Ultrathin phosphorene flakes for low-cost veterinary care

Disposable electrodes capped with functionalized phosphorene offer quick, simple method to measure bovine disease markers

By Mitch Jacoby

Conservative gamblers may not want to bet the farm just yet, but two-dimensional phosphorus may soon be coming to bovine health care. Satish K. Tuteja and Suresh Neethirajan of the University of Guelph have shown that 2-D sheets of phosphorus, dubbed phosphorene, can be functionalized and used to quickly and inexpensively measure bovine haptoglobin levels (*Nanotechnology* 2018, DOI: 10.1088/1361-6528/aaab15). In beef and dairy cows, elevated levels of this protein are indicative of inflammation, infection, and other ailments associated with a common and costly pneumonia-like condition known as bovine respiratory disease. Currently, clinicians measure haptoglobin via time-consuming and costly immunoassay and spectroscopy methods. The Guelph researchers sought to capitalize on phosphorene’s high charge mobility and reactive surface to make fast-acting, sensitive detectors. They exfoliated phosphorus into nearly atomically thin sheets, treated them with poly-L-lysine, and deposited the functionalized flakes on disposable electrodes. Then they attached haptoglobin antibodies to the electrodes and used them to detect haptoglobin in bovine serum samples by monitoring electrochemical signals induced by antibody-antigen binding. Whereas commercial immunoassay tests, which the team used for benchmarking, can take six hours, the new method gives results in just minutes. The team is now developing a handheld device for on-farm use.
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