

VOL. 5



RELIANCE

30 June 2025

# Newsletter

**Smart** response self-disinfected **bio-based**  
nanocoated surfaces for **healthier** environments

RELIANCE project aims to design and develop smart response self-disinfectant antimicrobial nanocoatings based on a new range of smart antimicrobial nanoparticles. They will consist of mesoporous silica nanoparticles with metallic copper in their structure (Cu-SMIN), modified with biobased bioactive compounds: Antimicrobial peptides (AMP's) based on protein containing waste streams, and essential oils (EOs) coming from non-edible plants. The antibacterial action of these additives will be adjusted to the specific application, according to the dosages and durability requirements.

---

## STEPPING INTO THE FINAL YEAR OF THE PROJECT

As we enter the final year of RELIANCE, several key developments mark our transition into the project's most impactful phase. In recent months, the consortium gathered in Bordeaux for a regular consortium meeting at the end of January to assess progress, address challenges, and align our next steps. We have now entered a pivotal stage of testing and validating our innovative smart-response antimicrobial nanocoatings in collaboration with industry partners.

These tests are being conducted through three coating deposition methods, with a strong emphasis on real-world use cases where RELIANCE results will be demonstrated and evaluated in operational environments.

The consortium has started the groundwork towards building the Final Exploitation Strategy and Business Plans for our Key Exploitable Results. This includes their characterization and strategic planning for stakeholder engagement events and workshops aimed at promoting the project's groundbreaking technologies and fostering public trust and acceptance.

Additionally, the socio-economic analysis of RELIANCE's innovations has been launched, focusing on their potential impact on public health systems, industrial productivity, and healthcare-associated cost reduction. This analysis will also examine the broader societal benefits of antimicrobial resistance (AMR) mitigation and assess how our technologies could contribute to more sustainable healthcare and antimicrobial disinfection practices across Europe.

A month ago, we started the second reporting period for the project, with preparations underway for the 6<sup>th</sup> consortium meeting, scheduled to take place in Ghent at the beginning of July.

Enjoy reading more about RELIANCE journey in the current issue of our newsletter, and visit our website for more updates on news, events and results:

<https://reliance-he.eu/>

---

## WHAT WE HAVE BEEN UP TO

**RELIANCE Consortium Meets in Bordeaux to Report on Project Progress**



The RELIANCE consortium convened in Bordeaux at the end of January 2025 for its fifth consortium meeting, hosted by partner Polyrise. With 18 months remaining until the end of the project, the meeting served as a key milestone to assess progress across work packages.

Noteworthy advancements included enhanced repelling properties of hybrid sol-gel nanocoatings, successful scaling-up of nanoparticle formulations, and improved deposition techniques for various surfaces such as stainless steel, glass, and textiles. The visit also included a guided tour of Polyrise's facilities, offering partners a closer look at the company's capabilities as the project enters its next critical phase: prototype and functional system validation at the manufacturing level.

[Continue reading...](#)

**Launching an e-book on the project use cases**



Smart response bio-based  
antimicrobial nanocoatings

## Application Areas



reliance-he.eu



**RELIANCE**

The closer we get to the exploitation phase of the project, the eager we are to talk about our results. Therefore, we compiled and published an e-book summarizing the use cases of [RELIANCE](#).

Visit our [website](#) to get your copy.



# ENGAGEMENT FOR PROMOTING MARKET UPTAKE

Engaging with students: RELIANCE researchers presenting the project at the Master's Degree Open Day at the University of Rome Tor Vergata



During the Master's Degree Open Day at the University of Rome Tor Vergata's Faculty of Sciences held in early June, Laura Fabiani presented RELIANCE as a leading example of how EU projects support cutting-edge innovation, data-

driven science, and international collaboration. The event offered a unique opportunity to introduce students to the tangible impact of European-funded research and inspire them to get engaged in similar initiatives.

[Read the whole story](#)

## RELIANCE and NANOBLLOC at the European Coatings Show in Nuremberg, Germany



During the last week of March, RELIANCE Coordinator Tekniker presented its latest research advances at the European Coatings Show 2025 in Nuremberg, Germany - Europe's leading trade fair for the coatings industry. At a joint booth with NANOBLLOC, samples of preliminary RELIANCE results were displayed, showcasing progress on smart nanoparticles designed as a sustainable alternative to conventional biocides in antimicrobial coatings.

Tekniker's team highlighted to visitors the cost-efficiency, safety, and



sustainability as leading criteria in the development of the nanoparticles and formulations while ensuring effective elimination of bacteria, fungi and viruses.

