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Expression of the IL-1β and CX3CR1 pancreatic β-cells of mice fed with a high-fat/high-sucrose diet

Abstract

Background/Objectives

Increased circulatory glucose and free fatty acids lead to glucolipotoxicity, which triggers inflammation, affecting the endocrine pancreatic β-cells. We investigated the comparative effects of a fish-oil-based-high-fat, high-sucrose-diet (Fish-HFHSD) versus a cocoa-butter-based-high-fat, high-sucrose-diet (Cocoa-HFHSD) on the expression of the inflammatory cytokine interleukin (IL)-1β and fractalkine receptor (CX3CR1) in mouse β-cells.

Methods

C57BL/6 male mice (n=18) were randomly assigned to three dietary interventions, including Chow, Fish-HFHSD, and Cocoa-HFHSD, for 22-weeks.Pancreatic tissues were collected for immunohistochemistry to quantify insulin-, IL-1β-, and CX3CR1-positive-areas.

Results

The immunostaining intensity of insulin in β-cells was significantly higher (P=0.0008) in mice fed with either Fish-HFHSD (180±10px GV) or Chow (173±6px GV) compared to those fed with Cocoa-HFHSD (118±12px GV).Conversely, the immunostaining intensity of IL-1β was significantly higher (P=0.0004) in mice fed with Cocoa-HFHSD (237±12px GV) compared to those fed with Fish-HFHSD (145±13px GV) or Chow (180±10px GV).

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As expected, the IL-1β:insulin ratio was significantly lower (P<0.0001) in Fish-HFHSD (0.80±0.04) and Chow (0.82±0.06) fed mice compared to that (2.11±0.22) in Cocoa-HFHSD fed mice. Unlike IL-1β, CX3CR1 immunostaining intensity was significantly higher (P<0.0001) in mice fed with either Fish-HFHSD (214±10px GV) or Chow (209±9px GV) compared to those fed with Cocoa-HFHSD (111±12px GV). In addition, the CX3CR1:insulin ratio was significantly higher (P<0.0001) in Fish-HFHSD (1.17±0.02) and Chow (1.2±0.02) fed mice compared to that (0.98±0.01) in Cocoa-HFHSD fed mice.

Conclusions

In contrast to Fish-HFHSD feeding, Cocoa-HFHSD feeding induces a metabolic insult in mice that results in increased IL-1β expression and reduced insulin and CX3CR1 expression in pancreatic β-cells.

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