

Basic Immunology

23rd lecture:

Immune components of the oral cavity.

Molecular and cellular elements of the oral immune system.

Oral cavity

Inductive site and **effector organ** of immunity

Systemic and **local** immunity

Part of the mucosa-associated lymphoid tissues, with **specialized components**

Stratified squamous epithelium + “hard” tissues (*teeth*)

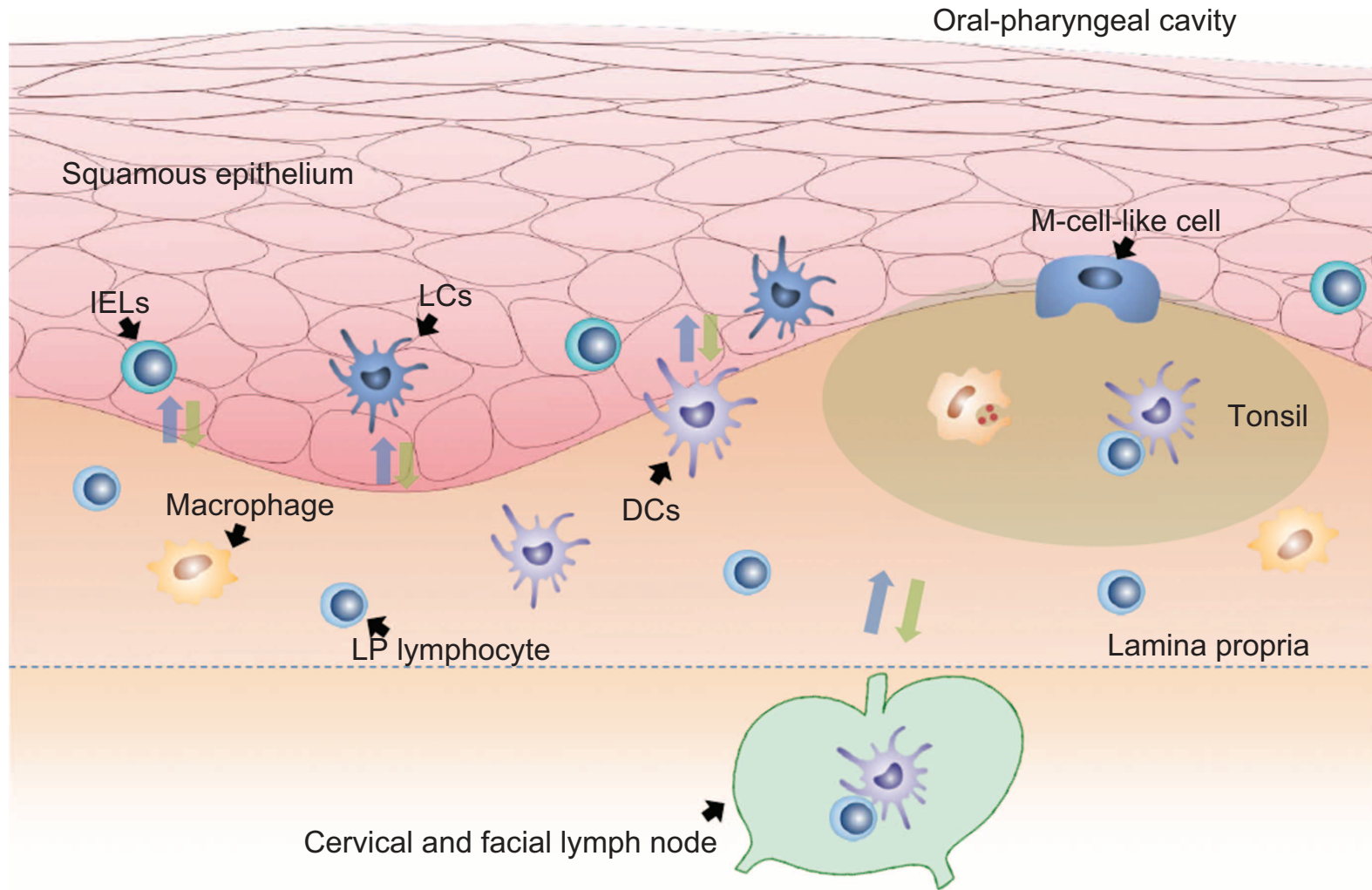
Thick and and dense physical barrier

Permeable: periodontal epithelium

Constant **antigen exposure**: ~100 million bacteria/ml of saliva (~700 species)
~500kg of food annually

Innate and **adaptive** components

Immunity of the oral cavity



DC: dendritic cell

LC: Langerhans cell

LP: lamina propria

IEL: intraepithelial lymphocyte

Cellular components

Epithelial cells

First line (physical + chemical) barrier

Express PRRs (TLRs)

Can produce inflammatory cytokines (IL-1 β , IL-6, GM-CSF)

Different types and thickness (influences permeability!)

keratinized, thick (>50 layers, dorsal tongue)

non-keratinized, thick (~30 layers, buccal mucosa)

non-keratinized, thin (~10 layers), rich in Langerhans cells (mouth floor)

NK cells

Langerhans cells, dendritic cells: antigen presenting cells

Mast cells

CD8 $\alpha\alpha$ + intraepithelial lymphocytes