[Read the full story here](#)

## Centexbel presented RELIANCE results at the INFOHappening Coating, Finishing & Printing 2025 in Zwijnaarde, Belgium



On 8 May 2025, the annual INFOHappening Coating, Finishing & Printing took place at Centexbel's facilities in Belgium, bringing together experts in materials science and industrial innovation to explore the latest advances in sustainable coatings, textiles and circular economy practices.

The RELIANCE project was proudly represented by project partner Brecht Demedts who delivered a presentation on “Combined Durable Water-Repellent and Antimicrobial Finish for Textiles”. His talk highlighted the team's latest results in developing copper-doped mesoporous silica nanoparticle coatings, engineered to repel water while offering robust antimicrobial performance.

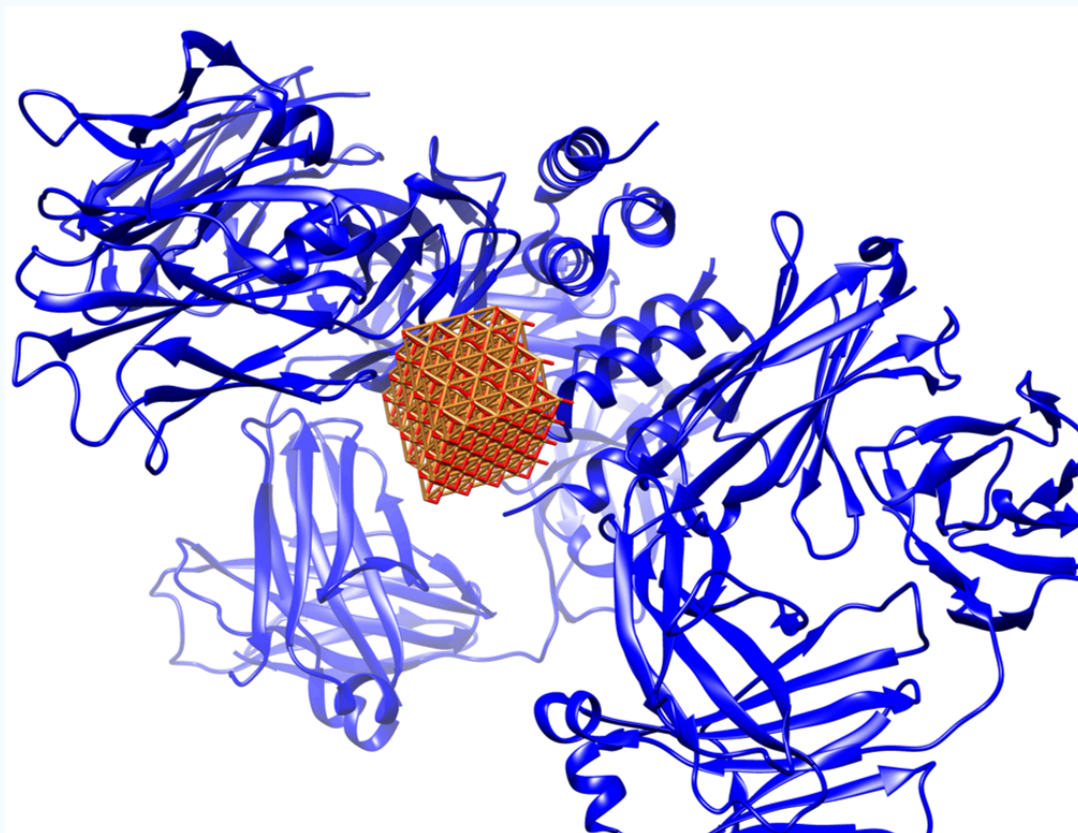
[Continue reading](#)

---



# DISSEMINATION WITH THE SCIENTIFIC COMMUNITY

University of Patras presented RELIANCE results at the 2nd BioExcel Conference on Advances in Biomolecular Simulations in Brno, Czech Republic



CuO–Staphylococcus aureus (SPA) Protein Complex

In October 2024, the 2nd BioExcel Conference on Advances in Biomolecular Simulations took place in Brno, Czech Republic, gathering experts from across the biomolecular modelling community. The event addressed key topics such as molecular dynamics, free energy calculations, integrative modelling, force field development, and the application of AI in biomolecular simulations.

[RELIANCE was represented](#) by the University of Patras (UPAT), with both oral and poster presentations delivered by the team. Dr. Georgios Leonis presented recent advances in computational modelling of bio- and nanostructures as antimicrobial agents, highlighting the interaction mechanisms of copper-based nanoparticles and essential oils with proteins relevant to antimicrobial action.

