



Twist Helps Develop Mobile, Open-Source COVID-19 Diagnostics Labs

When SARS-CoV-2 slammed into Europe, London-based OpenCell Labs designed an open-source diagnostic lab inside a shipping container to meet the emerging threat.



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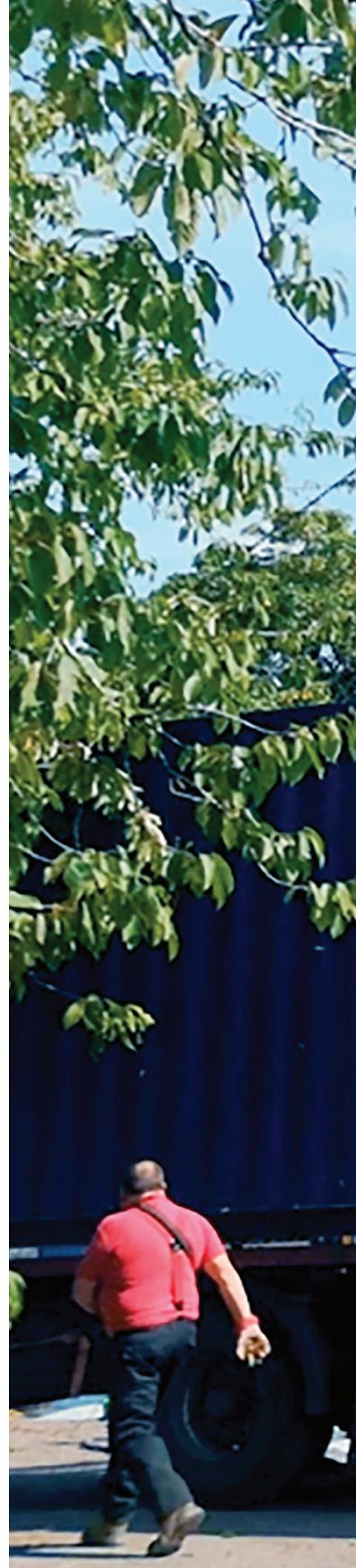
As of November 2020, OpenCell's first pilot is currently testing more than 1,000 passengers daily on the Isle of Jersey as a part of the Island's arrivals testing strategy.

Small, portable and modular, shipping containers were the readymade answer. OpenCell enlisted multiple collaborators, including Twist Bioscience, to design these biosafety level (BSL) 2+ minilabs, developing an efficient, accurate and reproducible workflow. Twist RNA controls played an essential role in developing this much-needed resource.

OpenCell was created to provide space for biotech startups. Lab facilities can be expensive and the team began converting shipping containers in labs in disused land in London.

Shipping containers are compact, ubiquitous, inexpensive, potentially portable and can even be stacked to form instant lab complexes. A standard container is 40 feet long and can pack-in a surprising amount of science.

Since founding in 2018, OpenCell has built these labs for 70 clients, studying synthetic biology, gene editing, next generation sequencing, therapeutic development, bioelectronics and many other disciplines, providing facilities for even the most cash-strapped startups and democratizing science.





COVID19 Testing
opencell.bio



The CONTAIN Project

In February 2020, when SARS-CoV-2 emerged as a global threat, the OpenCell team began working on COVID-19 diagnostic testing. Worldwide, millions (possibly billions) of people would need to be tested, and existing facilities would have trouble managing the load. When COVID-19 descended on the UK, they began the design process.

“In March, it all hit the fan, and we went from nothing to being shut down,” said OpenCell’s director and co-founder Tom Meany, PhD. “We put out a call through Twitter and other social channels, saying we’re developing a coronavirus diagnostics lab, and we’re looking for collaborators. Hundreds of people got in touch with us.”

Help came from a diverse group of academic groups and businesses: Imperial College, Kings College, Cardiff University, Effect Engineering and Just-Eat Takeaway.com (a UK version of Uber Eats that is providing software guidance), as well as companies working in the life sciences, like Opentrons, Applied Biosystems and Twist.

