ENVIRONMENTAL REGULATION OF MICROBIAL METABOLISM

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Environmental Regulation of Microbial Metabolism

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Preface

Whereas biochemical research in recent decades has tended to reveal ever more clearly the underlying unity of living processes, there are, nevertheless, important differences between microbial cells and the cells of, for example, higher animals. These differences are not simply nor necessarily those that distinguish prokaryotes from eukaryotes, but derive from the fact that the cells that collectively make up the animal's body spend the whole of their existence in a closely controlled environment. Seemingly, they have very limited powers of adaptability since, if the animal's internal environment is caused to shift beyond very narrow limits (of say, pH, oxygenation, salts balance, or nutrients concentration), the cells cease to function and the animal dies. In contrast, the free-living microbial cells frequently must experience marked shifts of environment which they are quite powerless to control. Indeed, in a closed environment like that of a batch culture, microbes provoke, through their own metabolism, extensive shifts in the chemical environment; yet often they are able readily and rapidly to accommodate these changes without there being a perceptible effect on growth rate right up to the moment when some essential nutrient becomes totally depleted. This, we now know, they do by changing themselves, structurally and functionally; and to such an extent can these organisms change *phenotypically*, as it is said, that it is quite impossible to specify precisely the structural and functional composition of any microorganism without reference to the environmental conditions prevailing during its genesis.

This physiological plasticity, as well as the metabolic versatility of microorganisms, has important consequences for their exploitation in new biotechnological processes. Hence, The Soviet Academy of Sciences, in conjunction with the Council of the Federation of European Microbiological Societies (FEMS), decided that it would not only be useful, but particularly appropriate to organize a symposium on the theme of Environmental Regulation of Microbial Metabolism. This meeting took place in the Soviet Academy of Sciences Institute of Biochemistry and Physiology of Microorganisms, at Pushchino, near Moscow, and the main aspects considered were as follows:

1. Environmental regulation of the metabolism of autotrophic and heterotrophic microorganisms.

2. Regulation of the biogenesis of cell walls and other structures in prokaryotic and eukaryotic microorganisms.
3. Regulation of the secretion of macromolecules and transport of ions and solutes across microbial membranes.

Alongside the plenary lectures and invited papers, the texts of which are contained in this book, a number of round-table discussions were held that addressed applied aspects of the regulation of microbial metabolism. Some of the more important of these round-table presentations also are included in this book. The editors hope, and indeed believe, that the scientific material contained herein will be helpful to a wide range of specialists in the fields of biochemistry and physiology of microorganisms, molecular biology and biotechnology.

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