In the poster session, Katerina Karadima discussed the structural dynamics

and membrane interactions of keratin-derived antimicrobial peptides (KAMPs), offering insights into their potential role in combatting Gram-positive and Gram-negative bacteria.

Check out the [Conference Abstracts](#)

## The University of Rome Tor Vergata presented progress with paper-based electrochemical sensors at the 6th International Environmental Chemistry Congress



The Environmental Chemistry Congress (EnviroChem) was held at Karadeniz Technical University in Trabzon, Turkey in November 2024. It brought together experts to discuss pressing topics such as pollution management, toxicology, sustainable materials, and green chemistry.

Prof. Fabiana Arduini from the University of Rome Tor Vergata was an invited speaker at the event where she presented RELIANCE to an audience of over 100 professionals, students, and researchers. Her presentation, titled

“Nanomodified Paper-Based Electrochemical (Bio)sensors for Smart and Sustainable Environmental Analyses”, showcased RELIANCE’s advancements in developing eco-friendly sensors for environmental monitoring. She highlighted RELIANCE’s contributions to detecting essential oils used as disinfectants, underscoring the technology’s sustainability and efficiency.

[Read the full story.](#)

## RELIANCE Poster Presentation at FTAL 2024 Conference on Circular Economy in Switzerland



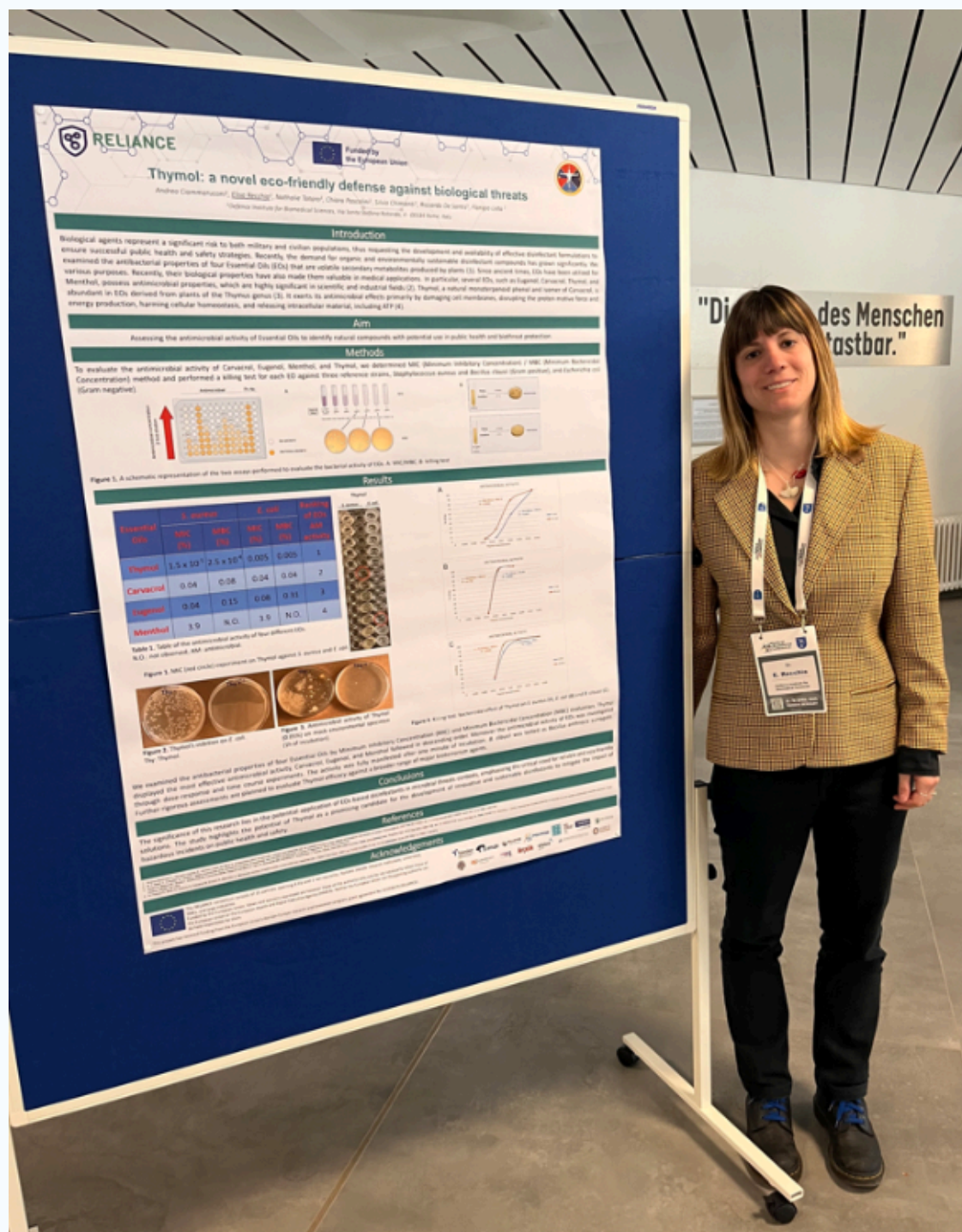
In November 2024, researchers from Haute Ecole d’Ingénierie et d’Architecture de Fribourg (HEIA-FR) presented their work within the project at the FTAL 2024 Conference on Circular Economy, held at Campus Est in Lugano-Viganello, Switzerland. The team showcased a poster presentation titled “Valorizing Agro-Industrial Waste: Exploring Antimicrobial Peptides Prepared from Feather Keratin”, led by Justine Horner.



