ORAL PATHOLOGY

An Introduction to
General and Oral
Pathology For Hygienists

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PREFACE

To most hygienists and students and teachers of dental hygiene previously published textbooks of oral and general pathology have represented a formidable coverage of disease unlikely to be encountered as a responsibility of the hygienist in clinical practice. This book has been written especially for the practicing hygienist and the student of dental hygiene to provide a simple and understandable account of the processes of disease and to provide the essential background for the recognition and prevention of diseases within the scope of responsibility and practice of the dental hygienist. An attempt has been made to establish a proper balance between the principles of pathology and the coverage of specific diseases in order to bridge the gap between general pathology and applied oral pathology. Such a balance is possible because the hygienist does not have the responsibility for the diagnosis and treatment of oral disease, and therefore much of the details of diagnosis and treatment of specific diseases found in standard texts of general and oral pathology can be omitted. The omission of such details should not minimize the role of the hygienist in the prevention of disease. The hygienist performs various services in the presence of systemic and oral diseases. These services will be of greater value and more ably carried out if the hygienist understands the principles of pathology. Furthermore the responsibility of the hygienist in the prevention of periodontal disease will be more adequately appreciated, if the hygienist has an understanding of the disease which she is trying to prevent. For example, the hygienist is responsible for the removal of stains, plaques, and calculus from the teeth and as such is as important as any other part of dental practice, since accretions on the teeth are the most important etiologic factors in periodontal disease. In this respect the hygienist is practicing preventive periodontics. Thus a basic understanding of the pathogenesis of accretions is essential for their prevention and removal as well as an understanding of the pathogenesis of periodontal disease.

It is important that the hygienist understand some of the aspects of general pathology; not only as the foundation for its application to the mouth, but as a basis for recognizing those departures of the

patient from good health which may have an important bearing on what is done for the patient. For example, scaling procedures may result in a transient bacteremia leading to subacute bacterial endocarditis. An understanding of the relationship between scaling procedures and endocarditis provides the hygienist with an interesting lesson and an enlightened interest in the cause and prevention of disease.

It is hoped that this book will stimulate an interest in pathology and provide an adequate foundation for its appreciation in clinical practice. An appreciation for the processes and prevention of disease by the hygienist is becoming an increasingly important consideration with our rapidly expanding population and failure to keep abreast of the expanding needs of detecting disease. Thus one of the objectives of this book is to provide the foundation for the expanding role of the hygienist in assisting the dentist in the detection and prevention of disease.

We wish to thank those who contributed greatly to the preparation of this text: Mr. Edward Crandall, photographer at the School of Dentistry, for the preparation of the photographs; Miss Rose Grace Faucher, librarian at the School of Dentistry for library services; and Miss Betty Sundbeck, secretary, who contributed many hours of secretarial assistance.

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Chapter One

INTRODUCTION

PATHOLOGY is that phase of biology which deals with the cause and mechanisms of disease of all living things. All living things are composed of units called cells and united in various arrangements to carry out all those functions of harmonious and coordinated activity which will allow the organism to adapt to its environment and to react to it in an altruistic manner. This cellular activity and reaction to environment is the essence of life When changes in environment alter the normal response or function of cells, or the organism as a whole, the alteration is termed disease. Thus, any change in form or function of the living organism or of its unit parts so that life exists outside the range of normal is considered disease. Pathology should then be considered as the study of life and the attempt to understand life as it exists under abnormal conditions. An integrated knowledge of altered form and function is the aim of pathology. The understanding of the interrelationship between altered form and function provides a corner stone for the study of all the health sciences.

An alteration of the form or function of one part of the body may affect the existence of the entire organism or affect only the part which is altered. This broad scope of pathology requires the investigation and understanding of the interrelationship between all types of alterations in all areas of the body. On this basis there are many approaches to the study of pathology: it may be *morphologic* in which alterations in form are emphasized (gross and microscopic pathology); it may be *physiological* in which the alterations of function are considered (physiologic pathology); it may be *experimental* in which attempts are made to investigate the cause of specific alterations, to produce changes previously observed, or to find means to prevent or correct tissue alterations (experimental pathology).

Pathology is the study of life outside the range of normal; from the death of a few cells to death of the whole body. Disease is always antagonistic to the survival of the organism, and the complete inability of the organism to adapt to an unfavorable environment results in death. A study of pathology is necessary in order to understand those significant alterations in form and function which are

considered as disease and to learn how such alterations may be changed to establish health.

