ISSN 2599-8293

European Commission

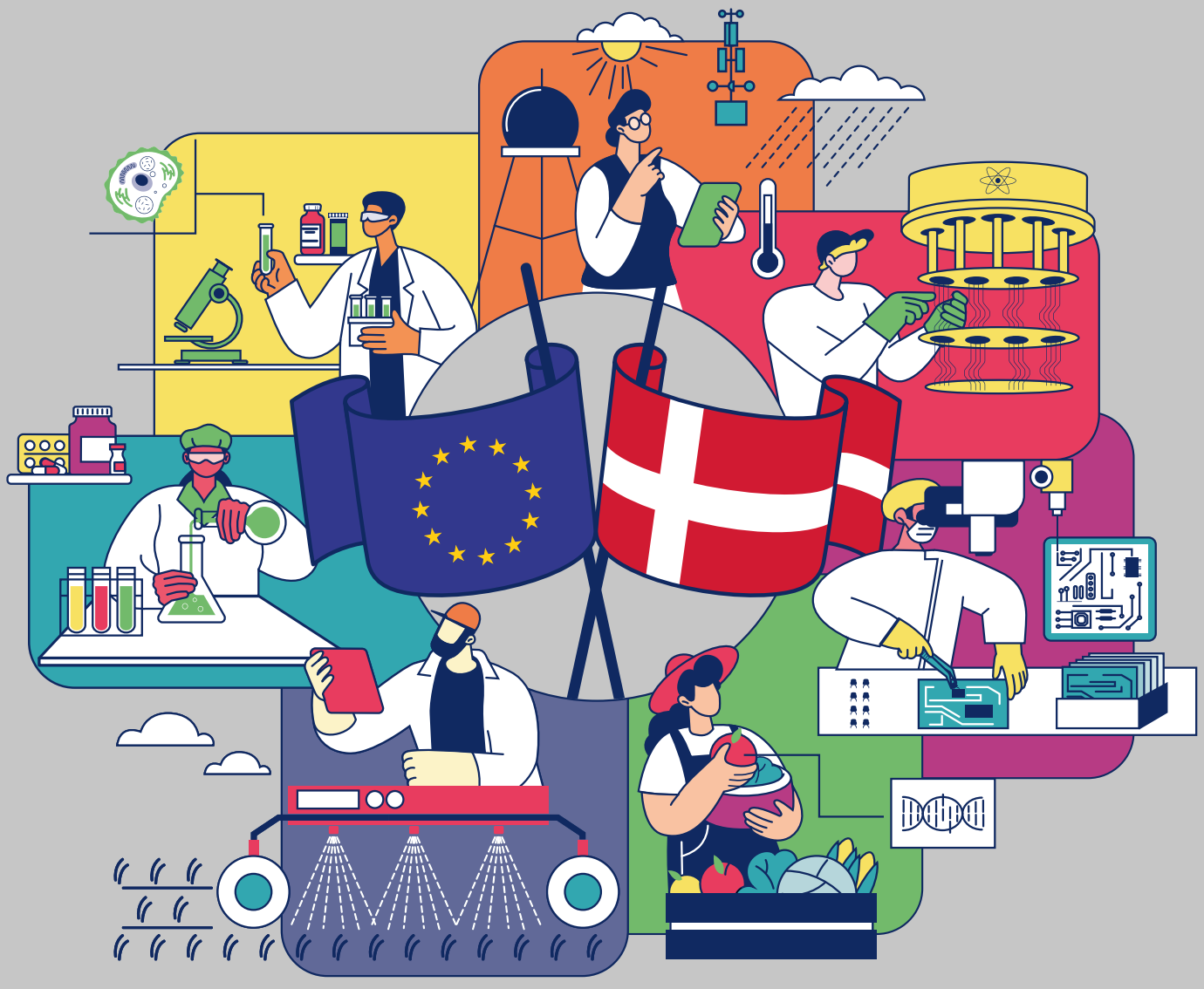
Research and Innovation

CORDIS Results Pack on
Horizon in Denmark

Supporting pioneering research, from fighting Parkinson's disease to developing drought-resistant plants

A thematic collection of innovative EU-funded research results

July 2025



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Editorial

Supporting pioneering research, from fighting Parkinson's disease to developing drought-resistant plants

For over 40 years, the European Union has supported cutting-edge science, research and innovation. By driving scientific progress, the EU R&I programme helps to tackle some of the most important challenges facing Europe, from cancer to climate change.

This CORDIS Results Pack on Horizon in Denmark highlights the impact of EU funding in fostering scientific innovation, increased competitiveness, employment opportunities, and the growth and scale-up of innovative businesses.

From the age of the Vikings to the present day, Denmark has consistently punched above its weight in scientific innovation. Technological breakthroughs that emerged during the first millennium AD such as the longboat, the potter's wheel and the vertical loom enabled Viking settlements to proliferate and prosper.

