

Purple tomatoes: The richness of antioxidants against tumors

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Purple, high anthocyanin tomatoes and red wild-type tomatoes. Credit: John Innes Centre

Researchers from the John Innes Centre in Norwich, Great Britain, in collaboration with other European centres participating to the FLORA project, have obtained genetically modified tomatoes rich in anthocyanins, a category of antioxidants belonging to the class of flavonoids. These tomatoes, added to the diet of cancer-prone mice, showed a significant protective effect by extending the mice lifespan. The research has been published in the 26 October issue of *Nature Biotechnology*.

It is a remarkable step ahead in the study on antioxidants, particularly flavonoids, widely considered as a useful tool for preventing a large

number of diseases, from cardiovascular disease to certain types of cancer. The diet followed by the majority of people living in the Western world does not appear to be sufficient to guarantee an adequate intake of these substances, present in many fruits and vegetables such as berries. That is why the FLORA project aims at understanding their mechanisms trying to find new ways to increase their consumption.

Researchers from the John Innes Centre, coordinated by Cathie Martin, tried to step on it by putting on the lab bench a naturally anthocyanins-free product as tomato and engineering it to enhance its flavonoid content. In this way researchers have obtained an ideal model to study the effect of anthocyanins.

In order to obtain fruit particularly rich in anthocyanins, that has conferred a peculiar purple colour to the tomatoes, the British team has used two genes from the snapdragon flower: Delila and Rosea1. "Our institute has a long standing interest in this plant that we use as a model to study flower development- says lead author Eugenio Butelli- The two genes we have isolated are responsible for flower pigmentation and, when introduced in other plants, turned out to be the perfect combination to produce anthocyanins, the same phytochemical found in blueberries. At a closer chemical analysis it comes out that our purple tomato has a very high antioxidant activity, almost tripled in comparison to the natural fruit thus it is very useful to study the effect of anthocyanins".

Subsequently, scientists have fed knockout mice lacking p53 gene, commonly known as the "genome guardian", with a powder obtained from purple tomatoes.

P53 is a key gene in the tumorigenesis process. Mice lacking p53 develop different types of tumours, especially lymphomas and die at a very young age.

Mice used in the experiment have been divided into three groups, fed three different diets: the first one has received a standard diet, while the second group was fed diet supplemented with 10% powder from freeze-dried red tomatoes and the last one with 10% powder from purple tomatoes. "We have not re-corded significant differences between the first two groups- argues Marco Giorgio from the European In-stitute of Oncology who followed the experimental phase on mice- But mice fed with purple tomatoes showed a significant increase of lifespan". The last group has reported an average lifespan of 182 days in comparison to the 142 recorded for mice fed standard diet.

However promising results appear to be, researchers prefer to be pretty cautious. "Actually- Giorgio con-tinues- it is a pilot test, a preliminary study useful to validate the hypothesis of obtaining health benefits from diet supplementation with modified food. Although mice's lifespan has significantly increased once fed on purple tomatoes we still don't know how it works. It is not likely everything can be explained on antioxidants basis alone. Moreover, we have to consider that in this study we have not taken into account any possible toxicity so I shall say we're far from considering a human trial. Next step is to investigate the effect of purple tomatoes on different kinds of tumor models and define the mechanism of action".

Nevertheless, FLORA researchers do believe we may start to do something. "The study- says Cathie Mar-tin, FLORA project coordinator- confirms the latest research trends arguing that we can obtain significant beneficial effects by simple changes in our daily diet. We are not talking of pills or supplements but only food. It is worthy of notice that recommendations by worldwide governments risk to be unaccepted. The 5-a-day program promoted by the American National Cancer Institute 20 years ago does not seem to be very incisive and not just because of the lack of time. Financial crisis is giving an hand to the failure of good intentions mainly due to the expensive costs of fruits and

vegetables. Research has to do something, has to find new ways to face the challenge. A solution may rely on concentrating in few but selected products the largest part of nutrients we should intake during the whole day".

Source: Catholic University

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