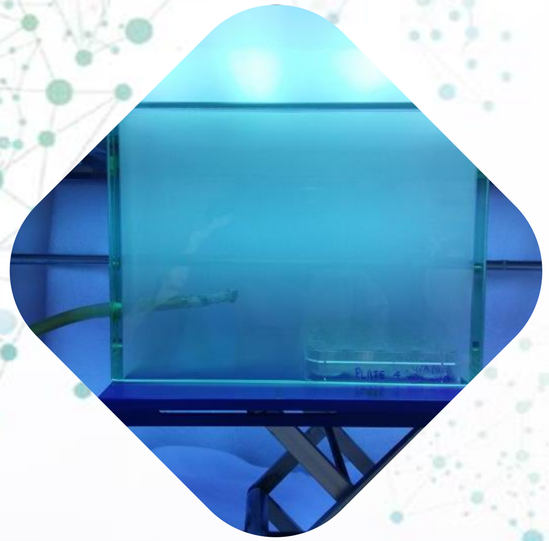
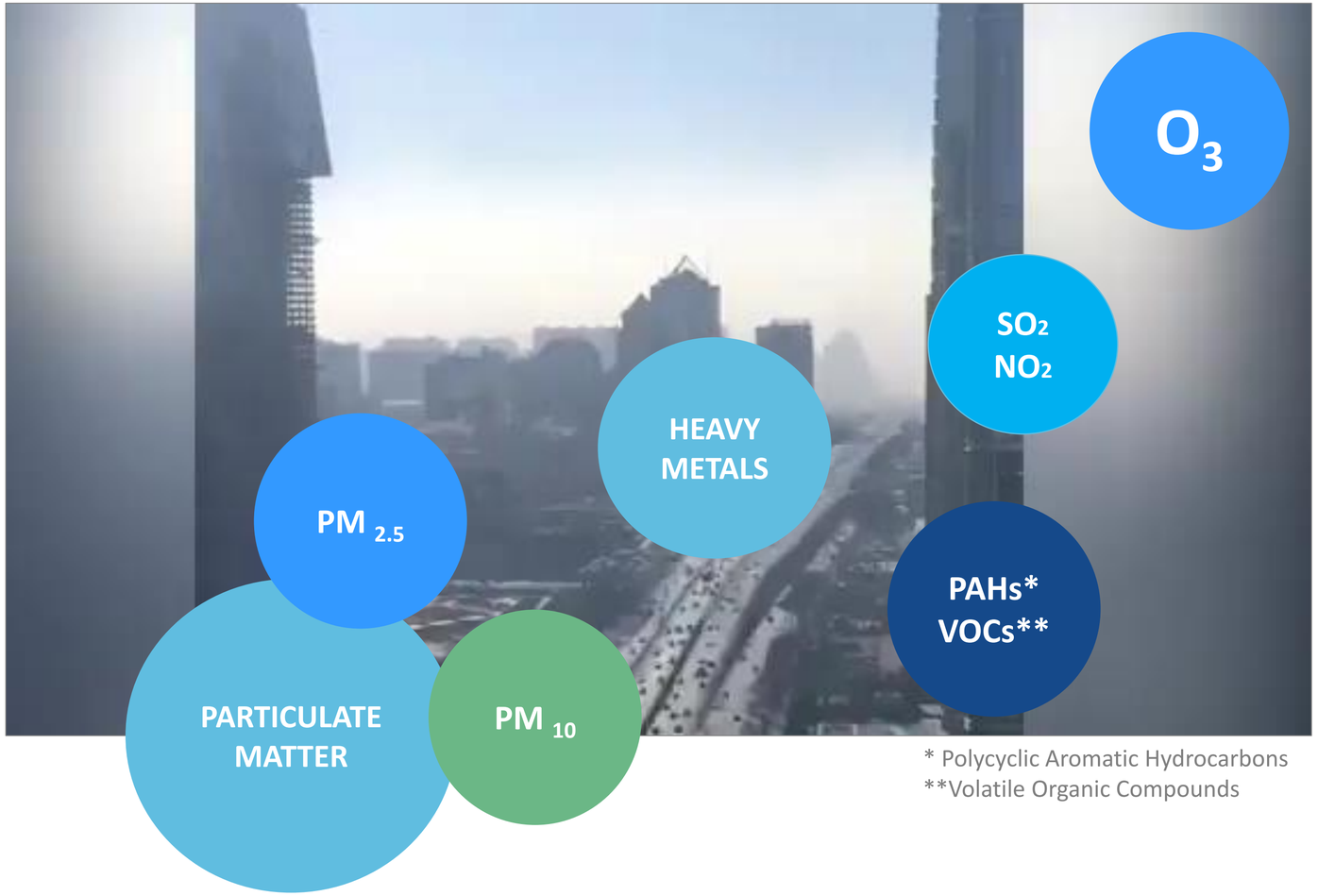
INNOVATIVE *EX VIVO* PROTOCOLS TO SUBSTANTIATE THE ANTI-POLLUTION CLAIM



