SenseBioTek
HEALTHCARE

BODY VOLATOLOME FOR DISEASE DETECTION

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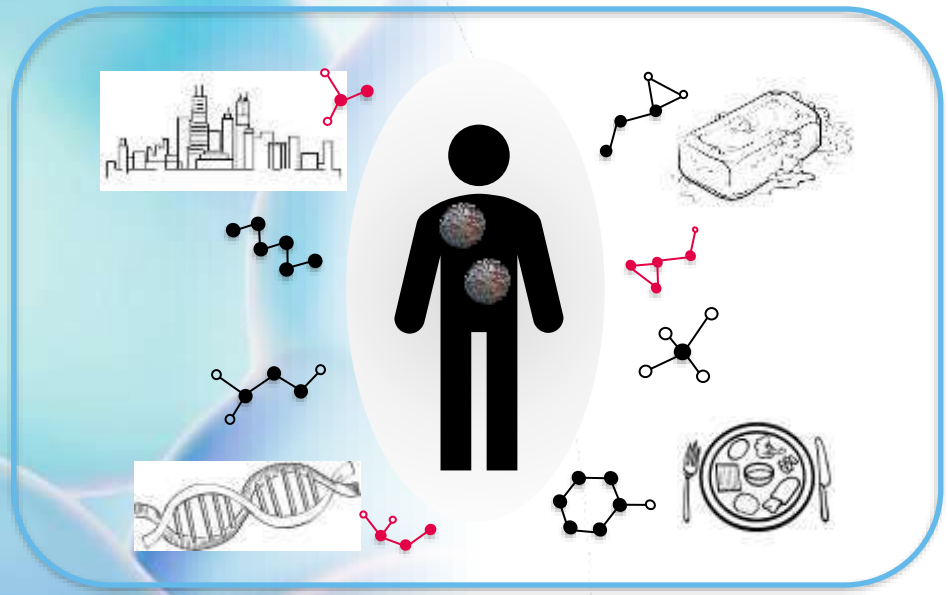
https://www.linkedin.com/company/sensebiotek-health-care/

Volatolome

Body odor



Volatile organic compounds

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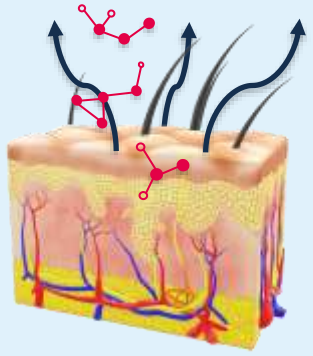
Pathology :
- Diabetes
- Epilepsy
- **Covid-19**
- **Cancer**

Metabolic activity

Cell

Metabolites

Skin



Blood, faeces, urine, breath...

Is this something new?

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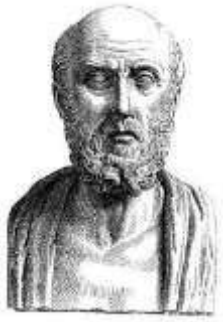
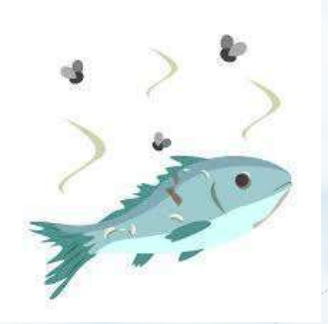
Ancient Greek and Roman medicine



Hippocrate

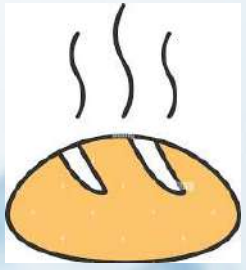
Galien

Contemporary medicine

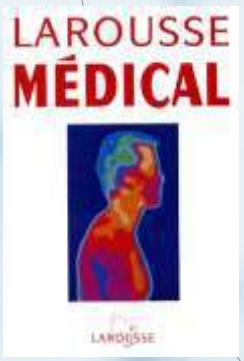


Trimethylamine

Diabetic ketoacidosis



Typhoid fever

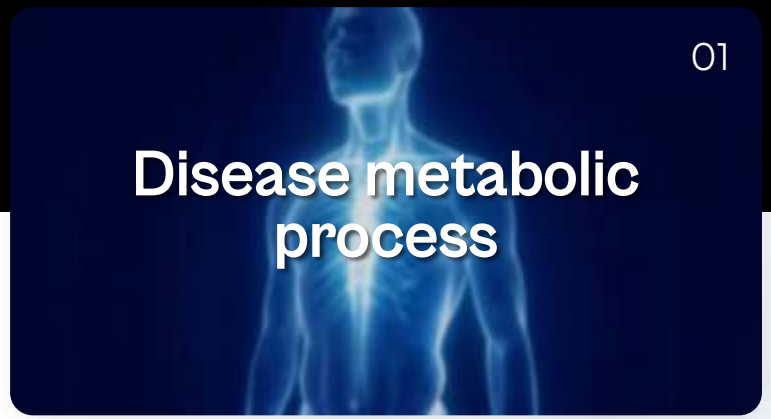


Early 20th century

Evidence

Every disease has unique scent

Mitra A, et al. The Human Skin Volatolome: A Systematic Review of Untargeted Mass Spectrometry Analysis. Metabolites. 2022 Sep 1;12(9):824.



Evidence

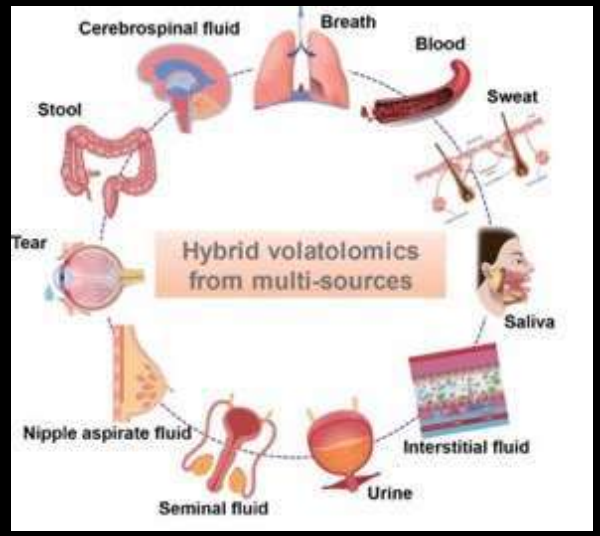
Every disease has unique scent

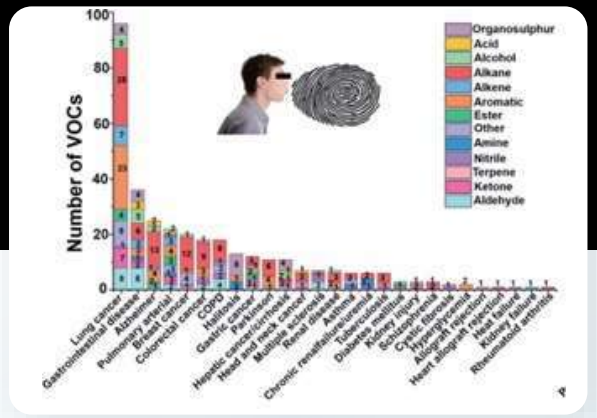
Nano Research
2022, 15(9): 8185–8213

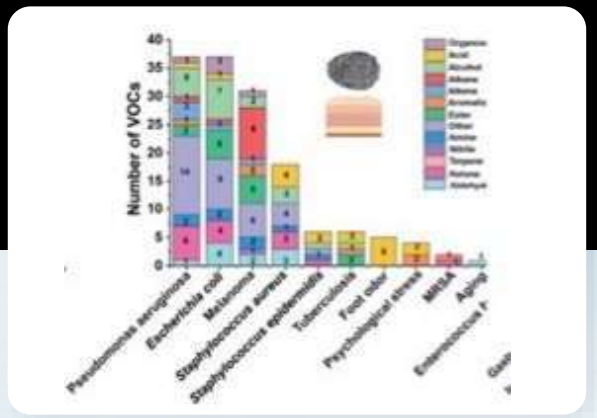
ISSN 1998-0124 CN 11-5974/O4
https://doi.org/10.1007/s12274-022-4459-3

