

## Inflammation and Glucose Sensors: Use of Dexamethasone to Extend Glucose Sensor Function and Life Span *in Vivo*

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### Abstract

#### **Background:**

It has been generally accepted that the acute loss of sensor function is the consequence of sensor biofouling as a result of inflammation induced at sites of sensor implantation, as well as tissue trauma induced by the sensor and its implantation. Because anti-inflammatory therapies are used routinely to control inflammation in a wide variety of diseases, we hypothesized that anti-inflammatory therapy would likely extend glucose sensor function *in vivo*. To test this hypothesis, we utilized our recently developed mouse model of implantable glucose sensors and the potent anti-inflammatory steroid dexamethasone (DEX).

#### **Method:**

For this study, glucose sensors were implanted subcutaneously into the head and neck area of mice and sensor function was determined up to 14 days postimplantation. These mice received a daily intraperitoneal injection of DEX at a dose of 1, 6, or 10 mg/kg body weight.

#### **Results:**

Mice not treated with DEX lost sensor functionality very rapidly, usually within the first 24 hours postimplantation. Mice treated with DEX at the various doses had an increased sensor life span of up to 2 weeks postimplantation. Additionally, sensitivity was maintained in DEX-treated mice as compared to control mice (non-DEX treated). Histologic evaluation of tissue surrounding the site of sensor implantation had almost no inflammatory cells in DEX-treated mice, whereas control mice had an intense band of inflammation surrounding the site of sensor implantation.

#### **Conclusion:**

To our knowledge this is the first study directly demonstrating that anti-inflammatory therapy can extend glucose sensor function *in vivo* and supports the key role of inflammation in loss of sensor function *in vivo*, as well as the uses of anti-inflammatory therapy as a potential key adjuvant in enhancing glucose sensor function and life span *in vivo*.

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**Abbreviations:** (BW) body weight, (DEX) dexamethasone, (DPI) days postimplantation, (H&E) hematoxylin and eosin, (HPI) hours postimplantation, (IP) intraperitoneal, (PBS) phosphate-buffered solution, (SEM) standard error of the mean, (TRT) tissue response triad

**Keywords:** anti-inflammatory therapy, dexamethasone, diabetes, fibrosis, implantable glucose sensor, inflammation, murine (mouse), sensor function *in vivo*, tissue responses, vessel regression

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