Entry #: 49
Date: 29 April 2018
Section: Phenolic compounds
Topic: Oleacein and insulin resistance
Type: In vivo model

OliveNet™ Journal Club
Expert review of literature related to olives and olive oil

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Title

Effects of oleacein on high-fat diet-dependent steatosis, weight gain, and insulin resistance in mice

Author(s)

Lombardo et al

Citation / Year

(*1*) / 2018

Keywords

Extra-virgin olive oil, oleuropein, oleacein, high-fat diet, obesity, liver steatosis, plasma glucose, insulin resistance

Summary

Metabolic diseases including obesity, metabolic syndrome, and diabetes represent major clinical problems which are anticipated to rise in coming years (*2*). One of the major underlying pathologies, is insulin resistance, resulting in higher the average blood glucose levels (*3*). Physical activity, and changes in dietary patterns have been in associated with improvements in various metabolic disorders, and in particular the Mediterranean diet with a high consumption of extra-virgin olive oil has been shown to be beneficial (*4, 5*). Research has indicated that the minor phenolic component of extra-virgin olive oil is largely responsible for the beneficial effects (*6*). Hydroxytyrosol and oleuropein have been the most widely investigated, and beneficial effects in cell culture, *in vivo* models, and in limited human trials have been observed (*7, 8*). In this study the authors investigated both oleuropein, and its degradation product oleacein. Oleacein has been shown to have a favourable bioavailability profile, and has recently been shown to have beneficial effects in models of ischemia and cardiovascular disease (*9-12*). In this study, the effects oleacein on metabolic parameters in mice fed a high-fat diet was investigated; oleuropein was also used in the first series of experiments.

Key points and implications

In these experiments the C57BL/6JOlaHsd mouse strain, which susceptible to diabetes and diet-induced obesity was used. For the first set of experiments, male mice (n=28), were divided into four groups: 1) normocaloric diet (n=8), 2) high-fat diet (n=12), 3) high-fat diet with 20 mg/kg oleacein (daily, oral gavage, n=4), and 4) high-fat diet with 20 mg/kg oleuropein (daily, oral gavage, n=4). The experiment was performed over a five week period. In the second set of experiments, at the end of the five week period, the mice from the high-fat diet group were divided into two groups and either: 1) continued to receive the high-fat diet

(n=4), or 2) received a high-fat diet with 20 mg/kg oleacein (daily, oral gavage, n=4), for a further eight weeks. Therefore, analyses were performed at week five and week 13. In summary the key findings indicated: 1) both oleuropein and oleacein decreased visceral fat and body weight compared to the high-fat fed animals, 2) oleuropein and oleacein attenuated high-fat diet-induced changes in biochemical parameters including, plasma glucose levels, insulin levels, insulin sensitivity, and total cholesterol, 3) oleuropein and oleacein prevented high-fat diet-induced liver enlargement and steatosis with decreases in the expression of SREBP-1, FAS, and p-ERK, and 4) the effects of oleacein in established disease (obesity; 13 week end-point), were less pronounced, indicating that oleacein may have more utility in prevention. Overall, these findings re-iterate and highlight the potential beneficial effects of olive phenolics in counteracting metabolic aberrations associated with obesity and insulin resistance. Further work is necessary to further clarify these findings and to determine applicability as appropriate dietary intervention in humans.

Related publications

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