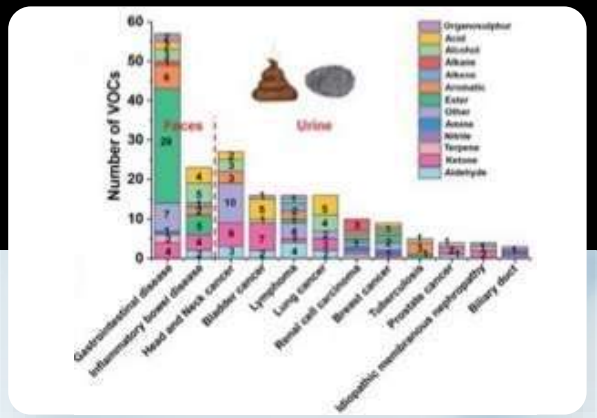
Volatolomics in healthcare and its advanced detection technology

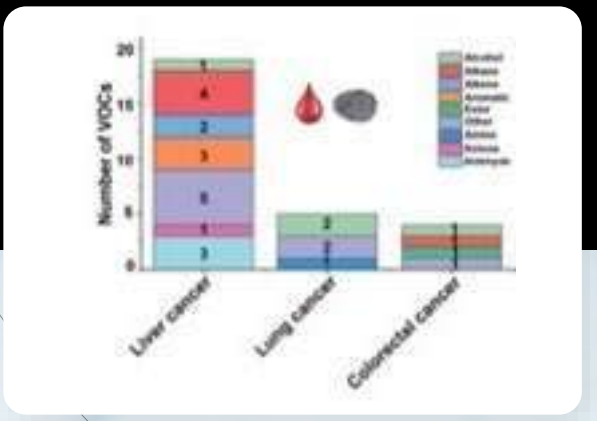
Wenwen Hu[1,§], Weiwei Wu[2,§], Yingying Jian[2,§], Hossam Haick[3], Guangjian Zhang[4], Yun Qian[5] (✉), Miaomiao Yuan[6] (✉), and Mingshui Yao[7,8] (✉)











Evidence

Every disease has unique scent

metabolites

MDPI

Systematic Review

The Human Skin Volatolome: A Systematic Review of Untargeted Mass Spectrometry Analysis

Anuja Mitra [1,*], Sunyoung Choi [1], Piers R. Boshier [1], Alexandra Razumovskaya-Hough [1], Ilaria Belluomo [1], Patrik Spanel [1,2] and George B. Hanna [1]

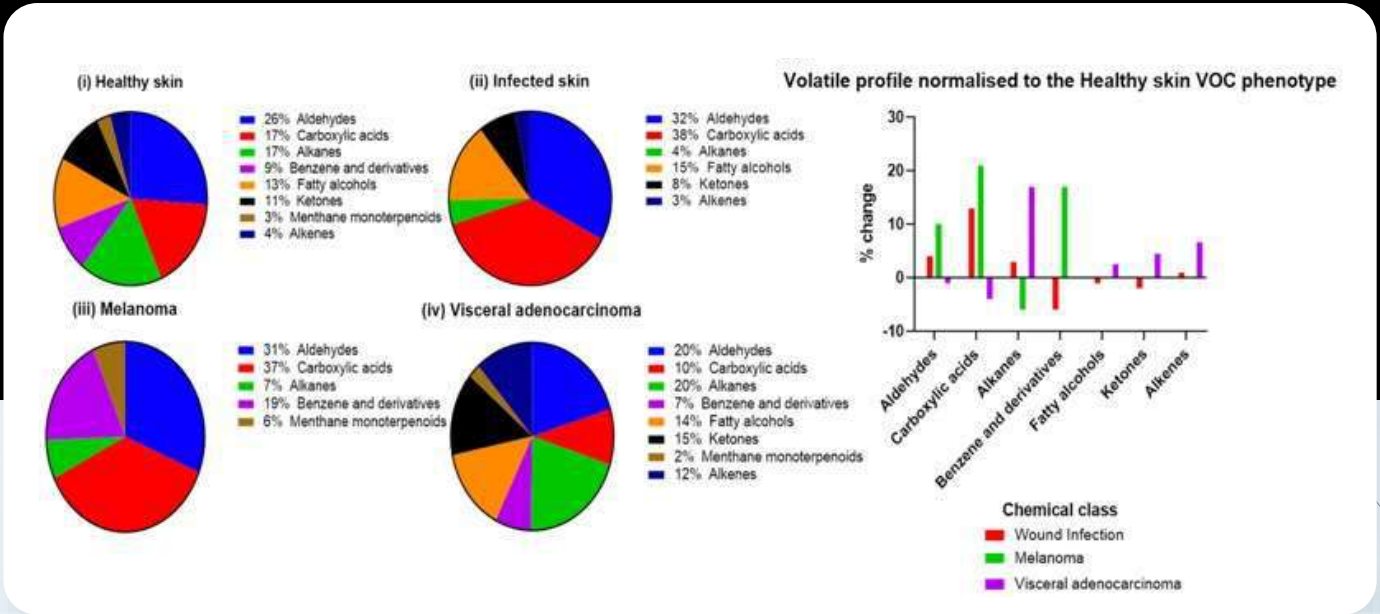
Metabolites. 2022 Sep; 12(9): 824. PMCID: PMC9504915

Published online 2022 Sep 1. doi: 10.3390/metabo12090824 PMID: 36144228

999 études

29 études éligibles

935 sujets



Evidence

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999 études

29 études éligibles

935 sujets

Workflow	Analytical Step	Considerations
Experimental design	Define intended population	Patient selection
		Separate into training and independent validation cohorts
Sample preparation	Pre-sampling	Define the anatomical location of skin sampling
		Avoid personal care products at the location of sampling for a minimum of 24 h
		Consider patient medication and use of xenobiotics
	Skin VOC collection and storage	Direct contact vs. non-contact methods
		Choice of sampling material (cotton/PDMS/SPME)
		Sampling time
		Sources of contamination
		Sample storage (direct analysis or storage at −80 freezer)
	Sampling technique	Consider the use of pre-concentration headspace step or direct injection
		Use of internal standards in patch
		QCs (spiking with internal standards to monitor and correct analytical variability)
MS analysis	Analytical platform	Online or offline platforms
		Optimisation of MS parameters
Data Analysis	MS data collection	Run order (randomisation) and batch effects
	Data pre-processing	Data deconvolution, scaling, peak alignment
		Removal of irreproducible, contaminant compounds
	Statistical analysis	Descriptive statistics
		Univariate analysis
		Multivariate analysis (e.g., PCA, PLS-DA, OPLS-DA)
		Prediction model (e.g., ROC analysis)
	Biological interpretation	Metabolic pathways (KEGG, HMDB)

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SkinVOCs®

1st Body Odor Sampling Device

Our story

SenseBioTek HEALTHCARE

From Canine Detection to Electronic Nose

SenseDetect

Canine Disease Detection

Sept. 2020

ESPCI PARIS

1st Partnership

Development of the analytical method

2021

Innov'up

ileDeFrance bpifrance

COVID-19 Clinical Trial

Validation of the canine detection method

POC

COVID-19

5 volatile biomarkers

2023

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Development of the Medical Electronic Nose

Sept. 2023

French Tech bpifrance

concours d'innovation i-Lab

PC'UP STATION F UM6P

2024

PRINT'UP INSTITUTE

Université Paris Cité

IMSE

2 New Partners

Development of Nanosensors

SkinVOCs®

1st Reliable VOC sampling device

March 24

Roadmap to MVP

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Medical Device with AI-powered Nanosensors

