**Abstract**

**Background:** Evolutionary tradeoffs between life-history strategies are important in animal evolution. Because microbes can influence multiple aspects of host physiology, including growth rate and susceptibility to disease or stress, changes in animal-microbial symbioses have the potential to mediate life-history tradeoffs. Scleractinian corals provide a biodiverse, data-rich, and ecologically-relevant host system to explore this idea.

**Results*:***Using a comparative approach, we tested if coral microbiomes correlate with disease susceptibility across 425 million years of coral evolution by conducting a cross-species coral microbiome survey (the “Global Coral Microbiome Project”) and combining the results with long-term global disease prevalence and coral trait data. Interpreting these data in their phylogenetic context, we show that microbial dominance predicts disease susceptibility, and traced this dominance-disease association to a single putatively beneficial symbiont, *Endozoicomonas. Endozoicomonas* relative abundance in coral tissue explained 30% of variation in disease susceptibility and 60% of variation in microbiome dominance across 40 coral genera, while also correlating strongly with high growth rates.

**Conclusions:** These results demonstrate that the evolution of *Endozoicomonas* symbiosis in corals correlates with both disease prevalence and growth rate, and suggest a mediating role. Exploration of the mechanistic basis for these findings will be important for our understanding of how microbial symbioses influence animal life-history tradeoffs.