Cellular Basis of Life and Disease

The entire body is composed of small units called cells which basically have the same structure in that each has a cell boundary enclosing a semisolid-like material called the cytoplasm, and a more solid body called the nucleus. Although all cells are basically alike, they vary in shape, size, and consistency in various parts of the body depending upon the function which they are to perform. Furthermore each cell has certain basic biologic attributes which are conductivity, contractility, respiration, excretion, secretion, cell division, irritability, and retractibility. The nucleus of a cell is considered primarily with growth and reproduction while the cytoplasm performs the functions of absorption, assimilation, excretion, secretion, respiration, and expresses other properties such as irritability, conductivity, and contractility.

The process of cell division (mitosis), whereby growth and reproduction are made possible, is a function of the nucleus. This structure, previous to cell division, contains a granular material called chromatin which becomes incorporated into small strands called chromosomes as cell division begins. The chromosomes contain the elements which dictate the character of the cells. In the sex cells the chromosomes are the structures which transmit genetic factors from the parent to offspring, and thus are responsible for the transmission of certain features from the parent to the offspring. These transmitted features are called hereditary features. In individual cell division, other than that occurring in sex cells, the chromosomes carry factors which determine the character of the cells. In the process of cell division the chromatin is incorporated into and replaced by chromosomes which divide longitudinally and into a set number of rod-like chromosomes. One-half of the chromosomes move to one side of the cell and one-half move to the opposite side; then a constriction through the middle divides the cell into two identical cells. It is by this process of cell multiplication that organs increase in size and the body grows. After a part of the body or tissue reaches full development, the rate of cell division decreases and the part ceases to grow. However, the ability for cell division is retained by the cells and can be stimulated to take place when the need arises for new cells to replace areas of injured tissue.

Irritability is that feature of the cell which enables it to respond to various stimuli. Because of the basic property of irritability proper stimuli may cause a muscle cell to contract, the cells of the salivary gland to secrete saliva, or nerve cells to conduct nervous impulses.

Nervous tissue has the most advanced development of the property of irritability.

Reactivity or specificity is that property of a cell to respond specifically to a stimulus. It is the ability of a cell to carry out a specific function as determined by the structure of the cell. Such cells have no capacity to alter their specific functions and can give rise only to the same type of specialized cell. The cytoplasm of the cell is chiefly responsible for this functional activity. *Absorption* is the process of taking dissolved substance into the cell. This physiologic property of the protoplasm of a cell enables it to obtain the necessary materials for function. *Excretion* is the ability of a cell or group of cells to eliminate waste products from within the cell or body. *Secretion* refers to the ability of a cell or group of cells to elaborate a specific product for use locally or for the whole organism. For example, the parotid glands are groups of cells elaborating saliva; the thyroid gland elaborates hormones for the whole organism.

Cells are formed into groups or systems having a particular architecture characteristic of each organ or tissue. Thus one or more aggregates of cells all having the same function and morphologic characteristics form the liver, another group muscles, another bone, and another nerve tissue. The grouping of specialized cells for the purpose of special functions represents a high degree of development of the physiologic properties of individual cells, *i.e.*, absorption by the intestines, excretion by the kidneys, secretion by adrenal glands, assimilation by the liver, and conduction by nerves. This state of development and specialization of cells makes all cells and aggregrates of cells, to a certain degree, dependent upon each other. Such dependence is of some disadvantage to the organism as a whole since an alteration of function in one area may upset the function of cells in another area. Thus, all cells function as individual units and as groups for the advantage of the whole body. Any alteration of one or more of the aggregates of cells may jeopardize the efforts of a whole community of cells or the whole organism itself. For example, the injury and destruction of only a certain area of the muscle cells of the heart may cause the heart to stop functioning and cause death of the whole organism. The regulation and integration of the cells functioning for the welfare of the whole organism is based on activities of the blood-vascular system, the nervous system, and the endocrine glands.

One additional fact should be considered in visualizing the alteration of cellular life as the basis of disease (*cellular pathology*): intercellular substances, which are formed by the cells, are responsible for the continuity that exists between cells and gives the cells and organism support. Thus, intercellular substances, although considered to be inert, are intimately related to the health of the cells and the organism.