This tradition of innovation is very much alive and well. Denmark was ranked first in the 2024 European Innovation Scoreboard[1] and is a leader in fields such as digitalisation and intellectual assets. The country has long made the most of its geographic situation: in 2023, wind power met nearly 60 % of the country's electricity demand[2]. Denmark's pioneering attitude has been attributed, among other things, to: an excellent education system; strong governmental support; and a thriving start-up community.

Through its flagship funding programmes, most recently Horizon 2020 (2014-2020) and Horizon Europe (2021-2027), the EU has invested over EUR 5 billion across over 1 500 research and industry organisations in Denmark[3]. This support comes from various initiatives, including the European Research Council, Marie Skłodowska-Curie Actions, European Innovation Council, and more.

The seven projects in this Pack highlight the breadth of the research supported through Horizon in Denmark. They include work towards an effective treatment for Parkinson's disease, AI-enhanced devices to detect chemical threats, bacteria-based polymers that could one day replace fossil fuel-based plastics, and new insights into cognitive development in infants. Projects also looked at developing drought-resistant plants, the impact of greening urban areas, and the impact of mercury pollution on Amazonian bird life.

Together, these projects showcase the continuing importance of Denmark's contributions to science, research and innovation, and the country's central role in tackling major challenges of our time.

1 European Innovation Scoreboard 2024

2 European Investment Bank

3 Data retrieved from Horizon Dashboard May 2025

Mercury pollution and its impact on Amazonian bird life

Mercury around artisanal small-scale gold-mining in the Amazon is inducing genomic changes in local bird populations.

© Amazon Mercury_Tali Magory Cohen

Mercury, the third most toxic metal after arsenic and lead, continues to increase in concentration due to human-related activities, posing a significant threat to ecosystems worldwide.

Heavy metals tend to persist in the environment, accumulate in animal tissues, magnify throughout the food chain and cause numerous adverse effects on the health of humans and animals.

Artisanal small-scale gold-mining (ASGM) is considered one of the largest sources of mercury emissions in the Western Amazon, where deposition into water bodies has increased substantially as a result of ASGM.

By identifying the mechanisms through which birds adapt to long-term mercury pollution, we can develop strategies to mitigate these impacts on birds, humans and other species.

Understanding the genomic changes induced by mercury exposure, along with its evolutionary effects on populations and species over time, will help estimate the cost to wildlife and ecosystems. It will also shine a light on how exposed human communities are to similar risks.

"By identifying the mechanisms through which birds adapt to long-term mercury pollution, we can develop strategies to mitigate these impacts on birds, humans and other species," says Tali Magory Cohen, principal investigator on the AMAZON_MERCURY project, supported by the Marie Skłodowska-Curie Actions programme.

Genomic sequencing indicates an evolutionary response to environmental mercury

The project focused on: piscivores, primarily kingfishers; insectivores, primarily the white-winged swallow; and granivores, primarily red-capped cardinal. These species best represent this region, by being relatively abundant, and by their size variation (14-304 g).

Magory Cohen, who conducted her research at the Center for Evolutionary Hologenomics of the University of Copenhagen, under the supervision of Tom Gilbert, explains the team captured some additional species where possible, and in accordance with permits.

By sequencing the genome (DNA) and transcriptome (RNA) of the birds, AMAZON_MERCURY examined different perspectives of the evolutionary change taking place. As she points out: "Whereas, generally, genomic changes represent changes that occur over multiple generations, changes to the transcriptome can be measured in the individual and are considered more immediate."

In collaboration with the University of California, Davis, where she was supervised by Rachael Bay, Magory Cohen measured mercury in both environmental and biological samples. She wanted to explore the correlation between available mercury in the environment and concentrations in bird tissues such as blood and feathers.

"We compared mercury levels between historic specimens and contemporary samples from birds captured in the same region, to understand the role of recent ASGM processes as a source of mercury pollution."

Impact of mercury in the unprotected areas of the Western Amazon

The project found that mercury levels in lake sediments were higher in unprotected areas, where artisanal gold-mining activities were conducted. This corresponded with known biochemical processes of ionic mercury methylation by sediment bacteria.

Mercury levels in birds were significantly higher in birds captured in unprotected areas, while levels of the stress hormone corticosterone were significantly lower in birds with higher mercury loads, suggesting that their health is impaired.

Magory Cohen also identified genes that are activated differently in birds with high mercury levels. Many of these genes were linked to enzymatic activity and cellular functions, and some had been previously identified in connection with responses to toxicity.

She notes: "This suggests that one of the mechanisms involved in responding to long-term mercury exposure is the regulation of specific gene expression, leading to a direct effect on the individual and possibly indirect effects on the bird population and overall biodiversity."

Predictably, given what is known about the characteristics of mercury magnification in the food chain, piscivores were most affected by environmental mercury pollution. They exhibited the highest mercury loads in their tissues, the most significant changes in stress hormone levels, and the most noticeable differences in gene expression patterns, compared to insectivores and granivores.

