

Protective effect of a novel anti-aging facial cream containing *Alteromonas ferment* extract and carnosine against environmental pollution in human skin explants in ex-vivo study

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INTRODUCTION

Environmental pollution in the form of fine or very fine particulate matter (PM2.5) from vehicle exhaust and industrial fumes are recognized as causing premature aging, acne and hyperpigmentation in exposed skin. A novel anti-aging facial cream with *alteromonas ferment* extract, carnosine and niacinamide (FC-AFE) has been designed to protect against the damage of pollution, reduce advanced glycation end-products and reduce jawline sagging.

OBJECTIVE

This ex-vivo study looks to establish the effects of pollution and the protective effects of the novel facial cream FC-AFE.

METHOD

Human skin explants were obtained from abdominoplasty and assigned to one of three treatment groups: untreated control (UC), pollution control (PC) and pollution+FC-AFE (PFC). On day 0

(D0), D1, D2, D3 and D4 (before exposure to pollutant), FC-AFE (2 μ l per cm²) was applied topically on explants in group PFC. On D2 and D4, the explants in groups PC and PFC were exposed by vaporization to a mixture of pollutants; diesel particles (PM2.5 and PM10)+ benzene + benzo[a]pyrene + heavy metals for 1.5 hours (Fig. 1). Malondialdehyde (MDA) was quantified on D5 in culture media as a marker for lipid peroxidation. The explants were divided for histological analysis or total RNA extraction. Histological sections were stained to check for tissue viability and immunostained for activated form of Nrf2 with monoclonal antibody (recognizing uniquely the Serine-40 phosphorylated form of Nrf2), corresponding to the nuclear activated form of Nrf2. Image analysis was used to assign level of staining very weak to strong. Genomic changes in select genes was determined by q-rPCR and amplification of cDNA.

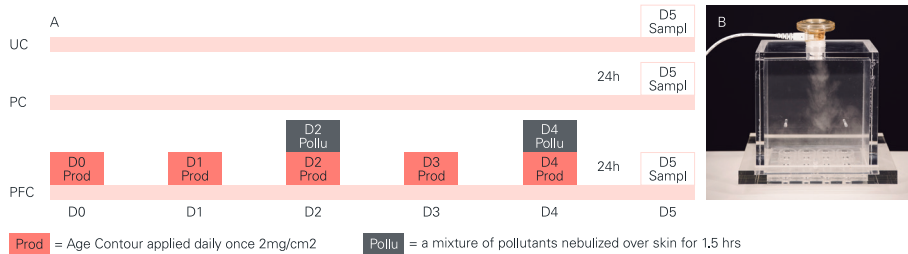


Figure 1. Study design (A) and chamber used to expose skin explants to nebulized diesel particles (B) fitico

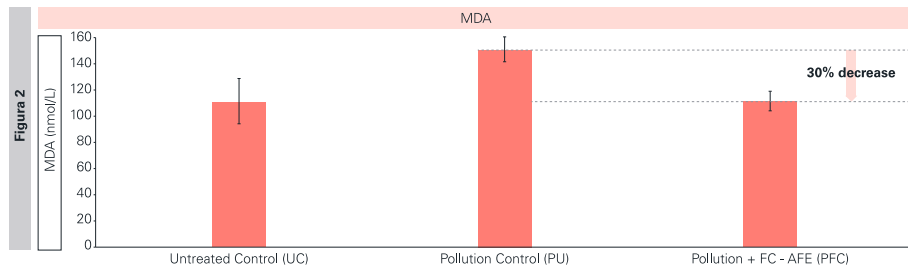


Figure 2. MDA levels (nmol/L) in untreated control (UC), pollution control (PC) and pollution+FC-AFE (PFC).

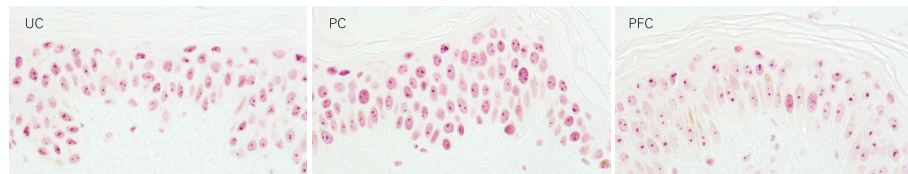


Figure 3. Histological skin sections immunostained with nuclear and activated form of Nrf2 in untreated control (UC), pollution control (PC) and pollution+FC-AFE (PFC)

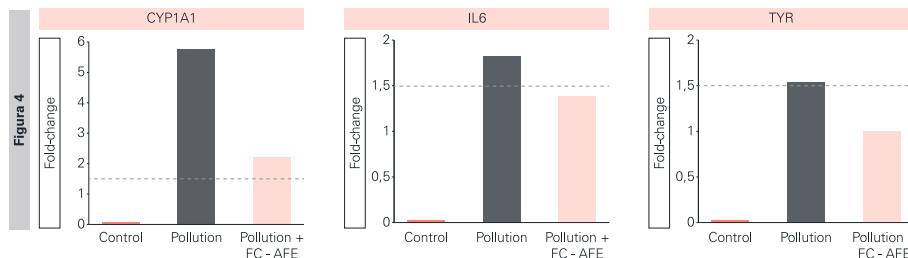


Figure 4. Levels of CYP1A1, IL6 and TYR in skin sections in untreated control (●) pollution control (●) and pollution+FC-AFE (◐). Results expressed as fold changes with respect to UC group. Only changes atleast 1.5 fold (indicated by red line) or higher were considered relevant.

RESULTS

Cellular viability of all tissues was good to very good. MDA levels in UC, PC and PFC groups on D5 were 108.5, 149.1 and 109.2nmol/L, respectively (Fig. 2). The exposure to pollution induced an increase of the quantity of serine phosphorylated Nrf2 (activated and nuclear form) compared to untreated control (PC vs UC). The application of FC-AFE produced a clear decrease in active Nrf2 expression in group PFC compared to PC group (Fig. 3). With respect to UC group, in PC and PFC groups the CYP1A1 expression increased by 474% and 122%, IL6 expression increased by 83.3% and 34.3%, and TYR expression increased by 53.3, and -3.6%, respectively (Fig. 4).

CONCLUSIONS

Exposure of human skin explants to pollution particles led to an increased release of MDA into the culture medium indicating an increase in lipid peroxidation.

Pollution exposure of skin also led to an increase in active Nrf2 staining indicative of oxidative stress and an increased expression of genes associated with detoxification, inflammation and pigmentation.

All these changes were blocked by the application of the novel face and neck cream prior to exposure to pollution indicating a protective effect of the FC-AFE against changes induced by pollution particles in the skin.

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- Osburn WO, Kensler TW. Nrf2 signaling: An adaptive response pathway for protection against environmental toxic insults. *Mutat Res.* 2008 Jul-Aug;659(1-2):31-9