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Preface for Volume 1

Volume 1 contains chapters on the history, nomenclature, and structure determinations of B₁₂ and related systems. The biosynthesis of the corrin macrocycle and coenzyme B₁₂ are covered, along with the total chemical synthesis of the vitamin. Reactions of both the corrin ring and the cobalt-carbon bond are discussed and related to the mechanism of action of coenzyme B₁₂. In addition, chapters on various aspects of spectroscopy including electronic, EPR, and NMR are included.

The final result is an up-to-date and critical review of the areas described above. This treatise provides, for the first time, a complete and comprehensive review of all of the major chemical, biochemical, and medical aspects of vitamin B₁₂.

I wish to take this opportunity to thank the contributors to this volume for both the scholarship of their work and the promptness with which they all met the various deadlines.

DAVID DOLPHIN

Vancouver, British Columbia
November 1981
General Preface

The vitamin B\textsubscript{12}, coenzyme and related corrinoids represent the most complex non-polymeric structures found in nature, and in addition they are the only known naturally occurring organometallic complexes. Their uniqueness and complexity have presented major challenges, and will continue so to do for some time to come, in all areas of the natural and life sciences. Indeed, solutions to B\textsubscript{12}-related problems present some of the principal scientific achievements of the past half century; each decade has recorded a milestone toward an understanding of the nature and function of these systems.

In 1926 Minot and Murphy announced a dietary treatment of pernicious anemia, which had previously proved to be a fatal disease. In 1934 they were awarded the Nobel Prize for their discoveries concerning liver therapy against anemias. In 1948 Folkers’s group in the United States and Lester Smith’s in Great Britain independently announced the isolation and crystallization of the red antiperinicious anemia factor now known as vitamin B\textsubscript{12}. The structure of vitamin B\textsubscript{12} was revealed in 1956 by the X-ray crystallographic work of Hodgkin’s group and by the chemical studies of Todd and Johnson. In 1958 Barker isolated and characterized coenzyme B\textsubscript{12}, showing that vitamin B\textsubscript{12} (cyanocobalamin) is an antifactor generated during its isolation. The structure of the coenzyme with its unique cobalt-carbon bond was elucidated once more by Hodgkin in 1961. The 1960s saw major advances in our understanding of both the chemistry and enzymology of B\textsubscript{12}, and its coenzyme, culminating in the total synthesis of vitamin B\textsubscript{12} by Woodward and Eschenmoser in 1976.

Since there are fewer molecules of B\textsubscript{12} in a man than there are red blood cells, it is not surprising that there is still much to learn about this molecule. This is especially true in mammals where the function of B\textsubscript{12} in such low concentrations is still unclear. Furthermore, although there are many enzymatic reactions dependent on coenzyme B\textsubscript{12}, its mechanism of action is still obscure.

This work consists of two volumes and covers all of the major aspects of the chemistry, biochemistry, and medicine relating to B\textsubscript{12}. Volume 1 emphasizes chemistry, biosynthesis, history, and nomenclature; Volume 2 covers biochemical and medical aspects.

I wish to thank Dr. Olga Avramovic for her assistance, Alan Johnson for introducing me to B\textsubscript{12}, and the late R. B. Woodward for expanding and encouraging my knowledge and interest in the subject.

DAVID DOLPHIN

Vancouver, British Columbia
November 1981
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