01

SkinVOCs®

Sampling device

2021-2023 ✓

02

Chromatography analysis

2021-2023 ✓

Skin Cancer Volatile Biomarkers

2024 ↻

BiOLFactive

03

Nanosensors Prototype

2024 ✓

- Multisensory Matrix
- Product Engineering
- Electronic

2024-2025 ↻

SenseNose

AI

Predictive Algorithm ↻

Development of sampling device

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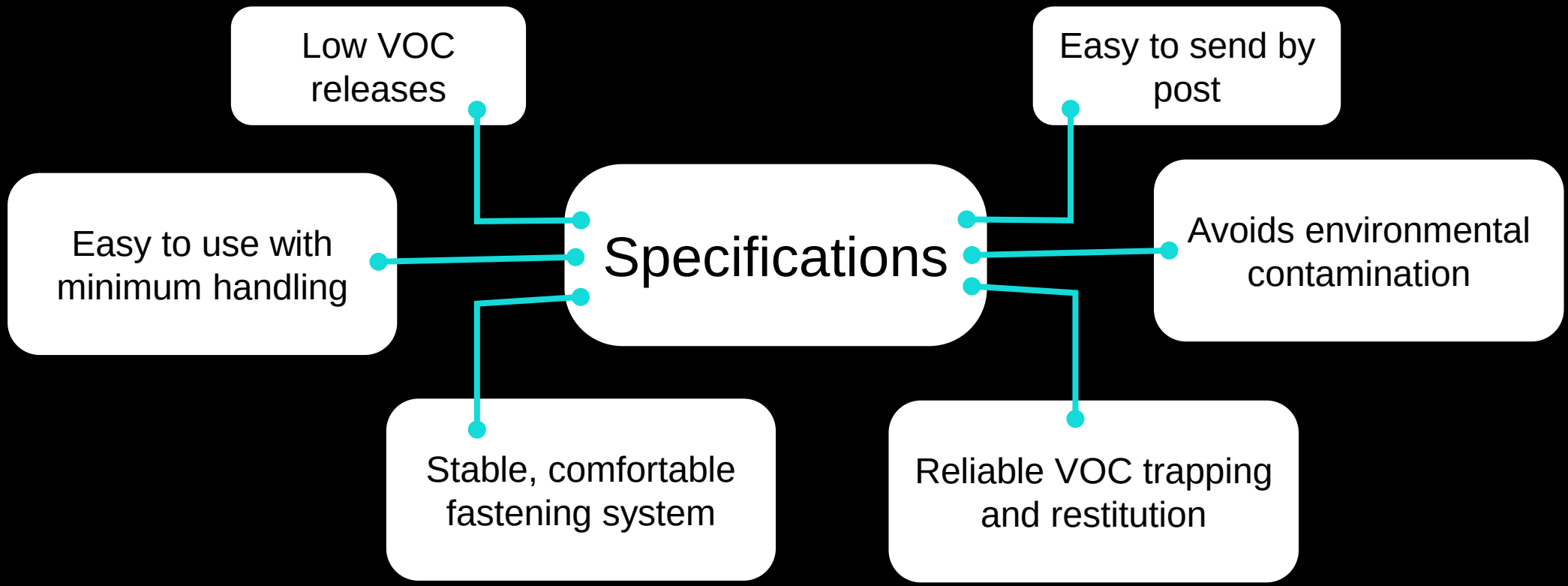
Sampling System Requirements

Sample duration < 1 hour

Samples can be taken from different parts of the body



Development of sampling device

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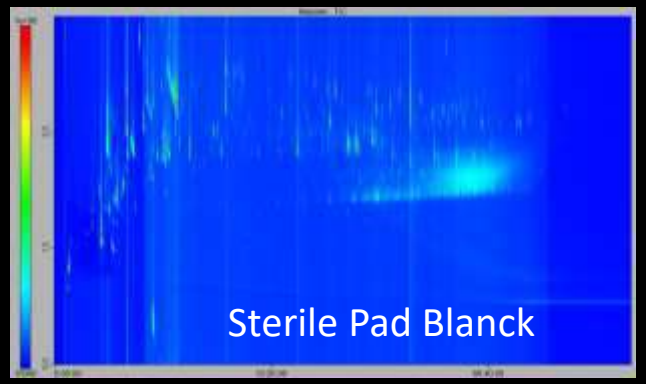
Sampling System Requirements

Sampling matrix

- ~~Paper~~
- ~~Cotton~~
- ~~Textile~~
- Polymer ✓

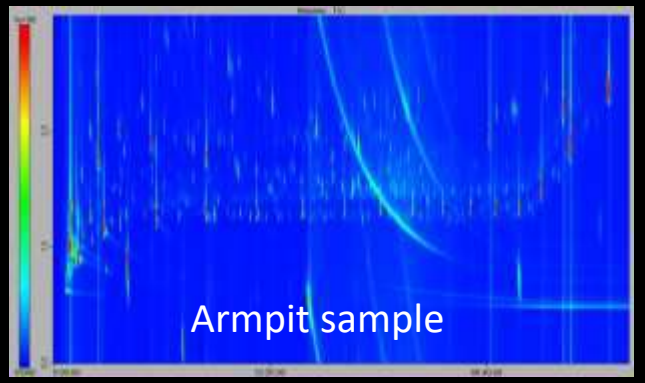


Sampling Method

- ~~SPME~~
- ~~Active sampling (Pump or friction)~~
- Passive sampling ✓

Analysis method

- > 500 VOCs in body odor ✓
- ~~GC-MS~~
- GCxGC/ToMS ✓



Development of sampling device

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Prototyping steps

COVID-19 Study

1st 3D printed Prototypes

1st Metal Prototypes

Post-study user feedback and improvements

Engineering Design

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Body Odor Sampling Device

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01

02

03

Methodology : Analytical flow and sampling

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Analytical flow

VOCs

Sorbent phase

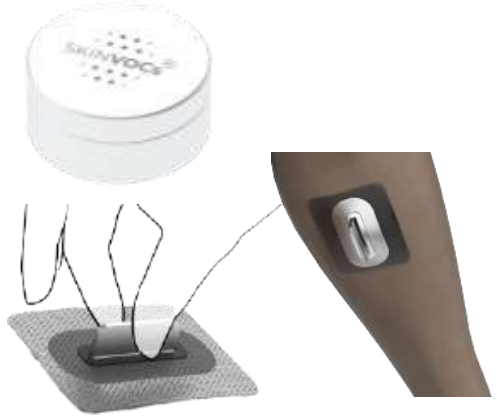
TD

TD-100xr, Markes
Pegasus BT 4D, LECO

GCxGC *TOF/MS*

Sampling

Sorbent



SkinVOCs®
sampling system

- **More powerful than 1D methods**
  - ⇧ Nb of VOCs identified
  - ⇧ Confidence of peaks identification
  - ⇩ Limit of detection of VOCs
- **Required collaboration with expert**
  - ⇨ Pr. Vial, ESPCI

