Scientists bring new insights into the heritability of HIV infection severity

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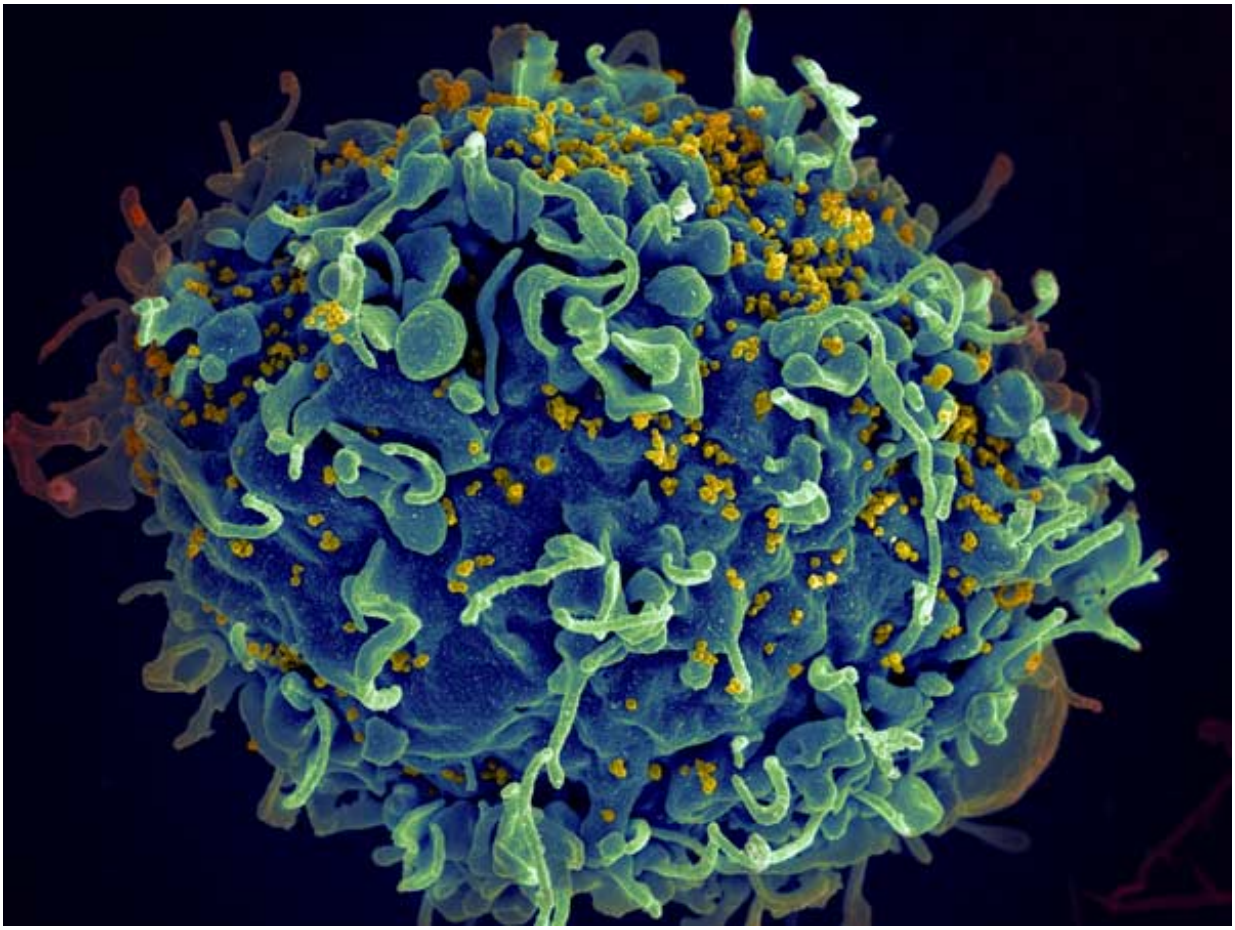

HIV infecting a human cell. Credit: NIH

HIV's pernicious persistence in human populations—despite more than

25 years of heroic HIV research efforts —owes in part to its particular abilities to exploit its human hosts, constantly adapting and mutating to enhance its infectiousness and virulence.

Using a population of HIV-1 infected individuals (the 2014 Swiss HIV Cohort Study data), an international research team of 17 institutions, led by ETH Zurich's Roland Regoes of the Institute of Integrative Biology, has now examined all aspects of HIV virulence, with a particular focus on how it ravages the human immune system.

The study investigated the heritability of three different aspects of HIV virulence: set point viral load (SPVL; which measures the virus' ability to exploit the host by measuring the amount of HIV circulating in the blood), CD4+ T cell decline (which measures the damage caused by the virus), and CD4+ T cell decline relative to set point viral load (which measures the damage for a given level of exploitation, also called 'per pathogen pathogenicity' or PPP). Per-pathogen pathogenicity captures how virulent a viral strain is irrespective of its load in the infected individual.

They investigated if HIV virulence, measured by the rate of decline in CD4+ T cells, and PPP are heritable from donor to recipient and therefore not solely dependent on the environment of the virus population (i.e. the human host).

Using the Swiss Cohort donor-recipient pairs, and phylogenetic methods, they suggest that HIV virulence and its effect on the human immune system is heritable.

They found that the heritability of the decline of CD4+ T cells and per-pathogen pathogenicity is 17 percent.

"Our analysis shows that the viral genotype affects virulence mainly by

modulating the per-parasite pathogenicity, while the indirect effect via the set-point viral load is minor," said lead author Roland Regoes.

With the results, Regoes, study first author Frederic Bertels et al. have brought important new insights into the role of HIV genotype in infection severity.

With a new understanding of the different facets of HIV virulence, the study will stimulate further research on HIV and other pathogens.

More information: Dissecting HIV Virulence: Heritability of Setpoint Viral Load, CD4+ T Cell Decline and Per-Parasite Pathogenicity *Molecular Biology And Evolution* (2017). DOI: 10.1093/molbev/msx246

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