NOSE AND THROAT HISTOLOGY

Photomicrographs

JAMES A. MOORE M.D.

MACMILLAN

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Photomicrographs

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The following photomicrographs of the histology of the nose and throat were compiled in the Mosher Laboratory at the Massachusetts Eye and Ear Infirmary under the supervision of Harris P. Mosher, M.D.

J.A.M.

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PREFACE

In 1937 when beginning my residency in otolaryngology at the Massachusetts Eye and Ear Infirmary, I was stimulated by the late Dr. Harris P. Mosher, then chief of the service and professor of otolaryngology at the Harvard Medical School, to do a monograph, which would include photomicrographs of normal histology related to the upper respiratory tract, with particular emphasis on nose and throat histology. The monograph was completed by February of 1938. Only three copies were compiled in the Mosher Laboratory.

These photomicrographs and the related subject matter were found to be of considerable value in preparing the student and resident for more advanced study of diseases and pathology of the nose, throat, and upper respiratory tract.

The photomicrographs were made from materials and sections available in the Mosher Laboratory of the Massachusetts Eye and Ear Infirmary and in the Mallory Laboratory of the Massachusetts General Hospital. Much information was obtained from Dr. Leroy A. Schall's lectures on histopathology of the nose and throat, given as a part of Dr. Mosher's course at the Harvard Medical School.

Through the courtesy of The Macmillan Company this monograph is now being published to make the material generally available for residency training at the basic science level and available to others interested in this field.

Finally, I wish to give Dr. Mosher credit, not only for inspiring this work, but also for sponsoring it and offering many helpful suggestions.

J.A.M.

January, 1960

CONTENTS

EPITHELIUM

Simple Squamous Epithelium	1–2
Simple Cuboidal Epithelium	3
Simple Columnar Epithelium	4
Simple Columnar Ciliated Epithelium	5
Pseudostratified Columnar Epithelium	6
Pseudostratified Columnar Ciliated Epithelium	7
Stratified Squamous Epithelium	8
Stratified Columnar Epithelium	9
Stratified Columnar Ciliated Epithelium	10
Transitional Epithelium	11–12

SCALP

Normal Scalp	13

MUCOUS MEMBRANE

Normal Septal Mucosa	14–15
Normal Middle Turbinate	16–17
Inferior Turbinate	18
Normal Ethmoid	19
Maxillary Antrum	20–21
Normal Sphenoidal Mucosa	22–23
Lip	24
Gum	25
Normal Uvula	26–27
Normal Mucous Membrane of Cheek	28

GLANDS

Normal Thyroid Gland	29
Parathyroid Gland	
Normal	30–33
Primary Hyperplasia	34
Secondary Hyperplasia	35
Adenoma	36

Salivary Glands
Base of Tongue 37
Normal Parotid Gland 38–39
Normal Submaxillary Gland 40–41
Normal Sublingual Gland 42–43
Normal Thymus Gland 44–45
Lacrimal System
Lacrimal Gland 46–47
Lacrimal Sac and Nasolacrimal Duct 48–49

LYMPHOID TISSUE

Normal Lingual Tonsil 50
Normal Palatine Tonsil 51–53
Normal Pharyngeal Tonsil 54–55
Normal Lymph Node 56–57