MAJOR AIR POLLUTANTS

Complex mixture of toxics

INDUSTRIES	TRANSPORT	AGRICULTURE	CONSUMPTION
			
52%	27%	10%	8%



* Polycyclic Aromatic Hydrocarbons
**Volatile Organic Compounds

- **UV** and **pollution** are considered as the two **major environmental factors** responsible for cutaneous ageing, appearance of wrinkles and formation of dark spots.

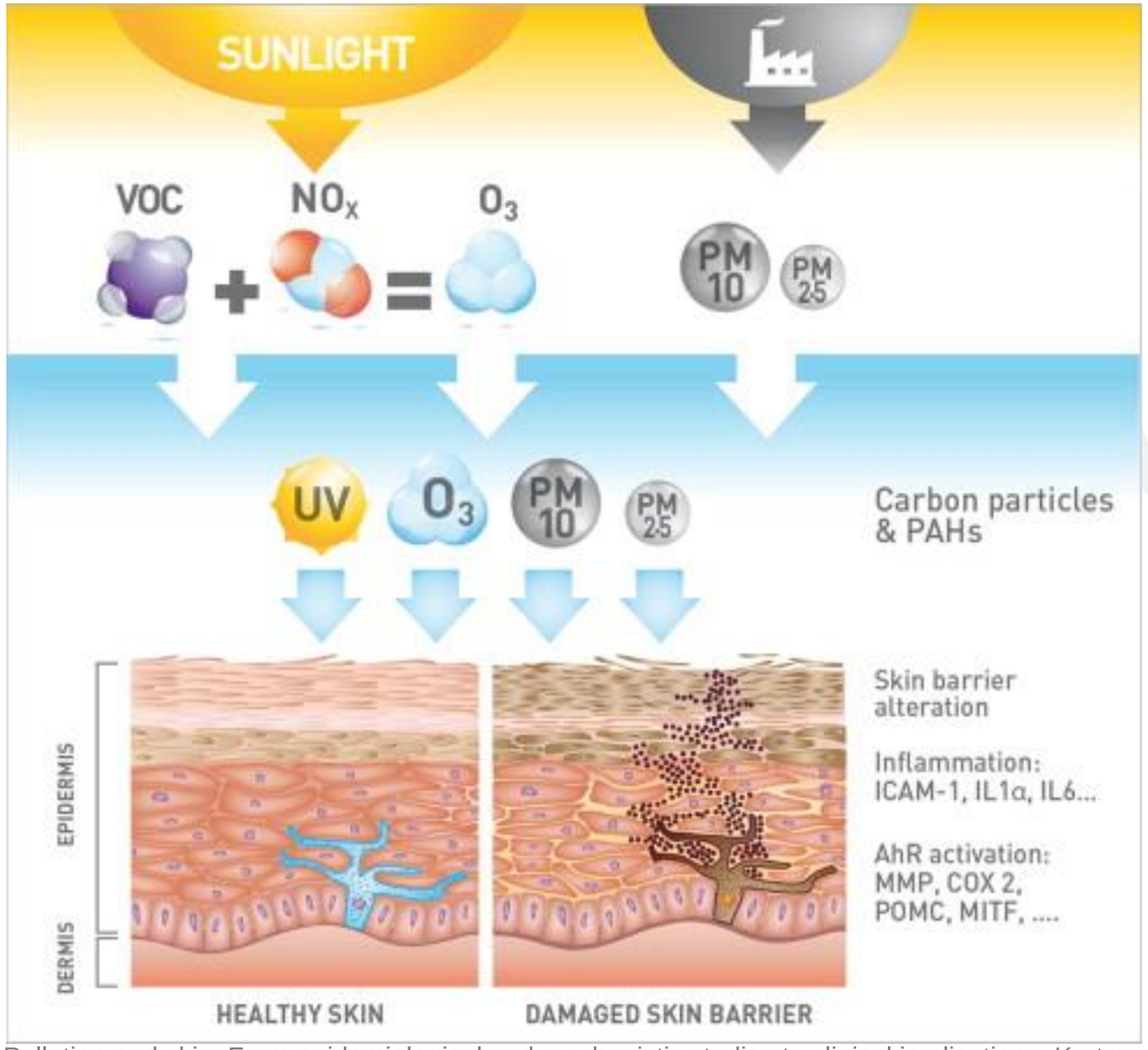
- Many scientific publications showed that **repeated exposure to pollution** :

