Marrubium vulgare

#### Picking Pollution Defence from Nature

Advanced technology for City-zen' and refreshed skin



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Pollution is everywhere and comes from human activities or natural sources.







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Air pollution 🌃 💶 🗲 🛌

Atmospheric pollution is composed of particulate matter, biological molecules or other harmful materials:

- Polycyclic aromatic hydrocarbons (PAHs)
- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Sulfur oxides (SOx)
- o Carbon monoxide
- o Ozone

#### Size distribution of particulate matter







#### Engine particulate matter

Engine particulate matter (PM) is a complex mixture of elemental <u>carbon</u> (EC) particles, soluble organic carbon, including 5-ring or higher <u>polycyclic aromatic hydrocarbons</u> (PAHs) such as <u>benzo[a]pyrene</u>, as well as other metallic compounds. Also, PM usually contains some small amounts of nitrates, sulfates and sulfuric acid.

The particle phase has many different types of particles: Nearly all diesel particulates have sizes of less than 3  $\mu$ m. As such, they represent a mixture of fine, ultrafine, and nanoparticles. Solid carbon cores (0.01-0.08 mm) Agglomerate (0.05-1.0 mm) and absorbed vapour phase species

Adsorbed hydrocarbons

Liquid condensed hydrocarbon particles

Hydrated sulfate species







**Pollution & Skin** 

- Major shift in population from rural to urban areas predicted for the coming decades,
- Projections show hundreds of millions more urban dwellers, especially in Asia and Africa.

Classification of particulate matter (PM2.5 and PM10) depends on the size and how they will be inhaled.

#### But skin is another route.

Biggest particles adhere to the skin (lipochemical affinity) and deliver small molecules. Very small particles (<13 nm) may penetrate the *stratum corneum* (no relevant data to date). Penetration depends on their lipophilicity. **Altered skin barrier leads to faster and higher percutaneous absorption of exogenous material**.







# CITYSTEM<sup>TM</sup> focus grou®

### POLLUTION and ANTI-POLLUTION from a CONSUMER point of view

### focus grou@







# CITYSTEM<sup>TM</sup> focus grou®

#### **POLLUTION and ANTI-POLLUTION from a CONSUMER point of view**

#### **KEY LEARNINGS**

- o Pollution is everywhere and not always visible.
- Strong consciousness that pollution is harmful, for humans and for the planet.
- o Pollution impacts skin and hair.
- Pollution causes dirt accumulation, clogged pores, dehydration, acne, rashes, dulling, has a cumulative effect, creates stress and premature ageing (Global).
- Pollution causes skin sensitiveness, erythema, rough skin (China).







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<ul> <li><u>Protection</u></li> <li>Shield effect</li> <li>Blocks penetration</li> <li>Anti-adhesion</li> </ul>		<u>Removal</u> • Detoxifying effect • Neutralising effect • Antioxidant		
	Consume ben	er desired efits		
<u>Repair</u> <ul> <li>Replenishing</li> <li>Calming/soothing</li> <li>Smoothing/Softening</li> </ul>		<ul> <li><u>Strengthening</u></li> <li>Natural antioxidants</li> <li>Skin barrier reinforcement</li> <li>Texture/Radiance</li> </ul>		

#### **PERFECT PRODUCT: ANTI-POLLUTION + SUSTAINABLE + UV PROTECTION**



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Especially designed to fight against visible and invisible pollution damage to the skin, CITYSTEM™ protects, removes, strengthens and repairs.



\* Test summarised at the end of the presentation





#### PROTECTION

- Penetration
- Ah receptor
- DNA protection

#### **REMOVAL**

- Detoxification of radical oxygen species\*
- Neutralisation of protein and lipid oxidation

#### **STRENGTHENING**

- Phase II natural anti-oxidant enzymes\*
- Skin barrier restoration

#### **REPAIR**

- Energy replenishment
- Anti-inflammation effect\*

\* Test summarised at the end of the presentation









### in vitro Testing protocols

Tests were performed on normal human keratinocyte cultures or skin equivalents. CITYSTEM<sup>™</sup> was applied at eq. 1.6 or 2%. Stresses were induced by:



#### **PM**: Engine (Diesel) Particulate Matter

(ref SRM2975 NIST; ~7% mass total polycyclic aromatic hydrocarbons, 30% PM Ø<11.7  $\mu$ m)



**B[a]P**: Benzo[a]pyrene, from wood burning, automobile exhaust fumes, cigarette smoke and over-cooked food



0<sub>3</sub>: ozone



 $0_2$ 

0°





### CITYSTEM<sup>™</sup> in vitr₂



Protection Repai Strengthening

#### Pollution can penetrate into the cells

CITYSTEM<sup>™</sup> prevents particulate matter cellular intake



Normal human keratinocyte culture received CITYSTEM<sup>™</sup> eq. 2% followed by a PM solution.







#### A pollution receptor in the cell: Aryl Hydrocarbon Receptor



Normal human keratinocyte culture received CITYSTEM<sup>™</sup> eq. 1.6% followed by a PM solution. Western blot and measurement of the ratio nuclear AhR/ cytoplasmic AhR. Measurement of CYP1A1 mRNA by qRT-PCR.









#### Pollution breaks DNA

#### CITYSTEM<sup>™</sup> prevents DNA damage.





Normal human keratinocyte culture received CITYSTEM™ eq. 2% followed by a B[a]P solution. Evaluation by comet assay technique.









