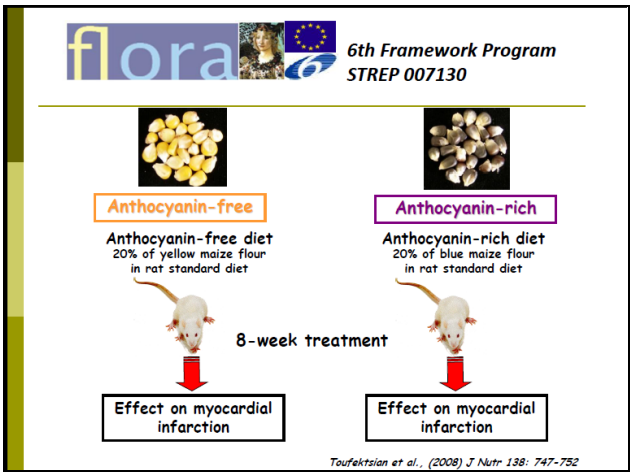
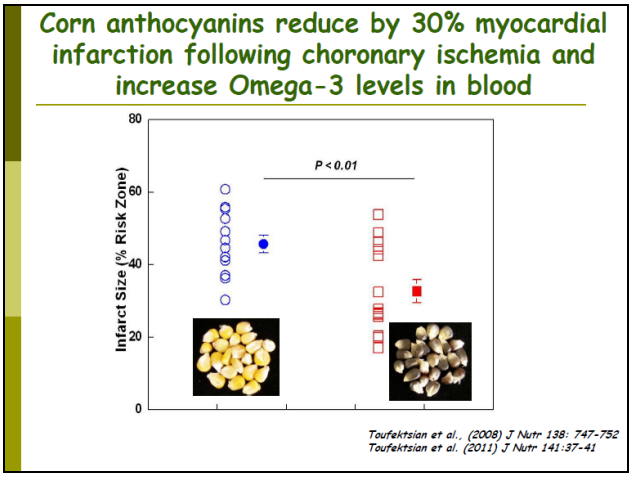
NUTRIGENOMICS, FUNCTIONAL FOOD AND PREVENTION OF CHRONIC DISEASES

Dott.ssa Monica Fornari
Dipartimento di Bioscienze
Università degli Studi di Milano

Being commonly found in fruits and vegetables, flavonoids and anthocyanins are widely distributed in the human diet. Epidemiological studies suggested that regular consumption of flavonoid-rich foods is associated with decreased risk of chronic degenerative diseases. In the frame of the EU-funded projects FLORA and ATHENA, we developed maize isogenic lines with high levels of anthocyanins by generating suitable allelic combinations of the *MYB* and *bHLH* regulatory gene families controlling activation of the anthocyanins biosynthetic pathway in maize. The aim was to provide dietary supplements to test the impact of anthocyanins in whole foods on cardiovascular diseases using animal model system. These studies demonstrated that in rats fed anthocyanin-rich blue maize the amount of cardiac tissue that was damaged following ischemic conditions was reduced by approximately 30% compared to rats fed anthocyanin-free maize. Cardioprotection was associated with increased myocardial glutathione levels and increased marine omega-3 levels in blood, suggesting that dietary anthocyanins modulate cardiac antioxidant defences and the conversion of plant α-linolenic acid into omega-3 fatty acid (Toufektsian et al., 2008, 2011). Within ATHENA, we are now using maize lines with increasing levels of anthocyanins to evaluate the dose/response, the influence of different nutritional contexts on the bioavailability/biological activity of bioactives, their mechanism of action with *in vitro* studies in cell model systems and their role against human diseases (clinical trials).





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 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, a significant increase in Omega-3 levels in blood was observed

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

ATHENA
AnThocyanin and polyphenol bioactives for Health Enhancement through Nutritional Advancement

In the frame of the FP7 European Project ATHENA, maize lines with increasing amounts of anthocyanins both in seeds and cobs will be used to evaluate:

1) the dose response of anthocyanins,
2) the influence of the food source on their absorbance and beneficial effect,
3) the potential benefit of anthocyanins to combat chronic diseases in humans,
4) their mechanism of action in cell-based experiments