Less than 5 experts and 10 apparatus in France

Body odor spectra

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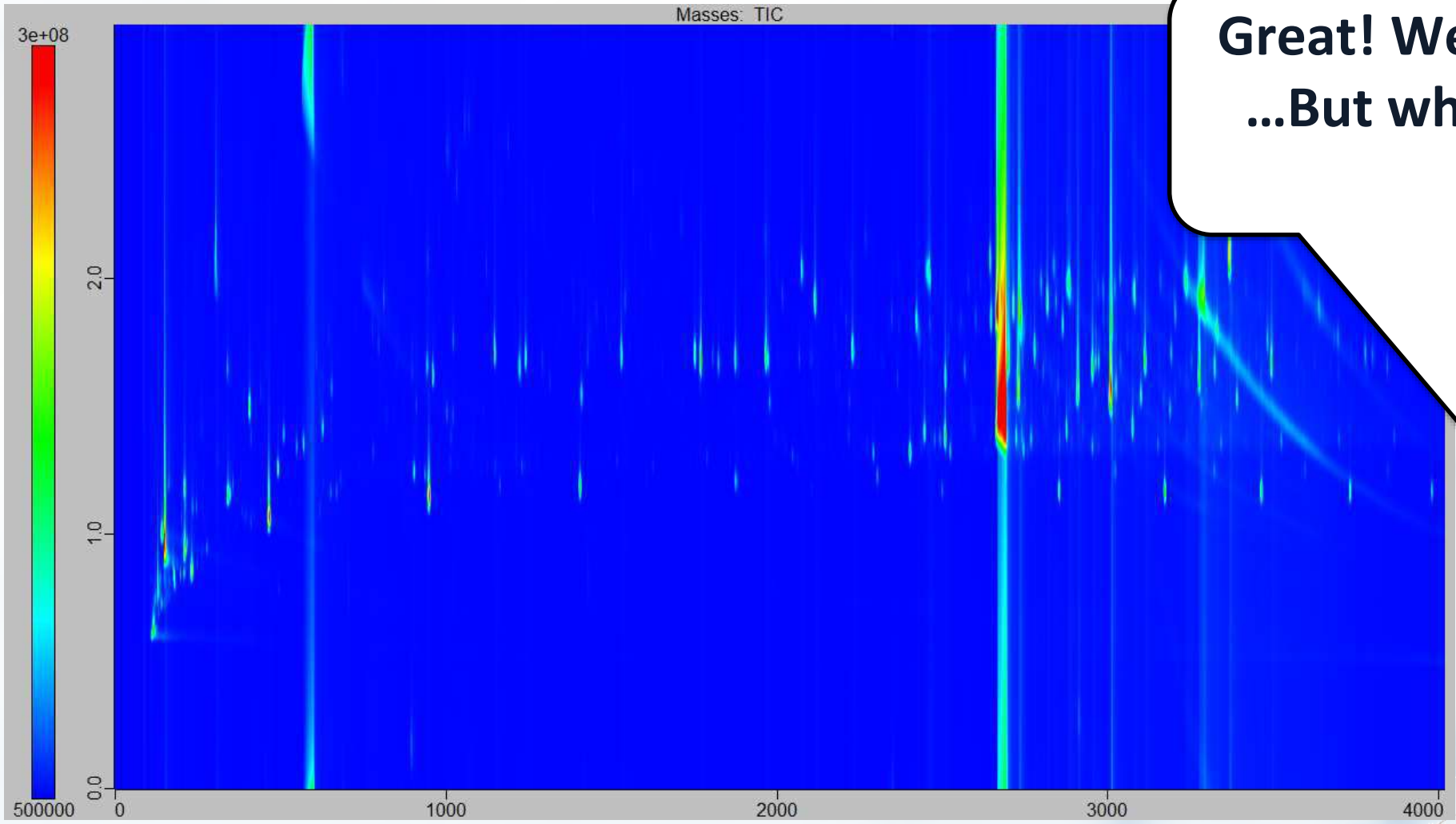
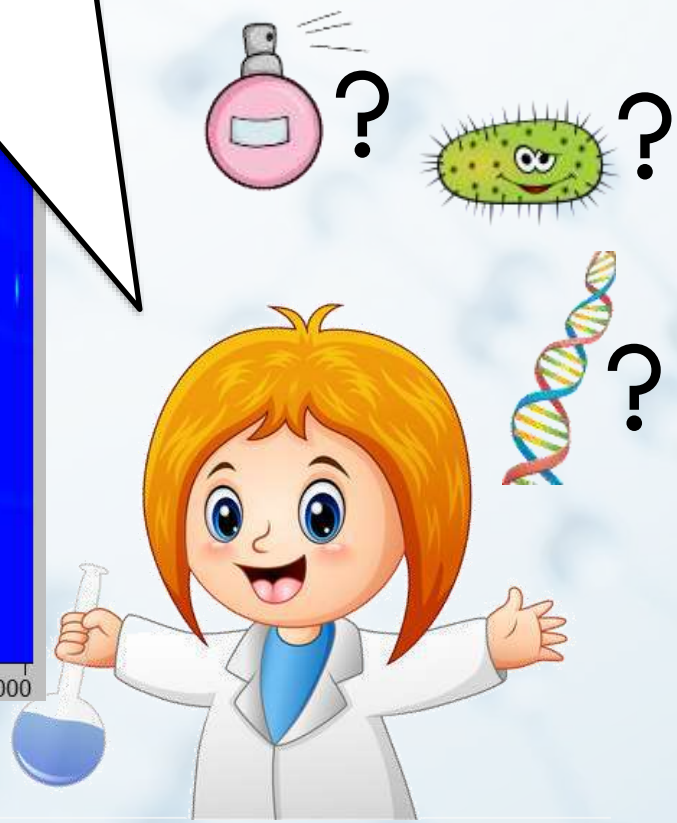


Great! We're seeing things!
…But what exactly do we see?



Body odor mapping

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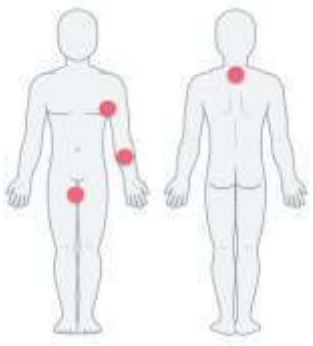


Sampling in **4 different body areas**: armpit, upper back, forearm, groin

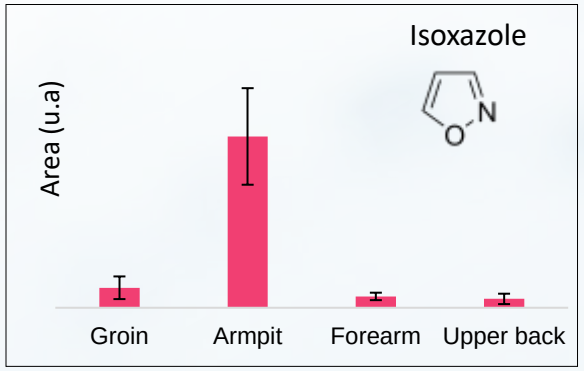
- Number of detected compound per sampled body area

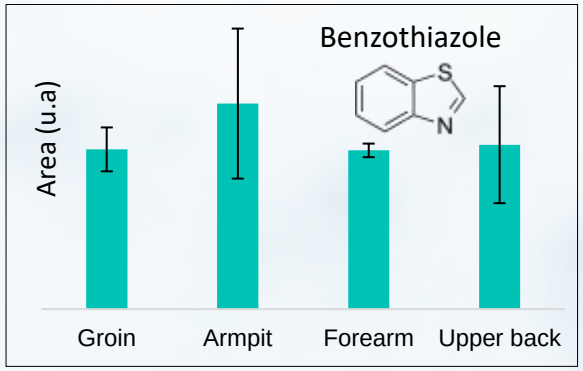
Area	Armpit	Forearm	Upper back	Groin
Mean	885 ± 159	497 ± 34	655 ± 130	548 ± 58

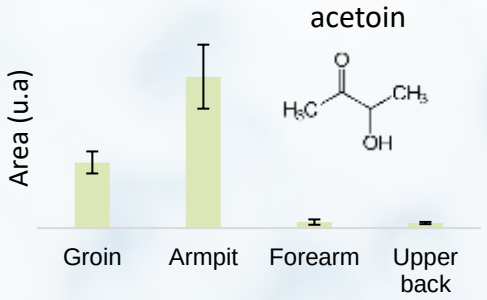
High density of **sweat glands**
Possibility of **maceration**
VOCs with bacterial activity origin

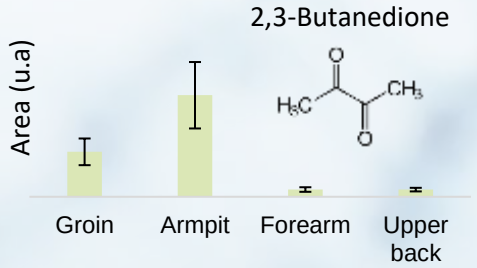
VOCs with shampoo origin

- Identification of area dependant or independant components within body odor









Use-case I : Cosmetic persistence

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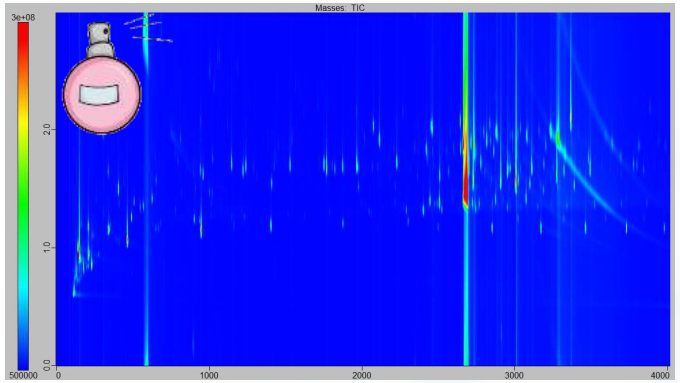
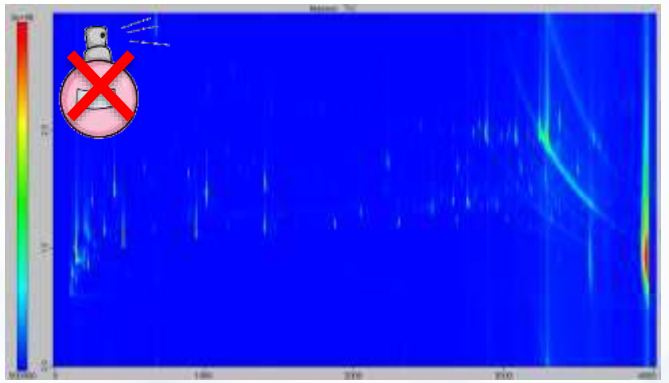
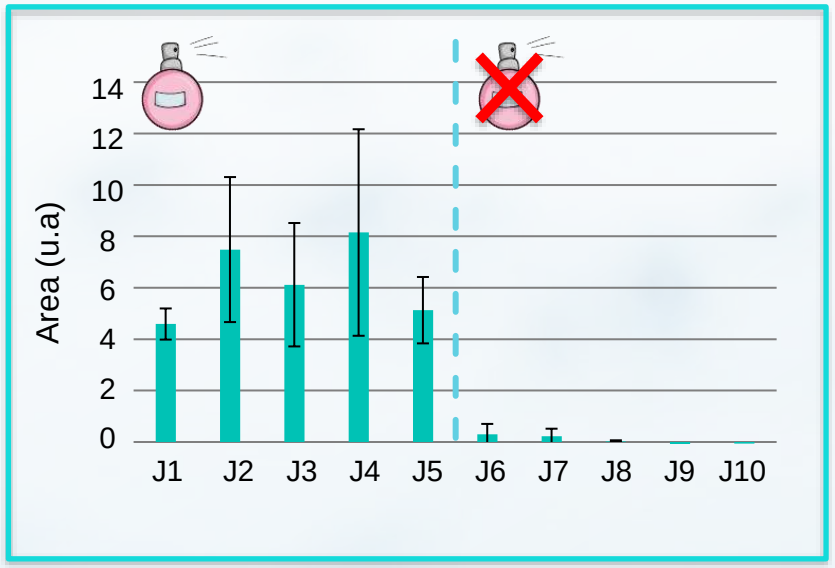