RESPIRATORY TRACT

Normal Trachea 58–59
True Vocal Cord 60

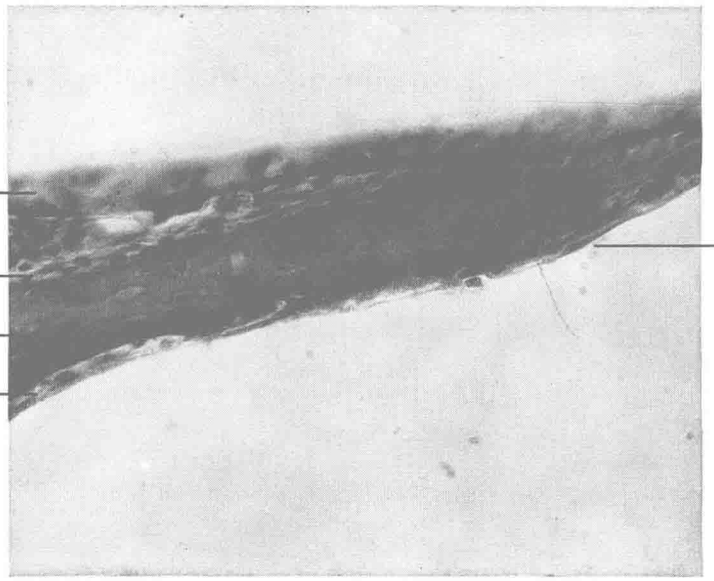
ESOPHAGUS

Esophagus 61

INNER EAR

Cochlea 62–63
Organ of Corti 64

SIMPLE SQUAMOUS EPITHELIUM



×100 (Tympanic Membrane, Guinea Pig)

Epithelial cells may be divided into three types: squamous, cuboidal, and columnar. These cells may be arranged in one or several layers. If arranged in one layer, the epithelium is called simple; if arranged in more than one layer, it is called stratified.

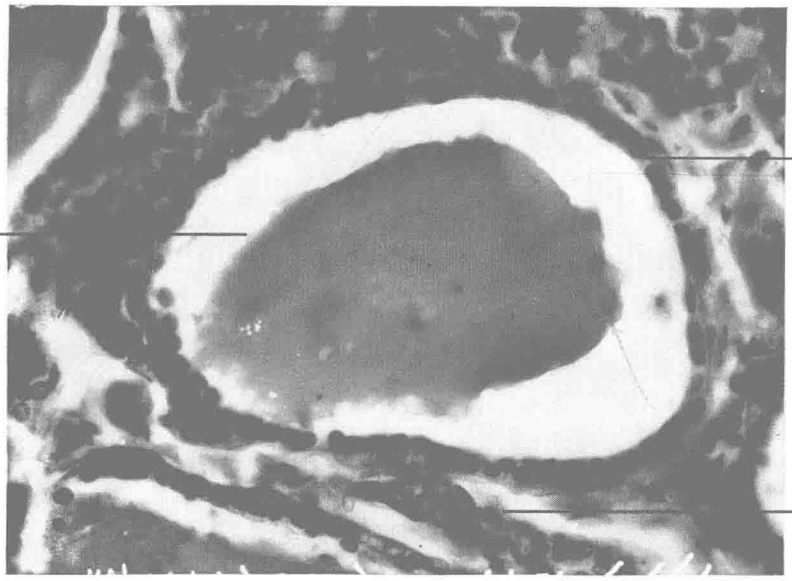
Epithelium as a whole may be divided into ten types: (1) simple squamous; (2) simple cuboidal; (3) simple columnar; (4) simple columnar ciliated; (5) pseudostratified columnar; (6) pseudostratified columnar ciliated; (7) stratified squamous; (8) stratified columnar; (9) stratified columnar ciliated; (10) transitional.

Simple squamous epithelium consists of thin, platelike cells arranged in one layer on the surface of connective tissue. The cells adhere closely one to another by their edges. The individual cells have regular (usually hexagonal) or wavy outlines, and each cell contains a nucleus, which may not show in a given section through that cell. In profile the contracted cell is a plump spindle.

Simple squamous epithelium may be found lining the inner surface of the tympanic membrane, the inner surface of the wall of the membranous labyrinth, and in other localities of less interest to the otolaryngologist.

The photomicrograph on page 1 is taken from a stained section through the tympanic membrane of a guinea pig at the site of attachment of the malleus to the tympanic membrane. The inner surface can be seen to be lined with a single layer of cells, with thin, spindle-shaped nuclei, on a connective tissue base. The malleus and the thicker, outer epithelial layer of the external ear may also be seen.

