

# Protein Engineering for Biosensor Design

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Although the advantages of proteins in biosensors have been enumerated many times less attention has been paid to their inherent limitations. These arise from the fact that proteins have evolved to fulfil a specific requirement in living organisms and are not necessarily well suited to the needs of analytical science. Many of the limitations in performance characteristics of proteins can now be overcome through protein engineering. In essence this relies on the fact that changes can be readily made in the sequence of DNA and this in turn alters the sequence and hence properties of the protein for which the gene codes (Figure 1).

This approach to protein engineering means we can adopt a modular design whereby each distinct element of the protein's function can be separately manipulated and optimised. In such a scheme we can think in terms of surface attachment modules, molecular recognition modules and signal transduction modules. In addition global properties such as stability can also be improved.

In this presentation I will take a variety of examples that show how different proteins can be engineered for controlled surface attachment, to alter their specificity for particular ligands and to improve the catalytic efficiency and stability of enzymes. Some of the proteins that we have successfully engineered include glucose oxidase, cytochrome c peroxidase, alkaline phosphatase, green fluorescent protein and various ligand binding proteins of both bacterial and mammalian origin. The signal transduction methods that can be used with these engineered proteins include both electrochemical (amperometric) and optical (fluorescence) modes.

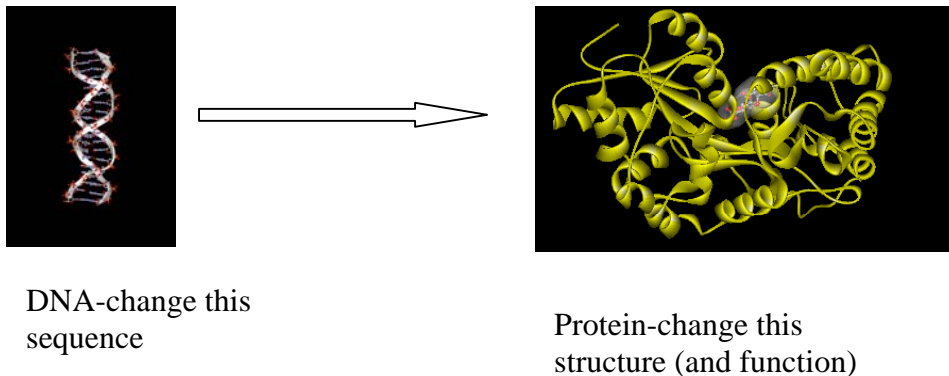


Figure 1