Target 'super-spreaders' to stop hepatitis C

January 31 2013

Each intravenous drug user contracting Hepatitis C is likely to infect around 20 other people with the virus, half of these transmissions occurring in the first two years after the user is first infected, a new study estimates.

The work, led by researchers from Oxford University, suggests that early diagnosis and treatment of Hepatitis C in intravenous drug users could prevent many transmissions by limiting the impact of these 'super-spreaders' (a highly infectious person who spreads a disease to many other people).

Working out 'who has infected who' in fast-spreading diseases such as influenza is often relatively straightforward, but in slow-spreading diseases such as Hepatitis C and HIV, where instances of transmission are spread over months or years, it is extremely difficult. The new approach, developed by a team from Oxford University, University of Athens and Imperial College, combines epidemiological surveillance and molecular data to describe in detail, for the first time, how Hepatitis C spreads in a population.

A report of the research appears in this week's PLOS Computational Biology.

'For the first time we show that super-spreading in Hepatitis C is led by intravenous drug users early in their infection,' said Dr Gkikas Magiorkinis of Oxford University's Department of Zoology, lead author of the study. 'Using this information we can hopefully soon make a solid

argument to support the scaling-up of early diagnosis and antiviral treatment in drug users. Helping these people and stopping the spread of Hepatitis C is our ultimate target.'

The World Health Organisation has identified Hepatitis C as a major public health problem: up to 180 million people worldwide live with the virus, most are unaware that they have been infected and remain undiagnosed for more than 10 years. 20% of those infected will develop cancer or liver scarring (cirrhosis) after 20 years of infection, at which point the only treatment is liver transplantation, which costs around £100,000 ($160,000) for each patient.

Unlike other forms of Hepatitis there is currently no vaccine available for Hepatitis C, although there are effective treatments. The virus mainly transmits through contaminated blood and before 1990 the major transmission route was blood transfusions and blood products. Since screening for blood transfusions was introduced, after the discovery of the virus in 1989, the only significant transmission route for Hepatitis C is now intravenous drug use – users are at risk through the sharing and re-use of syringes.

'Working out how many people are likely to be infected by each 'super-spreader' of Hepatitis C, as well as how soon they will be infected, has been a puzzle for over 20 years,' said Dr Magiorkinis. 'Our research has resolved this issue and paves the way for a modelling study to show what kind of public health interventions could really make a difference. Our approach should also be very useful to those studying HIV.'

The research draws on data from four Hepatitis C epidemics in Greece, using information on 943 patients in treatment studies between 1995 and 2000, and around 100 genetic sequences representative of the epidemic taken from frozen plasma samples collected between 1996 and 2006. The team then used a mathematical model to estimate the variance of

secondary infection and how long it takes for such infection to occur.

More information: A report of the research, entitled 'Integrating Phylodynamics and Epidemiology to Estimate Transmission Diversity in Viral Epidemics', by Magiorkinis G, Sypsa V, Magiorkinis E, Paraskevis D, Katsoulidou A, et al. is to be published in *PLOS Computational Biology* on January 31, 2013.

Provided by Oxford University