"It's important to realise that while we were looking at birds, the impact on health and evolutionary consequences can also be relevant to humans. Our evidence suggests environmental mercury pollution is a threat to biodiversity," Magory Cohen explains.

Note: this article was last updated on 16 August 2024.

PROJECT
AMAZON_MERCURY – Evolutionary adaptations to mercury pollution in avian bioindicators

COORDINATED BY
University of Copenhagen in Denmark

FUNDED UNDER
Horizon 2020-MSCA-IF

CORDIS FACTSHEET
cordis.europa.eu/project/id/896149

PROJECT WEBSITE
talimagory.wixsite.com/home/amazonmercury

How do young children read minds?

Researchers analysed infants' behaviour to test a hypothesis about Theory of Mind.

Human social interaction and learning depends on making the right inferences about other people's thoughts, a process commonly called mentalising, or Theory of Mind.

Several decades of research concluded this cognitive achievement is reached at around age four, however recent experiments found evidence that infants as young as six months were predicting other people's actions seemingly by considering their mental states.

"This work radically changed our views, and provided support for views that Theory of Mind was a very early emerging, perhaps innate, capacity," explains Victoria Southgate, a developmental cognitive neuroscientist at the University of Copenhagen and DEVOMIND project coordinator.

In the DEVOMIND project, which was funded by the European Research Council, Southgate's team looked at infants' behaviour

and brain activity to challenge this new view, in an attempt to resolve one of the greatest puzzles in the history of developmental science.

An altercentric view

The DEVOMIND team put forward a hypothesis that infants are not in fact thinking about other minds, but rather they are 'altercentric', or biased towards attending to the targets of others' attention. This adaptation for learning allows infants to focus on others' attention and encode the targets of their attention, but without understanding anything about mental states.

"I proposed that this altercentric bias is possible because infants have not yet developed a self-representation, which happens in the second year of life," adds Southgate. "Once a self-representation begins to emerge, it is more difficult for infants to simply prioritise the others' attention because there is a conflict between self and other representations."

Testing the hypothesis

DEVOMIND tested this hypothesis through a number of studies. In one study, published in 2023, the team found that eight-month-old infants looked longer at the outcome of an animation in which an object is revealed to be absent at a location where it was seen by another person, than one where just the infant saw it. "This tells us that infants remembered the object better where another person saw it," Southgate says. By 12 months, this bias is receding.

In another study, the researchers investigated how the emergence of self-representation changes how infants encode this kind of perspective conflict scenario. Infants who exhibited markers of self-representation showed evidence of experiencing a perspective conflict (seen through greater pupil dilation) whereas infants who did not yet show evidence of self-representation, did not.

"This suggests that indeed the emergence of a self-representation forces infants to confront two conflicting representations," remarks Southgate. "Both those studies are important evidence in support of our hypothesis."

Overturning Piaget

These results suggest that our long-held view – since the time of Jean Piaget – that cognition begins as 'egocentric' is wrong. Children become egocentric with the development of the self, but they begin life as altercentric.

Prioritising encoding of others' attention might be a good heuristic for early learning, Southgate says, when infants can't move around much and spend most of their time observing others. "I call it uniquely infant social intelligence."

The project highlights that the emergence of self may radically change cognitive development, something that has received little empirical study in developmental psychology. "We are now really focused on that question – how a self emerges and what it gives us that might make human consciousness unique," concludes Southgate.

This work radically changed our views, and provided support for views that Theory of Mind was a very early emerging, perhaps innate, capacity.

Note: this article was last updated on 25 December 2023.

PROJECT
DEVOMIND – How do infants mentalize? Bringing a neuroimaging approach to the puzzle of early mindreading

COORDINATED BY
University of Copenhagen in Denmark

FUNDED UNDER
Horizon 2020-ERC

CORDIS FACTSHEET
cordis.europa.eu/project/id/726114

PROJECT WEBSITE
psychology.ku.dk/ecc-en

Nature-based solutions: accelerating the transition with quantifiable impact

A qualitative and quantitative study of the impact of nature-based solutions tested in urban living labs – together with decision support tools and educational information – will guide and inspire myriad stakeholders.

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Nature-based solutions (NbS) protect or restore natural habitats and even create new ones in places they did not exist previously. Examples include creating green roofs or urban parks, and depaving to create new natural spaces. They improve and contribute to biodiversity, build resilience to heat and flooding, and create myriad additional environmental, social and economic benefits.

Mapping NbS and modelling the ecosystem services provided by them, the EU-funded REGREEN project advanced the understanding of what NbS work best for which challenges and where. Its tools and reports, openly available on the project website, will accelerate the transition towards equitable, green and healthy cities.

Mapping and modelling ecosystem services

REGREEN mapped the extent of nature in several European and Chinese cities and created detailed, quantitative scenarios for how it could change. "Through ecosystem services models, REGREEN looked at, for example, what impact increasing tree cover would have on air quality and mortality, or what impact planting trees along streams would have on water quality," explains Marianne Zandersen of Aarhus University, project coordinator.

