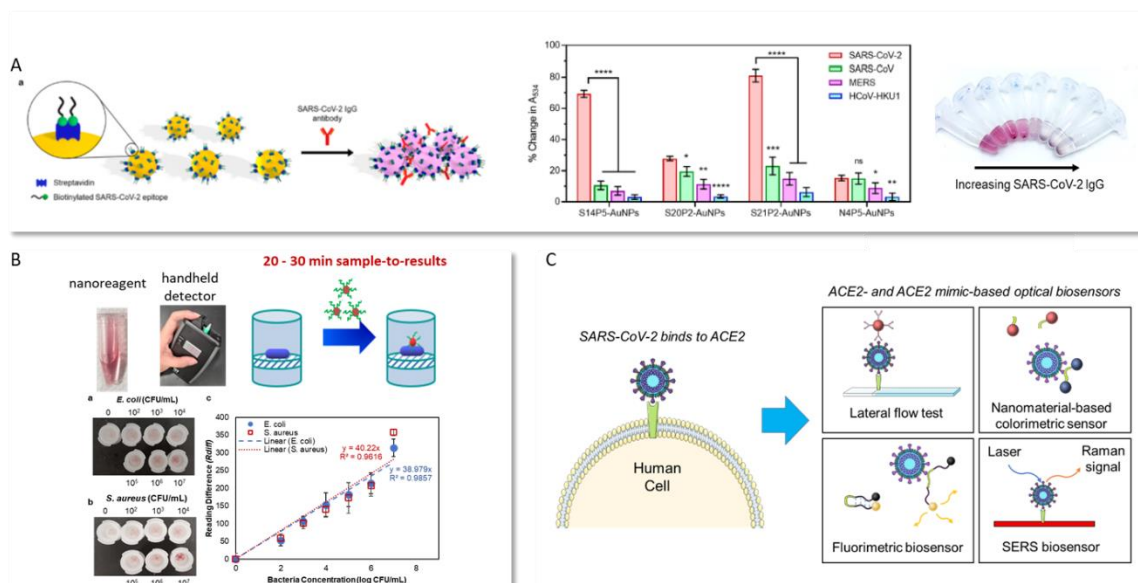


# Portable Nanosensors for Infectious Disease and Environmental Surveillance

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Nanomaterials have unique structural and physio-chemical properties for various applications. In this talk, I will present our research in using metal and metal-bearing nanoparticles for infectious disease diagnosis (Figure 1A),<sup>1</sup> antimicrobial treatment,<sup>2,3</sup> environmental bio-surveillance (Figure 1B).<sup>4</sup> By coupling novel affinity ligands, e.g. B cell epitopes,<sup>1</sup> sugar binding proteins,<sup>4</sup> and viral receptors<sup>5</sup> (Figure 1C), with metal nanoparticles' optical and catalytic properties, our nanosensors have superior selectivity, accuracy, and portability, relative to conventional laboratory-based technologies (e.g. HPLC, GC, bacteria culture, and ELISA etc). To enable the development and validation of airborne microbial sensors, we have fabricated an air chamber for aerosol and air sampling studies. All our nanosensors have been validated with real samples, including patient plasma, industrial water, and indoor/outdoor air samples.



**Figure 1.** (A) B-cell epitope coupled with gold nanoparticle (AuNP) for selective COVID19 antibody detection, (B) Rapid bacteria sensor using sugar binding protein-conjugated AuNPs in a “filter-and-stain” mode. (C) ACE2 receptor-based optical biosensors.

## References

- Lew, T. T. S., Aung, K. M. M., Ow, S. Y., S. N. Amrun, L. Sutarlie, L. F. P. Ng, X.D. Su, *ACS Nano* **2021**, *15* (7), 12286–12297.
- Zhong, Y. Y., Zheng, X. T., Zhao, S. Q., Su, X.D., Loh, X. J., *ACS Nano* **2022**, *16* (12), 19840–19872.
- Zhong, Y. Y., Zheng, X. T., Li, Q. L., Loh, X. J., Su, X.D., *Biosens. Bioelectron.* **2023**, *224* (15), 115033.
- Sutarlie, L., Chee, H. L., Ow, S. Y., Aabdin, Z., Tjiu, W. W., Su, X.D., *Nanoscale* **2023**, *15*, 16675 – 16686.
- Ow, S. Y., Lim, S. W. Y., Sutarlie, L., Tan, C.K. I., Su, X.D., *Trends in Anal. Chem.* **2024**, in press.