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# Flavonoids and carotenoids from vegetables and fruits play an important role with regard to prevention of diabetes, skin diseases and skin aging – clinical data

**Henning Vollert**[1, 2]
[1]University of Kiel, Germany
[2]BioActive Food GmbH, Germany

**Synergistic effect of apple and kale flavonoids to prevent diabetes:**

**Aim:** In the search for dietary ingredients that might help to reduce postprandial glucose levels to dietary carbohydrate intake, we tested flavonoid extracts previously identified by their ability to inhibit SGLT-1.

**Materials & Methods:** 20 obese subjects served as volunteers in a crossover trial. A test meal composed of 104 g white bread was administered with or without administration of either kale or apple extract or mixtures of these extracts.

**Results:** The ingestion of curly kale or apple extracts alone did not affect basal glucose levels in humans. Administration of apple extract together with curly kale extract significantly decreased blood glucose responses in mice as well as in humans.

**Conclusion:** Although the administration of individual flavonoid extracts from apple as well as curly kale alone failed to lower venous blood glucose in humans, the ingestion of apple extract in combination with curly kale extract showed significant anti-hyperglycemic activities in the obese subjects. In vitro data indicate that phlorizin is a potent SGLT-1 inhibitor, whereas kaempferol flavonoids may inhibit the hydrolases degrading phlorizin and therefore, creating a synergistic effect of phlorizin and kale flavonoids.

**Effects of a curly kale extract on the antioxidant status & collagen-index of the skin**

**Aim:** Numerous studies showed that a supplementation with a single Antioxidant (AO) in a high- dose shows only limited or even undesired effects. Recent studies demonstrated that a combination of various AOs in a low dose have a positive effect on the AO-system. Carotenoids are main components of the exogenous AO-system. To investigate their effect on the AO-status of the skin, 2 independent double-blind placebo controlled in vivo-studies were performed.

**Methods:** Healthy volunteers were supplemented with a natural curly kale extract at physiological concentration. In vivo electron paramagnetic resonance spectroscopy was used to determine the radical scavenging capacity of the skin. The cutaneous carotenoids were measured using resonance Raman spectroscopy, the collagen/elastin content was identified by two-photon tomography.

**Results:** A successive improvement of the entire AO network after 8 weeks of supplementation was demonstrated: A significant reduction in the radical formation after moderate stress induction by irradiation was shown, in comparison to a placebo group. Furthermore, a significant increase in the bioavailability of cutaneous carotenoids was indicated. In a second study, the intake of the same extract was extended to 10 months, showing significant increases in the concentration of the skin carotenoids and the collagen/elastin index of the dermis compared to the baseline measurements.

**Conclusions:** A supplementation with a mixture of several low-dose AOs including carotenoids at physiological concentration significantly reduce the amount of free radicals and improved the AO capacity of the skin, resulting in a better radical defense, thus counteracting an age-related collagen I degradation in the dermis in vivo.

## Biography

Henning Vollert studied Biology in Kiel and Hamburg, Germany. He received his PhD in Biology at Center of Molecular Neurobiology in 1994. From 1994-1997, he worked for Evotec AG. In 1997, he joined Sanofi holding several positions including Head of Cardiotechnology. In 2008, he started his own business and established BioActive Food Company. The company is developing innovative medicinal food addressing macular degeneration, skin aging and diabetes.

dr.vollert@bioactive-food.com