The brilliant thing about NbS is that they are multifunctional – one type can help reduce several challenges at a time, making them cost-effective compared to engineered solutions.

Well-being and benefits were both quantified and qualified by integrating health economics with citizens' perceptions and preferences. These were incorporated into a total economic value of NbS. "NbS are often undervalued in decision-making because assessments lack the full range of social, environmental and health benefits of NbS. However, value should be recognised as more than an economic metric," adds Zandersen.

Urban living labs: teaming up with local authorities in European cities

REGREEN worked with two municipalities in Croatia and Denmark, and a regional agency in Paris. The three cities differ widely in scale and complexity but share the same types of challenges and potential. Participation in REGREEN served as a catalyst for strategic shifts in planning, capacity building and stakeholder outreach. It also secured the mandate for further exploration and implementation of NbS in all three cities.

Of particular note, regional policymakers in Paris used a tool and report by REGREEN on renaturing cities to create a new agency with a multimillion-euro budget. It will finance depaving and renaturation projects and provide technical support to municipalities in the region. The report, available in four languages, will help European cities stop the decline in urban green space and increase it in alignment with the European Nature Restoration Law.

Raising awareness among stakeholders of all ages

REGREEN has something for everyone who wants to take action or learn more about NbS. Its 'Nature Solutions Platform' and Greenopolis learning platform target adult stakeholders, teachers and children respectively. Interactive 5x8 m² walkable floor maps that reproduce aerial photos of municipalities inspired unique reflections and innovation to solve challenges in urban areas.

REGREEN also published 29 public deliverables and 34 open access peer-reviewed articles by project end, with 29 more submitted or in preparation. It produced the REGREEN NbS handbook for ecosystem restoration and urban resilience, policy briefs and a podcast series as well.

REGREEN has holistically integrated ecosystem services modelling and mapping, quantitative benefits assessments, urban planning, education and business, taking into account the shared benefits of NbS. "The brilliant thing about NbS is that they are multifunctional – one type can help reduce several challenges at a time, making them cost-effective compared to engineered solutions. It's time to start scaling them up," concludes Zandersen.

Note: this article was last updated on 30 September 2024.

PROJECT
REGREEN – Fostering nature-based solutions for smart, green and healthy urban transitions in Europe and China

