

Revolutionising forensic DNA analysis: Maastricht University leads groundbreaking European project to unmask hidden evidence in sexual assault cases

New toolkit promises to transform crime scene investigations by isolating forensic DNA profiles from individual cells in mixed biological traces.

CapCell: a pathway to resolving more crimes across Europe

Led by Maastricht University, the CapCell consortium has secured €4.5 million in funding from the European Commission's Horizon Europe programme ([HORIZON-CL3-2024-FCT-01-02 – Open Topic](#)). The project, *CapCell: Innovative Forensic Trace Investigation via Microfluidics and Single-Cell Genomics*, will advance forensic science to improve the identification of perpetrators in complex criminal cases, particularly sexual assaults. By strengthening Europe's judicial system, CapCell aims to deliver more justice for victims across the continent.

Addressing an urgent societal need

At the heart of CapCell lies an urgent societal challenge: sexual violence remains a widespread issue across Europe, yet forensic methods still struggle to separate and analyse biological traces when they contain cells from multiple contributors. This means many crimes go unresolved and victims are left without justice. Current DNA profiling technologies often fail when evidence is scarce, degraded, or mixed, leading to results that cannot be used in court. Too often, cases are dismissed due to lack of interpretable evidence, preventing perpetrators from being identified. Victims of sexual violence are predominantly women and girls, and the lack of effective forensic tools continues to hinder access to justice for those most affected. CapCell aims to close this gap by providing new technologies that make DNA profiling more reliable, even in the most complex cases.



“This is a transformative moment in forensic genetics. By bringing together cutting-edge technologies, CapCell will enable precise identification of perpetrators in cases where conventional methods have failed for decades. It’s about justice, science, and impact.”

Dr. Athina Vidaki (CapCell project coordinator), associate professor and research group leader at the department of Clinical Genetics at Maastricht University Medical Centre.

The first modular forensic toolkit of its kind

To solve this, CapCell will develop a mobile, integrated toolkit of ten plug-and-play modules designed to capture, select, isolate, sequence and interpret individual cells. It will be the first modular forensic system capable of extracting and analysing single cells from mixed DNA evidence, enabling the generation of single-source DNA profiles even from highly complex samples. The modules will combine advanced microfluidic devices, next-/long-generation sequencing and automated machine learning pipelines for data interpretation; all validated in real forensic settings. Once developed, the toolkit can be adopted by forensic institutes and police authorities across Europe in their daily work.

“With CapCell, we will not only advance the science but also co-create best practices with forensic institutes and police forces across Europe.”

Dr. Titia Sijen, team leader at the Biological Traces division of the Netherlands Forensic Institute.



Translating science into better justice for Europe

CapCell is advancing forensic science to better serve justice across Europe. By enabling the collection and interpretation of DNA profiles from even the most complex evidence, the project will help law enforcement identify more perpetrators of sexual assault and rape cases and bring them to justice. In doing so, CapCell contributes to the UN Sustainable Development Goals 3 (Good Health and Well-being), 5 (Gender Equality) and 16 (Peace, Justice and Strong Institutions), while supporting EU efforts against organised crime and gender-based violence, including its commitments under the Istanbul Convention. With a toolkit designed for easy integration to existing systems by laboratories worldwide regardless of their level of technology, the project aims to promote wider access to advanced DNA profiling methods, boost cross-border cooperation and support the modernisation of Europe's justice system.



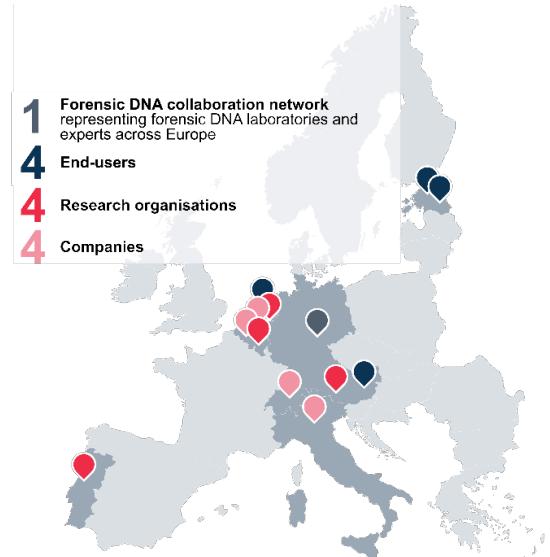
"Our focus is on usability, impact, and innovation for forensic end-users. CapCell's approach aims to provide practitioners with tools to recover informative single-cell profiles, even when the evidence contains just a few relevant cells. This could be a game-changer."

Prof. Walther Parson, associate professor at the Institute of Legal Medicine at Medical University Innsbruck.

A joint European effort to tackle crime

Crime knows no borders. To make its forensic toolkit available across Europe, CapCell brings together 13 expert partners from 8 countries, including universities, companies, forensic institutes and police forces. The consortium features Maastricht University (NL), KU Leuven (BE), Medical University of Innsbruck (AT), i3S – Institute for Research and Innovation in Health (PT), Netherlands Forensic Institute (NL), Estonian Forensic Science Institute (EE), Estonian Police and Border Guard Board (EE), Austrian Federal Criminal Police (AT), COPAN (IT), NimaGen (NL), Voxdale (BE), accelCH (CH) and EDNAP (GE). With strong expertise in DNA profiling and hands-on testing, the partners ensure that the tools developed will have direct practical use.

The project launched on 1 October 2025 and runs for four years.



Contact

For more information, visit the [CapCell website](http://www.capcell.eu) and follow the project on [LinkedIn](#) for the latest updates.



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