SIMPLE CUBOIDAL EPITHELIUM



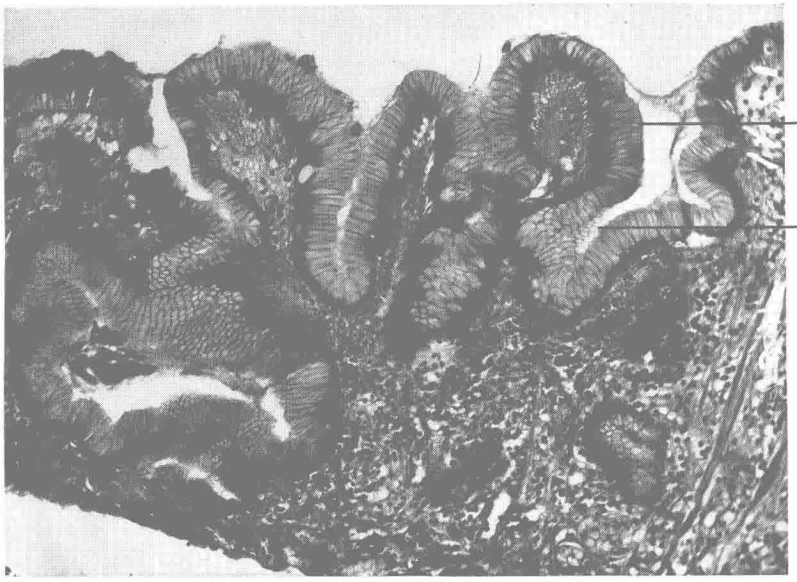
×400 (Fetal Thyroid)

Simple cuboidal epithelium is made up of low, prismatic cell bodies closely adherent one to another by their lateral surfaces. On the free surface this type of epithelium shows a mosaic of small, usually hexagonal polygons. The ribbonlike cross section of the epithelial sheet is subdivided into squares.

This type of epithelium is found in many glands such as the thyroid, the free surface of the ovary, the choroid plexus, the inner surface of the capsule of the lens, and some areas of the labyrinth. Also, it is found to line the excretory ducts of many glands, and the pigmented cells of the retina are of this type.

The above photomicrograph is taken from a stained section of fetal thyroid at birth. It is a high-power view showing a complete follicle with a central collection of colloid. Note the low, cuboidal type of epithelium which lies on the interfollicular, reticular connective tissue in close contact with the underlying capillaries, lymphatics, and nerves. The absence of basement membrane should be noted. The section also shows the abundant interfollicular blood capillaries.

SIMPLE COLUMNAR EPITHELIUM



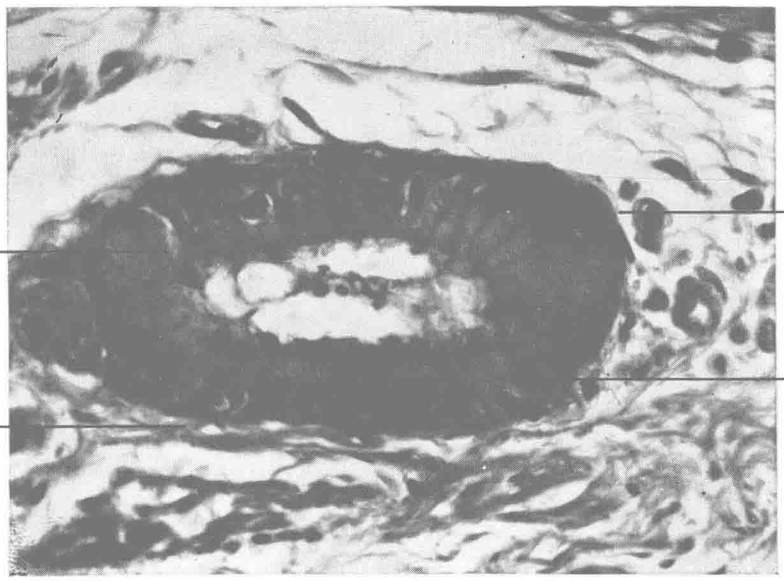
×100 (Gastric Mucosa, Cardiac Area)

Simple columnar epithelium is composed of tall, prismatic cells closely adherent one to another by their lateral surfaces. The surface area presents a mosaic similar to that of the cuboidal type. In perpendicular sections the cells are seen as tall rectangles resembling fence palings. The nuclei are oval and at about the same level.

