



Healthy food ingredients to reduce susceptibility to experimental food allergy

Dr Liz Forbes-Blom





MARINE BIOACTIVES WORKSHOP 10TH NOV

Functional food ingredients extracted from New Zealand's Greenshell[™] mussel and micro-algae species to create hypoallergenic, anti-allergenic and anti-inflammatory foods











Gut Immunology Team

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Ministry of Business, Innovation & Employment

Cawthron Institute Michael Packer Serean Adams Jonathan Puddick Donato Romanazzi Food allergy is no longer an oddity, the burden of an unlucky few. It affects millions of children worldwide. Le Gros dubs them "Generation A" – A for allergy, of course.

Food or Foe? Stacy Anyan, North and South; March 2013

Food allergy 'generation'



When I started my practice 18 years ago, I'd get one peanut allergy referral every six to 12 months. Now it's four a week.

Dr. Vincent St Aubyn Crump, Allergist; Auckland Allergy Clinic.













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Eicosapentaenoic acid (EPA)

- An omega-3 fatty acid, which are long chain polyunsaturated fatty acid (PUFA)
- Body converts the essential fatty acid ALA found in seeds, nuts and vegetable oils to EPA.
- Majority of EPA is from the diet e.g. oily fish, edible seaweed and phytoplankton
- EPA suppresses symptoms in food allergic mice van den Elsen L *et al* J. Nutr 2014
- EPA is present in breast milk van Elten TM *et al* Allergy 2015

Omega 3 Family Pathway

Alpha-Linolenic (ALA)

Your body converts ALA into:

Eicosapentaenoic Acid (EPA)

Your body converts EPA into:

Docosahexaenoic Acid (DHA)

Eating a diet rich in Omega-3 fats leads to:

Anti-Inflammation. Decreased Blood Clotting. Immune System Enhancement, and Lower Risk of Chronic Diseases

EPA and DHA can suppress food-induced allergic responses in mice

van den Elsen et al., J Nutr 2014 114:1970







Experimental food allergy

Brandt et al., 2003 JCI 112:1666

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IL-9 plays a role in the development of experimental food allergy

Osterfeld H et al., 2010 JACI 124 (2): 469







Targeting IL-4 and IL-13 alleviates experimental food allergy

Brandt et al., 2009 JACI 123: 53





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Loss of IL-3 ameliorates experimental food allergy

Poyntz H et al. submitted







Photonz EPA high oil inhibits the development of experimental food allergy





Photonz algal EPA high oil composition:

- Fatty acid ethyl esters
- ~80% EPA
- Other FAs including DHA
- Many minor algal components

including non-lipid moieties





Photonz EPA high oil has subtle effects mast cell responses and IgE

- Photonz microalgal EPA high oil
- Fish EPA high oil
- ▲ Fish EPA high oil
- Corn Oil

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Photonz EPA high oil reduced II4 and II13 expression



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Summary and current research focus

- Photonz EPA high oil protects against experimental food allergy as efficiently as cytokine deficient mice, or neutralization of cytokines by antibody administration.
- Photonz EPA high oil outperforms the other EPA high oils in preventing the development of experimental food allergy. These data suggest a synergistic effect of the components of the oil; and ongoing investigations will attempt to address this.
- We are currently examining the effects of EPA high oils on mast cell cultures *in vitro* and will perform RNA seq on intestinal tissue for an untargeted transcriptomics approach to identify candidate molecules the Photonz EPA high oil may be acting on.

