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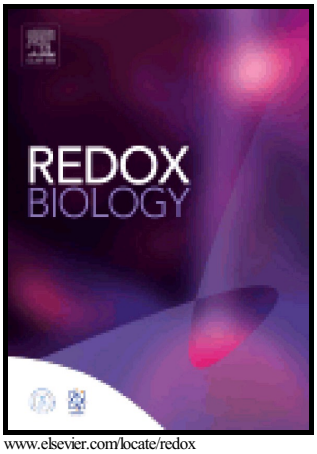

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PII: S2213-2317(17)30212-4
DOI: http://dx.doi.org/10.1016/j.redox.2017.04.014
Reference: REDOX639

To appear in: *Redox Biology*

Received date: 22 March 2017
Revised date: 6 April 2017
Accepted date: 8 April 2017

Cite this article as: Gęgotek Agnieszka, Bielawska Katarzyna, Biernacki Michał Dobrzyńska Izabela and Skrzydlewska Elżbieta, Time-dependent effect of rutin on skin fibroblasts membrane disruption following UV radiation, *Redox Biology* http://dx.doi.org/10.1016/j.redox.2017.04.014

Time-dependent effect of rutin on skin fibroblasts membrane disruption following UV radiation

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ABSTRACT

Chronic exposure of the skin to solar UV radiation induces a number of biological alterations, including a redox imbalance; therefore, there is an urgent need for skin cells protective compounds. The aim of this study was to determine the effects of natural, previously extensively examined, polyphenol with antioxidant properties – rutin, on UV-induced skin fibroblasts membrane disruption. Accordingly, fibroblasts exposed to UVA and UVB irradiation were incubated with rutin (12h before and/or up to 24h after irradiation), and the structural and metabolic changes were examined. Rutin penetration through the fibroblast phospholipid bilayer was aided by UVA-induced bilitranslocase activity 2-4h after irradiation, while UVB irradiation led to enhanced phospholipid peroxidation and higher membrane permeability to facilitate the interaction of rutin with phospholipids. Lipidomic analysis revealed that 4h of rutin treatment also partially prevented UVA/B-induced increase in phosphatidylethanolamine and phosphatidylcholine level, as well as their membrane localization, which resulted in an enhanced zeta potential in the cells and liposomes. Moreover, rutin 2h following irradiation, in a various degree, prevented the increased in phospholipase A2 activity and ROS generation, and partially protected against the reduction of arachidonic and linoleic acids level and the lipid peroxidation product 4-hydroxynonenal level increase. Rutin effectively prevented against decrease in glutathione peroxidase, glutathione and vitamins E and C activities/levels, particularly 2h following UVA irradiation.

In conclusion, highest skin fibroblasts membrane level of rutin occurred in 2-4h following UVA/B-radiation results in its strongest effect on biomembrane structure and functions and cellular antioxidant system irrespective of the radiation type.

Graphical abstract