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Norway to bring cancer-gene tests to the clinic

A pilot programme will use latest tumour-sequencing techniques to help guide cancer care.

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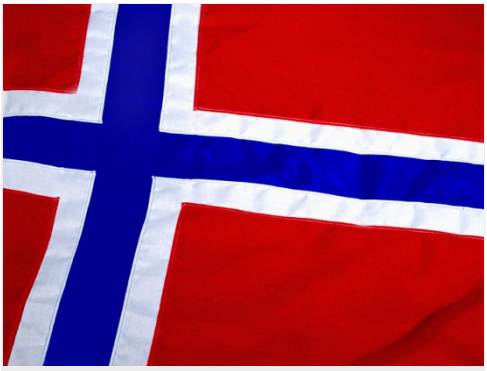
Norway is set to become the first country to incorporate genome sequencing into its national health-care system. The Scandinavian nation, which has a population of 4.8 million, will use 'next-generation' DNA sequencers to trawl for mutations in tumours that might reveal which cancer treatments would be most effective.

In its three-year pilot phase, the Norwegian Cancer Genomics Consortium will sequence the tumour genomes of 1,000 patients in the hope of influencing their treatments. It will also look at another 3,000 previously obtained tumour biopsies to get a better idea of the mutations in different cancers, and how they influence a patient's response to a drug. In a second phase, the project will build the laboratory, clinical and computing infrastructure needed to bring such care to the 25,000 Norwegians who are diagnosed with cancer each year.

"We don't think the clinic is really ready for it at this point but it's obviously coming fast, so we would like to get started," says Ola Myklebost, a cancer geneticist at Oslo University Hospital, who is spearheading the effort. The project has not yet been fully funded, but he expects it to cost upwards of £4 million (US$6.3 million), not including equipment costs.



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Norway eventually aims to sequence each cancer patient's tumour to provide personalized treatments.

Similar projects are under way in the United Kingdom and at research hospitals in the United States, France and elsewhere. But Norway's will be among the first to look for tumour mutations using next-generation DNA sequencing rather than conventional genetic testing.

Myklebost's team first plans to sequence 1,000 genes that are commonly mutated in cancers, including a handful for which drugs targeting the mutated gene products are available or in clinical testing. But the researchers will eventually sequence all of the human genome's 20,000 or so protein-coding genes, collectively known as the exome.

Saving on sequencing

That approach — now possible because of the plummeting price of DNA sequencing — has several upsides, says James Peach, director of stratified medicine at Cancer Research UK, the London-based charity that is coordinating the equivalent British pilot programme. "The Norwegians are quite lucky in that they're planning their initiative later than ours," he says.

More than a dozen drugs that specifically target the products of cancer-causing mutations are on the market, but many more are in development. Exome sequencing could identify, in a single test, the drugs from which a patient is most likely to benefit. Under the Norwegian programme, physicians will receive this information, and it will be up to them and their patients to use it.

Mutations in other genes could predict whether a patient with cancer is likely to develop resistance to a targeted drug, or help to explain why a certain drug isn't working, says Myklebost. Genome sequences from patients' tumours will also be a boon to cancer geneticists mining this data.

Norway's challenge will be to sequence cancer genomes quickly and accurately enough to guide physicians. The genetic tests that are currently used to determine whether someone should be prescribed a particular drug have typically received a stamp of approval from regulators, and are performed in certified labs. Clinical-quality genome sequencing, by contrast, is still in its infancy and few hospitals are yet equipped to offer it. Moreover, much of the information in a genome sequence, no matter how accurate, is of little direct use to oncologists.

“There are not many people I know who suggest that every cancer patient should have their whole exome sequenced and it’s going to inform their clinical management,” says Leif Ellisen, a cancer geneticist at Massachusetts General Hospital in Boston. Researchers at the hospital designed a single test that analyses 15 genes targeted by existing cancer drugs. The hospital now tests 60 patients a week, and is collaborating with a company to market the test commercially.

Six months into the pilot phase of the UK stratified-medicine programme, Peach says that other factors besides fast-changing sequencing technology will have an important role in the success — or failure — of these first programmes. “The most important thing that we’ve picked up is that pathologists are incredibly important,” he says. Tumour biopsies must be of a high quality to be used in genetic testing or sequencing.

Existing infrastructure in Norway’s health-care system could also give the programme a boost over others, particularly if it is expanded. Every patient with cancer in Norway is tracked under a single system. This will allow oncologists to easily draw on the experiences of other patients who have received experimental therapies targeted to their cancer mutation, says Myklebost.

“One of the big challenges with personal approaches is that you get these micro-trials” with just one subject, he says. With a national registry of patients whose cancer treatments were guided by genomics, “you can add together all these trials and over time you can get a lot of data,” he adds.

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