

Rapid spread of a meningitis bacteria linked to hypermutable sequences helping avoidance of the immune system

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The growth of Neisseria meningitidis colonies on New York City Medium Agar. Credit: Wikipedia

An enhanced potential to avoid the human immune system has been found in recent serogroup W isolates of Neisseria meningitidis by



University of Leicester researchers, which may explain in part why the strain spread so rapidly among young people in 2013.

The study, published last week in the *Journal of Infectious Diseases*, saw researchers from Leicester, the University of Nottingham and Public Health England collaborate to explore the reasons behind 2013's rapid expansion in MenW ST11, a specific strain of N. meningitidis.

N. meningitidis, commonly called the meningococcus, is a bacterial species that causes potentially fatal infections such as meningitis and septicaemia, with the most at-risk groups being infants and young adults. An increase in the number of meningitis and septicaemia cases caused by serogroup W, known as MenW, strains of this <u>bacterial species</u> was seen in 2009 to 2017.

The rise in cases of disease caused by MenW is being effectively combatted by use of highly efficacious MenACWY vaccines in year 9 and 10 pupils in schools, and by provision of these vaccines to new and soon-to-be university students. Cases have now started to decline although meningococcal strains are still however a major cause of disease in the UK.

N. meningitidis is usually found at the back of the throat of ~24% of 17to 21-year-olds, with even higher levels found in first year university students living in halls of residence. These individuals are said to 'carry' the bacteria in a safe way so that there is no disease, although 'carriage' does allow for spread of the organism.

Since 2009 there has been a significant increase in the number of young adults carrying MenW ST11, and in the number of cases of disease caused by it. In 2013, a new version of this strain emerged and spread rapidly across the UK.



Simple repeating regions of DNA allow bacteria to vary how their surface appears to the <u>human immune system</u>. In their work, the researchers found evidence that the rapid expansion of the 2013-strains was linked to increases in the length of these repeating regions. These changes resulted in making some important surface structures more variable. This process, known as phase variation, allows bacteria to reversibly adapt to different environments.

This implies that this particular N. meningitidis sub-lineage is better able to avoid the human immune system during carriage in the upper respiratory tract and as the bacteria transmit from person-to-person. This immune avoidance attribute may have allowed these hyper-virulent meningococcal strains to spread rapidly throughout the UK population.

Dr. Chris Bayliss, a Reader in Microbial Genetics at the University of Leicester and researcher for the project, said: "It is imperative that we learn how meningococcal bacteria are spreading and causing disease so we can adapt our strategies for preventing infections by these dangerous pathogens."

All university students up to the age of 25 can request the highly effective MenACWY vaccine for free from their GP. This vaccine protects against MenW strains and strain types of serogroups A, C and Y, but not against MenB <u>strains</u>. All students should maintain vigilance for the signs and symptoms of meningitis and septicaemia.

More information: Luke R Green et al. Potentiation of Phase Variation in Multiple Outer-Membrane Proteins During Spread of the Hyperinvasive Neisseria meningitidis Serogroup W ST-11 Lineage, *The Journal of Infectious Diseases* (2019). DOI: 10.1093/infdis/jiz275



Provided by University of Leicester

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