HANDBOOK OF INFLAMMATION 3

L.E. Glynn, John C. Houck and Gerald Weissmann Editors

Tissue Repair and Regeneration

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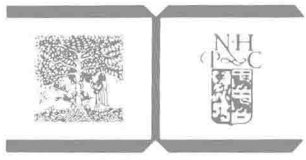

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Preface

The editors propose to publish, over the course of the next few years, a series of at least five volumes entitled 'The Handbook of Inflammation', each volume focussing on a major element of the inflammatory process. Insofar as possible the editors have endeavored to select authors who were both knowledgeable and willing to review in detail the voluminous literature of their particular view of the field of inflammation in an interdisciplinary fashion. Each of the various editors are solely responsible for the selection of authors and subject of each volume, while all of the editors collectively are responsible for the volume topic.

The purpose of the series is to provide detailed and definitive reports of many of the multiplex components which go into the inflammatory process and to do this on an interdigitated and integrated basis. Because of the multidisciplinary aspects of inflammation, this is both necessary and difficult. In this field investigators must be capable of both 'looking down the tube' as well as 'pouring things into it'. To some workers the expression 'broken cell' means biological and membrane disaster, whereas to others it means that the ultracentrifuge is broken. Over the past decade, however, biologists have learned biochemistry to some degree and biochemists have had to learn some biology. Because of a shared vocabulary which has been developing as a consequence of this understanding of another discipline, a greater dialogue is now possible about inflammation than ever before. It is the conclusion of the editors that the compilation of interdisciplinary reviews side-by-side in the same volume will contribute to the further development of this colloquy.

L.E.G.
J.C.H.
G.W.

Volume 1 – Chemical messengers of the inflammatory process
Volume 2 – The cell biology of inflammation
Volume 3 – Tissue repair and regeneration
Volume 4 – Immunology of inflammation
Volume 5 – The molecular basis for anti-inflammatory therapy

Introduction to volume three

The first two volumes of this series have dealt with the various aspects of the inflammatory response that, depending upon the intensity and persistence of the initiating agent, result in accumulations of cells and fluids associated with various degrees of local tissue necrosis. The present volume takes up the story when the primary cause of the tissue injury has been contained or overcome, and lost tissue must be replaced either by specific cells capable of functioning in the same way as those that are lost or by connective tissue where such replacement is impossible.

Although it is convenient for descriptive purposes to separate those aspects of the inflammatory process that lead to the neutralisation of the causative stimulus from those which lead to the replacement of the lost tissue, it is essential to appreciate that both components of the inflammatory reaction proceed simultaneously but with degrees of intensity which differ markedly according to the stage of the process. In chronic reactions, that is those in which the causative agent is only overcome with difficulty or not at all, both phases of the reaction contribute conspicuously and simultaneously to the pathological picture.

The processes of healing differ strikingly in the various tissues and organs, depending mainly upon the capacity or otherwise of the affected organ to replace lost cells by those of the same kind. Where this capacity is absent the healing process is brought about by the new formation of connective tissue in which collagen is the predominant component and the end result a scar. In those organs, however, in which the lost cells can be entirely replaced, the newly formed tissue is indistinguishable from its surroundings and no scar tissue is formed. In most organs of this kind, however, especially if the original supporting connective tissue framework has been destroyed with the specific parenchymal cells, the final healing presents a composite picture in which the original architecture is lost or obscured.

Factors responsible for and modifying the healing process will obviously differ depending upon whether it is predominantly of the kind leading to scar formation or of the regeneration variety. In the formation of scar tissue the fibroblast is the key cell and collagen its principal product. The non-collagen components of connective tissue are also secreted by these cells and the factors responsible for the stimulation of fibroblasts to proliferate and to secrete are therefore of major significance in the healing process. These cells are highly dependent upon various nutritional factors, both specific and nonspecific, and in recent years their hormonal susceptibilities have become increasingly apparent.

Since the healing process is considerably modified by the organ or tissue in which it is occurring it is necessary to consider the manner in which this modification arises and how in its turn the end result modifies the structure and function of the healed organ. It has therefore been necessary to consider each organ and tissue independently.

Before the processes of repair or regeneration can make reasonable progress it is important that the site of their operations be adequately cleared of necrotic tissue and exudate. This is largely a function of extracellular enzyme activity supplemented by intra cellular digestion, in both of which activities the monocyte-macrophage system plays the dominant role.

Although the healing process is usually preceded by an obviously noxious or traumatic stimulus, this is not invariable and several important forms of scar formation are not preceded by any obvious cause, e.g. scleroderma, or Dupuytren's contracture. Whether the site of the primary stimulus is the fibroblast or the parenchyma in which it is situated is still a moot point. Such examples of scar formation are also considered in this volume since their understanding must contribute significantly to the clarification of the formation of scar tissue in general.

Finally, the healing process, as already stated, frequently involves regeneration. Adequate consideration of this merges imperceptibly into that of atrophy and hypertrophy both of which are active processes involving both anabolic as well as catabolic processes.

L.E. Glynn

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