COORDINATED BY
Aarhus University in Denmark

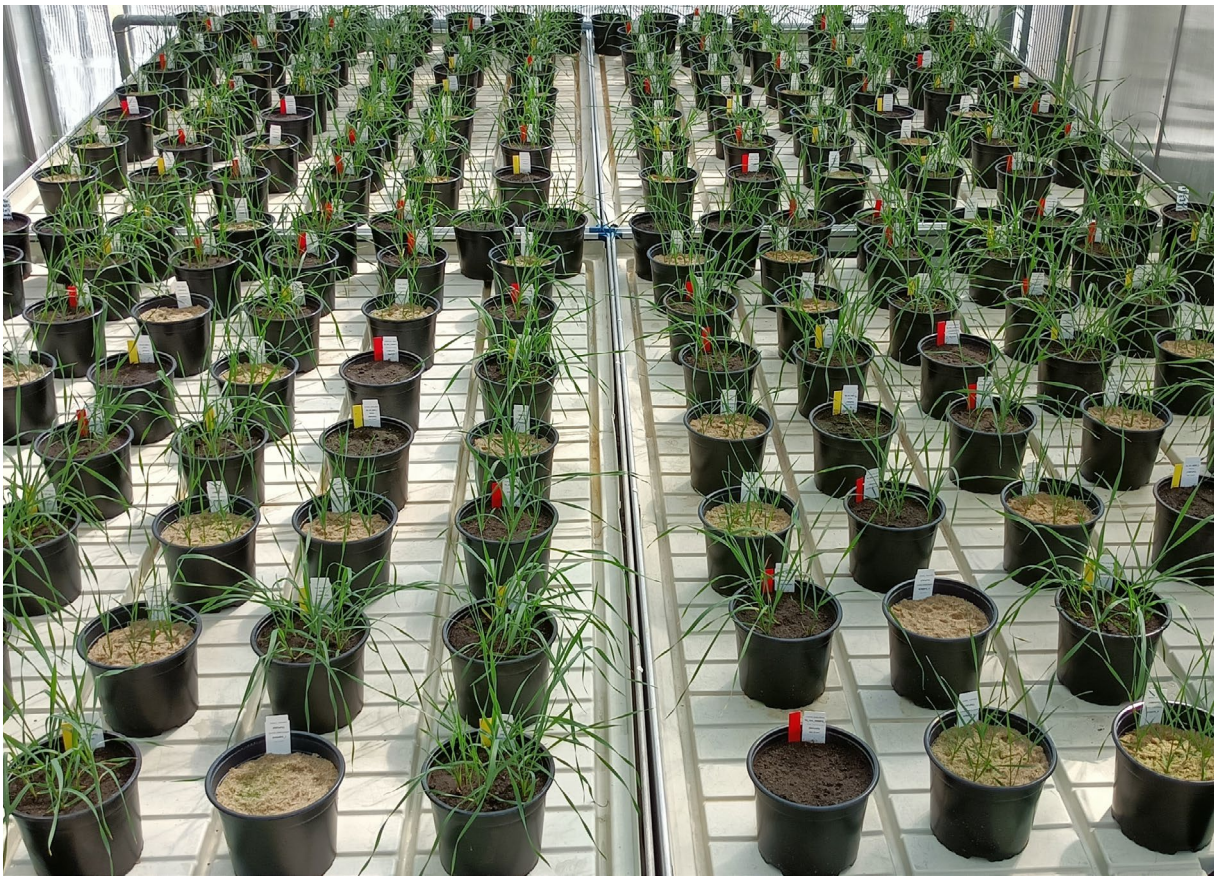
FUNDED UNDER
Horizon 2020-ENVIRONMENT

CORDIS FACTSHEET
cordis.europa.eu/project/id/821016

PROJECT WEBSITE
regreen-project.eu

Rhizosphere solutions support stress-resistant wheat

Examining the interplay between root secretions and beneficial microbes is advancing the field of rhizosphere engineering to yield drought-resistant plants.



© Ajay M. Sorty

Climate change and a growing human population present critical challenges to food production. The world needs reliable staple crops that can withstand climate-related stressors such as heat, salinity, flooding and drought.

The RhizoEng project, undertaken with support from the Marie Skłodowska-Curie Actions programme, investigated how signalling between wheat root secretions and beneficial microbes in the soil can yield hardier plants.

Building a synthetic community in the rhizosphere

The rhizosphere is the area in the soil where the metabolic functions of a plant interact with surrounding microorganisms. As plants release secretions such as amino acids, organic acids and sugars into the soil, these root exudates act as chemical

signals that attract microbes. Given this natural symbiosis, RhizoEng hypothesised that creating a synthetic community through rhizosphere engineering – manipulating the microbial consortia available to root exudates – could result in hardier, drought-resistant strains of wheat.

To test this theory, RhizoEng carefully documented root exudates present in a natural soil matrix, developing a standardised and systematic pipeline for extracting these secretions. The project also conducted a pre-screening to select beneficial and responsive microbial strains. According to Marie Skłodowska-Curie Actions fellow Ajay Madhusudan Sorty: "This approach enabled us to deliver specific microbial strains alongside root exudate components as signalling molecules, ensuring the sustained presence of the inoculated strains near the root zone."

Interdisciplinary greenhouse experiments

Chemical ecology – particularly rhizosphere engineering – is an emerging field. The project used information and approaches from several disciplines, including microbiology, plant science, molecular biology and molecular ecology to fill the knowledge gap concerning host-microbe interactions in the soil and develop a practical tool for crop cultivation.

We successfully identified exudates that activate beneficial counter-responses in stress-mitigating microbes, fostering overall positive interactions with host plants.

Project results were based on two meticulously run greenhouse experiments. The first identified characteristics of wheat root exudates in natural soil under drought conditions. The second trial investigated the responses of microbes beneficial to wheat. Regarding the results of the greenhouse experiments, Sorty shared: "Under stress conditions, adding synthetic root exudates as colonisation signalling mediators enhances rhizosphere chemical ecology, making this approach a robust tool to engineer wheat rhizospheres against stress-induced dysbiosis, which is an imbalance in the microbiome."

Rhizosphere engineering in the future

RhizoEng unveiled for the first time the underground signalling behaviour of wheat root exudates under drought conditions. The innovative approach of rhizosphere engineering highlights the importance of chemical ecology to drought-resistant crop production. In the short term, the project's promising experimental results will be shared within academic and research communities, where the technological interventions needed to address abiotic stress management in crops can be developed.

Next steps in the mid and long term include scaling up the strategy of rhizosphere engineering for wider application and exploring the efficacy of the approach in other crops. As Sorty points out: "We successfully identified exudates that activate beneficial counter-responses in stress-mitigating microbes, fostering overall positive interactions with host plants." This positive outcome deserves follow-up. Managing a stable food supply under adverse conditions is a looming challenge for humanity, and the results of the RhizoEng project point to a path forward.

Note: this article was last updated on 6 December 2024.

PROJECT
RhizoEng – Rhizosphere engineering: influence on signaling behavior and colonization under drought conditions

COORDINATED BY
Aarhus University in Denmark

FUNDED UNDER
Horizon 2020-MSCA-IF

CORDIS FACTSHEET
cordis.europa.eu/project/id/101028448

PROJECT WEBSITE
pure.au.dk/portal/en/projects/rhizosphere-engineering-influence-on-signaling-behavior-and-colon

The device enhancing our protection from chemical threats

Artificial intelligence-enabled handheld device for fast, reliable detection of chemical threats has led to promising patent applications.

