The Nakhoul Lab: Acid/Base Balance & Kidney Disease

Acid/Base balance, or the maintenance of an appropriate pH within the body, is important to every physiological process in human health. The kidney is one of two organs that is responsible for regulating pH, with the other being the lung. The kidney secretes extra acids and bases from the body through a complex series of filtration steps and ion exchange pathways. Imbalances in this process are both indicative of and contribute to a wide variety of human diseases, the two largest in terms of sheer numbers being cardiovascular disease and kidney disease.

The lab of **Nazih Nakhoul** studies how the transport of ammonium in the kidney, which is a major player in clearing excess acid from the body, takes place and is regulated, with an eye towards its importance in chronic kidney disease.

Ammonia, the Kidney and Human Health

Within the past year, it has begun to be appreciated by nephrologists that people who have blood pH that is slightly on the acidic side of normal with chronic kidney disease progress more quickly to end-stage renal disease.
It was recently discovered that these patients have lower than normal levels of ammonia in their urine. This points to a possible defect in ammonia transport as a cause of this mild, chronic acidosis in chronic kidney disease in predialysis patients. Studying ammonia transport and finding ways to correct this imbalance could lead to a major delay and overall decrease in patients with kidney disease that eventually need dialysis.

Further, monitoring urinary ammonia is now an obvious way to monitor the progression of chronic kidney disease, though it has yet to be embraced by clinicians. Dr. Nakhoul has been studying mechanisms of ammonia transport in the kidney through the Rh membrane proteins for well over a decade.

Nephrology

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Ammonia, the Kidney & Human Health (cont.)

The Nakhoul Lab utilizes a wide array of techniques to study mechanisms of ammonia transport and their effect on cellular physiology. On example is a murine model of acidosis, used to research the importance of ammonia transport, especially as it relates to the whole-body system.

These lines of nephrology research present a wealth of opportunities: enabling a deeper understanding the basic biology and importance of ammonia transport-mediated acidosis in the kidney, as well as the development and use of potential model systems to test corrective, preventative, or diagnostic measures. A final resource is the implementation of a patient study to examine levels of urinary ammonia in chronic kidney disease patients.

The lab's work fits into the broader focus and goals of the Tulane Nephology Department, which consists of a constellation of collaborative investigators, each researching different transport mechanisms in the kidney and their relevance to human disease – and sharing their insights to leverage their scientific outcomes to have maximum impact on human health.

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