**Bacteria that Convert Ammonia Discovered in Fish Gills:**

Introduction: Microbiologists at Radboud University have recently made an exciting discovery that could contain implications for many fields of science. They discovered bacteria residing in the gills of fish that can convert ammonia waste from the fish into nitrogen gas that is innocuous. An ammonium balance within the environment is crucial to the survival of many species and habitats, so this discovery is important in more ways than one.

Background: Ammonia is produced by fish as a metabolic waste product from protein. In high concentrations, ammonia is toxic to aquatic life, and it can contribute to eutrophication and algal blooms. All animals excrete ammonia in some form. Humans excrete it through urea in our urine, and fish excrete it through their gills. Microbiologists and fish researchers at Radboud University were particularly curious as to how the ammonium balance was maintained in the aquatic environment. Not surprisingly, the first thought was bacteria that convert the ammonia were present and somehow influential. The real question was where these bacteria resided and how they were capable of performing such a feat. In order to answer these questions, microbiologists and fish researchers teamed up to study certain fish species and their commensal bacteria.

Discovery: Utilizing the knowledge that fish excrete ammonia through their gills, the choice to first begin looking for ammonia eating bacteria in the gills was obvious. Researchers observed the gills of zebrafish and carp and found them to be filled with microorganisms. To identify these organisms, DNA fingerprinting, isotope measurements, and other techniques were performed. This portion of the research was said to be difficult because it was tricky to slice the cartilage in this area of the fish into thin enough sections. Eventually, the researchers removed the gills from the fish in order to further examine them. The bacteria on the gills remained alive and active, continuing to produce nitrogen gas. The researchers were also interested in how much ammonia the bacteria were actually converting. They measured the nitrogen levels and balance in fish tanks, accounting for biofilters and other added amenities. The study showed that in fish that were fed consistently, 18% of the feed ended up as ammonia, but in fish that were fed inconsistently, 31% of the feed ended up as ammonia. These results showed that the relationship between the bacteria in fish gills and the fish themselves was symbiotic and thrived on constancy--a finding that is useful to those in aquaculture.

Conclusion: The discovery that the bacteria in fish gills converts the ammonia produced by the fish themselves is one that is not often found. This suggests that the fish adopted the bacteria at some point in their evolution, and it has benefitted both species very well. The researchers suspect that most freshwater fish utilize this type of symbiosis, and they are now focusing on proving that. The discovery itself has implications for both microbiologists, environmental scientists, and aquatic biologists alike. This knowledge could lead to a better understanding of a healthy environment and balance between organisms. It could also lead to a discovery in pollution prevention and control.

Sources:

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