Traditional chemical threat detectors, relying on ion mobility or mass spectrometry, are often bulky and expensive. While immunoassay-based detection offers more specificity, it can't detect the full range of evolving threats.

AI-enabled Raman-SERS handheld device

The EU-funded SERSing project has developed an artificial intelligence (AI)-enabled Raman-SERS handheld device, able to rapidly detect and identify liquid chemical hazards at low concentrations, with a gas equivalent under development.

Raman spectroscopy (RS) is a chemical analysis technique used to identify unknown, suspicious solid or liquid compounds. In the surface-enhanced Raman spectroscopy (SERS) system, geo-tagged data about the threat is transmitted to an online platform for swift response decisions.

"Our device can be used by first responders, installed in fixed locations and mounted on robots or drones," explains project coordinator Tomas Rindzevicius from Silmeco in Denmark. "When we started, AI-driven SERS data analysis was relatively new; it has proved to be an outstanding addition to our detection toolbox."

Benefits of more sensitive RS

The SERS substrates developed by SERSing are already used by project partner Serstech in their SERS kit, which can be used to detect and identify various chemical threats in liquid samples.

The Serstech device is equipped with geolocation capabilities, tracking the location of where samples are taken, along with their movement – critical in field operations. The device can also be remotely connected, transmitting data to a central control system or cloud-based platform, and multiple devices can work in coordination, providing a comprehensive threat overview.

"This real-time monitoring enhances decision-making, allowing teams to quickly respond, managing resources and containing threats more efficiently. The system can also be trained to detect emerging hazards as they develop, improving overall situational awareness and safety," says Rindzevicius.

SERSing behind new groundbreaking invention

Most recently, the project has sparked several patent applications – including one from the Swedish Defence Research Agency (FOI).

The Swedish FOI leveraged some of the SERSing project's work in SERS to develop a new, patent-pending solution that could enable the high-sensitivity, rapid detection of various nerve agents and pesticides in the liquid and gas phase.

What makes the FOI method so innovative is its use of a patented compound to functionalise SERS surfaces. "Think of this compound as a nano-sized antenna that can help us pick up SERS signals from nerve agents that are either in a gas or vapour phase or that are embedded into complex multicomponent fluids," explains Rindzevicius.

According to Rindzevicius, the FOI invention will help to further the SERSing project's goal of building cost-efficient and reliable handheld devices for detecting chemical warfare agents (CWAs) and pesticides in the liquid and gas phase.

In fact, Serstech is considering licensing the patent rights from FOI once the invention is filed.

"Working with CWAs and related technology isn't just expensive and time-consuming, it also requires very special knowledge, clearance, facilities and safety protocols – all of which were developed during our work," says Rindzevicius.

"Without the SERSing project, it would have been impossible for FOI to create this exciting new concept, synthesise the compound and, most importantly, rigorously test it."

This real-time monitoring enhances decision-making, allowing teams to quickly respond, managing resources and containing threats more efficiently.

SERSing's achievements also align with the needs identified by the EU's ENCIRCLE initiative for better hazardous chemicals detection, identification, modelling, risk assessment and impact reduction.

PROJECT
SERSing – Advanced Surface Enhanced Raman Spectroscopy (SERS) based technologies for gas and liquids sensING in the area of chemical protection

COORDINATED BY
Silmeco in Denmark

FUNDED UNDER
Horizon 2020-SECURITY

CORDIS FACTSHEET
cordis.europa.eu/project/id/883390

PROJECT WEBSITE
sersing.eu

Bacteria could hold key to replacing 'forever chemicals'

Sustainably producing polymers from living bacterial cells could help us to move away from our overdependence on petrochemicals.

The chances are that at some point today, you will make use of a product containing fluorinated materials. A quarter of all pharma drugs for example contain fluorine in one way or another, while fluorinated polymers can be found in items ranging from coated cooking pots to water-repellent fabrics.

One reason for their usefulness is that fluorinated molecules are very stable – the bond formed between carbon and fluorine atoms is incredibly strong. It is precisely this strength however that makes fluorinated chemicals so difficult to break down and recycle.

When multiple fluorine atoms are present in these fluorinated compounds, they are referred to as forever chemicals.

"These fluorinated molecules are typically produced with oil-derived petrochemicals," explains SinFonia project coordinator Pablo Iván Nikel from the Technical University of Denmark. "This is very environmentally impactful, and waste streams are very difficult to treat."

Bioengineered bacteria to produce polymers

The question posed by the SinFonia project was whether fluorinated compounds could be manufactured in a more sustainable way, using renewable resources to produce biodegradable compounds with similar properties – thus avoiding 'forever chemicals'. The project team landed on the idea of bioengineering bacterial cell 'factories' to produce polymers, the building blocks of plastic.

The first step in this process was to screen and identify enzymes that could connect carbon and fluorine atoms, to create organofluorines. It was discovered that only about 20 enzymes can achieve this – an incredibly small number.