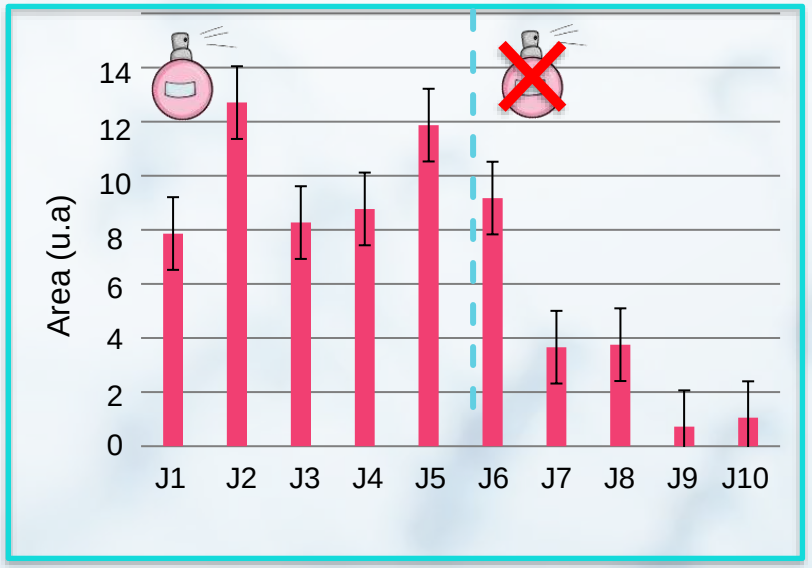


70 peaks attributed to cosmetics

64 molecules = non persistent cosmetics



6 molecules = persistent cosmetics



Use-case II : Bacterial activity

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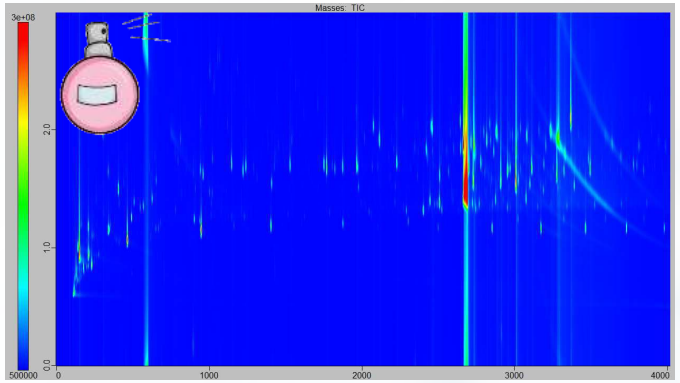
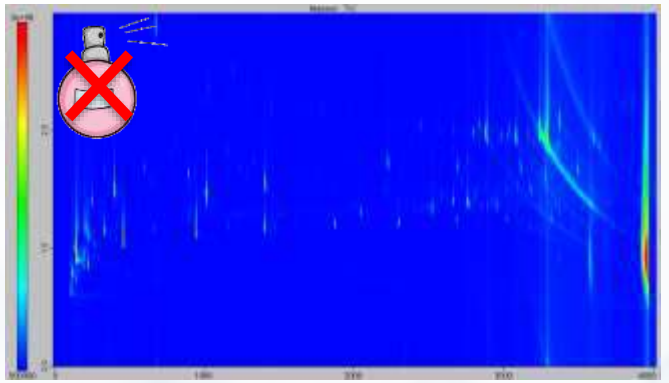
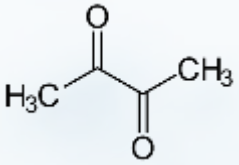
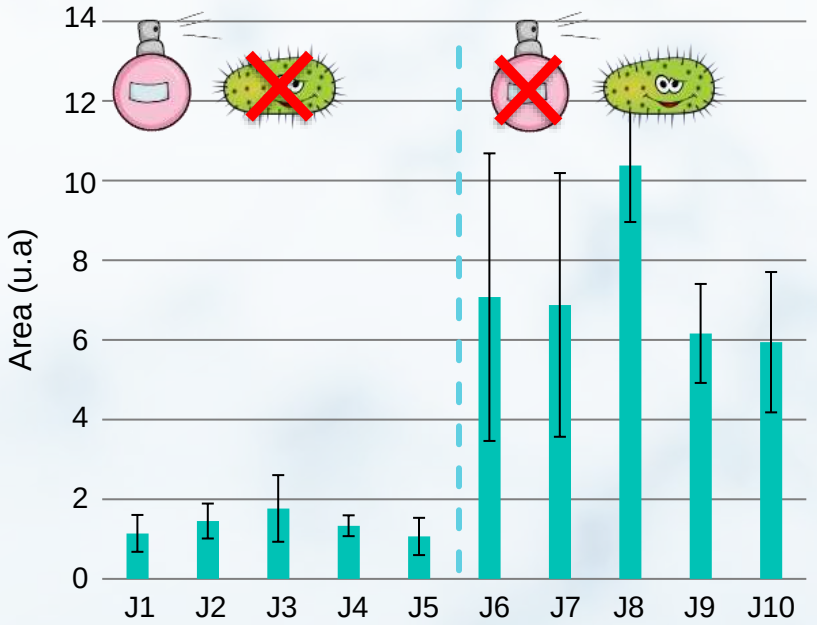




15 peaks attributed to bacterial activity



2,3-Butanedione



Use-case III : environmental exposure

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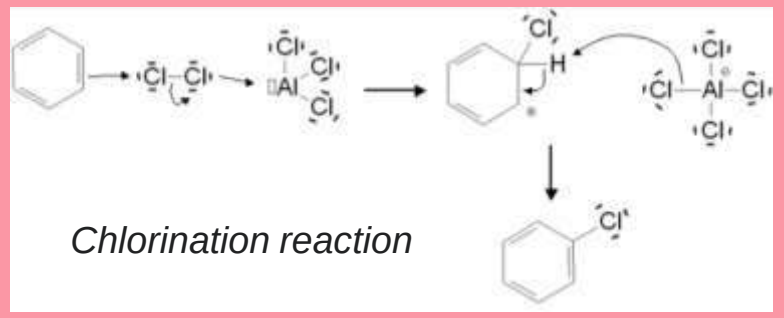
Samples taken from an individual from Monday to Friday

