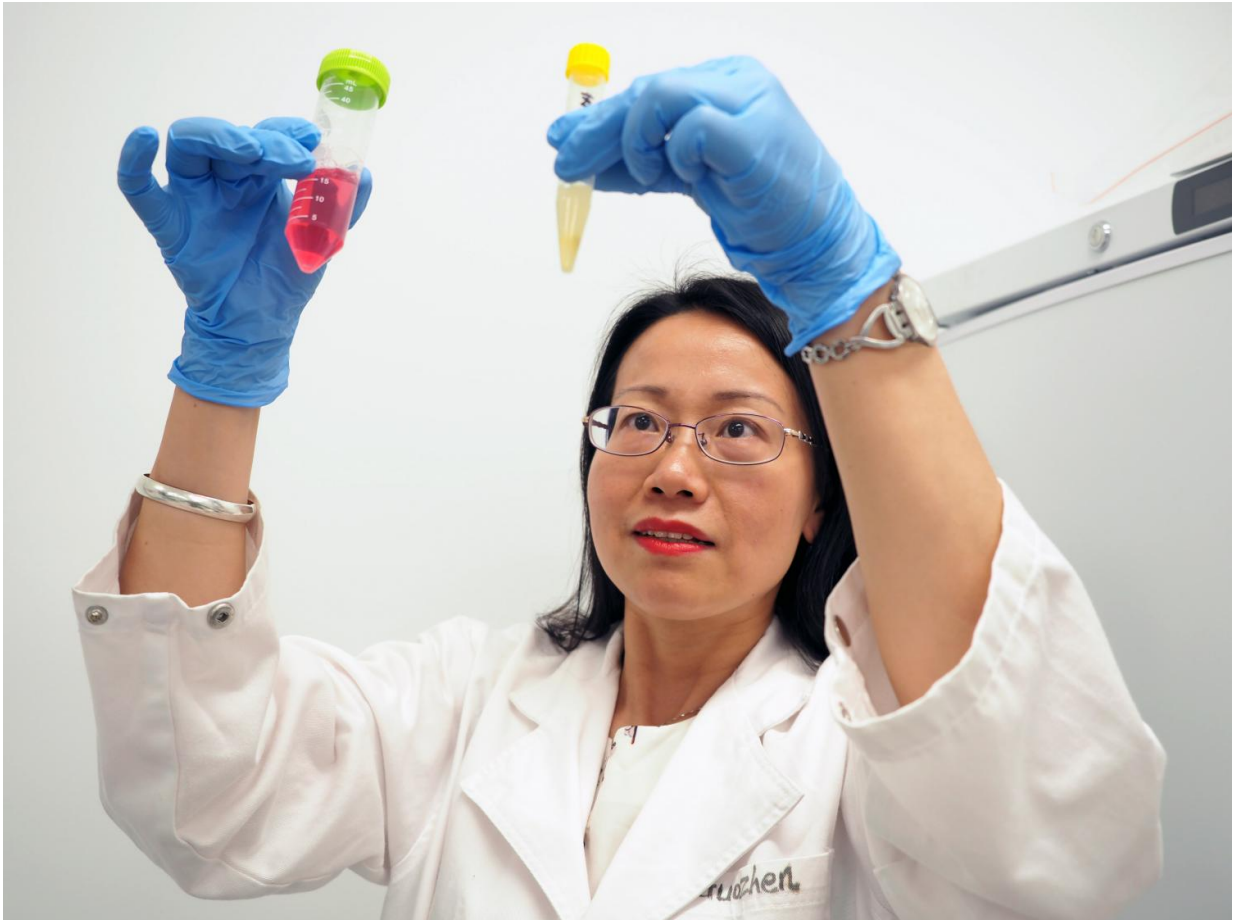


Nanoscale sensor to spot disease

March 28 2017



CNBP Researcher A/Prof Guozhen Liu. Credit: CNBP

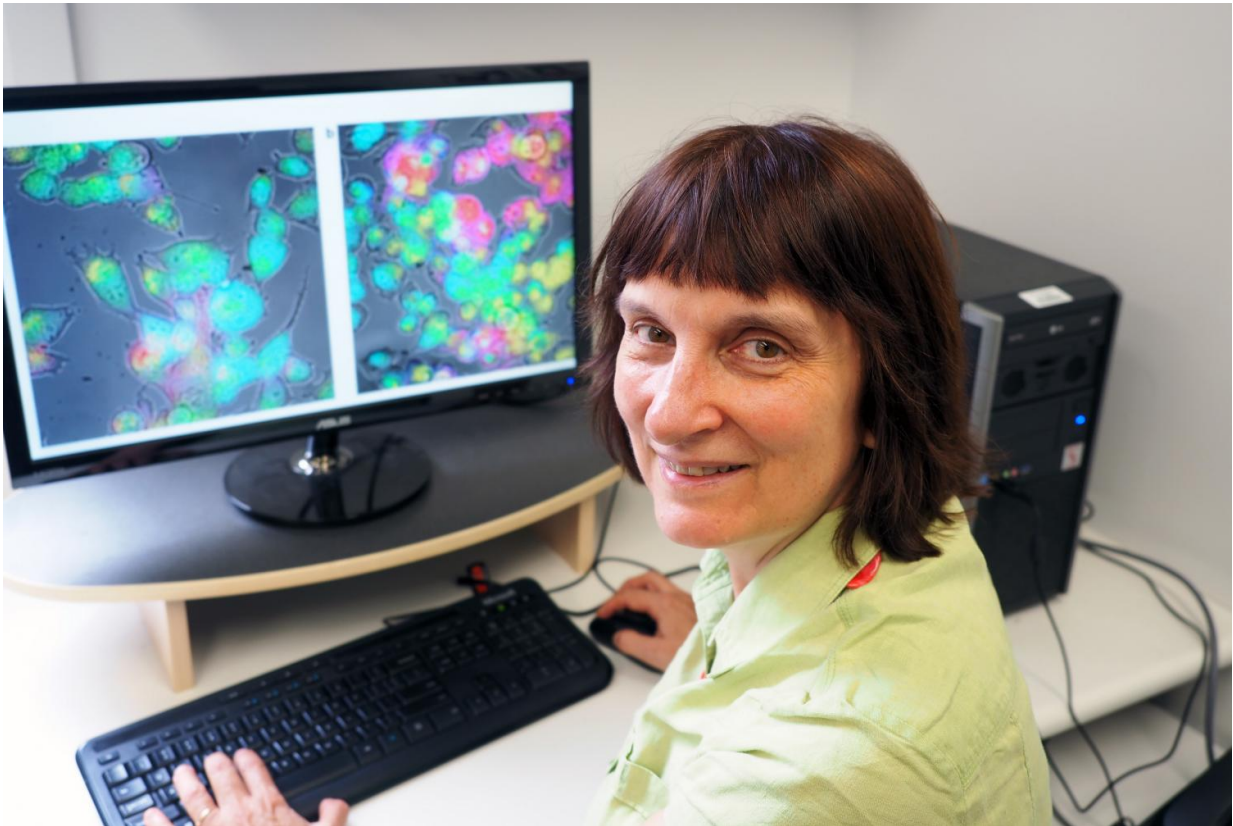
A new nanoscale sensor has been developed that can help detect cytokines—molecules that play a critical role in cellular response to infection, inflammation, trauma and disease.

Reported in the science journal *Nanoscale*, the sensor consists of a modified graphene quantum dot (or GQD) that has been designed by researchers at the ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP). It identifies ultra-small amounts of cytokines in and around [cells](#), potentially opening up an exciting new avenue of [biomedical research](#).

"Cytokines are molecules secreted by the cells of the immune system," explains lead CNBP project scientist Guozhen Liu, associate professor at Macquarie University.

"The release of certain cytokines by the body is frequently symptomatic of a disease or health-related issue, such as arthritis, inflammatory disorder or even cancer. Consequently, monitoring [cytokine](#) secretions at the cellular and sub-cellular level, has enormous value in our understanding of basic physiology and how the body is actually working."

Traditionally, cytokine molecules have been extremely hard to measure and quantify. "This is due to their small size and their dynamic and transient nature," says A/Prof Liu.



