Do microbes play by the rules?

There is compelling evidence of interspecific variation in competitive abilities, in many different guilds of organisms. Why do some species persist as poor competitors? Ecologists working with plants and animals have converged on explanations that emphasize tradeoffs between competitive ability and dispersal capacity (e.g., “r-K selection”, Grime’s model of “3 primary strategies”, and Reynolds’ modification of Grime’s model for phytoplankton). This tradeoff is widely viewed as an ecological “rule” that contributes to the structure of communities. Does this rule apply also to microbes? What are the consequences for structure and function of microbial communities depending on whether or not microbes play by the same rules?

Please organize your response as follows.

1. Briefly summarize the chief theories that have been proposed for plants and animals to explain the persistence of interspecific variation in competitive abilities. (Here, and throughout your responses, focus on interspecific variation within guilds of interacting species, not, for example, on oaks vs. lichens or moose vs. leafhoppers). Reference the seminal papers, elucidate the logic and theoretical mechanisms, and describe results from two of the most rigorous tests involving (1) plants, and (2) animals. (~2-3 double-spaced pages)

2. Based on your review of the literature, how would you characterize the importance of competitive abilities in structuring guilds of (1) plants and (2) animals? Choose one of the following: weak importance, moderate importance, or high importance. Defend your answer. Be sure to clearly indicate what is meant by “structure”. (~ 2 double-spaced pages)

3. Compare the case of microbes to your responses in 1 and 2. Answer in three parts.

a. For what types of resources do microbes compete? Provide a bulleted list of the major guilds of microbes and the resources for which they may compete with one another. (~1/2 single-spaced page)
b. Is there meaningful interspecific variation in the competitive abilities of microbes that regularly compete for the same resources? (~1 double-spaced page)
c. Answer TWO of the following THREE questions, each of which should be answered in ~2 double-spaced pages:
   • Do there tend to be genetic correlations between the competitive ability of microbes and other physiological or demographic attributes (e.g., dispersal ability, virulence in pathogens, etc.). Evaluate this possibility based upon both data and theory.
   • What are the best current theories regarding the role of competition in microbial communities? Compare and/or contrast with your response to #1 regarding plant and animal communities.
   • What are consequences for the structure and function of microbial communities depending upon whether or not microbes “play by the same rules” as plants and animals?