

Singapore National Academy of Science Young Scientist Awards 2019

Physical, information & Engineering Sciences category

Dr Shao Huilin

Assistant Professor, Department of Biomedical Engineering, NUS
Principal Investigator, Institute for Health Innovation & Technology (iHealthtech), NUS
Joint Investigator, Institute of Molecular and Cell Biology, A*STAR

“For her research in developing innovative diagnostic technologies”

Dr Shao’s research focuses on developing transformative technologies to empower non-invasive disease detection and treatment monitoring. In comparison to invasive tissue biopsies, circulating biomarkers² can be safely and repeatedly obtained from bodily fluids (e.g. blood). Despite the clinical potential of many novel circulating biomarkers, their clinical application remains challenging, due to a lack of compatible biosensors. Dr Shao’s research is motivated by these unmet biomedical needs and accomplished through a highly interdisciplinary approach. Her work spans the field of molecular biology, nanomaterials science, and device engineering.

Dr Shao has pioneered multiple platform technologies for non-invasive molecular diagnostics, including the world’s smallest nuclear magnetic resonance system for molecular detection, nanoplasmonic sensor for label-free analysis of cancer exosomes, and novel microfluidics for serial monitoring of tumour drug resistance. More recently, she has led the development of molecular switches for direct and visual detection of infectious diseases. These switches, made of hybrid enzyme-DNA nanostructures, are rapidly turned on by pathogen nucleic acids to produce a colour readout that can be detected by the naked eye.

She has also led the development of an amplified plasmonic detector that can accurately measure brain changes in Alzheimer’s disease, even at a very early stage, through a fast and cost-effective blood test. Her latest research on nanostructured DNA barcodes not only improves cancer detection accuracy, but also provides early indication of disease aggressiveness, making biopsies less invasive and more informative. These technologies have been successfully validated in clinical trials and have far-reaching impacts on basic and clinical studies. They will continue to expand the clinical reach of previously under-appreciated biomarkers, and introduce new opportunities for non-invasive disease detection and monitoring of personalised treatment.

² Biomarkers are cellular, biochemical or molecular alteration in cells, tissues or fluids that can be measured and evaluated to indicate normal biological processes, pathogenic processes, or pharmacological responses to a therapeutic intervention

Dr Shao's work has been published in internationally acclaimed journals such as Nature Biotechnology, Nature Medicine, Nature Biomedical Engineering, and Nature Communications. She has received multiple awards and fellowships, including the NUS Early Career Research Award, L'Oréal-UNESCO For Women in Science National Fellowship. She is also a National Science Scholar.