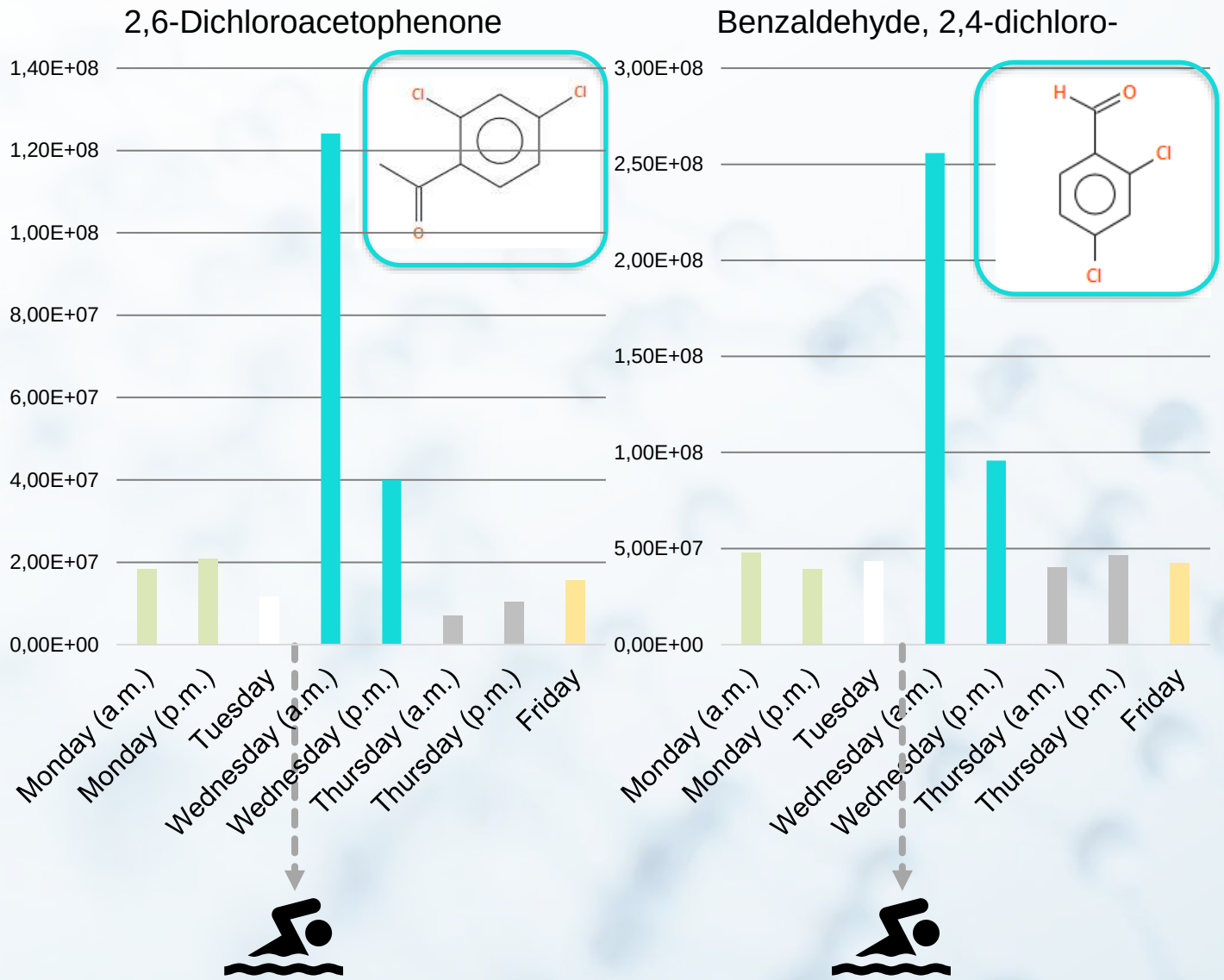
ChromaTOF-Tile

to identify significantly different compounds over the course of the week

Tuesday → Wednesday

Apparition of chlorine compounds





POC I : COVID-19 VOCs biomarkers

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AIM

- Investigating the connection between viruses and the body volatilome
- Identifying potential biomarkers
- Elucidate potential sources of inconsistency and external bias in biomarker findings

METHODOLOGY

- 40 Covid + / 12 Covid –
- Armpits samples
- Powersorbs sorbent phase
- TD-GCxGC/ToFMS analysis
- chemometrics (F-ratio, volcano plot)

24 compounds significantly different in Covid + and Covid -

12 linked to cosmetics

5 biomarkers
Assessed with ROC curves
2-ethylhexanoic acid
AUC 92.1%
Covid + = 16.4 ng vs Covid - = 6.5 ng

7 linked to environment
(hospital, air pollution)

Body Volatilome Study Strategy for COVID-19 Biomarker Identification Considering Exogenous Parameters
Separations, 2024, 11 (12), 10.3390/separations11120336

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ESPCI PARIS
EDUCATION SCIENCE INNOVATION

SkinVOCs®

The 1st innovative method to collect skin odor molecules

Chromatography analysis

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SenseNose

Electronique Nose

Concept : General

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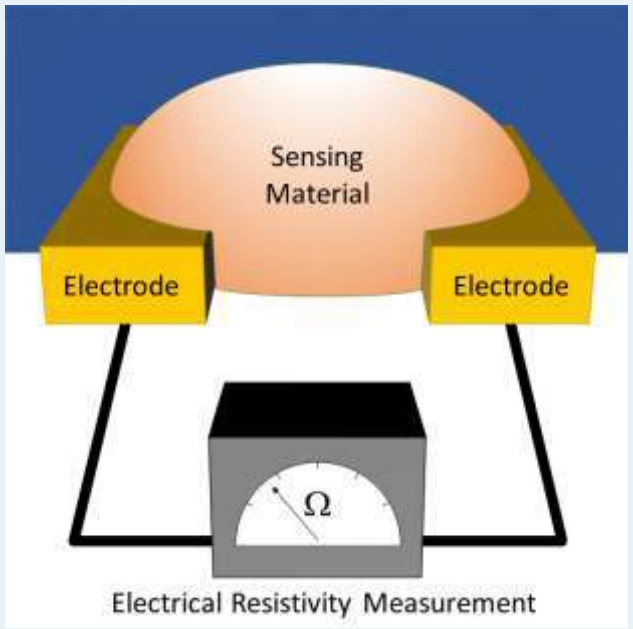
Electronic nose based on the end-to-end integration of

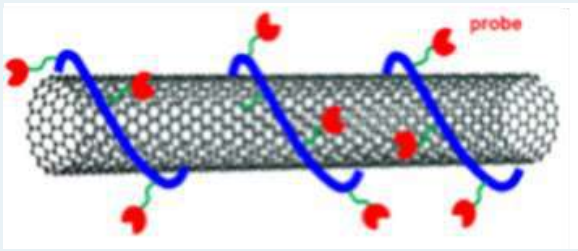
a carbon nanotube-based chemistor array

Chemistor



Interdigited electrodes

Carbon nanotube with chemically-sensitive coating



G Zucchi, et al., , US Patent 11,697,707

Concept : Details

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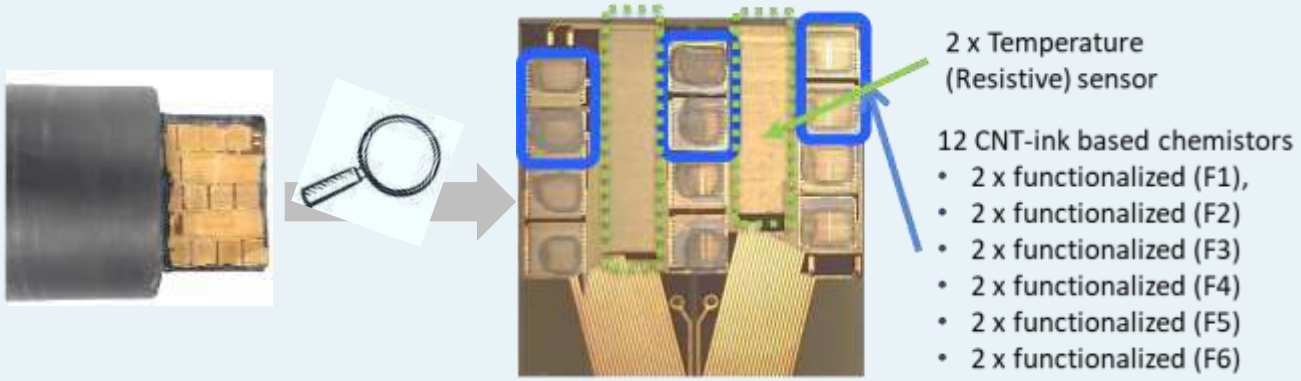
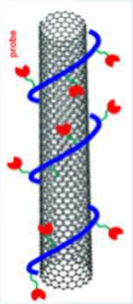
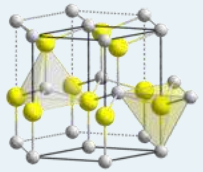
- Chemistor array

