Abstract

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Re-evaluating density-dependent fecundity in human *Schistosoma mansoni* infections using novel molecular techniques: implications for control and elimination

The stability of parasite populations may be regulated by density-dependent processes occurring at different stages of their life cycle. Understanding how such mechanisms affect the transmission dynamics of parasites is essential to inform control strategies, to predict resilience to interventions and to develop robust mathematical models. In diecious helminth infections, density-dependent fecundity describes the reduction in egg production by female worms in high worm burden within-host environments. For human schistosomiasis, unlike intestinal worms, investigating density-dependent fecundity is hampered by the inaccessibility of adult worms within hosts, due to the intravascular location of the parasite. Hence, whether density-dependent processes regulate the fecundity of schistosomes is contested, with the total evidence base to date generated from a single human autopsy study providing data on *Schistosoma mansoni* worm burdens and associated faecal egg counts. Furthermore, analyses of these data by various authors have reached contradictory conclusions. We used a novel multiplexed microsatellite-derived dataset, in which adult worm burdens of *S. mansoni* were estimated indirectly from genetic data, via parentage analysis, of *S. mansoni* miracidia obtained from children undergoing long term preventive anti-schistosome chemotherapy in Tanzania. Using associated parasitological data on eggs excreted per gram of faeces, we re-examined the longstanding and controversial issue of density-dependence in *S. mansoni*. We used Bayesian statistical techniques to highlight uncertainties in the density-dependent relationship, while showing that indirect genetically-based techniques can be useful for estimating adult worm burdens. We discuss the implications of our results in the context of developing *S. mansoni* transmission models, and the feasibility of schistosomiasis control and elimination.