Scientists understand how E. coli clone has become globally distributed

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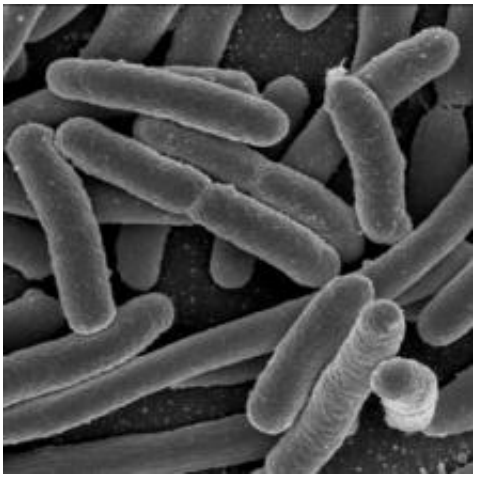

A scanning electron micrograph of E. coli. Credit: NIH

Scientists have for the first time come closer to understanding how a clone of *E. coli*, described as the most important of its kind to cause human infections, has spread across the world in a very short time.

E. coli clone ST131 is one of the leading causes of urinary tract and blood stream infections and has crossed the globe at a rapid rate. Worryingly, members of this clone are becoming more resistant to antibiotics. As an indication of scale, more than half of all women will suffer a urinary tract infection at least once in their lives. An international team of scientists, led by the University of Queensland in Australia and with the UK work led by Plymouth University and the

Cardiff University has studied ST131 and now has a better understanding of how it operates.

Their findings, published today in the prestigious *Proceedings of the National Academy of Sciences* (*PNAS*) USA, have two significant potential outcomes: the first and in the short term, enhanced screening of patients with either urinary tract or blood stream infection, so that those with ST131 receive appropriate treatment and management (ensuring that our most potent antibiotics are only used to treat severe infections caused by these resistant bacteria); and in the long term, the potential for the development of vaccines and other ways to control infection specific to this clone.

No one knows where or when ST131 came into being, but it is one of the most successful of its kind in terms of spread and invasiveness. It has become effective at causing infections and resisting antibiotics because it continually exchanges bits of DNA with other bacteria, a clever process which also gives it specific ways of hiding from the body's immune system.

The research team used genome sequencing to analyse strains of ST131 from six distinct geographical locations across the world spanning 2000 to 2011. Their work shows that, despite such a large geographical spread, the ST131 clone of *E. coli* came from a single ancestor, prior to the year 2000.

By isolating ST131's progression in this way, and understanding how it has been able to thrive, work can begin on the development of effective screening and vaccination strategies.

Dr. Mathew Upton, who led the study from Plymouth University, said: "The Chief Medical Officer has stated that antibiotic resistance is one of the leading threats to human health. We need to ensure that patients are

treated, but we also need to be certain that we use the most appropriate antibiotic for the job. In a condition such as urinary tract infection, most patients will receive a 'best guess' diagnosis and treatment from their GP. While most will react favourably to the antibiotics they are given, others will not and in this case a possible culprit is *E. coli* ST131."

He added: "What we need to avoid is doctors using the few antibiotics that are effective against resistant ST131 for all cases of urinary tract infection, because it is seen to be the only therapeutic strategy that works. The outcome of this will be that all the other bacteria that contribute to urinary tract infection become resistant too, which in turn reduces the number of effective antibiotics available for treatment, especially for those patients who are really sick. Instead, we need to create effective screening processes for patients, to ensure that only those who are infected by ST131, and other drug resistant, virulent clones receive those 'reserve' antibiotics. Our global survey of ST131 *E. coli* is helping us to understand these bacteria in great detail and will support development of these urgently needed screening strategies.

"In time we can also use our findings to develop vaccines that are specific to ST131, but this solution is some years away."

Dr Tim Walsh from Cardiff University's School of Medicine added: "The paper describes the global distribution of an *E. coli* clone called ST131. This clone is recognised as a human pathogen and has collected additional DNA making it highly resistant and difficult to treat. The spread of these clones is due to economic globalisation through international food exports and human travel."

More information: Global dissemination of a multidrug resistant Escherichia coli clone, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1322678111

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