Antioxidant action of two polyphenols, resveratrol and piceid, on a biological in vitro model

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Introduction
Among natural antioxidants found in many natural foods and beverages, the flavonoid resveratrol and piceid have been proven to be effective against a broad range of diseases whose origin can be attributed to oxidative damage.

Resveratrol is a polyphenol, a secondary metabolite synthesized by Pteromycetes in response to stress conditions caused, for example, by exposure to UV radiation or fungal infection. Piceid, called also piceatannol, is the glucosylated form of resveratrol, and also shows two isomers α and β. It is more resistant to enzymatic oxidation than resveratrol, enters the cell through an active transport mechanism that uses the glucose transporter, and, because of its higher solubility in water, is more efficiently absorbed from the mammal’s intestine.

This work was planning to evaluate the antioxidant action of these polyphenols on a biological in vitro model (i.e., mitochondria) and to assess, then, any protective action of these substances when the same organoids are exposed to toxic environmental substances well known to give rise to a state of oxidative stress. The choice of using a mitochondria-based biometry was determined by the need to clarify the biochemical mechanisms underlying the antioxidant effect of resveratrol and piceid on natural membranes. In particular, starting from some studies (Fabris et al., 2009) conducted to date on model membranes (i.e., synthetic organoids like the mitochondria or liposomes), using ABIP as radicalic initiator, we tried to investigate resveratrol and piceid antioxidant action performed at mitochondrial membranes, using freeze-bulk heart mitochondria, called PMS test (see poster EU IUC for more detailed information).

Initially, it has been utilized with the classical mitochondrial endpoint, i.e., respiratory chain inhibition (data not shown here). Then, it is reported that the antioxidant polyphenol’s activity is linked to their ability to block or slow down lipid peroxidation, reacting with peroxide radicals formed in the propagation phase. The work proposed the potential use of resveratrol and piceid and to interact with inhibitor radicals, since it is possible that oxidation is inhibited in the initiation stage. Indeed, the antioxidants resveratrol and piceid act as a scavenger against radical initiators and propagators of membrane oxidation, and its effectiveness in preventing the lipid peroxidation in different types of substrates, is well known.

French paradox
Low levels of dietary antioxidants are supposed to be linked to a lower incidence of cardiovascular disease. This has been attributed to the low antioxidants/antioxidant consumption of non-Western populations compared to the resveratrol and piceid.

I² plan - Bibliographic search
Environmental compound identification able to produce oxidative stress

In Conclusions
Objective limits of mitochondrial test because of organic complexity; it is impossible to distinguish the specific action of tested antioxidant from other components of total mitochondrial output.

Unable to shed light on the mitochondrial membrane antioxidant action of resveratrol and piceid demonstrated on synthetic membranes and to clarify their biochemical mechanisms on these membranes.

Trans-resveratrol and piceid not inhibit or have any unfavorable effect on the electron transport chain.