Understanding Human Immunity from Studying Fish

Daniel Bolnick
Early Career Scientist, Evolutionary Biology, GeneticsProfessor, Integrative Biology

CURRENT RESEARCH

Harnessing a complete map of genetic variations in immunity to fight against parasites and diseases

Research in epidemiology has iconically relied on the white lab mouse as a means to explore the immune system of a species believed to accurately reflect that of human beings; however, mice are proving to be an insufficient model on their own. Experimentation with mice has overlooked some important features of immune function, such as the fact that B cells can ingest pathogens directly, which was instead discovered in recent studies of fish immunity. Dr. Daniel Bolnick, of The University of Texas at Austin, leads investigations in fish because of prominent similarities both in genes shared between fish and humans and the similar parasites and viruses that we face. His group reaches beyond the conventional "break it and see what happens" technique commonly employed by immunologists who search for natural mutations (or induce mutations) to see how genetic changes undermine immune function. Instead, Dr. Bolnick takes advantage of evolutionary history to find genes with different beneficial functions. Fish from different habitats have evolved unique immunological solutions to their particular native parasites. By surveying different habitats, he can find immune genes used in beneficial adaptations to diverse parasite conditions. This approach should identify immune genes that, when changed, provide new beneficial functions, in contrast to the traditional search for genes that can break immune functions. The genes that natural selection favors to evade parasites may be more useful in designing anti-parasite therapies, and may provide a more accurate picture of the human immune system and its challenges.

As the only investigator to be awarded both the Dobzhansky Prize in evolution and the Mercer Award in ecology,...

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AFFILIATION

Howard Hughes Medical Institute

EDUCATION

- Postdoctoral Fellow in Ecology and Evolution, 2004
University of California, Davis
- Ph.D. in Population Biology, Ecology and Evolution, 2003
University of California, Davis
- B.A. in Biology and Environmental Studies, 1996
Williams College

AWARDS

- David Starr Jordan Prize for Innovative Contributions to the Study of Evolution, Ecology, Population or Organismal Biology, 2014
- College of Biological Sciences Young Alumni Award, 2011
- Secretary, 2010-2012
- Stand Up for Science Award, 2009
- Early Career Scientist, 2009-2015

RESEARCH AREAS

Life Science, Infectious, Evolution, Immunology / Inflammatory

FUNDING REQUEST

Your contributions will help fund the $600K/year for Dr. Bolnick's investigations both in the lab, through state-of-the-art gene sequencing, and out in the wild of Pacific Northwestern lakes, where his group must travel and spend three months out of the year observing their target species in their natural setting. By choosing to donate, you will be supporting the research necessary to develop protective treatments against parasites that attack a large portion of the undeveloped world.