

The effects of various n-3 and n-6 polyunsaturated fatty acids on the secretion of insulin like growth factor-I by MC3T3-E1 osteoblast-like cells



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Aim

The purpose of this pilot study was to test the hypothesis that polyunsaturated fatty acids (PUFAs) increase the secretion of insulin like growth factor-I (IGF-I) by osteoblasts.

The PUFAs used included docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) both members of the n-3 PUFA family as well arachidonic acid (AA) and gammalinolenic acid (GLA) of the n-6 PUFA family.

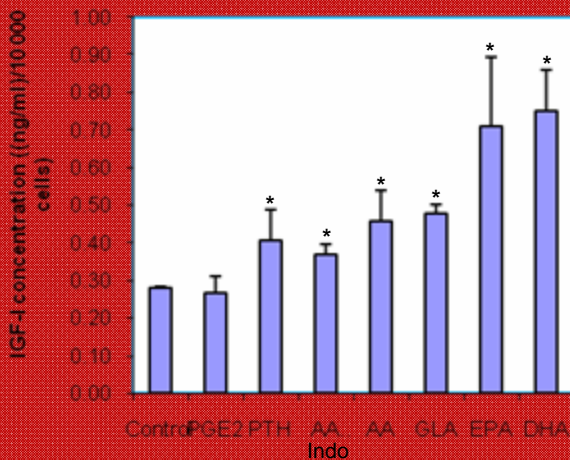
IGF's are autocrine as well as paracrine stimulators of osteoblast proliferation.

Increased osteoblast proliferation could lead to increased bone mineralisation and a possible reduced risk of osteoporotic fractures.

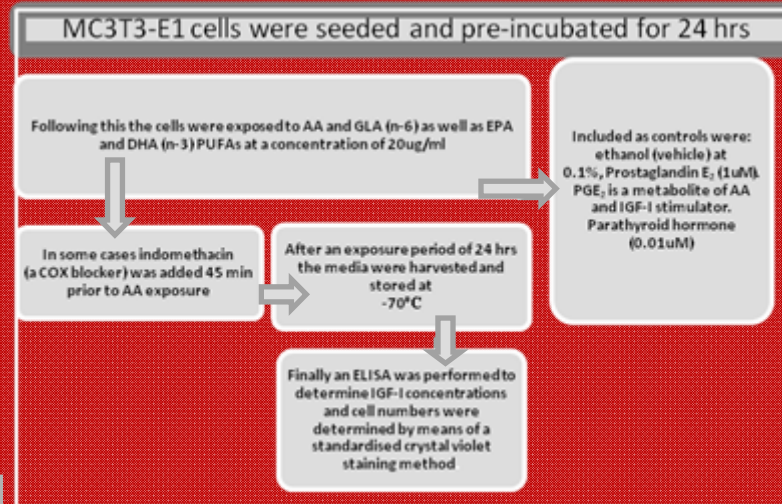
Results

The effects of the various PUFAs on IGF-I secretion as well as cell morphology

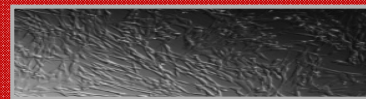
The effects of the PUFAs on IGF-I secretion



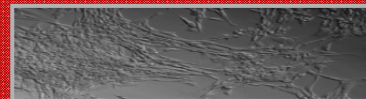
Method



The effects of the PUFAs on cell morphology



Control (vehicle only) at 0.1% after 24hr exposure, (10X magnification)

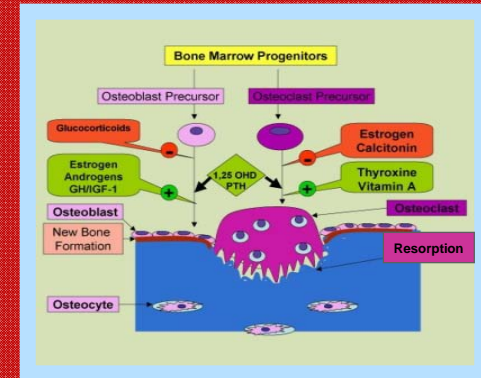


GLA (n-6 family) after 24hr exposure at a concentration of 20ug/ml



EPA (n-3 family) after 24 hr exposure at a concentration of 20ug/ml

The various factors playing a role in bone formation and breakdown. GH=Growth Hormone, IGF=Insulin like growth factor



Valsamis et al. Nutrition & Metabolism 2006 3:36

Discussion

- Parathyroid hormone (PTH) was one of the positive controls used in this experiment as it is a known stimulator of IGF-I secretion. PTH increased IGF-I levels in this experiment confirming the experimental set up.
- Compared to the control the PUFAs all stimulated IGF-I secretion with the n-3 family having the greatest effect.
- Prostaglandin E₂ (PGE₂) did not stimulate secretion as expected, this could be due to the fact that the concentration used was not optimal for this model.

Conclusion

- It appears as if the PUFAs do increase IGF-I secretion, with the n-3 PUFAs exhibiting the largest effect
- The levels detected were however very low, for this reason the duration of the experiment will be increased and the medium supplemented with osteogenic factors to allow for maturation and mineralisation of the osteoblasts prior to PUFA exposure

Acknowledgements

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