T cells: rare in healthy mucosa, T_H17s important in pathology

B cells: mainly IgA+, few IgG+

Saliva

750-1000 ml/day

3 pairs of major glands (parotid, submandibular, sublingual) + several minor glands

Important in:

- physico-chemical protection of teeth
- immunity of oral mucosa
- mucosal healing

Contains lots of proteins with innate and adaptive immunologic features

Low concentrations of the various factors, but synergistic effect

Salivary antibodies

Types

IgA: usually dimer (from the salivary gland),

IgG: lower amounts (from serum or local plasma cells)

IgM and IgE: very low amounts

IgA+ B cells

Activated in NALT (nasopharynx-associated lymphoid tissue, tonsillae + adenoids, *Waldeyer's ring*)

Migrate to salivary gland stroma (and mucosa)

IgA

Transported across epithelial cells via polymeric Ig receptor + secretory component

Constitutively secreted into saliva

Salivary IgA function

Neutralization

Agglutination

Surface immune exclusion

Opsonization (Fc α RI) – antigen presentation,
degranulation, cytokine production

Catalyze oxygen burst

Salivary antimicrobial proteins

Defensins

Disrupt pathogen membranes; antibacterial, antifungal, antiviral activity

Lactoferrin

Iron-binding protein; neutralizes bacteria and viruses, disrupts bacterial membrane

