New research could revolutionize genomic sequencing of drug-resistant bacteria

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Credit: Oxford Nanopore Technologies Ltd

New nanopore DNA sequencing technology on a device the size of a USB stick could be used to diagnose infection - according to new research from the University of East Anglia and Public Health England.

Researchers tested the new technology with a complex problem - determining the cause of antibiotic resistance in a new multi-drug

resistant strain of the bacterium that causes Typhoid.

The results, published today in the journal *Nature Biotechnology*, reveal that the small, accessible and cost effective technology could revolutionise genomic sequencing.

Current technology for 'long read' detailed genomic sequencing can be performed using expensive instrumentation (around £500,000). It is complex to perform, and generally only available in specialist laboratories.

The research team tested a new device called MinION, produced by Oxford Nanopore Technologies Ltd. The machine produces long sequencing reads using a different methodology that does not require optimal imaging - but at a small fraction of the instrument cost (expected to be around £650 per device). These long reads are important when trying to determine where resistance genes are.

Researchers proved its utility by successfully mapping the multi-drug resistance genes in a strain called *Salmonella Typhi* haplotype H58 - which has recently emerged globally.

They successfully pinpointed the exact spot in the chromosomal structure that is home to the genes which makes it drug-resistant, known as an antibiotic resistance island. The MinION took just 18 hours to produce the results, with similar accuracy to current technologies.

Lead researcher Dr Justin O'Grady, from UEA's Norwich Medical School, said: "This type of technology will revolutionise the way that we characterise the rapid spread of emerging antibiotic-resistant infectious diseases.

"This analysis would previously have taken months using traditional

methods, due to extensive post-sequencing lab-based analysis. By the time the results are available, they might well be irrelevant for clinical diagnostics and guiding public health interventions.

"This is the first published research in the world to demonstrate the huge potential of MinION sequencing to solve important and complex biological problems.

"Public health and clinical laboratories could soon have easy access to this rapid, cheap technology which, in combination with short read sequencing, is capable of providing fully assembled bacterial genomes. Further improvements to the system are likely to remove the need for short read sequence data.

"MinION technology could potentially enable bacterial identification, diagnosis of infectious diseases and detection of drug-resistance at the point of clinical need.

"This type of technology makes next generation sequencing accessible to scientists everywhere."

More information: 'MinION nanopore sequencing identifies the position and structure of a bacterial antibiotic resistance island' is published in the journal *Nature Biotechnology* on December 8, 2014: DOI: 10.1038/nbt.3103

Provided by University of East Anglia