The next step was to use these basic fluorinated molecules to gradually create more complex biochemical networks in the cells. Through this process, the project was able to demonstrate that bacteria can be used to produce polymer building blocks.

Same physical properties as conventional materials

The project went one step further however. "We realised that a major share of all fluorinated molecules produced by industry end up in fluorinated plastics," says Nikel. "We wanted to see if we could produce plastic using living cells, with lower concentrations of fluorine but with the same physical properties as conventional fluorine materials."

Nikel notes that in conventional polymers, carbon atoms are typically saturated with fluorine. The polymers produced by SinFonia's novel bacteria-based process however, contain far less fluorine.

"We were able to show that while our sustainably produced polymers contain a little fluorine, they were able to retain many of the benefits of heavily fluorinated materials," he notes. "This was one of the most impactful findings of the project."

We were able to show that while our sustainably produced polymers contain a little fluorine, they were able to retain many of the benefits of heavily fluorinated materials.

Consumers open to sustainable alternatives

Industrial partners within the consortium have been quick to identify the potential market value of these molecules. Since project completion, a spin-off company has been launched, intent on looking into ways of commercialising this innovation.

"The project has also tested the water in terms of consumer acceptance. Surveys carried out have shown that consumers are largely open to using polymers produced by bacteria, as well as a high level of awareness when it comes to the issue of 'forever chemicals'.

"We are still at the early stages of development," adds Nikel. "We need to consolidate our results, and of course scale up our technology. It is one thing to show how this works in the lab, but another to cost-efficiently produce large amounts of polymers to replace forever chemicals. We are positive though that the outcomes of the project will lead to the sustainable use and production of fluorinated materials."

Note: this article was last updated on 19 January 2024.

PROJECT
SinFonia – Synthetic biology-guided engineering of Pseudomonas putida for biofluorination

