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SYMPOSIUM

Metabolic Biofouling of Glucose Sensors *in Vivo*: Role of Tissue Microhemorrhages

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Abstract

Objective:

Based on our *in vitro* study that demonstrated the adverse effects of blood clots on glucose sensor function, we hypothesized that *in vivo* local tissue hemorrhages, induced as a consequence of sensor implantation or sensor movement post-implantation, are responsible for unreliable readings or an unexplained loss of functionality shortly after implantation.

Research Design and Methods:

To investigate this issue, we utilized real-time continuous monitoring of blood glucose levels in a mouse model. Direct injection of blood at the tissue site of sensor implantation was utilized to mimic sensor-induced local tissue hemorrhages.

Results:

It was found that blood injections, proximal to the sensor, consistently caused lowered sensor glucose readings, designated temporary signal reduction, *in vivo* in our mouse model, while injections of plasma or saline did not have this effect.

Conclusion:

These results support our hypothesis that tissue hemorrhage and resulting blood clots near the sensor can result in lowered local blood glucose concentrations due to metabolism of glucose by the clot. The lowered local blood glucose concentration led to low glucose readings from the still functioning sensor that did not reflect the systemic glucose level.

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Abbreviations: (AAH) acute artificial hemorrhage, (CGM) continuous glucose monitoring, (DAH) delayed artificial hemorrhage, (DPI) days post-implantation, (GSF) glucose sensor function, (HWB) heparinized whole blood, (RBC) red blood cell, (TSR) temporary signal reduction, (WB) whole blood

Keywords: artificial hemorrhages, blood clots, continuous glucose monitoring, implantable glucose sensor, metabolic biofouling, mouse, sensor function *in vivo*, temporary signal reduction, tissue hemorrhages

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