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Lihong Zhao* (lihong@uidaho.edu). *Population Dynamic Model of Microbial Interactions and Traits Associated with Microbiome*. Preliminary report.

Microbes are everywhere; they form complex communities which are essential in maintaining the balance of ecosystems and hosts' health. The generalized Lotka-Volterra (gLV) model has been applied to microbiome data to infer interactions between microbes within the community and gain insight into the stability of microbial communities. However, this model has a few limitations: it ignores the interaction mechanism and assumes that microbial community dynamics are driven by pair-wise interactions only. We propose a resource-mediated model, as we know that in many microbial communities, interactions between microbes are typically indirect and mediated by molecules in the environment (e.g., resources, toxins), rather than direct as assumed in the gLV model. In the model, we allow species to transition between various metabolic states. To gain insight into dynamics, we have rewritten the model in terms of the proportion of microbial abundance that is a given species. Rewriting the equations in this way uncovers relationships governing the evolutionary dynamics of the system explicitly in terms of the fitness of each species relative to the mean fitness of the entire population, and offers a way to model trait dynamics that emerge from the microbial interactions. (Received September 16, 2019)