Cells and Their Motility

“Science flows through the veins”, quoted Dr. Randy Morgenstein, an Assistant Professor at Oklahoma State University. He was destined to be interested in microbiology, as his father was a doctor and learning math and science came naturally growing up. For numerous years, Morgenstein had a fascination for working within the laboratory; his passion for research blooming in his undergraduate years at UC Berkley, then to his Ph.D. at Emory University, continuing into his post-doctorate from Princeton. This drive continued, guiding him to his own laboratory to teach and continue exploration as a profession at Oklahoma State University.

Dr. Morgenstein has completed research with many facets over the years, including cell shape, motility, and protein differentiation. Hearing Morgenstein speak about his most recent research was fascinating, as he is the spear head and driving force of new and innovative experimentation within the microbiology laboratory.

“The two cell shapes, bacillus (or rod) and cocci (or circles), are the most commonly known, yet there are numerous cell shapes unknown to many persons” explains Morgenstein. In the research lab, his undergraduate assistants, subordinates, and himself, are examining how each characteristic and protein affect the cell and its shape; These individual features and their effect on cell shape are observed through differing isolation techniques.

In the laboratory, the researchers commonly work with MreB, a bacterial filament, which has been studied in the past. MreB works similarly to Actin, the protein that forms the contractile filaments of the muscle cells, and is one of the ways in which cell shape is achieved.

Dr. Morgenstein and his crew are reviewing the role that MreB plays in not only cell shape determination but it’s characteristics. “If you disrupt the MreB cytoskeleton chemotaxis is inhibited”, and the laboratory is aiming to “determine what role MreB is playing in chemotaxis” as well as to “separate the role of MreB in cell shape control from its role in chemotaxis”, Morgenstein clarifies. Simplified, chemotaxis is the movement of an organism in response to a chemical stimulus.

In addition, cell motility is studied. In Dr. Morgenstein’s undergraduate research, he studied swarming, which is only one example of a method of motility. Swarming includes multiple cells positioning themselves close together, so that each flagellum, the part that moves the cell, is connected to move the entire unit (Morgenstein 2018). The different forms of motility are studied in his current laboratory using the same isolation techniques for cell shape, yet focusing on which proteins promote different techniques of motility.

In the future, Morgenstein “plans to study isolation of components in the cell wall, specifically on if the roles of differing components in Pathogenic verse non-pathogenic microorganisms”. Through each of these experiments, Morgenstein excavates undiscovered knowledge regarding cells as well as microbiology overall.

References

Morgenstein, R., Rather, Phil N., Kalman, Daniel, Moran, Charles, Shafer, William, & Weiss, David. (2011). *Proteus Mirabilis Swarming O-antigen, Surface Sensing, and the Rcs System,*ProQuest Dissertations and Theses.