

Oral Mucosa in Health and Disease

edited by
A.E.Dolby

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ORAL MUCOSA IN HEALTH AND DISEASE

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EDITOR'S PREFACE

This book represents a critical presentation of modern scientific knowledge relating to oral mucosa and is intended primarily for graduates with a clinical or biological interest in the oral mucosa. It is intended also to serve as selective reading for undergraduate students.

The knowledge relating to the structure, function and disease of the oral mucosa has increased considerably during the past decade. Equally, the necessity for the interpretation of this basic knowledge has become of great importance to the clinician who seeks to base his practice on scientific principles. The contributors to this book have endeavoured to fulfil such an interpretative role. In addition to a reappraisal of the knowledge relating to the structure and physiology of oral mucosa comparison has been made with these features in the skin. The relationship of oral mucosal disease to systemic disease has been re-examined. Particular attention has been paid to those oral mucosal diseases in which a greater understanding of the disease process has arisen.

I would like to thank the authors for endeavouring to maintain, successfully, a coherent theme throughout the text. I would like also to thank the publishers, Blackwell Scientific Publications Limited, Osney Mead, Oxford, for their full co-operation, in particular Mr Per Saugman who has given generous support during the preparation of the book. Lastly, I would like to thank Mrs V. Davis for invaluable secretarial assistance.

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CHAPTER 1

STRUCTURE AND FUNCTION OF NORMAL HUMAN ORAL MUCOSA

C.A. SQUIER, N.W. JOHNSON
AND MARGARETE HACKEMANN

1.0 Introduction

In writing this chapter we have attempted to provide an account of the structure of oral mucosa which will serve as a framework both for the physiological features described in subsequent chapters and for the pathological changes described in the second half of the book.

As the title suggests we have deliberately set out to relate the histology and ultrastructure of oral mucosa to its function as the lining tissue of the oral cavity, while at the same time considering some of the similarities and differences between this tissue and that covering the rest of the human body, the skin.

The account therefore begins with a survey of the major functions of oral mucosa and skin, followed by a general account of their organization. Sections 1:3 to 1:6, which follow, deal in more detail with the various components. Finally the way in which these tissues age is discussed.

References to recent original work are given throughout the text and a list of more general references is included at the end of the chapter which provide more comprehensive accounts of many aspects.

1:1 The Functions of Skin and Oral Mucosa

In discussing the functions of human skin it is easy to become preoccupied with details of the functional adaptations shown by this tissue and to forget what is perhaps its most significant role—its aesthetic qualities. To a great extent we describe (and judge) people by their skin—by its colour and texture, its hairiness, its dryness or its oiliness. Of course these aesthetic qualities are only the superficial manifestations of more basic properties that enable the skin to function as an efficient covering tissue, and thus

enable the organism to survive in its environment. These properties may be considered under the following headings:

Barrier function,

Thermal regulation,

Sensation,

Secretion and excretion.

In the following section these will be described and discussed in relation to the functions of oral mucosa. Other roles that are sometimes suggested for the skin include highly specific metabolic functions, such as the synthesis of vitamin D and cholesterol (Kandutsch 1964), and storage. There is little information about these processes in the oral mucosa, and they will not be discussed further in this chapter.

1.1.1 Barrier function

The skin is the barrier between the organism and the potentially hostile world around it. As well as protecting the deeper tissues from mechanical damage and solar radiation and preventing the entry of micro-organisms and toxic substances, the skin has in terrestrial animals to prevent dehydration of the body. This protective barrier function resides primarily within the epidermis, although both the dermis and the skin appendages, the hairs and glands, contribute to the effectiveness of the system, and it is worth remembering that should the primary epidermal barrier be breached, there are available in the dermis the protection provided by the inflammatory and immunological defence reactions.

The oral mucosa, while having the same embryological origins as the skin and showing in many ways a similar morphology, has less of a role to play as a barrier layer. There is mechanical insult, such as the trauma of mastication, but the lining of the oral cavity is rarely exposed to solar radiation. Information regarding the permeability of the oral mucosa is confusing, for despite the suggestions that the mucosa shows a permeability far greater than any region of the skin, salivary flow creates a perpetually moist mucosal surface without, apparently, causing waterlogging of the tissues. In the opposite direction a loss of interstitial fluid to the exterior is less likely to occur because of the humidity of the oral cavity, although a barrier to outward movement does seem to exist within the epithelium. Thus the oral mucosa is not simply a highly permeable lining membrane but has barrier functions similar to those of skin, the weakest link possibly occurring at the gingivo-dental junctions where the continuity of the epithelial surface is interrupted by the penetration of teeth.

1:1:2 Thermal regulation

The large surface area presented by the skin to the external environment makes it the most important factor in maintaining thermal homeostasis in mammals and this function is largely subserved by the connective tissue. Surface features such as creases and grooves increase the area while the presence of hair and subcutaneous fat provides insulation. The dermis is provided with an extensive vascular system and the blood flow to the skin is greatly in excess of the metabolic demands of the tissue. The presence of arterio-venous anastomoses enables the flow through the dermis to be regulated; increasing the blood flow leads to increased heat loss when the external temperature is lower than body temperature. When the external temperature is higher, heat loss is dependent on evaporation of water secreted by the sweat glands.

To what extent the human oral mucosa participates in thermal regulation is unclear because of a lack of detailed information on the organization and behaviour of blood vessels in this region. In the much-quoted example of the dog, it is known that during panting there is considerable heat loss from the tongue in which well-developed arterio-venous connections are present (Liebow 1963). Their existence in human mucosa does not appear to have been established (Hellekant 1972; see section 1:6:3).

1:1:3 Sensitivity

Much of the information reaching the nervous system from the outside is collected and transmitted by an extensive cutaneous nerve plexus. Sensory nerves terminate in both the epidermis and dermis over the entire body but are particularly concentrated, and show specialized receptor endings, in such regions as the palms and soles.

The oral mucosa has an equally extensive sensory innervation, terminating in both simple and organized nerve endings. The discrimination of certain sensations such as touch and temperature has been shown to be greater in certain oral regions, such as the lip, than in the skin; in mammals taste buds are located in the oral epithelium.

1:1:4 Secretion and excretion

The skin participates to a certain extent in both these processes although it is difficult, and perhaps meaningless, to try to separate these functions. Thus, although the sweat produced by the sweat glands contains water and small quantities of urea and salts, the prime function is the reduction of