

On a very practical level, how does a sample journey look like in a testing lab?

Yeah. It's a great question. It's evolved over time but not really significantly. The volumes have changed for sure. But roughly speaking, we get deliveries around the clock, can be any time during the day. And so we have a team that is dedicated to making sure no samples get misplaced. Everything is queued up so that we process everything first in, first out order.

So these samples then make it into the first step of what we call sample handling. Some samples come in small boxes because they came from a home test kit where one person swab themselves, put it in there. Other samples come from regional testing centres, like at the airport where four times a day they collect samples. And they can be hundreds or thousands of samples coming at once, individually bagged but then in a larger container.

So the sample handling group's job is to get tubes out of these boxes or bags. Now they have to do it very safely because these are coming from the general public. We don't know what happened. All sorts of problems could have occurred during transit-- leaks, or damage to these-- and so they have to be done in containment hoods to make sure that the operators are safe.

They collect these tubes. Now it's a tube with viral transfer media and a swab in it, and therefore a patient sample. These get collected, counted, and tracked as they move out of sample handling and into the lab.

And now the lab is where we have both automated as well as manual liquid handling that takes an aliquot of that viral transfer media, puts it into the extraction buffer, and reagents that we perform in 96-well plates. And that goes through the chemistry of first viral inactivation so that it's safe. We can now move outside of a hood.

And then we extract RNA. That purified RNA then is combined with master mix for the PCR reagents, and then we run lots and lots of PCR reactions doing real-time PCR on the 7500, every 72 minutes running through the cycle.

And it's really about making sure that each step along the way we've got pressure coming of samples so that no one has to stop. Because stopping and starting is a real efficiency drag through the lab, and especially when demand is high during waves of a virus. Then you've got issues that you just can't overcome. If you slow down, you can't speed up again.

And then once the PCR reactions are complete, those data files are uploaded to a piece of software that does a preliminary calling of the traces. We have human operators then reviewing all of those calls. So the human makes the call, but the software helps. When you're looking at thousands of traces a day, having a little bit of an automated helper through there helps the cognitive load and really helps people move along quickly.

And then from there, we have a result that goes out through IT systems through NHS Digital. And people may get a text message or an email, or it may go back to the study sponsors. If it's a vaccine trial, for instance, different channels there. Then the next things that happen are somewhat variable. That's where the main journey ends. You've got a diagnostic, a result of virus detected or not detected.

We also, in the lab, run genotyping assays to look for variants. These change over time. They're policy based depending on WHO classifications and what the public health experts need, and so we'll change what those are. But those then inform public health activities. It's not for a diagnostic result to the patient.

Then the rest of the RNA goes off for sequencing, which is part of the UKs COG activities where pretty world-leading data collection and sequencing efforts that go, and then all the analysis downstream of that.