# Basic Immunology

24th lecture:

Immunology of dental caries

# Dental caries

Latin, *decay*

Localized **decay** of tooth tissue

Sugar + bacteria = acid, dissolving the hard tissue of tooth

Prevalence: 95% in developed countries

Leads to loss of ~ **US$ 27 billion** annually worldwide

Prevention!!!  **Physical** (brushing teeth) + **chemical** (fluoride)

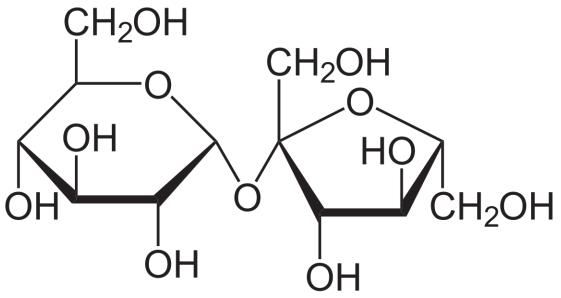
# Dental caries

# Pathophysiology

-Carbohydrates are fermented into acid by bacteria
-Acid (~*pH* < *5.2*) leads to demineralization of enamel and dentin

**Carbohydrates**

- Glucose
- Fructose
- Sucrose

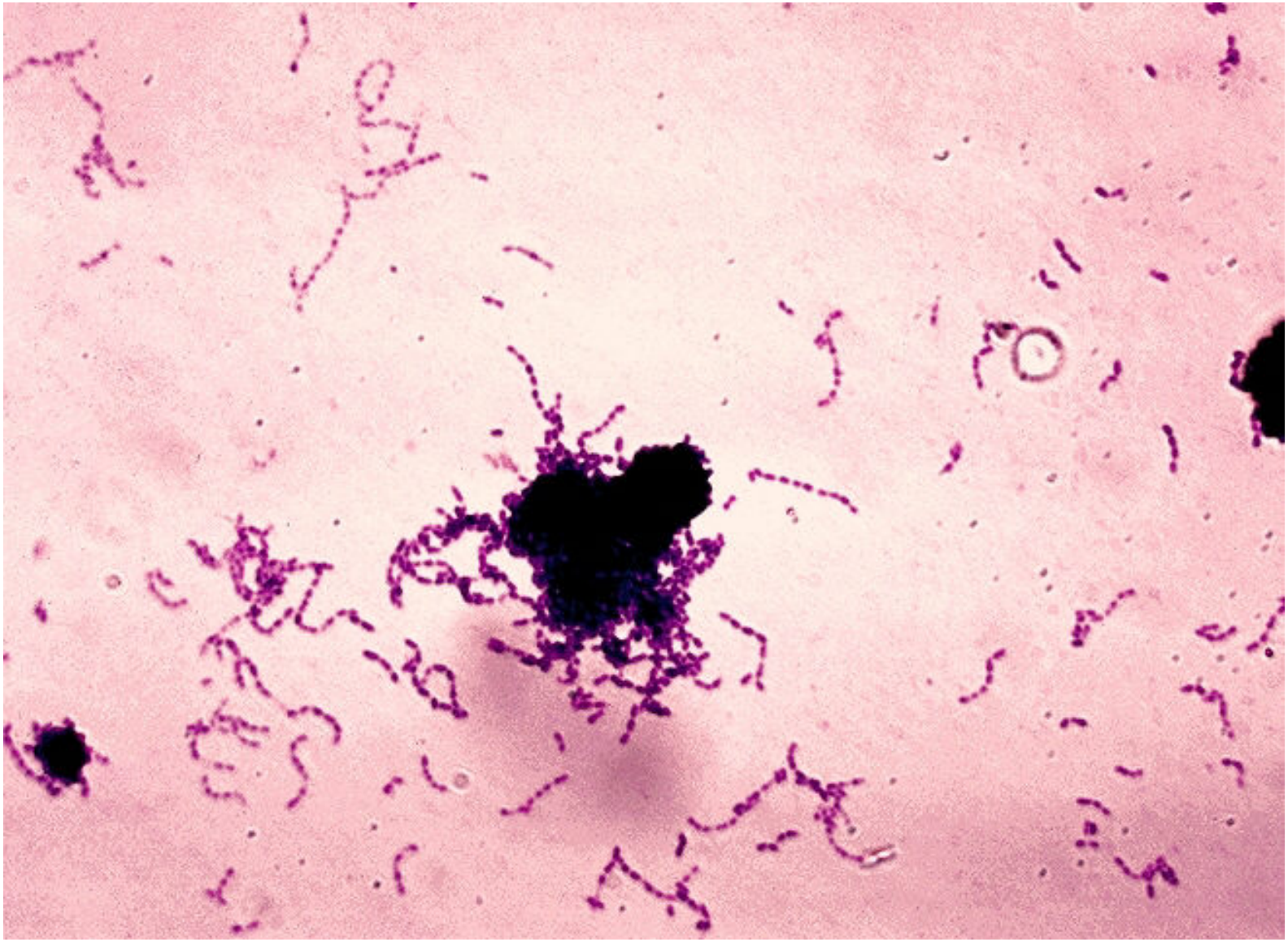



*Sucrose*

**Bacteria**

- Streptococci
- Lactobacilli
- Actinomyces
- *Most important: S. mutans*

# Streptococcus mutans



# Streptococcus mutans

Gram-positive, facultative anaerobe bacterium

Produces high amounts of extracellular polysaccharide, enhancing adhesion to tooth surface