Their research focuses on the extraction and purification of antimicrobial peptides (AMPs) from feather keratin, a poultry industry by-product.

[Read the full story](#) and download the poster [here](#).

## A Stimulating Experience at the Biomedical Defence Conference in Munich, Germany



The Biomedical Defence Conference took place in April 2025 in Munich, bringing together participants from over 50 countries. This event remains one of the most important platforms for scientific dialogue in the field of medical

bio defence, covering topics such as pathogen surveillance, synthetic biology, genomics, vaccines, and antimicrobial countermeasures.

RELIANCE was represented by the Defense Institute for Biomedical Research (ISBD), with two posters focused on ISBD research.

The first one focused on thymol, a natural antimicrobial compound that showed 100% bactericidal activity within 5 minutes against key pathogens, including *E. coli* and *Bacillus clausii*. The second poster highlighted silica mesoporous nanoparticles (SMINs) functionalised with copper and carvacrol, demonstrating significant antimicrobial and antiviral effects on *S. aureus*, *E. coli*, and SARS-CoV-2.

Both contributions sparked strong interest and fruitful exchanges with fellow scientists, reaffirming RELIANCE's role in advancing eco-friendly, rapid-response solutions in the field of medical bio defence.



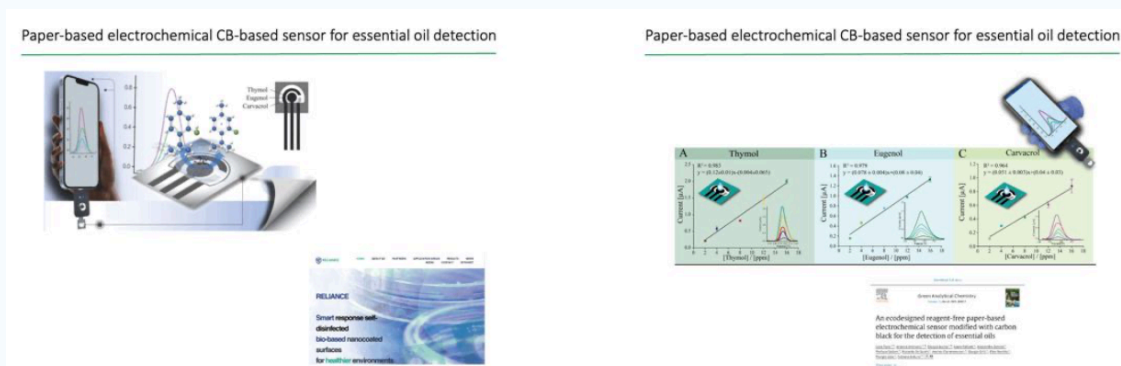
[Read the full story.](#)

# Innovative Biosensing Technology highlighted by UNITOV at the 7th International Electrochemistry Symposium in Durban, South Africa



From 13 to 16 April 2025, the coastal city of Durban, South Africa hosted the 7<sup>th</sup> International Symposium on Electrochemistry, under the theme ["Electrochemical Solutions for a Sustainable Future"](#). Hosted by Electrochem SA of the South African Chemical Institute, the event gathered global experts to explore innovative approaches to energy, environment, water treatment and biosensing.

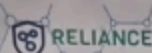
RELiance prominent partner Prof. Fabiana Arduini, UNITOV delivered a plenary lecture on "Paper-based electrochemical (bio)sensors for sustainable analysis". Her talk drew significant attention to promising results from both RELiance and Phoenix-OoC Horizon Europe projects.