This type of epithelium is found lining the intestinal tract and the excretory ducts of many glands such as the parotid and submaxillary glands.

The above photomicrograph is made from a stained section of gastric mucosa obtained by biopsy from the cardiac area of the stomach. The section shows the typical cardiac glands with the mucosa thrown into folds forming fairly deep gastric pits. The individual mucous cells are active with the nuclei pressed firmly against the base of the cells.

SIMPLE COLUMNAR CILIATED EPITHELIUM



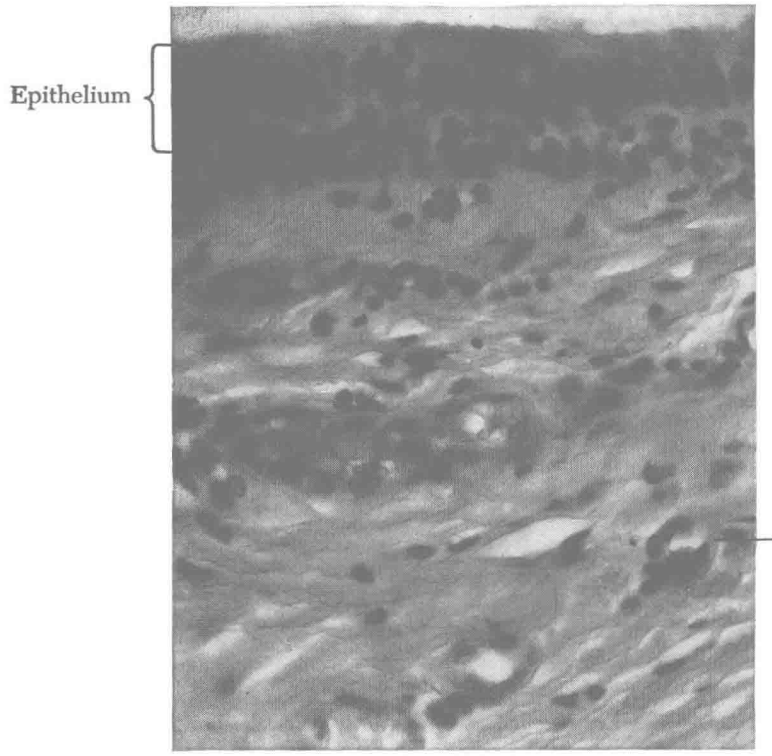
×400 (Terminal Bronchiole)

In simple columnar ciliated epithelium, the form and arrangement of the cells are the same as in simple columnar. In addition, the free surface of the cells is provided with cilia.

This type of epithelium is found in the small bronchi and bronchioles, some of the nasal sinuses, the central canal of the spinal cord, and several other locations of less interest to the otolaryngologist.

The above photomicrograph shows a terminal bronchiole with surrounding loose connective tissue. The epithelium is simple columnar ciliated with the nuclei at one level. At the base of the cilia is a dark border line formed by the basal corpuscles of the cilia. Between the columnar cells on the right and on the left, active goblet cells may be seen. In these areas there is a break in the outline of the columnar cells.

