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Turning the glucose sensor into a versatile point-of-care platform for the detection of a wide range of biological analytes

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So far, the most successful class of biosensor currently available on the market, is the glucometer used to monitor blood glucose concentrations. Issues with performance in clinical samples, sensitivity and specificity have long been resolved, measuring devices have been miniaturized and production costs optimized. We aimed to develop a technology that makes use of this existing biosensor but adds versatility by increasing the type of analytes that can be analysed. We reported trehalase as a novel split enzyme reporter capable of converting various analytes into glucose. Conditional complementation of the trehalase fragments, resulting in trehalose hydrolysis and glucose production, was used to detect antibodies, bacterial cells, viral particles, small molecules, hormones, and cytokines. This was achieved by specific interactions between these analytes and the trehalase fragments through fusions with epitopes, protein antigens, peptide aptamers, single chain fragment variables and dimerizing proteins. By incorporating recombinant prion proteins, the biosensor was modified to detect spontaneous protein aggregation. In all cases, fast detection of the analytes was achieved with a conventional glucometer without the need for rinse steps or other sample preparation. In conclusion, the resulting trehalase-based biosensor platform offers a versatile and convenient method for point-of-care applications as it does not require any sample preparation or handling and can be integrated with existing glucometers or sensors.

Biography

Jeroen De Buck is an Associate Professor in Bacteriology at the University of Calgary. He has completed his BSc and MSc in Bio-Engineering from Ghent University and a PhD in Veterinary Medical Sciences. He has specialization in "The study of bacterial infections in humans and animals, with a focus on the evaluation and development of novel diagnostics". His current research work focuses on "Creating biosensors to detect pathogens, immune responses and disease biomarkers". He has published more than 60 papers in peer reviewed journals and been invited to be a speaker at numerous conferences.

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