Long-Term Dynamics of the Kidney Disease Epidemic Among HIV-Infected Individuals

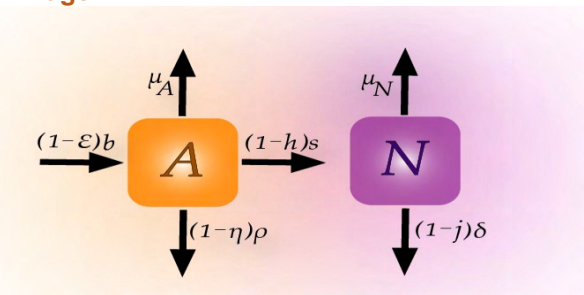
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Abstract

One of many risks facing HIV+ individuals is the development of kidney dysfunction and end stage kidney disease (ESKD). A differential equation-based mathematical model was developed to assess the impact of antiretroviral therapy on the progression to kidney disease and on reducing mortality due to kidney failure. Analytical and numerical predictions of long-term HIV+ ESKD prevalence show that therapy can lead to either extremely low levels of disease prevalence or increased prevalence, depending on drug efficacy levels and mechanisms of action. Maintenance of HIV+ ESKD prevalence below one individual is possible with sufficient efficacy (e.g., 99%) against the progression from AIDS to HIV+ ESKD and against entry to the AIDS population, when the reduction in mortality in the AIDS and HIV+ ESKD populations is modest (e.g., 10%). However, the concomitant decrease in mortality in the AIDS and HIV+ ESKD populations due to therapy is predicted to sustain greater disease prevalence.

Keywords: continuous ODE model, epidemic modeling, HIV infection, kidney disease, antiretroviral therapy

Image



Photograph



Biography

Henry Ogu is a Systems Modeling and Analysis PhD student (Applied Mathematics option) at Virginia Commonwealth University, USA, He has two master's degrees in Pure Mathematics and Applied Mathematics respectively, from the United States. He is interested in mathematical modeling, dynamical systems, and mathematical biology. While pursuing his degrees, he has been collaborating with his professors and peers on problems relating to disease modeling, and one of the results of such collaborations is the paper: Long-term dynamics of the kidney disease epidemic among HIV-Infected individuals, which focuses on how treatment levels affect the development of End Stage Kidney (Renal) Disease among individuals with HIV.

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