

# INNOVATIVE *EX VIVO* PROTOCOLS TO SUBSTANTIATE THE ANTI-POLLUTION CLAIM

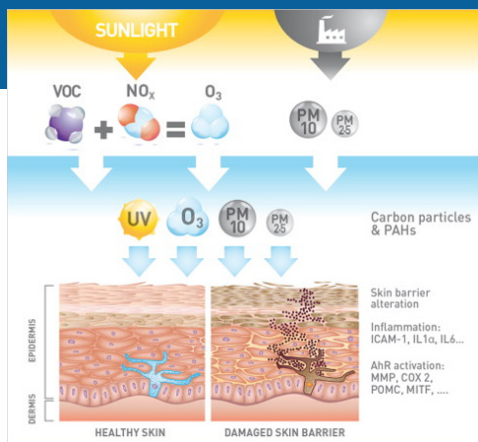
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## Abstract

In response to manufacturers' needs for anti-pollution claims substantiation, CIDP has developed *ex vivo* protocols that objectively evaluate effect of pollutants (ozone, cigarette smoke, ambient dust) and light (UV, blue light, IR) on the skin. Our anti-pollution study protocols call for specific biomarkers to be identified and monitored, to show their evolution when samples are exposed to pollutants, light or both. The *ex vivo* model is an efficient testing model that serves as a good intermediate between the *in vitro* and the *in vivo* methods. This model helps manufacturers demonstrate the effects that their cosmetic products have against pollution.

## Introduction

### CELL MECHANISM & BIOLOGICAL RESPONSE TO POLLUTION



Pollution and skin: From epidemiological and mechanistic studies to clinical implications. Krutmann J. et. al. 2014

## INNOVATIVE STANDARDIZED METHODOLOGIES



Cigarette Smoke Box

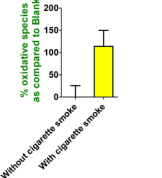
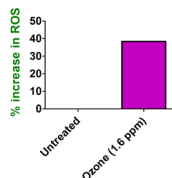
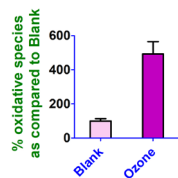
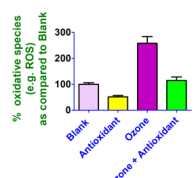


Ozone Generator

• CIDP HAS DEVELOPED A POLLUTION EXPOSURE SYSTEM TO ALLOW *IN-VITRO* CONTROLLED EXPOSURE TO POLLUTANTS (O<sub>3</sub>, CIGARETTES SMOKE, DUST...) MIMICKING POLLUTION.  
 • *IN VITRO* ANTI-POLLUTION ASSAYS ARE PERFORMED ON CELLS AND TISSUE MODELS (SKIN EXPLANTS AND 3D RECONSTRUCTED HUMAN EPIDERMIS).

## ROS QUANTIFICATION AFTER O<sub>3</sub> OR CIGARETTE SMOKE EXPOSURE

*In vitro & Ex vivo models*

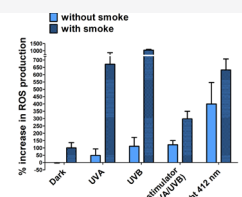


THE LEVEL OF REACTIVE OXYGEN SPECIES (ROS) INCREASES AFTER EXPOSURE TO EITHER O<sub>3</sub> OR CIGARETTE SMOKE. ADDITION OF AN ANTIOXIDANT DECREASES ROS INDUCED AFTER O<sub>3</sub> EXPOSURE.

## PHOTO-POLLUTION

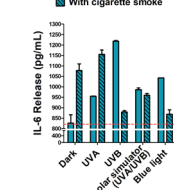


HUMAN SKIN EXPLANT

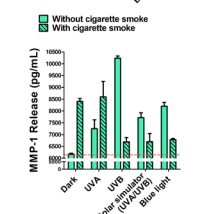


OXIDATIVE STRESS WITH LIGHT

Without cigarette smoke / With cigarette smoke



IL-6 Quantification INFLAMMATION



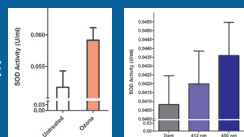
MMP-1 Quantification EXTRACELLULAR MATRIX

THE COMBINED EXPOSURE OF CIGARETTE SMOKE + LIGHT POTENTIALISES ROS INDUCTION. CIGARETTE SMOKE +/- LIGHT INDUCES THE PRO-INFLAMMATORY CYTOKINE IL-6 AND THE MATRIX METALLOPROTEINASE MMP-1.

## QUANTIFICATION OF AN ANTI-OXIDANT ENZYME SUPEROXIDE DISMUTASE (SOD)



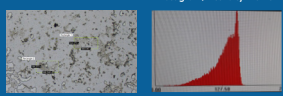
HUMAN SKIN EXPLANT



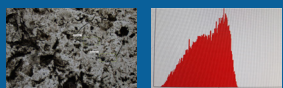
INCREASE IN SOD ACTIVITY AFTER EXPOSURE TO EITHER O<sub>3</sub> OR BLUE LIGHT.

## GRAY SCALE QUANTIFICATION

Untreated

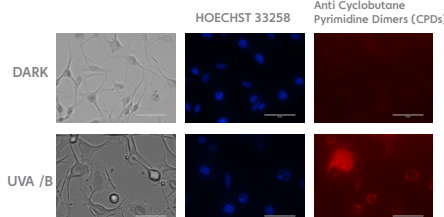


After 30 minutes exposure to ambient dust



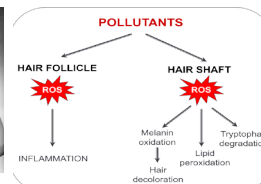
DECREASE IN THE MEAN GRAY SCALE PARAMETER AFTER EXPOSURE TO AMBIENT DUST

## OXIDATIVE DNA DAMAGE MONITORING



INCREASE IN OXIDATIVE DNA DAMAGE AFTER EXPOSURE TO UVA/B BY PROMOTING CPDS FORMATION.

## AIR AND WATER POLLUTION ON HAIR



## Conclusion

In response to manufacturers' needs for anti-pollution claims substantiation, CIDP has developed *ex vivo* protocols that evaluate the effect of different pollutants and light on the skin. Different biomarkers have been identified and monitored, ranging from oxidative stress markers to pro-inflammatory and matrix metalloproteinases induction. We thus demonstrate the evolution of these markers when samples are exposed to pollutants, light or both.

To conclude, the *ex vivo* model is an efficient testing model that serves as a good intermediate between the *in vitro* and the *in vivo* methods. Thus helping manufacturers demonstrate the effects that their cosmetic products have against pollution.