REACTIVE DYES IN PROTEIN AND ENZYME TECHNOLOGY

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Preface

The initial observations which led to the first use of reactive dyes in biochemistry predates the elucidation of the genetic code. As with so many critical but unusual and unexpected discoveries, the importance and breadth of applications were hardly even imagined in those early days. In the ten years immediately following the pioneering work, fewer than thirty papers were published on further applications. However, in 1976 alone we have details of thirty-two and the first century was recorded in 1979.

This rapid expansion in the utilisation of reactive dyes followed the combined realisations that the useful properties were not confined to just one or two dye molecules and that, in marked contrast to the earlier theories, the dyes could interact with a broad spectrum of proteins — from kinases to restriction endonucleases and from dehydrogenases to interferon. The research was given additional impetus by the wider availability of dozens of triazine dyes in suitable quantities for biochemical studies in the mid-1970s. All the researchers are greatly indebted to Dr C. V. Stead and his colleagues at the ICI Organics Division for much of this increased availability. We are also grateful for his contribution to this volume, on the basic chemistry of the reactive dyes — a subject which is frequently rather ignored by biochemists and biotechnologists to their cost.

The binding of Cibacron Blue F3G-A to dehydrogenases was first exploited in the development of new techniques for their purification. The entire family of reactive dyes is now used extensively in protein purification. If different species are counted, purification protocols for over a thousand proteins have been published. Two chapters on dye-ligand chromatography, one on the conventional scale and one on larger-scale applications, are very appropriate.

The dye-ligand technology is not limited to conventional matrices. HPLC supports have been modified to incorporate the reactive dyes to provide high-performance dye-ligand chromatography. This can also be operated on a preparative scale, and a further chapter describes these developments.

The binding of the triazine dyes to proteins can be affected by many other molecules and ions. These characteristics have led to dye-ligand

aqueous two-phase systems and metal ion-promoted dye-ligand chromatography. Both these areas are described in this volume.

The observation that many enzymes were specifically eluted from 'dye columns' by substrates or inhibitors suggested that the dyes were mimicking some parts of the structures of those substrates and inhibitors and that they could be used as active-site probes in the elucidation of enzymes' structures and mechanisms. Some particular examples of this novel approach are discussed in Chapter 8.

The Editors thank all the authors for their contributions and hope that these examples will stimulate the readers into further innovative exploitation of these remarkable molecules.

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