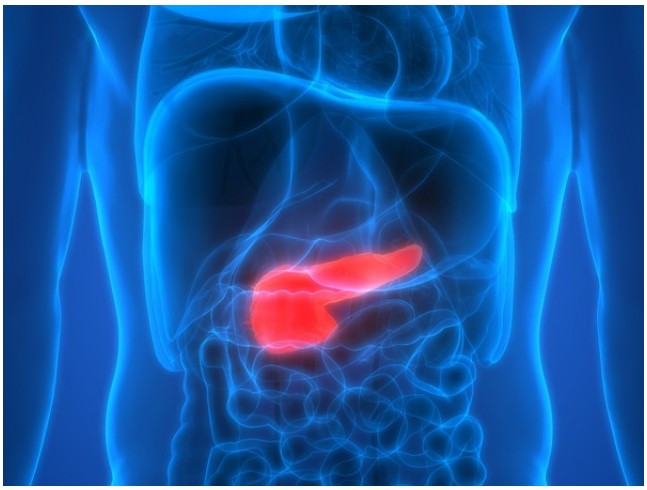
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

GeLite: Bioluminescent Reporters for Monitoring Transplant Rejection

TECHNOLOGY NUMBER: 2024-544



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Category
Medical Devices
Life Sciences

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OVERVIEW

Non-invasive optical monitoring system for tracking cell therapy engraftment and immune responses.

- **GeLite: G**lowing **E**ngineered **L**um**i**nescent Microgels for **T**ransplant **E**valuation
- Enables real-time, multiplexed, non-invasive monitoring—reducing risk, invasiveness, and cost
- Real world applications: transplant monitoring, early immune rejection detection, real-time therapy adjustment, improved patient outcomes

BACKGROUND

Cell therapies have revolutionized the management of chronic diseases, such as diabetes, by restoring critical cell functions like insulin production. In clinical practice, consistently monitoring the fate of transplanted cells and their interactions with the host immune system is vital for long-term therapeutic success. Traditionally, tracking cell engraftment and immune responses has relied on invasive biopsies, imaging techniques with limited sensitivity, or expensive and endpoint-only assays. These current approaches not only risk disrupting the graft and destabilizing cell function but also add significant procedural burdens and may delay vital clinical decisions. Furthermore, they fail to offer timely, continuous insights needed to manage early signs of immune rejection or graft failure. Thus, there is a pressing demand for non-invasive, sensitive, and longitudinal tools that enable clinicians to monitor cell therapies in real

time, facilitating early intervention while improving patient safety and treatment efficacy.

INNOVATION

This invention introduces an advanced biomaterials engineering platform that integrates protein sensor probes immobilized on the surface of a synthetic network for multiplexed, non-invasive monitoring of immune signals and cellular activity. By anchoring optically active probes directly at the biomaterial interface, the system enables robust and reusable detection of immune communication pathways and graft-specific responses through distinct optical outputs. Unlike approaches limited to in vivo applications, this surface-immobilized probe system can also be deployed as a point-of-care diagnostic in vitro, providing accessible immune readouts in rural settings or physician offices without specialized equipment.

The immobilization strategy preserves probe activity while preventing leaching, enabling repeated use and long-term stability. This design supports early detection of adverse immune reactions or engraftment issues while reducing costs and logistical challenges. By delivering a ready-to-use, surface-immobilized, multiplexed diagnostic technology, this invention expands real-time immune monitoring to both advanced therapies and accessible clinical settings.