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REVIEW ARTICLE

# Common Causes of Glucose Oxidase Instability in *In Vivo* Biosensing: A Brief Review

James M. Harris, Ph.D.,[1] Catherine Reyes, Ph.D.,[2] and Gabriel P. Lopez, Ph.D.[1]

## Abstract

Clinical management of diabetes must overcome the challenge of *in vivo* glucose sensors exhibiting lifetimes of only a few days. Limited sensor life originates from compromised enzyme stability of the sensing enzyme. Sensing enzymes degrade in the presence of low molecular weight materials (LMWM) and hydrogen peroxide *in vivo*. Sensing enzymes could be made to withstand these degradative effects by (1) stabilizing the microenvironment surrounding the sensing enzyme or (2) improving the structural stability of the sensing enzyme genetically. We review the degradative effect of LMWM and hydrogen peroxide on the sensing enzyme glucose oxidase (GOx). In addition, we examine advances in stabilizing GOx against degradation using hybrid silica gels and genetic engineering of GOx. We conclude molecularly engineered GOx combined with silica-based encapsulation provides an avenue for designing long-term *in vivo* sensor systems.

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**Author Affiliations:** [1]Department of Biomedical Engineering, Research Triangle Materials Research Science and Engineering Center, Duke University, Durham, North Carolina; and [2]Research Triangle Materials Research Science and Engineering Center, Durham, North Carolina

**Abbreviations:** (CBD) chitin-binding domain, (ELP) elastin-like polypeptide, (GAX) glutaraldehyde cross-linking, (GOx) glucose oxidase, ($H_2O_2$) hydrogen peroxide, (LMWM) low molecular weight materials, (OPH) organophosphorus hydrolase, (PBSA) protein-based stabilizing agent, (PEG) polyethylene glycol

**Keywords:** genetic engineering, glucose sensor, hydrogen peroxide, silica, stability

**Corresponding Author:** James M. Harris, Ph.D., Department of Biomedical Engineering, Research Triangle Materials Research Science and Engineering Center, Duke University, 101 Science Dr., Durham, NC 27708; email address *james.m.harris@duke.edu*