PSEUDOSTRATIFIED COLUMNAR EPITHELIUM



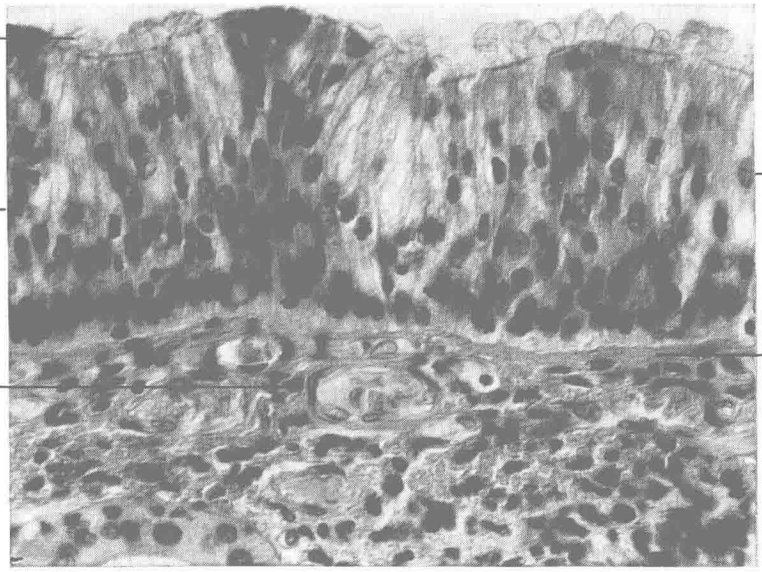
×400 (Large Excretory Duct of Sublingual Gland)

While in simple cuboidal and simple columnar epithelium the cells are uniform and their nuclei are at approximately one level, in the pseudostratified columnar epithelium the nuclei are at different levels, and the cells lose their uniformity and acquire a different aspect. In may cases some of the cells, although remaining in connection with the underlying connective tissue, lose their connection with the free surface. These cells are covered by the tall, superficial cells. In perpendicular sections, the nuclei form several rows. The form of the cells, due to mutual pressure, may become very irregular and gives the impression of being stratified.

This type of epithelium is found lining the large secretory ducts of several glands such as the parotid and the sublingual.

The above photomicrograph is made from a stained section of the sublingual gland and shows a high-power view of the wall of a large excretory duct. The epithelial lining is pseudostratified columnar, as described above.

PSEUDOSTRATIFIED COLUMNAR CILIATED EPITHELIUM



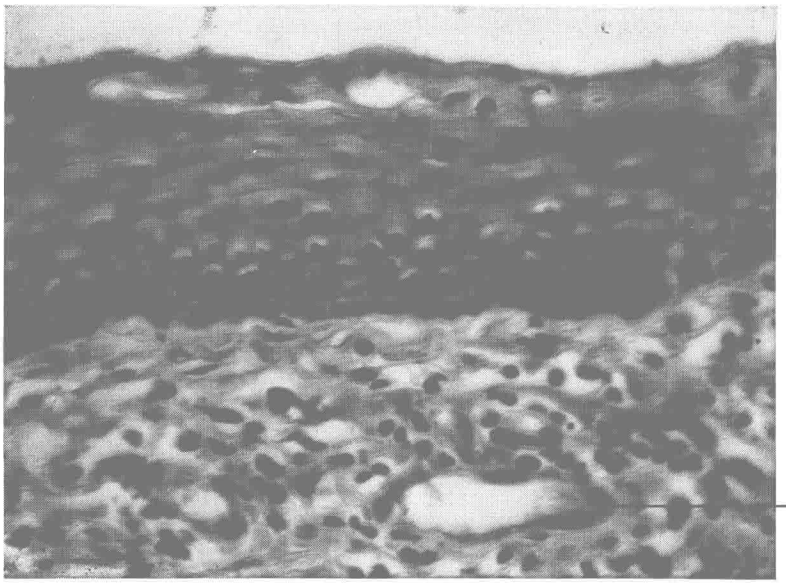
×400 (Mucosa of Posterior Nasal Septum)

In pseudostratified columnar ciliated epithelium, the structure is the same as that of pseudostratified columnar, with the addition that the free surface of the cells is provided with cilia.

This type of epithelium lines the greater part of the respiratory passages, the eustachian tube, a part of the tympanic cavity, and the lacrimal sac.

The above photomicrograph is made from a stained section of the posterior part of the nasal septum. It is a high-power view showing the pseudostratified columnar ciliated epithelium with its distinct basement membrane (Bowman's membrane). In this section numerous cells are seen with secretory activity (goblet cells). Due to the presence of goblet cells, the cilia are indistinct over most of the free surface, but in one or two areas they are clearly seen.

