

Can evolution explain why the young are often more susceptible than adults to infection?

June 19 2018



Credit: CC0 Public Domain

In many species, including humans, the young are often more susceptible to infection than adults, even after accounting for prior exposure to

infection. From an evolutionary perspective this may seem puzzling, as dying young or becoming infertile due to infection means organisms will be unable to reproduce. However, new research from the University of Bath suggests that many species may have evolved to prioritise growth over immunity while maturing.

Understanding precisely how immunity varies with age in different species is complex. Humans, like other vertebrates, possess both innate and adaptive immune responses, but the adaptive component is only effective against infections following exposure. Since younger individuals are less likely to have prior exposure to many infections, they are expected to be more susceptible. Yet even after accounting for prior exposure, there is growing evidence that children are inherently more susceptible than adults to certain infections. Similarly, many animal and plant species which lack adaptive immune systems have also been found to be more susceptible during juvenile stages, suggesting this phenomenon is widespread in nature.

In a new study published in *Proceedings of the Royal Society B*, scientists from University of Bath and the University of Virginia use theoretical models to predict how and when juveniles evolve to be more susceptible than adults to infection. Crucially, the researchers study what happens if juveniles have to choose between using their limited resources for growth or to prevent infection.

Dr. Ben Ashby, lead author on the paper and a research fellow funded by the Natural Environment Research Council (NERC) in Bath's Department of Mathematical Sciences, explains: "By temporarily diverting resources away from immunity during development, organisms are at greater risk of [infection](#) while young but can grow faster or larger, giving them an advantage during adulthood."

The models show that the extent to which juveniles evolve to be more

susceptible than adults depends on both the life cycle of the [host](#) and the characteristics of the disease.

On the use of mathematical models, Dr. Ashby said: "Studying simple mathematical models allows us to make general predictions about how juvenile [susceptibility](#) is likely to evolve in nature, telling us how factors such as lifespan and the length of the juvenile period affect the trade-off organisms may face between growth and immunity."

Indeed, the models predict that juvenile susceptibility should generally be lowest when organisms have lifespans that are neither too short, nor too long. If the lifespan of the host is too short, then it is difficult for the disease to spread and so hosts can risk being more susceptible during development. If hosts have long lifespans with relatively short juvenile stages, then the risk of increased susceptibility while developing is only incurred for a brief time and so juvenile susceptibility is again favoured.

In future, the team hopes to test their predictions by studying seedling resistance in plants. Dr. Ashby added: "Many important crops have been artificially selected for seedling resistance, so we know that it is physiologically possible but often doesn't evolve in nature. It seems likely that this is because plants, like other hosts, have to balance resources during development between growth and immunity."

The study "The evolution of juvenile susceptibility to infectious disease" is published online in journal *Proceedings of the Royal Society B*.

More information: The evolution of juvenile susceptibility to infectious disease, *Proceedings of the Royal Society B*, rspb.royalsocietypublishing.org/doi/10.1098/rspb.2018.0844

Provided by University of Bath

Citation: Can evolution explain why the young are often more susceptible than adults to infection? (2018, June 19) retrieved 18 April 2024 from <https://phys.org/news/2018-06-evolution-young-susceptible-adults-infection.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.