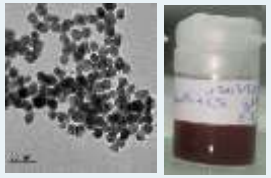


- Functional probes

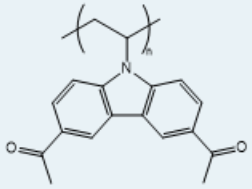




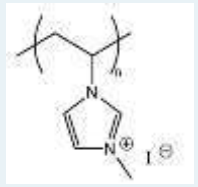
NP/ZnO$_x$



NP/Au



PVK

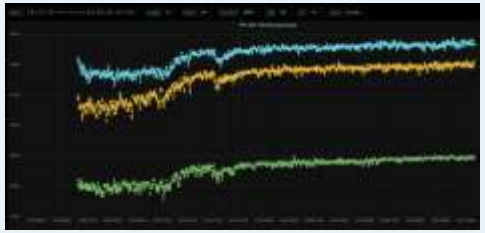


PVIZ

ssDNA

- Electronic and signal transduction

Real-time data display



Bench POC : Gas detection

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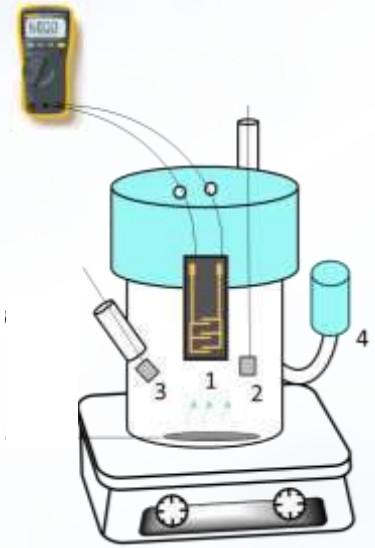
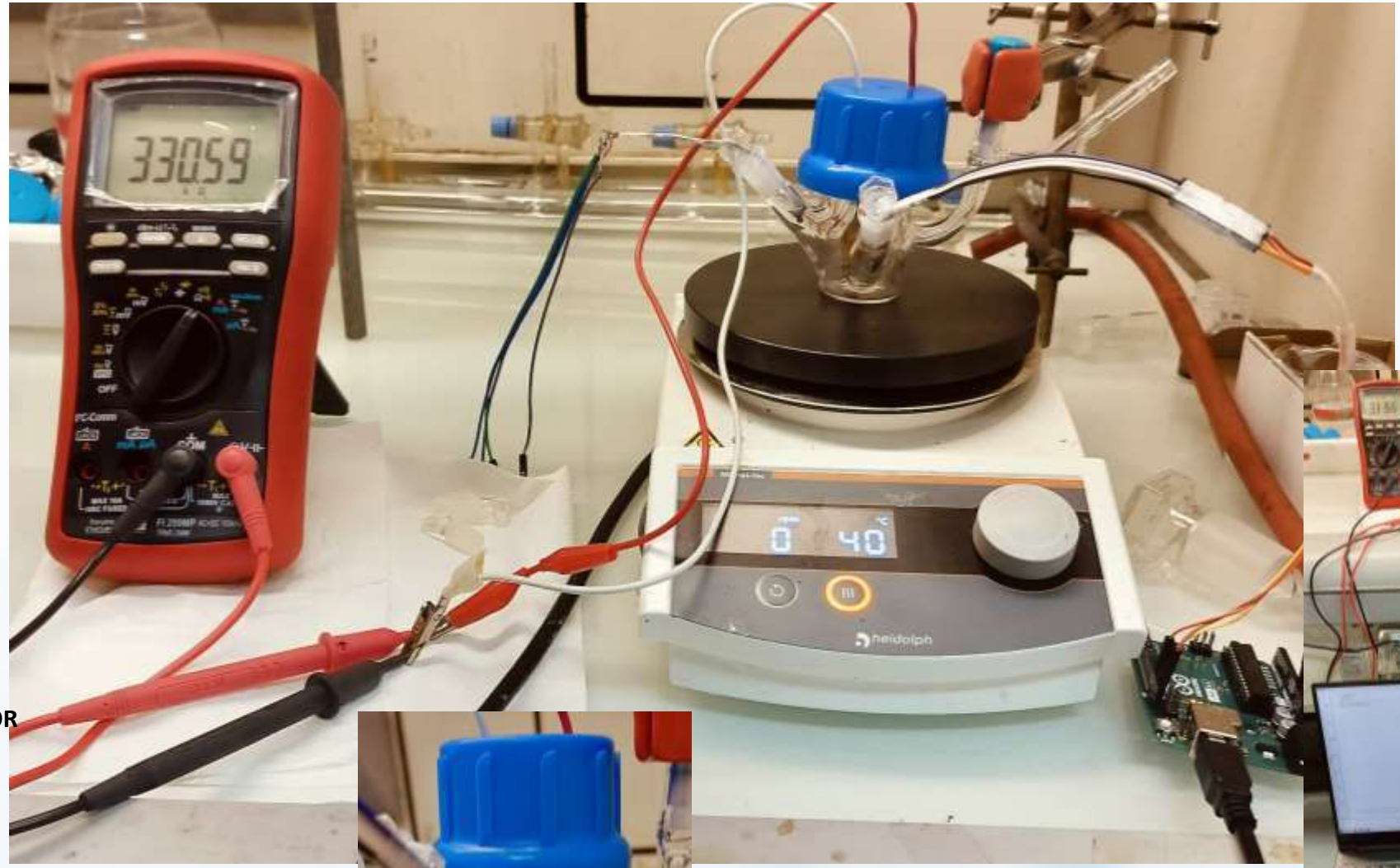


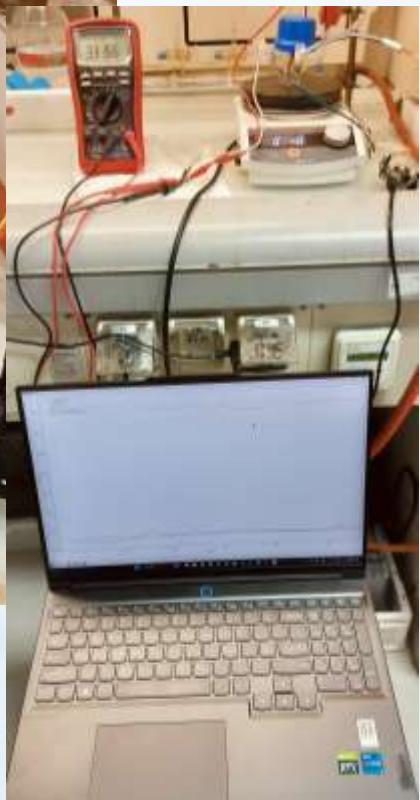
1- GAS SENSOR

2- PRESSURE SENSOR

3- TEMPERATURE AND HUMIDITY SENSOR

4- GAS INLET AND OUTLET





Bench POC : Dynamic response

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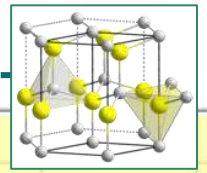
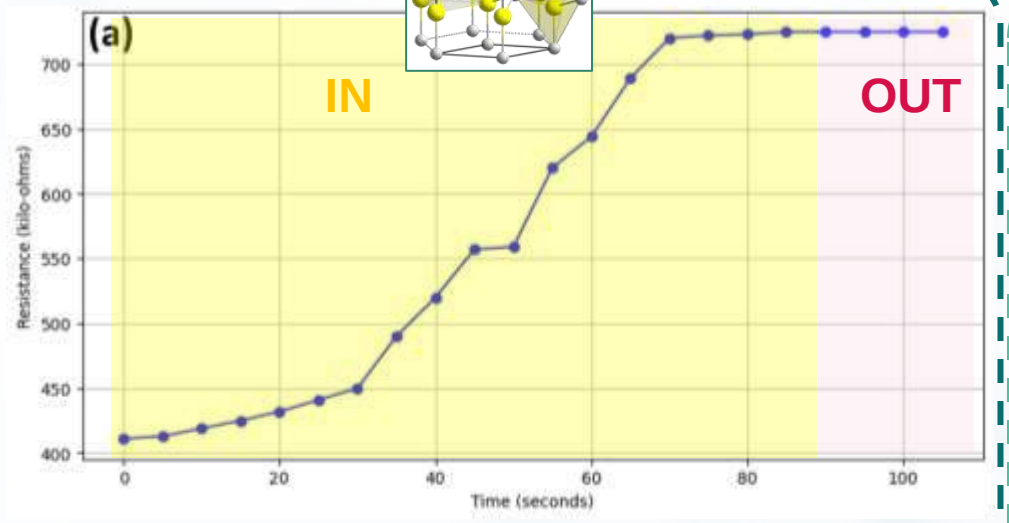
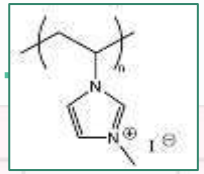
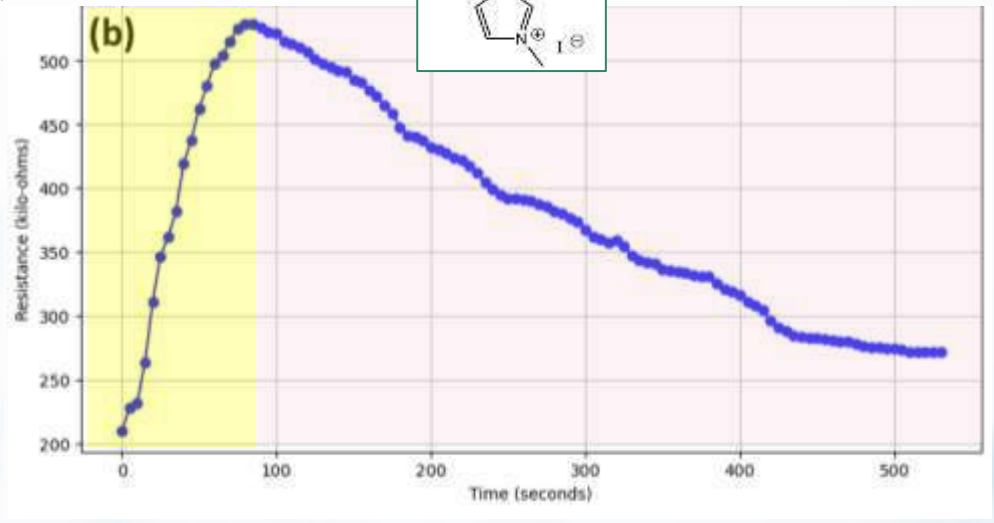
Gas : Acetone