Metabolizes sucrose to lactic acid via glucansucrase

Tolerates low pH (active excretion of protons)

**Antigens:**

- -Glucosyltransferase (GTF)
  - *Synthesis of adhesive glucans*
- -Streptococcal antigen I/II (SA I/II)
  - *Adhesin, important in bacterial colonization*
  - *Vaccination against SA I/II antigen?*

# Immune response

## Humoral response

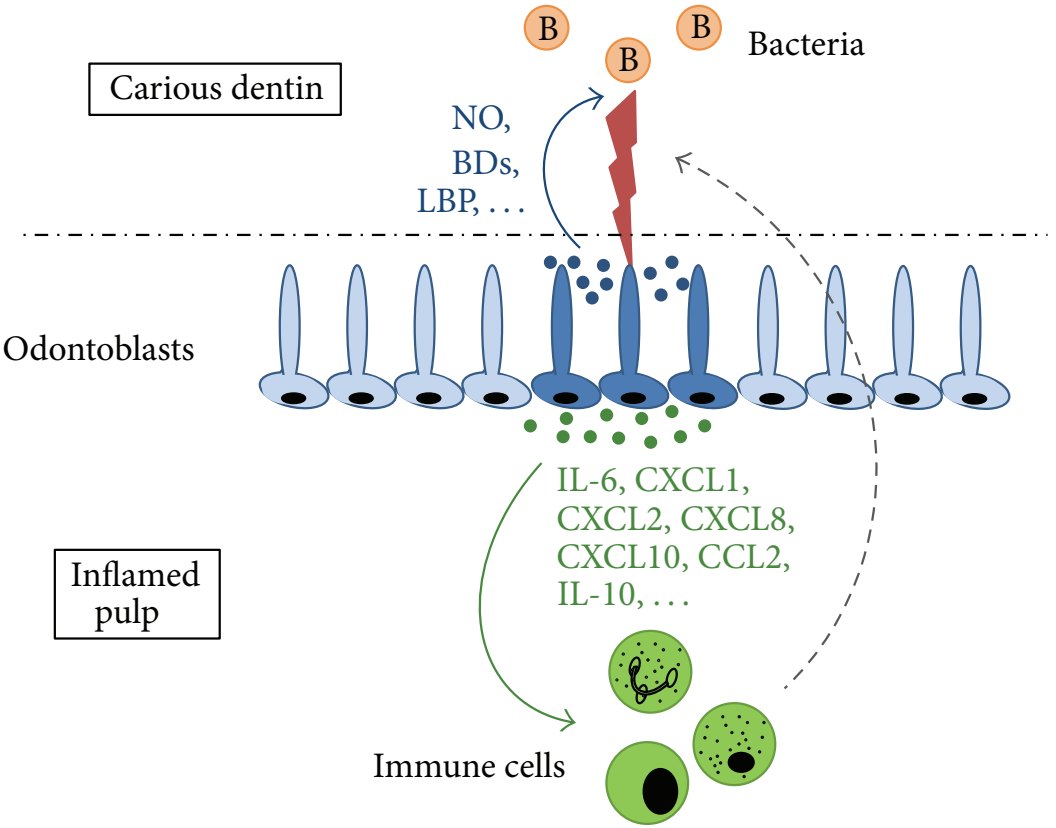
-Elevated serum IgG to S. mutans

-Salivary antibody response less consistent

## Odontoblast defense against dentin-invading bacteria

*-antibacterial molecules (blue)*

*-proinflammatory cytokines (green)*




*Dental pulp defence and repair mechanisms in dental caries. Farges JC et al 2015. Mediators Inflamm 2015:230251.*

# Immunization against caries

## Active immunization

Mucosal (oral/nasal) or systemic immunization

Repeated immunizations needed

Few human studies

## Passive immunization

*mAb against SA I/II fragment 3 prevented colonization of S. mutans*

*Antibody in milk…?*

## Natural immunity to caries

*Individuals with low caries experience had higher levels of serum IgG against SA I/II and salivary IgA against GTF*

# Genetic factors

HLA-DR6: low incidence of caries

HLA-DR6+ lymphocytes: stronger response against cariogenic bacteria (S. mutans)

HLA-DR4: higher risk of caries

# BRUSH YOUR TEETH!!!