Cathelicidins

Destruct bacterial membranes; bind LPS

Lysozyme

Hydrolyzes peptidoglycan, effective mainly against Gram+ bacteria

α -Amylase

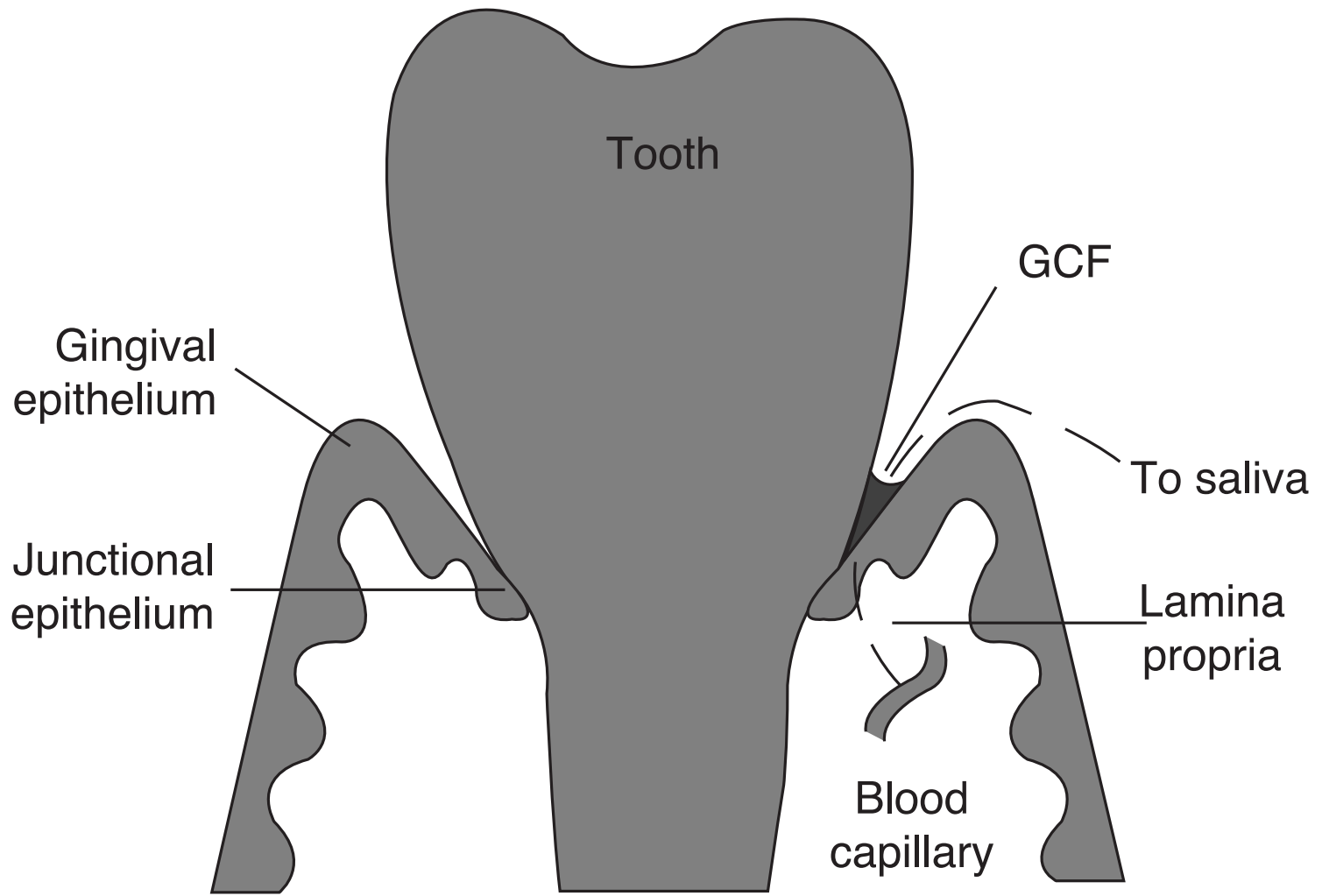
Cleaves the α -1,4-glycosydic bond; can bind LPS, influences bacterial adhesion

Mucins

Secretory and membrane-bound form, entrap and agglutinate pathogens

Gingival crevicular fluid (GCF)

Origin and flow of crevicular fluid



Gingival crevicular fluid (GCF)

Transudate from gingival capillaries

Accumulates around the necks of the teeth

Normally ~1ml/day, significantly increases in periodontitis and gingivitis

Content:

humoral components: antibodies (IgG), cytokines, digestive enzymes, antimicrobial proteins

cellular components: leukocytes, lymphocytes

Function: cleans the crevice between the tooth and the gingival epithelium

Gingival crevicular fluid (GCF)

Collection of GCF



Comparison of matrix metalloproteinase-3 and tissue inhibitor of matrix metalloproteinase-1 levels in gingival crevicular fluid in periodontal health, disease and after treatment: a clinico biochemical study. 2013. Kumar PM et al, Dent Res J.