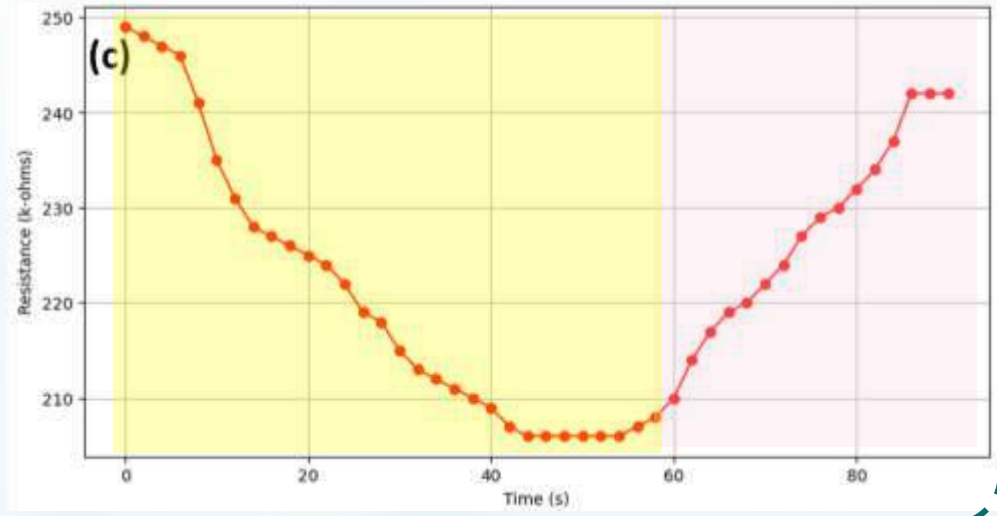


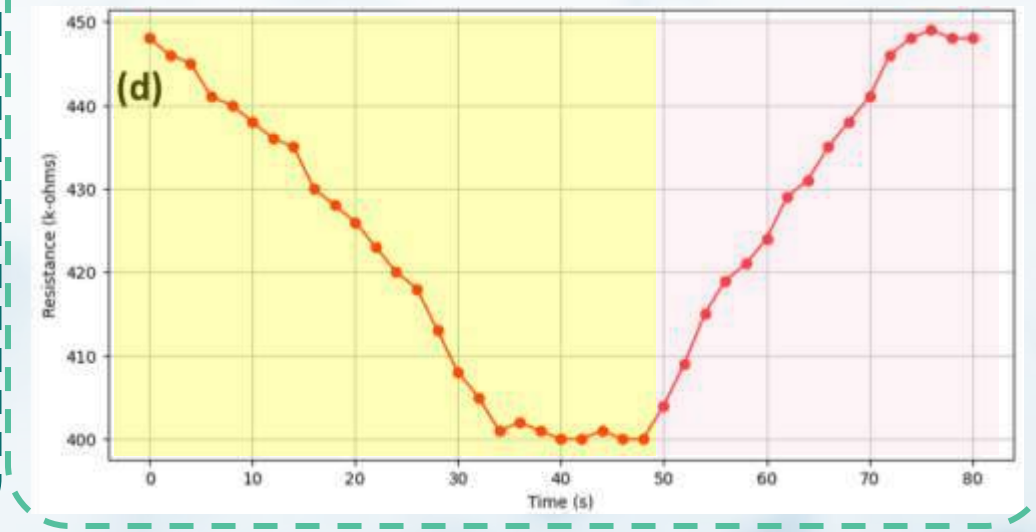






Gas : 2-ethyl hexanoic acid





UNIQUE RESPONSE

UNIQUE PATTERN

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Major Scientific Results

Body Volatolome Study for COVID-19

- Deep evaluation of environmental and cosmetic effects
- 2-ethylhexanoic acid **biomarker** found and quantified in Covid(+) samples at **16.4 ng**

* separations

Use of cosmetics and volatolome

- Evaluation of cosmetic persistence on skin
- Assessing deodorant performance by analyzing bacterial VOCs

Nanosensors detection

- Picogram LOD as a major result **(< 1ng)**
- Different responses of the different sensors to different gas

* *Boudard et al. Volatilome Study Strategy for COVID-19 Biomarker Identification Considering Exogenous Parameters. Separations 2024, 11, 336*

SenseBioTek
HEALTHCARE

Solution to speed up diagnosis

Screening Medical Device

Non Invasive, Easy to use, Accessible

"Electronic Nose" that detects the smell of cancer before symptoms appear

01

SkinVOCs®
(15 to 20 ')

02

SenseNose
(Immediate results)

SenseBioTek
HEALTHCARE

Screening Medical device for Skin Cancers

Dedicated to General Practitioners

Multi-sensor central module

Single-use consumables
(Subscription)

For General Practitioners

With SenseNose

VISIT + SCREENING FEES

Reimbursed
by Social Security
& Health insurance providers

Competition

the only solution that detects symptoms before they appear

SenseBioTek
HEALTHCARE

	Derm.AI	Dermatoscope	SenseNose
			
COST	✓	✓	✓ Accessible
EASY TO USE	✗	✗	✓ **Convenient**
NON-INVASIVE	✓	✓	✓ Noninvasive
EARLY DETECTION	✗	✗	✓ **Pre-symptomatic**
INSTANT RESULTS	✓	✓	✓ Quick
RELIABILITY	=	=	✓ Reliable
MUTILCANCER	✗	✗	✓ **Scalable**

The Team

SenseBioTek
HEALTHCARE

LEADERSHIP

Nabil Moumane, (MD)
Founder & CEO

Health Physics Engineer,
+15 years experience in the biomedical industry

Nathalie Gagey (PhD, HDR)
Chief Technology Officer (CTO)

+15 years experience in Physics and Analytical Chemistry

Sarah ELIRAKI (MD)
Chief Medico-Marketing Office (CSO)

+15 years experience in dermatology and immunology

Boutaina Benkirane
Chief HR Officer (CHRO)

+15 years experience in business management

Lambert Trenoras (PhD)
Chief Business Dev Officer (CBDO)

Robotic Engineer
+15 years experience in MedTech

OPERATIONS

Kleidisa Rrushka
Chemical Engineer (employee-PhD)

Emilie Duval
Engineer ESPCI-MINES

Charlène Beyaz
Tech. Lab

Q2 2025
Data Scientists

ADVISORS

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Finance Expert
Engineer Centrale Paris

Alice Matheron
Health Economics Expert Pharmacist

Medical Device International Business Dev

KOL In Oncology

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Professor of Chemistry
& Biosensors, U. Paris Cité,
Print'Up Institute

Dr Bérengère Lebantal
Chief Engineer of Water, Bridges
and ForestsLaboratoire IMSE
Université Gustave Eiffel.

Soutenu par GOUVERNEMENT Liberté Égalité Fraternité

FRANCE 2030

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The First and the only Noninvasive method

Why Support SenseBioTek?

Early Cancer Detection based on body odor

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HEALTHCARE

THANK YOU FOR
YOUR INTEREST

Nabil Moumane, MD

CEO & Founder

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