Improving Parasite Transmission Parameters for a Mathematical Model of Swimmer's Itch Through Both Empirical and Analytical Techniques

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Swimmer's itch is a skin condition caused by avian parasitic worms that attempt to invade human skin within infested water bodies. Although the parasites fail to develop in people, infection does result in extreme itching and discomfort that can last for days to months. Because of this, there is growing interest in developing strategies that can help better predict outbreaks of swimmer's itch and, ultimately, reduce the number of human cases. One novel approach is to develop mathematical models that adequately capture the biology of the system; however, establishing relevant parameters can be difficult due to the complex nature of host-parasite interactions. We developed a seasonal model for swimmer's itch which initially contained a number of unresolved parameters (such as parasite transmission rates and death rates in infected birds). To rectify this issue, we employed field collections, literature searches, and mathematical techniques (specifically, genetic algorithm approaches) to better estimate biologically relevant parameters for the model. Through this process we have enhanced the predictive capacity of our swimmer's itch model which, in turn, could serve as an important tool for managing outbreaks of the disease throughout the Midwest.