Semi-quantitative RT-PCR
- Western blotting
- Multiplex assay

- High-fat diet (HFD), 5.1 kcal/g, 61.6% from fat
- Low-fat diet (LFD), 3.8 kcal/g, 10.2% from fat

RESULTS

Weight gain and food intake were higher in males (A and B), with HFD increasing the latter in females (B). HFD-fed male mice showed increased glycemia (C) and insulin levels (D). Males on a HFD had higher glycemia than those on a LFD (C), but no change in insulin levels (D). HFD tended to augment serum leptin levels, especially in males, increasing the sex difference (E). IL6 levels were significantly higher in males, regardless of diet (F). Levels of the microglial marker Iba1 in the hypothalamus were different between sexes when on a HFD (G). Hypothalamic expression levels of IL1β where higher in males, when compared to females on a LFD, but this dimorphism disappeared in HFD-fed mice (H). Expression levels of IL6 and TNFα showed no changes (data not shown).

CONCLUSIONS

1. HFD rapidly increases food intake, especially in female mice.
2. Adolescent male mice respond rapidly to HFD intake, by increasing leptin and glucose levels after only eight days of exposure.
3. Sex differences in certain obesity and inflammation-related factors are exacerbated by a HFD in pubertal mice.