In May 2025, Lisbon hosted the **35<sup>th</sup> Anniversary Biosensors Conference**,



P3.85







## Electrochemical paper-based device for the detection of SARS-CoV-2 on the surface

Luca Fabiani<sup>1</sup>, Rosalee Annackner<sup>1</sup>, Georgia Gini<sup>1</sup>, Riccardo De Santis<sup>1</sup>, Giorgio Lioati<sup>1</sup>, Fabiana Arduni<sup>2</sup>

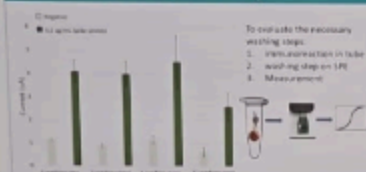
<sup>1</sup> Department of Chemical Sciences and Technologies, University of Rome Tor Vergata, via della Ricerca Scientifica 1, Rome, Italy

<sup>2</sup> Institute for Chemical and Environmental Sciences, Via Salaria 100, 00138 Rome, Italy

### CONCEPT

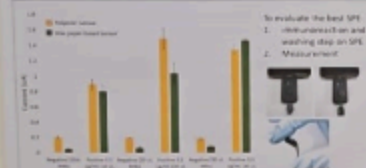
The European project RELIANCE aims to create modified self-disinfecting surfaces as a way to control the spread of pathogens better. In this context, we present a paper-based electrochemical immunosensor capable of measuring the effectiveness of the specific surface modification. Following up on our previously published work<sup>1</sup>, which was the first publication describing an electrochemical immunosensor for SARS-CoV-2 detection in saliva, we adapted the sensor to easily detect the virus on the surface. The method uses the magnetic beads as support for the sandwich-type immunological chain, which, thanks to their high surface/volume ratio, permits the load of a high amount of antibodies, improving the sensitivity. For electrochemical measurement, we functionalised the working electrode by drop casting with carbon black, demonstrating improved sensitivity using this affordable nanomaterial.

### Optimization of MBs-based assay



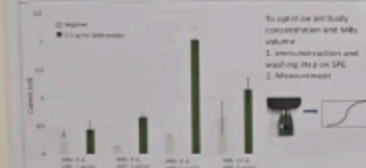
To evaluate the necessary washing steps:

1. Immobilization on the electrode
2. Washing step on LPE
3. Measurement



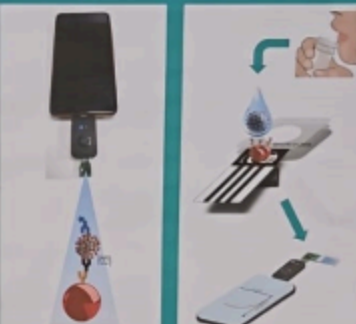
To evaluate the best LPE:

1. Immobilization on the electrode
2. Washing step on LPE
3. Measurement



To optimize the MBs concentration and MBs volume:

1. Immobilization on the electrode
2. Washing step on LPE
3. Measurement



### Future developments

- Optimization of reagent pre-loading
- Test of the analytical performances
- Specificity test with different viruses
- Surface test for real application

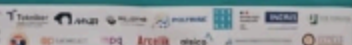
### References

1. Fabiani, L., Gini, G., De Santis, R., Gini, G., Lioati, G., Pappalardo, G., Di Lorenzo, M., Rosalee, A., Annackner, R., Torrisi, F., Turchio, G., Maccione, E., Lioati, G., Annackner, R. (2021) Magnetic Beads Combined with Surface-Based Assay for the Detection of SARS-CoV-2 by a Portable and Miniaturized Electrochemical Immunosensor for Saliva. *Biosensors and Bioelectronics*, 111, 117888. <https://doi.org/10.1016/j.bios.2021.117888>

### Acknowledgements

The authors acknowledge the support of the European Union (ERC-101019181) and the Italian Ministry of Health (Ministero della Sanità) for the funding of the project. The authors also acknowledge the support of the Italian Ministry of Health (Ministero della Sanità) for the funding of the project. The authors also acknowledge the support of the Italian Ministry of Health (Ministero della Sanità) for the funding of the project.

This project has received funding from the European Union's Horizon research and innovation programme under grant agreement No 101019181.



