TCS/25/15 - Shifting the Clinical Standard: Multiplex Imaging for Cancer Diagnostics

Cancer is diagnosed by pathologists using microscopes to look at tissue biopsies, and special pathology tests are used to refine diagnosis and select treatments. These tests use antibodies as tools to detect and highlight proteins, helping pathologists and doctors to make accurate life-saving decisions. So far, these tests detect single proteins, and many tests are often required, sometimes meaning additional invasive biopsies, delaying life-saving treatments.

Combining multiple tests simultaneously, or ‘multiplexing’, can save precious time and tissue, and highlight cells expressing several genes. Until recently, this approach has been complex, expensive, and difficult to use in real-world clinics.

We will explore how multiplex testing can be brought into clinical use, using new technologies to detect both proteins and mRNAs, the genetic instructions used by cells to make proteins. Multiplex mRNA tests would open up testing of thousands of new genes where we currently have no good antibodies. Multiplex tests for protein and mRNA will make very data-rich images which new digital and artificial intelligence methods can use to make very precise clinical decisions.

Using archival tissue from Scottish cancer patients and our own expertise in cancer diagnostics and AI, we will design and assess several new multiplex tests which ask important diagnostic questions, detecting 20 proteins and up to 12 mRNAs at once.

We will show how multiplex testing for protein and/or mRNA can enable a faster, more precise diagnostic process. This innovation could set a new benchmark in cancer pathology, enabling more personalised and timely treatment for patients.