

ANTHOCYANINS AND FLAVONOIDS IN PREVENTION OF CHRONIC DISEASES

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The risk of chronic diseases, such as cardiovascular disease (CVD), cancers and age-related neurodegenerative diseases, is strongly associated with three socio-behavioural risk factors, i.e. smoking, lack of physical activity and unhealthy diet. Several epidemiological studies support the idea that increased consumption of diets rich in the phytonutrients derived from fruit and vegetables can maintain the health, enhance the life expectancy and improve the quality of life of healthy individuals. Among phytonutrients, polyphenols are made by all plants and constitute collectively the most abundant antioxidants in the diet. Their role in the protection particularly against CVD was launched by the publication, about 20 years ago, of the epidemiological observation called “French paradox”, which suggested a cardioprotective role of red wine consumption. Among phytonutrients, anthocyanins are water-soluble pigments that colour the fruit and flowers of many plants. Preclinical studies with animal models fed anthocyanin-rich diets demonstrated that they confer cardioprotection, that they inhibit adipocyte development and weight gain on a high fat diet, that they can extend the life-span of cancer-prone mice and that they confer cardioprotection. In the frame of the EU-funded projects FLORA and ATHENA, we have demonstrated that in rats dietary anthocyanins from blue corn reduced by approximately 30% the amount of cardiac tissue that was damaged following ischemic conditions. Cardioprotection was associated with increased cardiac glutathione levels and increased marine omega-3 levels in blood, suggesting that dietary anthocyanins modulate cardiac antioxidant defences and synthesis of omega-3 fatty acids.

Protective role of anthocyanins in animal and human health

- They protect against cardiovascular diseases
- They inhibit tumor formation and reduce cancer proliferation
- They protect against neurodegenerative diseases
- They have an anti-obesity effect
- They enhance visual acuity





Objectives: To generate defined dietary material (model foods) to test the impact of specific flavonoids on cardiovascular and age-related degenerative diseases in a whole food context using animal model systems





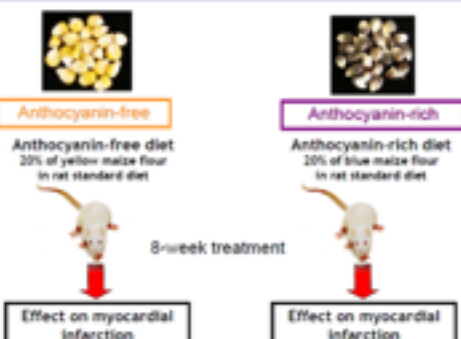
ATHENA
Anthocyanin and polyphenol bioactives for Health Enhancement through Nutritional Advancement



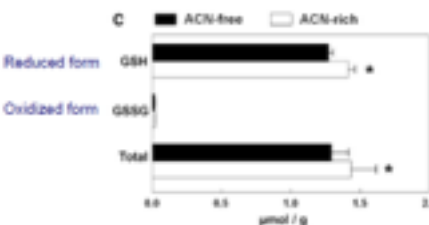
Mechanism of protection

Glutathione is a tripeptide. It is one of the most important antioxidant molecules produced by our body

NC(CCC(=O)NCC(=O)N)C(=O)O



Effect on myocardial infarction



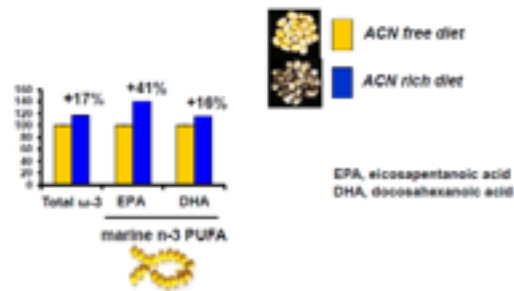
Form	ACN-free (μmol/g)	ACN-rich (μmol/g)
Reduced form GSH	~1.4	~1.7*
Oxidized form GSSG	~0.1	~0.1
Total	~1.5	~1.8*

The preischemic cardiac level of reduced glutathione was greater in rats fed the ACN-rich diet

Tognolon et al., (2008) / Nutr 138: 747-752

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Dietary anthocyanins have a fish-like effect enhancing Omega-3 levels in blood



In Western diet, low of fibers and rich in fats, the average intake of anthocyanins is estimated to be 12 mg/day

In proportion in our studies, rats and mice received 13-fold more anthocyanins than most people following a standard Western-type diet

...and the amount of cardiac tissue that was damaged following ischemic conditions was reduced by approximately 30% Furthermore, glutathione and omega-3 levels were increased.

For humans, this dosage would correspond to 156 mg/day of anthocyanins