The key was finding inexpensive, open-source components that would be readily available, overcoming the supply chain pressures many labs had already faced during the pandemic. The result was CONTAIN, an open-source shipping container lab that could enable more widespread coronavirus testing.

*Marcus Walker,
Head of OpenCell Laboratories*



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TOM MEANY, PHD, OPENCCELL DIRECTOR AND CO-FOUNDER

Twist Validation

The CONTAIN labs had to meet a high bar: biosafety, accurate results, and speed. The labs were designed with three separate areas to remove RNA from patient samples and execute qPCR testing. The design included relatively inexpensive liquid handling robots run on Python from OpenTrons.

OpenCell opted for magnetic bead extraction to isolate patient RNA, but to validate the qPCR assays, they needed control samples with known coronavirus RNA levels. That's where Twist stepped in.

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Twist quickly shipped controls to OpenCell, as well as providing trans-Atlantic consulting services. "We immediately saw the potential of what OpenCell and their collaborators were trying to do and got them the controls as rapidly as we could," said Emily Leproust, PhD, CEO and co-founder of Twist. "In the middle of a global pandemic, or operating day to day, speed is always essential."

In addition to optimizing in the workflow, Twist RNA controls are helpful in validation and ultimately the steps to medical laboratory accreditation (ISO 15189).

"Twist controls are affordable and practical for conducting limit-of-detection assessments and regular batch-to-batch variability tests," said Meany. "We can have a known concentration, and this is what happens when we do the following steps that may cause it to break."

Pilot Study on the Isle of Jersey

Their first pilot study is as a part of the Isle of Jersey testing program for all incoming travelers. Located next to the airport, they are currently testing in excess of 1,000 people daily with an average turnaround for swab-to-result of less than 12 hours. Without this resource the Island would need to ship samples to UK testing labs meaning passengers would need to quarantine for days. Access to effective testing is a critical component for any reopening strategy, OpenCell's BSL 2+ labs provide an effective alternative to centralized diagnostic laboratories.

Extending this, hospitals could use CONTAIN labs to augment already overtaxed pathology labs. Schools could adopt them to test students, staff and faculty. A single CONTAIN lab can perform an average of >100 tests per hour.

"Think of a business, where you may have around 10,000 employees, you've got to test them on a weekly basis and they're spread across the campus," said Meany. "With CONTAIN, you can move the lab to exactly where they're needed, reducing turnaround time and taking pressure off hospital pathology labs."

CONTAIN labs can also augment the capabilities of existing diagnostic laboratories. They can be installed in a parking lot or virtually anywhere with utility access. Since they are stackable, they can be combined to create a large temporary facility and because they comply with international sea-freight standards, they can be shipped virtually anywhere in the world.

"We've had a huge number of calls from local hospitals," said Meany. "Their pathology departments are intended for all manner of pathology tests, not just COVID. They're worried about this pandemic taking over their departments and not being able to deliver care for the whole spectrum of patients."

OpenCell and collaborators have published an article on bioRxiv to disseminate the solution: CONTAIN: An open-source shipping container laboratory optimized for automated COVID-19 diagnostics. The hope is that, with this information, countries all over the world can adopt CONTAIN to help meet their COVID-19 diagnostic testing needs.

About OpenCell

OpenCell was founded in June 2018 to provide biotech startups with lab space and have grown to 70 shipping containers in White City, London. Since the pandemic Opencell have been converting developing testing laboratories to support the COVID-19 response.

