Understanding the immune system at the nanoscale

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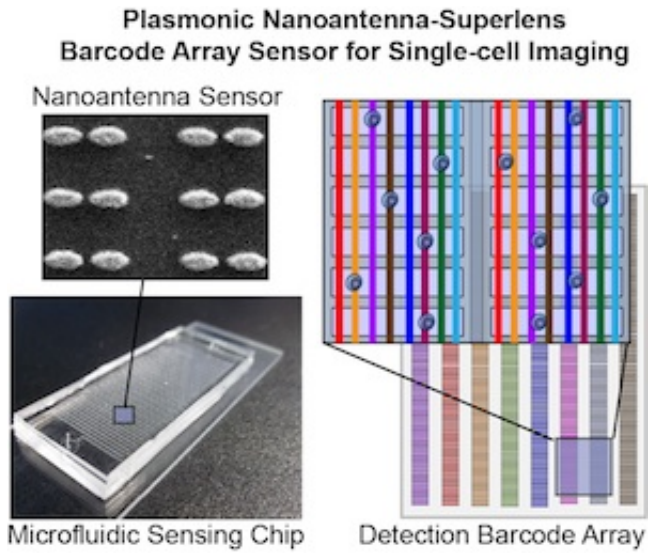

Credit: NYU School of Engineering

Gaining a better understanding of immune cells allows physicians to more effectively diagnose, monitor, and treat a wide range of diseases. Their complexity and sheer number make studying immune cells a difficult challenge, however.

Recently, researchers at the NYU Tandon School of Engineering, led by Assistant Professor of Mechanical and Aerospace Engineering Weiqiang Chen, were awarded a three-year grant from the National Science Foundation (NSF) to develop a new platform that combines an efficient

microfluidic immune cell isolation technique and an ultra-sensitive nanoscale biosensor that will provide biologists and clinicians with a new approach to analyzing the proteins secreted from individual human immune cells.

Collaborating with co-principal investigator Pengyu Chen of Auburn University, and Assistant Professor of Endocrinology Jose O. Aleman and Pathologist Matija Snuderl of NYU's School of Medicine, Chen has devised a dual system that first separates a single immune cell from a microliter of blood (easily obtained with a simple pinprick) and then performs a multi-subset, multiplex functional immune analysis—mapping its phenotype, identifying its exact variety, and tracking its function.

"Current techniques look at a large number of cells and average the results, which doesn't permit for a truly granular examination," Chen explains. "In addition to conducting our analysis on a single-cell level, we're getting results about the immune status of patients in near real-time—allowing clinicians to test the efficacy of their therapies quickly enough to modify them if needed."

Not only will single-cell analysis allow medical personnel to modify their treatment in a timely enough way to significantly improve patient prognosis in cases of immune system disorders like HIV, sepsis, malaria, and tuberculosis, it may enable the deployment of personally tailored immunotherapy for certain diseases, such as glioblastoma, an aggressive form of cancer.

"We hope to help open new doors in the field of immunotherapy by making treatment more agile, responsive, and personalized," Chen says, "and to one day improve the outcome for countless patients."

Provided by NYU School of Engineering