Repair Removal

Protection

#### Pollution damages proteins and lipids

PM

CITYSTEM<sup>™</sup> prevents protein carbonylation and lipoperoxidation

**Carbonylation** targets all functional proteins (enzymes, transcription factor, actin, etc) and leads to mitochondrial damage, inflammation, cell death, tissue damage etc.

**Lipoperoxidation** targets lipid structures including cell membrane, mitochondria, sebum and leads to impaired mitochondrial activities, DNA damage, cell death etc.



Normal human keratinocyte culture received CITYSTEM™ eq. 1.6% followed by a PM solution.







Strengthening

Protection

Pollution de-structures the stratum corneum and impairs the barrier function

CITYSTEM<sup>™</sup> helps recreate a healthy *stratum corneum* to prevent further damage and dehydration.



Skin equivalents produced by Sederma have received CITYSTEM<sup>™</sup> eq. 2% and PM the day after. Evaluations were performed two days after.









Pollution depletes cell energy.

CITYSTEM™ improves mitochondrial respiration thus replenishes the cells with energy.

#### Mitochondrial respiratory chain



Normal human keratinocyte culture received CITYSTEM™ eq. 1.6% followed by a B[a]P solution.



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# CITYSTEM™ in vivo

### in vivo Clinical testing protocols

Measurement of the **comedone** and **blackhead** characteristics.

Twice-daily application of a cream containing 2% CITYSTEM<sup>™</sup> on the face for 4 weeks by 40 male and female volunteers mean age 44 (21-67). Test performed in Paris. Photograph analysis and extractions with a patch.

Measurement of the skin texture and the skin roughness.

Twice-daily application of a cream containing 2% CITYSTEM<sup>™</sup> on half face for 4 weeks by 30 Thai/Chinese female volunteers mean age 45 (36-50) against placebo. Test performed in Bangkok by DERMSCAN. Evaluation with VISIA<sup>®</sup> and Silflo<sup>™</sup> prints + fringe projection technique.

#### Use test with a detoxifying facial sheet mask:

100 female volunteers (18-60) tested the benefits of CITYSTEM<sup>™</sup> 2% in a facial sheet mask applied once for 10-15 minutes. Test performed by EUROFINS in the South of France.

They answered a questionnaire just after removal, after an hour and the next morning.





### <u>CITYSTEM™ in vivo</u>

Comedones darken due to oxidation and pollution absorption

#### CITYSTEM<sup>™</sup> helps make blackheads less visible, leaving the skin purified and flawless.



	Number of blackheads	Surface of blackheads	Colour	Comedone size	Number of comedones
Mean result	<b>-8.8%</b> , p<0.05	<b>-8.8%</b> , p<0.01	<b>-9.5%</b> , p<0.01	<b>-15%</b> , p<0.01	<b>-45.7%</b> , p<0.01
Maximum	-50%	-67%	-52%	-52%	-93%
Responders	68%	73%	68%	78%	85%



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### CITYSTEM™ in vivo

Pollution damages the stratum corneum, skin grain becomes irregular

#### CITYSTEM<sup>™</sup> helps maintain a fine skin grain and thus stops complexion from becoming dull



Texture parameter extracted by VISIA®





### CITYSTEM<sup>™</sup> in vivဂ

Pollution increases skin asperities that make it feel rough.

CITYSTEM<sup>™</sup> helps make the skin smooth and soft.





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### <u>CITYSTEM™</u>



**Use test** on 100 female volunteers. Facial sheet mask applied once for 10-15 minutes.

#### 84% of volunteers feel their skin fresher the next morning.



Test performed with formulation SE0001H containing 2% CITYSTEM™





# CCC Listed

#### THE POWER OF A WEED

CITYSTEM<sup>™</sup> is obtained by the extraction of the cell culture of *Marrubium vulgare*.

The white horehound (or common horehound) is an edible herbaceous plant in the family *Lamiaceae*, spontaneously growing in temperate areas of Europe, America and Asia. Horehound medicinal properties were esteemed by the Romans and the Arabs. It is often used in the popular medicine as a remedy for respiratory conditions and to improve the digestive function. The plant has also anti-inflammatory properties and is used externally for skin problems.

CITYSTEM™ is titrated at 350 ppm in forsythoside B.

CITYSTEM<sup>™</sup> is a transparent liquid. **Recommended level: 2%** 











Especially designed to fight against visible and invisible pollution damage to the skin, CITYSTEM™

**Protects** the skin cells from the penetration of pollutants and genetic ravage.

**Removes** and neutralises the toxic oxidant species that damage proteins and lipid structures.

**Strengthens** the skin barrier, stimulates the skin's natural antioxidants.

**Repairs** the cell metabolism by replenishing the energy level and reducing the inflammation.

The skin grain is refined. The complexion looks radiant and purified. The skin feels soft and smooth. China IECIC Listed



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Advanced technology for City-zen' and refreshed skin

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### in vitrð



• **CYP2U1** 



Normal human keratinocyte culture received CITYSTEM<sup>™</sup> eq. 2% followed by a PM solution. Evaluation by DNA array.



Normal human keratinocyte culture received CITYSTEM<sup>™</sup> eq. 2% followed by a PM or a B[a]P solution.



