

Research on the Composition of Functional Foods



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What are Functional Foods?

Food similar in appearance to conventional food that is intended to be consumed as part of a normal diet, but has been modified to subserve physiological roles beyond the provision of simple nutrient requirements

M. Roberfroid (2000) *Functional Foods: Concept to Product*

Simplest definition: Foods that may provide health benefits beyond basic nutrition

Nutritional Issues

- What are the active components in foods?
- A deficiency might be harmful but excess is not necessarily good
- What is the effect of overall diet?
- Are there any negative effects of functional foods?

Types of Functional Foods

- Fortified products (increasing the content of existing nutrients)
- Enriched products (adding new nutrients or components)
- Replacing existing components
- Enhanced commodities

Concerns Related to Nutrient Composition & Functional foods

- What components are in the foods?
- How much is in the foods?
- Particular concerns with phytonutrients
 - ◆ Growing conditions
 - ◆ Genetic manipulation
- Proprietary products/information

How could we enhance the
food supply?

Enhanced Commodities

- Golden rice: introduced β -carotene biosynthesis pathway into rice by genetic engineering
- Enhanced production of vitamin E
- Nu-Sun sunflower oil: Overproduction of oleic acid in sunflowers



Tomato Enhancement (Autar Mattoo/BARC)

- S-Adenosylmethionine decarboxylase-E8 gene
- Enhanced lycopene production
- Enhanced polyamine synthesis
- Increased synthesis of arginine and ornithine
- Increased synthesis of carnitine



Probiotics

- Live microbial food ingredients that have a beneficial effect on human health
- *Lactobacillus* sp.
- *Bifidobacter* sp.
- Traditionally found in fermented dairy products but also in fermented vegetables

Prebiotics

- Provide a GI environment in which beneficial bacteria can thrive
- Fermentable dietary fiber (oatmeal, flax, barley, whole grains, fruits vegetables and beans)

Health Effects of Pre/Probiotics

- Balance between harmful and beneficial bacteria
- Lactose intolerance
- Improved digestion
- Enhance immune response
- Cholesterol lowering
- Reduced cancer of the GI tract

Effect of Plant Sterol Esters on Cholesterol Levels

Treatment	LDL Chol	HDL Chol	TG
Control diet	↓7.9%	↓3.1%	↓9.3%
3.6 g/d PSE	↓17.6%	↓3.1%	↓16.6%

26 Men and 27 women fed isocaloric diets (32% fat) for three weeks with two servings of salad dressing per day.

Judd et al. (2002) *Lipids* 37: 33-42



Soy Protein

- Soy protein has lipid lowering abilities
- Presumably due to isoflavone content
- Isoflavone isolate from soy protein not as effective as intact protein
- Studies from BHNRC did not see expected effect: must be part of low fat diet and also great individual variation

Oatrim Studies

- Oatrim is a high fiber fat substitute developed and licensed by ARS
- Can substitute for 50% of the fat in foods
- Increased fiber
- Improved glucose tolerance
- Weight loss
- Reduced fat

How should we enhance
the food supply?