**P3.85**

**RELIANCE** Funded by the European Union TOR VERGATA

## Electrochemical paper-based device for the detection of SARS-CoV-2 on the surface

Laura Fabiani<sup>a,b</sup>, Rosalee Annackner<sup>b</sup>, Georgia Gini<sup>c</sup>, Riccardo De Santis<sup>d</sup>, Giorgio Lioati<sup>e</sup>, Fabiana Arduni<sup>f</sup>

<sup>a</sup> Department of Chemical Sciences and Technologies, University of Rome Tor Vergata, via della Ricerca Scientifica 1, Rome Italy  
<sup>b</sup> Institute for Advanced Materials Research, University of Rome Tor Vergata, Via del Politecnico 1, Rome Italy  
<sup>c</sup> Institute for Advanced Materials Research, University of Rome Tor Vergata, Via del Politecnico 1, Rome Italy  
<sup>d</sup> Institute for Advanced Materials Research, University of Rome Tor Vergata, Via del Politecnico 1, Rome Italy  
<sup>e</sup> Institute for Advanced Materials Research, University of Rome Tor Vergata, Via del Politecnico 1, Rome Italy  
<sup>f</sup> Institute for Advanced Materials Research, University of Rome Tor Vergata, Via del Politecnico 1, Rome Italy

### CONCEPT

The European project RELIANCE aims to create modified self-disinfecting surfaces as a way to control the spread of pathogens better. In this context, we present a paper-based electrochemical immunosensor capable of measuring the effectiveness of the specific surface modification. Following up on our previously published work<sup>1</sup>, which was the first publication describing an electrochemical immunosensor for SARS-CoV-2 detection in saliva, we adapted the sensor to easily detect the virus on the surface. The method uses the magnetic beads as support for the sandwich-type immunological chain, which, thanks to their high surface/volume ratio, permits the load of a high amount of antibodies, improving the sensitivity. For electrochemical measurement, we functionalised the working electrode by drop casting with carbon black, demonstrating improved sensitivity using this affordable nanomaterial.

### Optimization of MBs-based assay

To evaluate the necessary washing steps:

1. Immobilization on the electrode
2. Washing step on SPE
3. Measurement

To evaluate the best SPE:

1. Immobilization on the electrode
2. Washing step on SPE
3. Measurement

To optimize the antibody concentration and MBs volume:

1. Immobilization on the electrode
2. Washing step on SPE
3. Measurement

### Future developments

- Optimization of reagent pre-loading
- Test of the analytical performances
- Specificity test with different viruses
- Surface test for real application

### References

1. Fabiani, L., Gini, G., De Santis, R., Gini, G., Lioati, G., Pappalardo, E., D'Amico, M., Regazzoni, E., Savarino, F., Turchese, G., Marzulli, E., Lioati, F., Annackner, R. (2021) Magnetic Beads Combined with Carbon Black-Based Screen-Printed Electrodes for COVID-19: A Simple and Miniaturized Electrochemical Immunosensor for SARS-CoV-2 Detection in Saliva. *Biosensors* 11(1), 17. DOI: 10.3390/bios11010017

### Acknowledgments

This research has been funded by the European Union Horizon Europe research and innovation program under grant agreement No 101019715.

practical utility for virus detection on surfaces.

## RELIANCE featured at the 1st Swiss Sustainable Polymer Conference



May 2025 welcomed the inauguration of the Swiss Sustainable Polymer Conference (SSPC) in Fribourg, Switzerland - the first national platform connecting science and industry in the field of sustainable polymers. Prof. Roger Marti (HEIA-FR) presented RELIANCE through a poster and booth,



showcasing its innovative work on bio-based, circular-by-design polymers and its contribution to the EU's green transition goals.

[Continue reading](#)

---

## MORE VISIBILITY

### RELIANCE Project Highlights Advances at Bioanalytical Chemistry Days in Rome, Italy



In mid-spring this year, RELIANCE project made an appearance at the Bioanalytical Chemistry Days in Rome, Italy, with a poster presentation: “Origami paper-based biosensor to SARS CoV-2 on the surface.” The collaborative work between the University of Rome Tor Vergata and the Defense Institute for Biomedical Sciences highlighted the adaptation of RELIANCE’s origami-style electrochemical sensor for rapid, surface-level



