

A novel framework to account for ecological drivers in the control and elimination of environmentally transmitted disease: a modelling study

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Author:

De Leo, G. A., Sokolow, S. H., Garchitorena, A., Ngonghala, C. N., Lund, A., Barry, M., et al.

Abstract

Background

Popular fears about human infectious disease often focus on pathogens spread by person-to-person contact. By contrast, we show that 70–80% of human pathogens are environmentally transmitted (ie, people are infected through contact with free-living stages or environmental reservoirs including soil, water, vectors, food, or non-human hosts in the environment). In fact, environmentally transmitted diseases represent about 40% of today's global burden of human infectious disease (or 150 million disability adjusted life-years). Here, we call for renewed attention to the connection between human health and environmental factors, with a focus on identifying ecological solutions to interrupt transmission.

Methods

We developed a simple modelling framework that is able to capture the two main transmission pathways—namely, direct (host-to-host transmission, such in the case of influenza and measles) and transmission through an environmental reservoir (such, in the case of cholera, vector borne diseases, helminthiasis and saponosis). We used the epidemiological model to analyse the role of ecological drivers for environmentally transmitted parasites and pathogens and to investigate the effectiveness of drug treatment for both directly and environmentally transmitted diseases.

Findings

Through the analysis of system dynamics, we show that periodic drug treatments that lead to the elimination of directly transmitted diseases might fail to do so in the case of human pathogens with an environmental reservoir. For environmentally transmitted diseases, more effective control can be achieved when classic treatment strategies are complemented with interventions that act on the environmental reservoir of the pathogen or reduce exposure.

Interpretation

Control of environmentally transmitted diseases can be more effective when human treatment is complemented with interventions targeting the environmental reservoir of the pathogen. Wherever environmental approaches to reduce human disease and preserve ecosystems are available, health

practitioners, environmental scientists, and communities can work synergistically to solve health problems.

Read the article in [The Lancet](#). [1]

Associated Project:

[Land Use Change & Infectious Diseases](#) [2]

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