THE BIOSENSOR TECHNOLOGY PROGRAM AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

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Abstract The biosensor technology program at NIST has been in existence for less then two years. During this time we have initiated projects using both optical and electrochemical methods for analyte detection. Projects presently underway include: DNA intercalation for carcinogen detection using evanescent wave technology, electrochemical detection of glucose using a mediator containing electrode, detection of bacteria by natural fluorescence, characterization of lipid membranes for two dimensional protein movement, α-toxin pore characterization, a light-activated enzyme switch, and a series of studies on bacteriorhodopsin films, sol-gel glasses, and membranes for several future applications.

INTRODUCTION

Recently NIST has initiated a major effort in the area of Biotechnology. As part of this effort we have organized a biosensor technology program. This program is directed toward examining generic biosensor technologies applicable to a wide variety of industries and to transfer of this technology to industry as it becomes available.

Although the Biosensor Technology Group is part of a larger and diversified Biotechnology Division, the programs within the group either directly involve biosensors or have application to biosensor technology.
DNA intercalation for detection of Carcinogens

This project utilizes the ability of most of the major carcinogens to intercalate into DNA. The assay is carried out using an architecture similar to that commonly used for immunoassay. The carcinogen of interest is permitted to compete with and displace a fluorescent intercalating dye. The quantity of carcinogen can be determined, using a standard curve, from the quantity of the fluorescent dye remaining intercalated after the system reaches equilibrium. Figure 1 shows in cartoon form, the process of intercalation upon which this assay is based.

![Diagram of DNA intercalation](image)

**FIGURE 1.** Cartoon representation of DNA intercalation.

Initial studies were carried out using fluorescence polarization. The intercalating dye when bound into the DNA shows strong