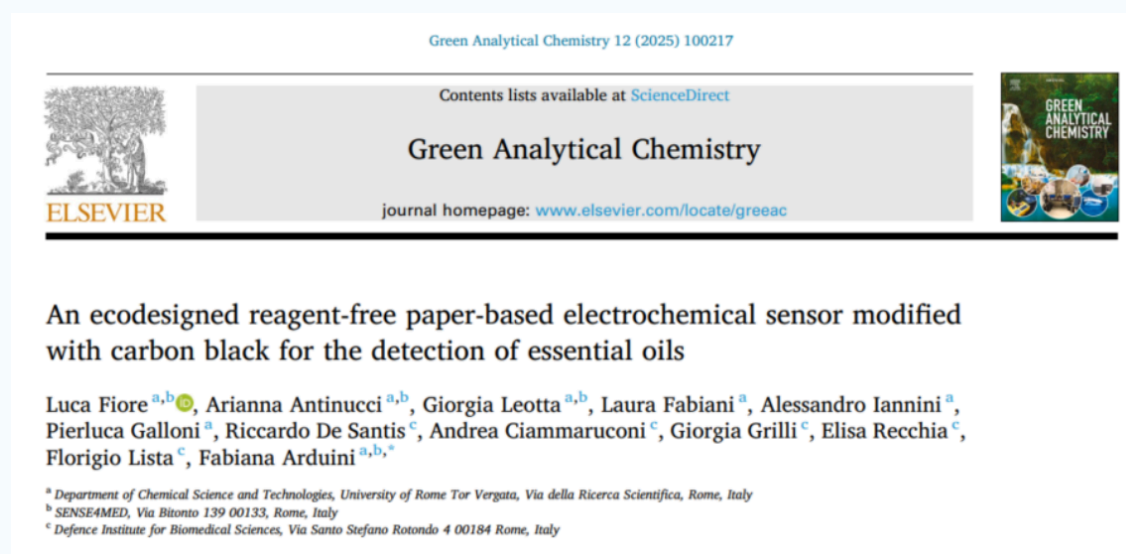
detection of SARS-CoV-2.

Held at the historic Palazzetto Mattei, headquarters of the Italian Geographical Society, the event brought together around 100 participants for a rich programme of oral talks, flash presentations, and scientific poster sessions.

[More...](#)

## SCIENTIFIC PUBLICATIONS

### RELIANCE first open access scientific publication by the University of Rome Tor Vergata



A talented collective of authors from the Università di Roma Tor Vergata contributed to the first open access scientific publication derived from RELIANCE! Our partners' paper was published in the Green Analytical Chemistry journal, under the title *"An ecodesigned reagent-free paper-based electrochemical sensor modified with carbon black for the detection of essential oils"*.

In the era of sustainability, the use of natural compounds with antimicrobial action is the rational selection to avoid the release of pollutants into the environment. Among them, essential oils are characterized by reliable antimicrobial activity and their use is estimated to grow in the future, thus their detection is in demand in research.

[Download the publication](#)

---

## FROM OUR BLOG

### Watching keratin-derived antimicrobial peptides (KAMPs) in Action

By the University of Patras

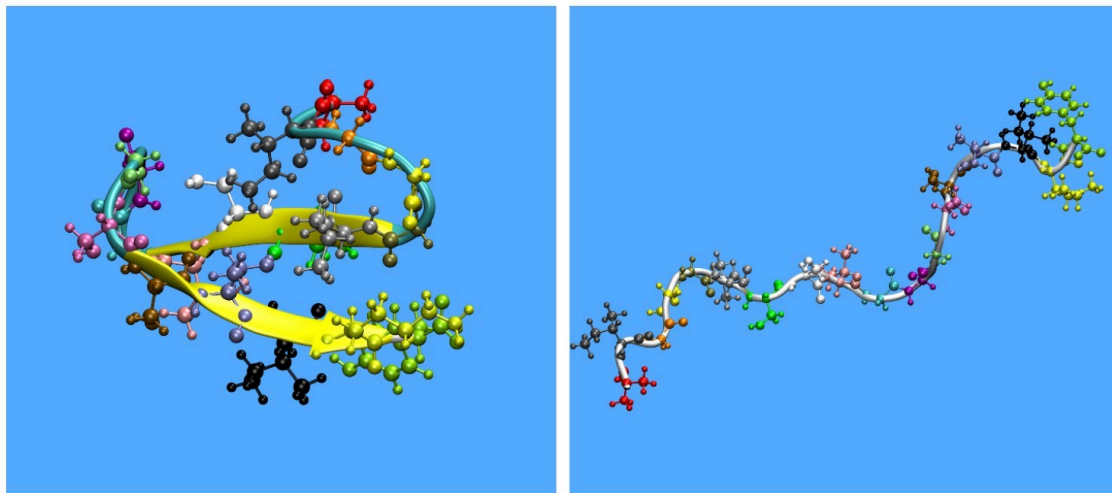


Figure 1: Initial (left) and final (right) configuration of KAMP-18N in dilute solution. Side chains are coloured by amino acid type while the backbone chain is coloured by secondary structure type.

