Pushed, poked, and prodded: Documenting changes in magnetotactic bacteria from wetland to pure culture

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While it has been the gold standard of microbiology for decades, the pure culturing of bacteria inevitably segregates organisms from their environments, isolates them from potential cooperators competitors and predators, subjects them to selective pressures, and excludes "unculturable" organisms altogether. Pure culturing approaches can change the organism or its behavior; distorting our perception of what is happening in the wild and ignoring the ecological and environmental aspects of the organism's existence.

In order to better understand how culturing can be disruptive to bacteria, we examine a consortium of magnetotactic bacteria (MTB) from the Wilma H. Schiermeier Olentangy River Wetland Research Park in Columbus, Ohio. MTB are an excellent organism with which to examine the repercussions of attempting to create pure cultures. Their magnetism makes them innately easy to separate from environmental samples and the metabolic demand of the magnetosome makes them susceptible to perturbation by even minor changes in their environment.

For these experiments we began with an environmental sample containing no fewer than four distinct species of MTB. We track the changes both in terms of diversity of the community and phenotypic response of the surviving organisms as attempts were made to establish a pure culture (Figure 1). We also tracked the chemical and minerological changes as pure culture were established. The overall goal is to better understand just how biased a pure culture is toward one specific phenotype of single species when compared to an environmental sample of MTB.

Figure 1: The wetland samples contain at least four distinct species of MTB and are dominated by the "wobbling" coccoid cells seen in Figure 1.A. When the pore water and sediment from the wetland is autoclaved and inoculated with enriched sample of the wetland MTB, the distribution of species changes dramatically. Small spirochete cells (Figure 1.B) dominate the autoclaved sample.