  Increases risks of several diseases (chronic and acute respiratory diseases, cardiovascular diseases, lung cancer…)

  Exacerbates dermatological pathologies (atopic dermatitis, eczema, dry skin..)

  Worsen cutaneous sensitivity and reactivity

CELL MECHANISM & BIOLOGICAL RESPONSE TO POLLUTION



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

Biological pathways

- ROS production
- Lipids & proteins oxidation
- DNA damages (apoptosis)
- Activation of Nrf2 pathways and detoxifying enzymes…
- Inflammatory response (NFkB, proinflammatory cytokines)
- Activation of melanogenesis

Skin damage

- Oxidative stress
- Skin barrier alteration
- Inflammation & Sensitive skin
- Pigmentation & Dark spots
- Premature skin aging
- Sebum excretion
- Skin unbalance (microbiota)

INNOVATIVE STANDARDIZED METHODOLOGIES

- CIDP has developed a pollution exposure system to allow ***in-vitro* controlled exposure** to pollutants (O_3, cigarettes smoke, dust…) **mimicking pollution**.

- *In vitro* anti-pollution assays are performed on **cells** and **tissue models** (explants and 3D Reconstructed Human Epidermis).

Cigarette smoke box

Without or with Light exposure (UVR, blue light)

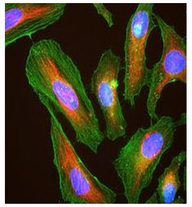
Ozone Generator

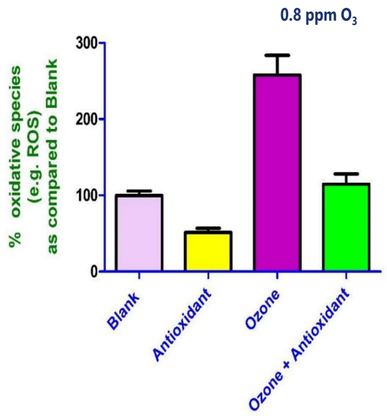
Ozone Production: 1.6 ppm/h
Temperature inside chamber: 37.5°C

