



Title: *Microfluidics: Revolutionizing Healthcare with Small-Scale Solutions*

Speaker: Iene Rutten, Biosensors group – Lammertyn lab, Department of Biosystems – KU Leuven

In modern healthcare, *in vitro* diagnostic tests play a crucial role in enabling early detection of diseases (e.g. cancer, infectious and chronic diseases, etc.), which is essential for effective patient management. However, these tests are often limited to specialized labs, leaving many without access due to financial or geographic constraints. To overcome this challenge, the Biosensors group has developed the self-powered microfluidic (i)SIMPLE technology, which offers a solution for complex manipulation of small liquid volumes without the need for expensive equipment. Designed for high-throughput manufacturing, this autonomous cost-effective microfluidic platform holds the potential to support the next generation of microsampling and point-of-care diagnostic applications.

Next to diagnostic tests, life science research tools play a crucial role in advancing healthcare as they provide foundational knowledge on diseases at the molecular and cellular level (e.g. through biomarker identification). In this context, the Biosensors group focuses on the development and optimization of diverse microfluidic tools, including droplet and continuous microfluidics, that enable single-cell manipulation and analysis. Among our key areas of focus are techniques for isolating rare cell populations from complex mixtures to perform downstream (omics) analysis, platforms for spatial (omics) analysis of cells and tissues, and platforms to study cellular responses to external stimuli (e.g. other cells or drugs). These cutting-edge platforms hold enormous potential for applications such as cancer research, monoclonal antibody discovery, drug screening and forensics. The integration of microfluidics in these areas not only enriches our understanding of cellular behavior but also paves the way for impactful applications in disease diagnostics and therapeutic development.