STRATIFIED SQUAMOUS EPITHELIUM



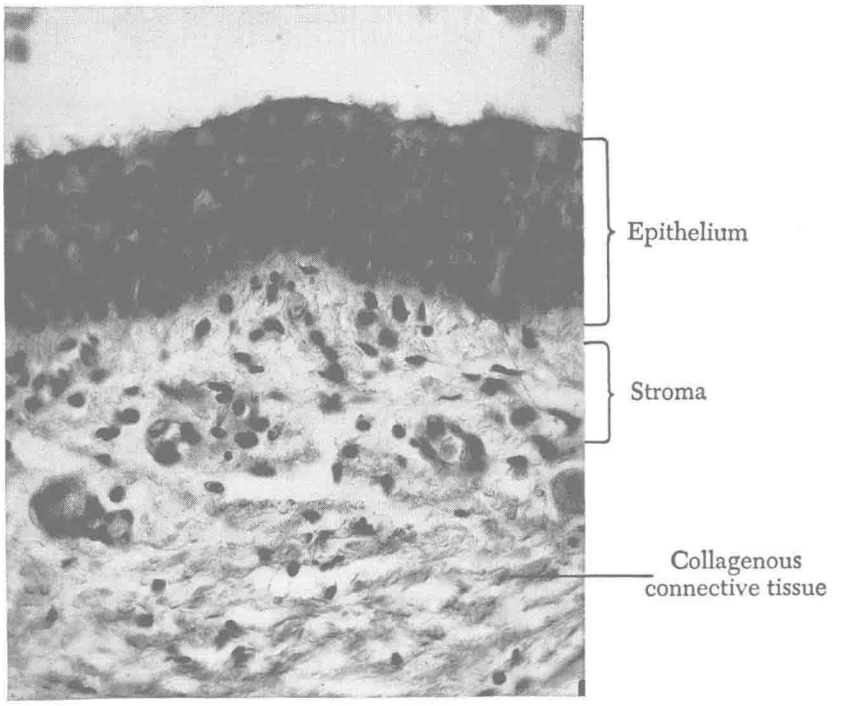
×400 (Lining of Branchiogenic Cyst)

In stratified squamous epithelium the epithelial sheet is thick, and in perpendicular section the cells are seen to be of very unequal form. The deepest layer, adjacent to the underlying tissue, consists of cuboidal or even columnar cells, sometimes, as in the cornea, with rounded upper ends. Then follow a varying number of layers of more or less irregular, polyhedral cells, often provided with excavations which fit the convex surfaces of their neighbors, or with long stalks attached to the basement membrane. The nearer to the free surface, the more the cells are flattened. A varying number of superficial layers consist of thin squamous elements.

This type of epithelium covers the whole surface of the skin and the mucous membrane of the mouth. It also covers parts of the epiglottis, the conjunctiva, the cornea, and other localities of less interest to the otolaryngologist.

The above photomicrograph is made from a stained section of the lining of a branchiogenic cyst. It shows the stratified squamous epithelium, as described above, lying on a loose connective tissue stroma.

STRATIFIED COLUMNAR EPITHELIUM



×400 (Larynx, Six-Year-Old Child)

In stratified columnar epithelium the deeper layer or layers consist of small, irregularly conical, polyhedral, or fusiform cells which do not reach the free surface. The superficial cells are tall and prismatic and are not connected with the underlying tissue.

This type of epithelium is rare and does not cover large surfaces. It is found lining the fornix of the conjunctiva, in the pharynx, on the epiglottis, in the upper larynx, and also in the excretory ducts of some glands.

The above photomicrograph is made from a stained section of the upper larynx of a six-year-old child and shows the type of epithelium described above. The stroma is composed of a moderately dense connective tissue. The free border of the cells appears to be a fairly sharp cell border covered by droplets of mucus.