

Scientists create a global repository for cell engineering

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Dr Jonathan Tellechea, a synthetic biologist, in the lab while working on the project. Credit: Professor Natalio Krasnogor/Newcastle University, UK

A cloud-based repository that creates a digital fingerprint of engineered microorganisms has been successfully trialed.

An international team led by Newcastle University has launched [CellRepo](#), a species and strain database that uses cell barcodes to monitor and track engineered organisms. Reported in a new study in the journal *Nature Communications*, the database keeps track and organizes the digital data produced during cell engineering. It also molecularly links that data to the associated living samples.

Available globally, this resource supports [international collaboration](#) and has significant safety advantages, such as limiting the impact of deliberately or accidentally released genetically modified microorganisms by enabling faster tracing of organisms lab of origin and design details.

CellRepo is built on version control, a concept from software engineering that records and tracks changes to software code. The scientists believe that version control for cell engineering will make engineering biology more open, reproducible, easier to trace and share, and more trustworthy.

The research team highlights additional benefits of this community resource, such traceability—providing the exact documentation for a strain and properly crediting laboratory work. The database also puts responsibility in focus by making it easier to track and assign ownership.

With access to a global database, researchers will be able to reproduce results and collaborate more easily. The scientists also argue that the repository will improve transparency and reduce costs associated with data and source code losses.

Lead author, Natalio Krasnogor, Professor of Computer Science and Synthetic Biology at Newcastle University's School of Computing, said: "Engineering biology is not rocket science. It is much, much harder. And because of that it is imperative that we do it more openly and more

collaboratively. CellRepo, at its core, is a collaboration platform in which cell engineers can document their work and share it with others (within their own lab or more widely). By enabling more collaboration and the seamlessly sharing of engineered strains we hope to accelerate and improve synthetic biology processes and reporting for everybody. CellRepo is a community resource and as such we invite engineering biologists, synthetic biologists, biotechnologists and life scientists more generally to try it and get in touch with us so we know what works and what needs to be improved!"

Dr. Jonathan Tellechea, a synthetic biologist in the project says:

"I have always had some misidentification issues during my projects. Fortunately I was able to find them early on and solve them but I can't imagine how many good projects have failed or stalled because of this. Some other chunk of my time as a biologist goes into retroactively building the history of the plasmids and strains I use. I may get the genetic material from someone, but who was the original author? Sometimes I am lucky and it is just one paper away, sometimes its down a rabbit hole that may end up in the 80s. CellRepo fixes these and other important problems for experimentalists. "

Leanne Hobbs, the senior [software engineer](#) in the project reflects: "As a software engineer coming from industry to academia, it has been both a challenge and pleasure to work on a project where I can use my skills for the public good. Version control is a staple of software engineering and I am proud that we are now bringing these tools to engineering biology".

Dr. Lenka Pelechova, a social scientist working at The Interdisciplinary Computing and Complex Biosystems (ICOS) research group, added: "As a [social scientist](#), I believe the Responsible Research and Innovation framework is crucial in addressing societal expectations and in opening up public's conversations about new research and technology. In my

view, these conversations should start early on and CellRepo supports this by making research transparent from its onset.'

Study co-author, Professor Víctor de Lorenzo, from the Systems and Synthetic Biology Program at the Centro Nacional de Biotecnología in Madrid, Spain, said: "Given the innate tendency of engineered constructs to mutate and overcome any type of genetic firewall, decades of efforts for containment of recombinant bacteria have delivered few practical results. Instead, CellRepo offers stable and unequivocal identification of given strains that can be rigorously tracked and associated to digital twins with all information available—should it be required for countermeasures, ownership or liability purposes."

Elena Velázquez, Ph.D. student in Víctor de Lorenzo's lab, added:

"As a synthetic biologist who works all day with plasmids and strains from different origins, I am used to find that the plasmid or strain I was using in my experiments were not what I requested. This, of course, cannot be blamed on scientists who kindly donate their hard work altruistically and, moreover, since there was not an easy way to label and identify if the strain at stake was the intended one.

"CellRepo is a platform that represents an incredible advance in this matter and that can save a ton of time and useless work to researchers all around the world. Moreover, the global repositories of strains that are to be shared through this platform can be an invaluable open-source of samples and a bridge for new collaborations between different labs. Thanks to CellRepo, scientists have the possibility to speed up their investigations and the reliability of their Science."

Co-author Simon Woods, Professor of Bioethics at the Policy Ethics and Life Sciences Research Center, Newcastle University, added: "The wide adoption of the CellRepo platform will make a major beneficial

contribution to the culture of science by providing a mechanism that ensures traceability and transparency and enabling reproducibility. In addition, CellRepo is a novel instrument of science governance that supports responsible but innovative science."

More information: Versioning Biological Cells for Trustworthy Cell Engineering, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-28350-4](https://doi.org/10.1038/s41467-022-28350-4)

Provided by Newcastle University

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