CNBP Deputy Director, Prof. Ewa Goldys. Credit: CNBP

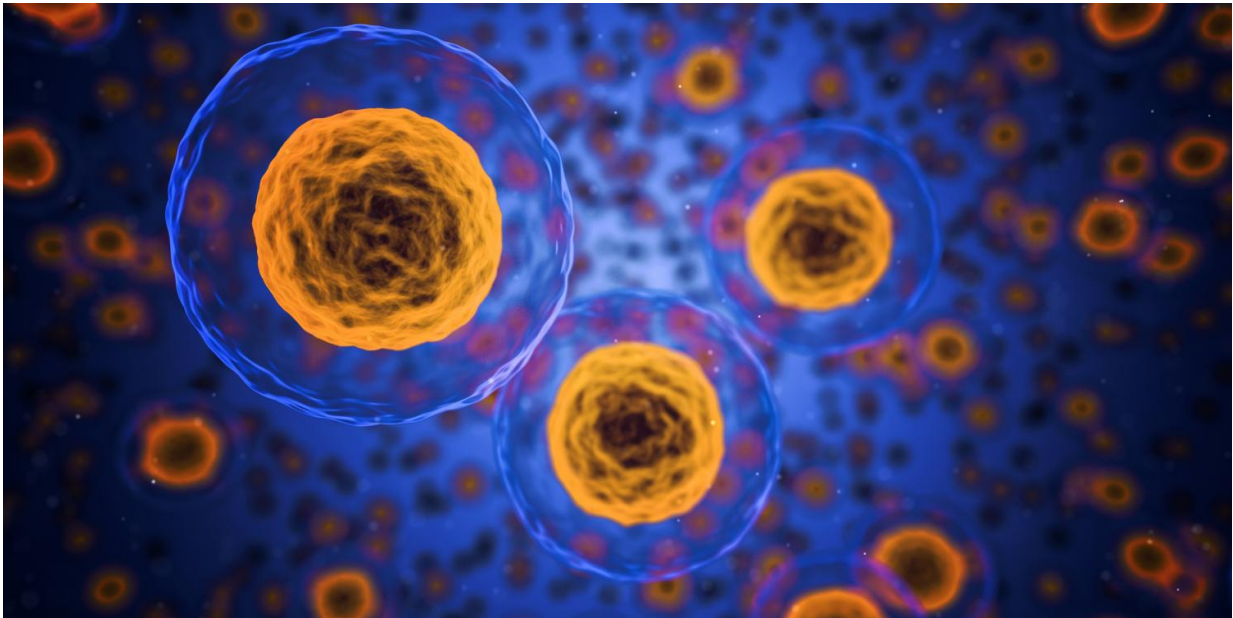
"What we've been able to do is to design and make a sensor that is so small that it can easily penetrate inside cells. Moreover, unlike other [sensors](#) it only responds when the cytokine is present. To this aim we have connected GQDs to cytokine sensing DNA molecules known as aptamers."

Professor Ewa Goldys, also on the project team, noted that the detection of cytokines in body fluids, cells, tissues and organisms was attracting considerable attention in the biomedical research field. "Being able to track cytokine levels in real time opens new ways to monitor body physiology. This will ultimately lead to new diagnostic tools and new

ways of treatment monitoring."

Goldys believes that the innovative GQD sensing technology developed by the CNBP has potential widespread applications, due to the universal nature of the sensor design.

"We see these graphene quantum dot sensors as being excellent candidates for many other biomedical applications such as DNA and protein analysis, intracellular tracking as well as for monitoring of other cell secreted products in the body."



The cellular environment. Credit: ARC Centre of Excellence for Nanoscale BioPhotonics

Although still some years away from clinical study Goldys and Liu are both excited by the research.

"Operating at the nanoscale, we're creating entirely new windows into the body and will gain valuable insights into the [body](#), health, wellbeing and disease," concludes Goldys.

More information: Graphene quantum dots based "switch-on" nanosensors for intracellular cytokine monitoring, Guozhen Liu, Kai Zhang, ke ma, Andrew Care, Mark Hutchinson and Ewa M. Goldys, *Nanoscale*, 2017, [DOI: 10.1039/C6NR09381G](https://doi.org/10.1039/C6NR09381G)

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