ROS quantification after O_3 or cigarette smoke exposure

In vitro & Ex vivo models

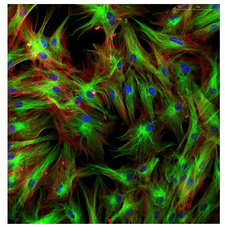
HELA CELL

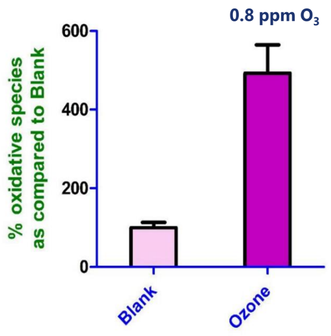




ROS Quantification
OXIDATIVE STRESS

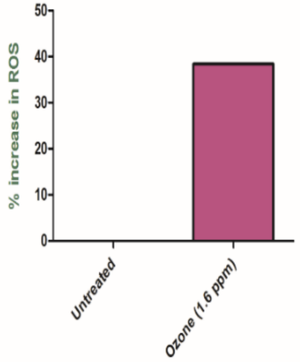
NHDF

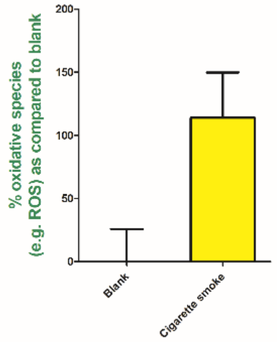




ROS Quantification
OXIDATIVE STRESS

HUMAN EXPLANT



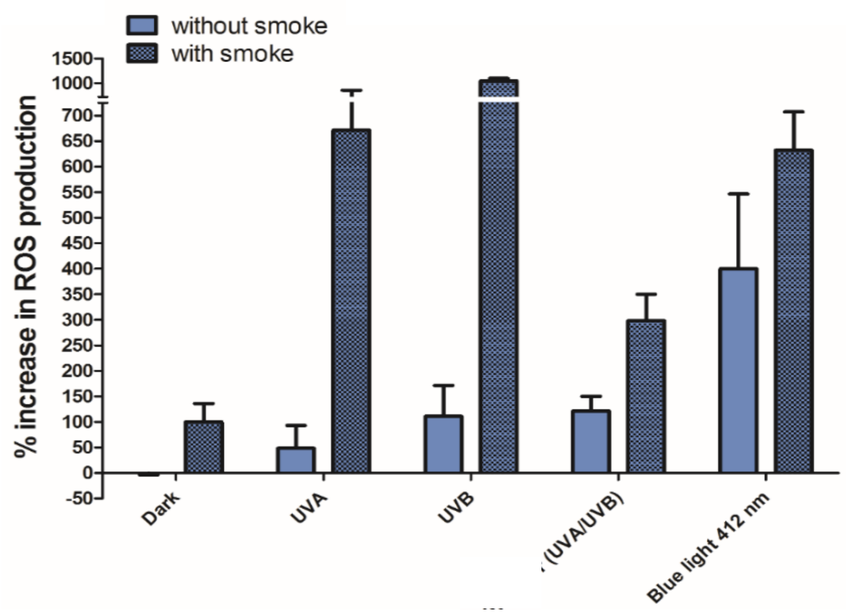


ROS Quantification
OXIDATIVE STRESS

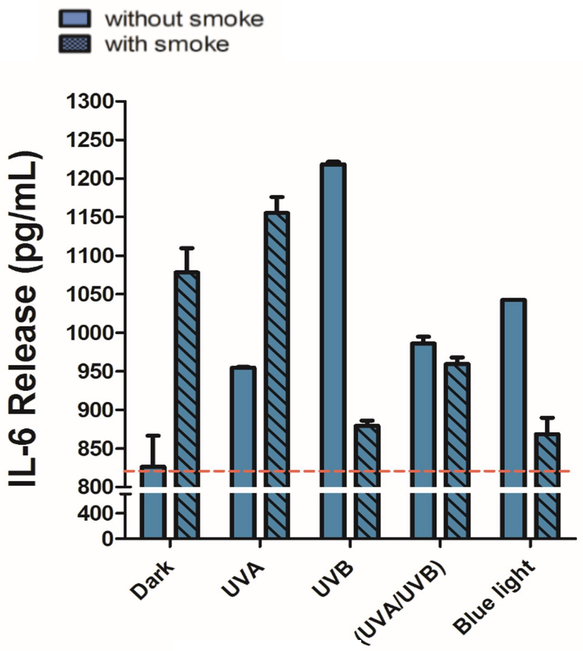
The level of Reactive Oxygen Species (ROS) increases after exposure to either O_3 or cigarette smoke. Addition of an antioxidant decreases ROS induced after O_3 exposure

Biomarkers quantification after the combined exposure of cigarette smoke with light

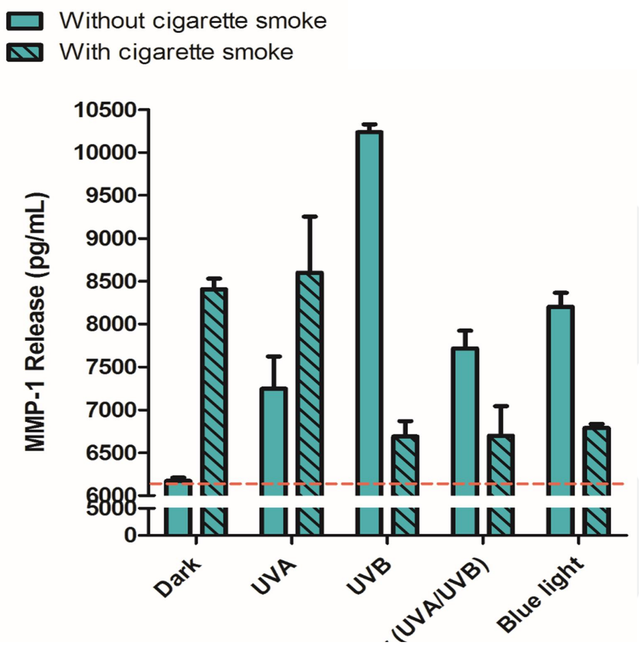
HUMAN EXPLANT



OXIDATIVE STRESS



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

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