COORDINATED BY
Technical University of Denmark

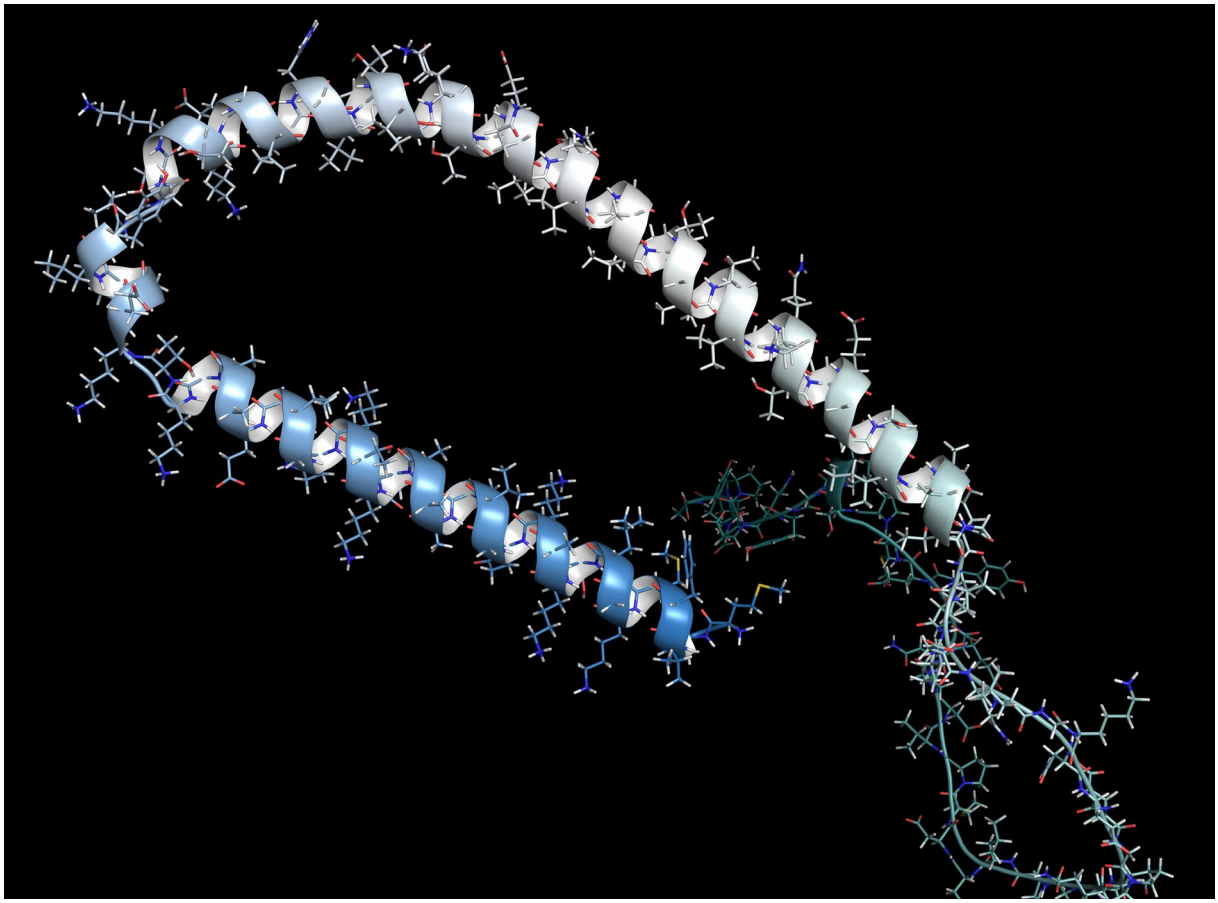
FUNDED UNDER
Horizon 2020-LEIT-BIOTECH

CORDIS FACTSHEET
cordis.europa.eu/project/id/814418

PROJECT WEBSITE
sinfoniabiotec.eu

New insights into the capacity of mirror image proteins to interact

When a theory about the cause of Parkinson's turned out to be a dead end, researchers changed course – their doing so led to a breakthrough finding.



At least 1 % of adults over the age of 60 will be diagnosed with Parkinson's disease, a neurological disorder that impacts one's ability to move. While what causes Parkinson's remains unknown, scientists do have some clues to work with.

"A hallmark of the disease is the formation of aggregates of the protein alpha-synuclein in inclusion bodies known as Lewy bodies," says Birthe Brandt Kragelund, a professor of Biomolecular Sciences at the University of Copenhagen.

With the support of the EU-funded SYN-CHARGE project, Kragelund, together with researcher Estella Newcombe, originally set out to determine whether the proteins involved in Parkinson's disease pathology could undergo a highly charged, disordered interaction with part of a calcium pump, thus causing its activation.

Challenging what we know about protein interactions

But sometimes research decides to take you in a different direction. So, when Kragelund and Newcombe discovered that their original plan was a dead end, they changed course. "While still interesting, the original focus wasn't going to lead us much further, so we made changes," explains Newcombe.

By showing that L- and D-proteins can interact in certain conditions, we have pushed the boundaries of what we know about protein biochemistry.

Instead of looking at a specific interaction, the project, which received support from the Marie Skłodowska-Curie Actions programme, pivoted to studying this type of interaction within the context of different protein systems. "We ended up testing whether disordered proteins could interact with their mirror image enantiomers," adds Kragelund.

Perhaps this pivot was a blessing in disguise, as it turned out that the new line of research led to a breakthrough finding – one that challenges what we know and assume about protein interactions.

According to Newcombe, it wasn't that surprising that structured proteins could not interact with the mirror image of their binding partner, as this alters how the proteins fit together. "However, when it comes to disordered proteins, they can interact as though nothing is different," she says. "What makes this finding interesting is that it contradicts preconceived notions about mirror image proteins' capacity to interact."

Opening the door to developing new drugs and therapies

Finding that mirror image enantiomers can interact when the protein binding partners are disordered opens the door to using enantiomers to target disordered proteins in disease.

"Peptide-based therapies are increasingly being studied, and our work positions D-peptides as an interesting option as they are not readily degraded by the proteolytic activity of biological systems," notes Newcombe.

"By showing that L- and D-proteins can interact in certain conditions, we have pushed the boundaries of what we know about protein biochemistry," adds Kragelund.

The project published a paper covering some of its results, while Newcombe discussed the topic on a podcast about neurodegenerative disease proteins.

Both Kragelund and Newcombe plan to continue their work in the field, with Newcombe recently taking a job at a pharmaceutical company and Kragelund continuing her efforts in the lab.

Note: this article was last updated on 21 June 2024.

PROJECT
SYN-CHARGE – Novel avenues of action for a hallmark disordered protein of Parkinson's disease

COORDINATED BY
University of Copenhagen in Denmark

FUNDED UNDER
Horizon 2020-MSCA-IF

CORDIS FACTSHEET
cordis.europa.eu/project/id/101023654

PROJECT WEBSITE
researchgate.net/profile/Estella-Newcombe

CORDIS Results Pack

Available online in 7 language versions: cordis.europa.eu/article/id/459533

Published
on behalf of the European Commission by CORDIS at the
Publications Office of the European Union
L-2985 Luxembourg
LUXEMBOURG

cordis@publications.europa.eu

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Print	ISBN 978-92-78-44890-5	ISSN 2599-8285	doi:10.2830/5141834	OA-01-25-079-EN-C
PDF	ISBN 978-92-78-44889-9	ISSN 2599-8293	doi:10.2830/1236383	OA-01-25-079-EN-N

Luxembourg: Publications Office of the European Union, 2025

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RESULTS PACK ON HORIZON IN BULGARIA

For over 40 years, the European Union has supported cutting-edge science, research and innovation. This CORDIS Results Pack on Horizon in Bulgaria highlights the impact of EU funding in fostering scientific innovation, increased competitiveness, employment opportunities, and the growth and scale-up of innovative businesses.

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