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Lab-on-chip system project to detect cancer cells takes off

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[Nanoelectronics research](#) specialist IMEC and its project partners have launched the European Seventh Framework [Project Miracle](#) at the Engineering in Medicine and Biology [Conference \(EMBC\)](#) in Buenos Aires, Argentina. The project aims to produce an operational lab-on-chip for the isolation and detection of circulating and disseminated tumour cells (CTCs and DTCs) in the blood. This new lab-on-chip will be an essential step towards a faster and cost-efficient diagnosis of cancer.

The detection of circulating and disseminated tumour cells in blood is a promising methodology to diagnose cancer dissemination or to follow up cancer patients on therapy. Currently, the detection analyses of these cells are only done in medical laboratories requiring labour intensive, costly and time-consuming sample processing and cell isolation procedures. A full tumour cell detection analysis may take more than a day to complete. In contrast, a lab-on-chip, with many processing steps integrated, would enable a faster, patient-friendly, cost-effective detection of tumour cells in blood. Thus, they are therefore labour-saving and minimally invasive, promoting patient's comfort and the efficiency of today's healthcare delivery.

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In this connection, a preceding joint project by some of the partners (MASCOT FP6-027652), individual microfluidic modules for cell isolation, cell counting, DNA amplification and detection have already been developed. Based on this expertise and further supported by additional partners, the development of a fully automated, lab-on-chip platform to isolate, count and genotype CTCs is envisioned within the framework of the Miracle project.

For genotyping, genetic material (such as mRNA) will be extracted from the cells and multiple cancer related markers will be amplified based on multiplex ligation dependent probe amplification (MLPA) followed by their detection using an array of electrochemical sensors. Full integration of all steps requires innovative research and processing steps which need a combination of the multi-disciplinary and unique expertise of the different project partners (ranging from microfluidics to interfacing, miniaturisation, and integration skills). The resultant lab-on-chip tumour detection system will be significantly advanced compared with current state-of-the-art systems, revolutionizing cancer diagnostics and individualized theranostics.

Within the framework of the Miracle project, IMEC (as project coordinator), works together with the Universitat Rovira I Virgili (Spain), the Institut für Mikrotechnik Mainz, AdnaGen, ThinXXs and Consultech (Germany), MRC Holland (The Netherlands), the Oslo University Hospital (Norway), the KTH Royal Institute of Technology, Multi-D and Fjurebio Diagnostics (Sweden), ECCO—the European CanCer Organisation and ICsense (Belgium) and Labman (UK). The project's aim is centred at the development of a fully automated and integrated microsystem providing the genotype (gene expression profile) of CTCs and DTCs primarily from clinical samples.

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