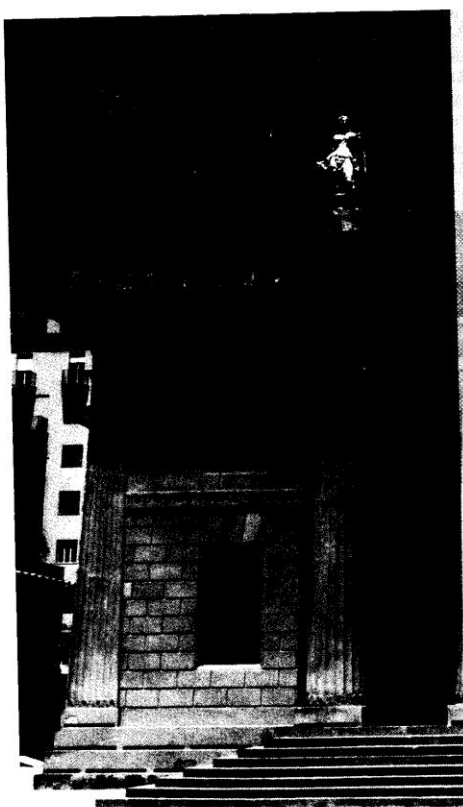


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NON INVASIVE RAMAN SPECTROSCOPIC DETECTION OF SKIN CAROTENOIDS IN HEALTHY SICILIAN SUBJECTS

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Carotenoids are plant pigments widespread in nature. In particular, they are largely represented in various Sicilian fruits and vegetables, such as carrots, tomatoes, peppers and pumpkins routinely consumed by population. Epidemiological studies have shown that the carotenoid intake is associated with a diminished risk of cardiovascular diseases and some kinds of cancer, and may help to prevent malignancy in the skin. These effects are thought to be secondary to carotenoid radical scavenging and antioxidant capacity.

It is known that blood/tissue carotenoid concentration correlates with dietary intake. In addition, plasma carotenoid levels may be a reliable indicator of the total antioxidant status. A recent study (1) reported that the ability of carotenoids to predict serum levels of other antioxidants is stronger than the predictive ability of alpha, beta, delta and gamma tocopherol, as well as glutathione.

Measurement of carotenoids in plasma is obviously an invasive method, which prevents what would be a simple check up of the antioxidant status of population. Nevertheless new methodologies have been developed, taking into account that carotenoids are physiologically accumulated in the skin in relation with their plasma concentration.

A novel non invasive optical method, based on the Raman resonance spectroscopy (RRS), can accurately measure the level of carotenoids in skin. RRS is a form of laser spectroscopy that detects the characteristic vibrational/rotational energy levels of a molecule. Carotenoids have a conjugated carbon backbone molecular structure and are Raman-active. A recent study showed a highly significant correlation between serum total carotenoids and skin carotenoids measured by Raman spectroscopy (2), which validated the Raman spectroscopy as a method to assess these compounds in skin, and then predict the broad-spectrum antioxidant status, without the inconvenience of blood samples.

In this small epidemiological trial we have measured the carotenoid level in the skin of 74 healthy Sicilian subjects by using the Pharmanex BioPhotonic scanner, an instrument based on Raman spectroscopy, patented for the measurement of carotenoid in living tissue. In order to assess the relation between fruit and vegetable intake and skin carotenoid levels, demographic data and fruit and vegetable intake were recorded and the data were reported as 3 groups based on the amounts of fruit and vegetable intake. The data were analysed according ANOVA one-way, corrected with Bonferroni. Skin carotenoid levels are reported as Skin carotenoids score (SCS).

Results : Mean SCS of low intake of fruit and vegetables (23.40 ± 5.30 , $p < 0.05$) was significantly lower than SCS of moderate intake (34.03 ± 6.89 , $p < 0.05$) and high intake (46.93 ± 11.20 , $p < 0.05$).

Conclusion. Our data confirm that carotenoid concentration correlates with dietary intake and Raman spectroscopy is a feasible and valid method of skin carotenoid detection.

Apart the interest in evaluating the organic antioxidant status, the skin carotenoids play *per se* an important role in the skin antioxidant defence, and may protect against a number of free-radical triggered conditions such as premature skin aging, oxidative cell damage and even development of skin cancer. Then monitoring their amount can also offer the opportunity to evaluate the importance of diets rich in carotenoids in order to

prevent such conditions. The Raman spectroscopy that is a rapid, non invasive method, may be a simple and promising approach.

References:

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