Leading researchers from the University of Patras (UPAT), Greece are harnessing Molecular Dynamics simulations to explore the antimicrobial potential of keratin-derived peptides (KAMPs) used in RELIANCE. These naturally occurring peptides, sourced from human or chicken keratin, have shown promise as alternatives to conventional antibiotics, acting through multiple mechanisms and making it harder for bacteria to develop resistance.

The UPAT team investigates various KAMPs under different conditions, analyzing their secondary structures, aggregation behaviors, and interactions with model bacterial membranes. Simulations confirm that these peptides predominantly adopt a random-coil structure, occasionally forming transient  $\alpha$ -helices or  $\beta$ -structures. In semi-dilute solutions, the KAMPs tend to form small amorphous aggregates driven by hydrophobic and electrostatic interactions.

[Read the full blog post](#)

---

## NETWORKING FOR AMPLIFYING KNOWLEDGE

In RELIANCE, we believe that building strong connections with relevant projects, platforms, networks, and initiatives is essential to maximizing European projects' impact and enhancing the value of their outcomes. This collaborative approach supports our shared mission of fostering more resilient societies and promoting sustainable living.

Effective synergies emerge from actively establishing and maintaining relationships with ongoing projects, sharing similar goals, and developing resources through a collaborative lens.

### RELIANCE Project Champions Collaboration at Collab4Resilience Initiative Kick-off



In early April 2025, RELIANCE project Coordinator Tekniker proudly participated in the launch of Collab4Resilience (C4R), a new initiative led by the [CheMatSustain project](#) under the shared vision: *Stronger Together in Science and Sustainability*.



The online workshop brought together several EU-funded projects in the fields of advanced materials, nanoscience, and Safe and Sustainable by Design (SSbD), to foster impactful collaboration across communication, dissemination, and research activities. This new cluster network seeks to amplify the visibility of project results, promote innovation, and accelerate progress toward a climate-neutral, circular economy.

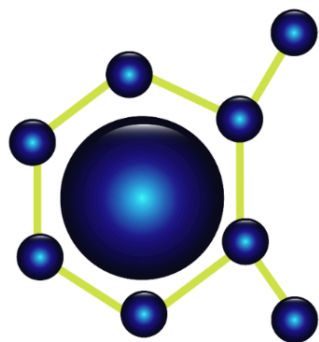
The meeting outlined six strategic collaboration areas: coordinated social media engagement, a joint newsletter, co-authored publications and open-access promotion, shared multimedia channels, joint events and training activities, and thematic campaigns. Through this collective framework, RELIANCE and fellow C4R participants aim to strengthen scientific exchange, policy influence, and societal impact, establishing a dynamic platform for sharing knowledge and advancing sustainable materials research across Europe.

[Read more](#)

## Stay tuned ...



From 8 to 11 July 2025, the [22<sup>nd</sup> International Conference on Nanosciences & Nanotechnologies](#) will take place in Thessaloniki, Greece. The event will spotlight the latest advances in Nanosciences and Nanotechnologies (N&N), fostering in-depth scientific dialogue among researchers, scientists, and market leaders from diverse disciplines. This multidisciplinary event invites front-line experts to explore the role of N&N in R&D, promote collaboration across academia and industry, and stimulate the exchange of innovative educational and research concepts.



10th Edition

# SMS

Smart Materials and Surfaces

## 2025

SMS Conference and Exhibition

29 - 31 Oct. 2025 | Rome, Italy

The [10<sup>th</sup> Smart Materials & Surfaces Conference \(SMS 2025\)](#) is an international event focused on the latest breakthroughs in the design, modification, and application of smart and multifunctional materials, surfaces, and structures. Taking place from 29 to 31 October, it will bring together researchers and engineers from academia and industry worldwide. The conference fosters global collaboration and dynamic exchange of innovative ideas through plenary sessions, invited talks, oral presentations, and poster discussions.

HELP US SPREAD THE WORD ABOUT THE LATEST GOINGS ON IN  
THE WORLD OF ADVANCED MATERIALS AND FORWARD RELIANCE  
NEWSLETTER TO FRIENDS, COLLEAGUES AND PARTNERS.



Get the next issue straight into your Inbox by [subscribing here](#).

RELIANCE project is social. Visit our [website](#) or stay in touch by following us on [LinkedIn](#) and [X](#).





Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.



---

*Copyright 2024 © RELIANCE project, All rights reserved.*

Want to change how you receive these emails?

You can [update your preferences](#) or [unsubscribe from this list](#).