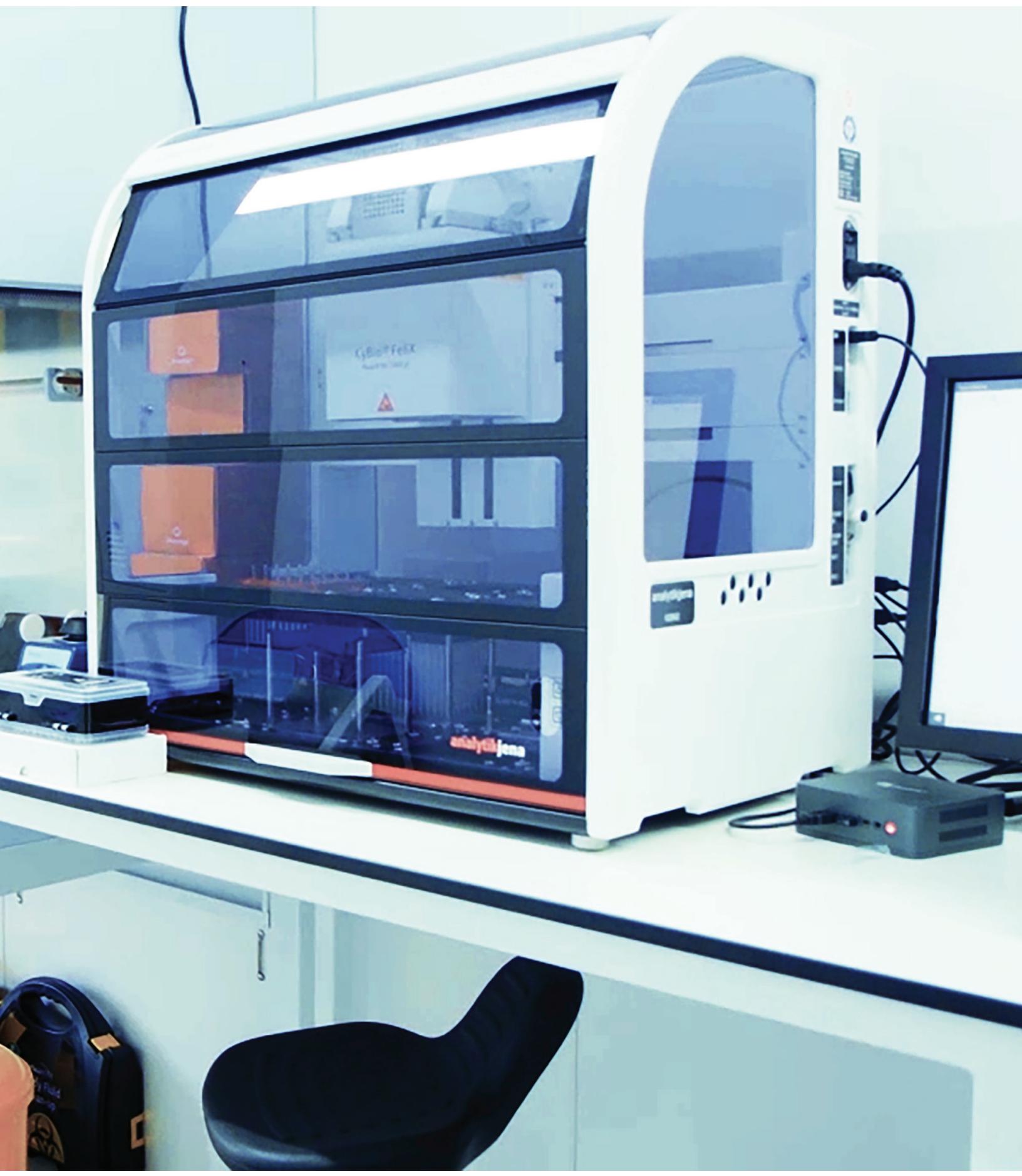


This is a wonderful illustration of how research should work. A diverse group of scientists get together to solve an urgent problem—a solution that could help millions. We are proud to have the opportunity to contribute.

EMILY LEPROUST, PHD,
CEO AND CO-FOUNDER OF TWIST BIOSCIENCE

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