



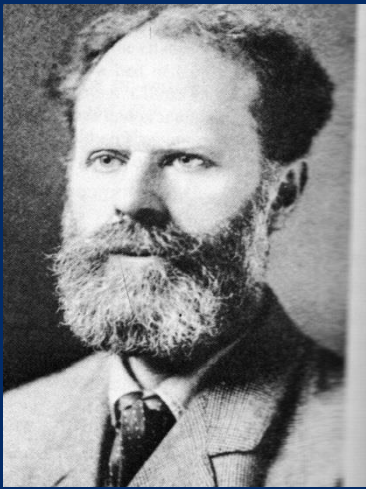
# Aethiology

- Infectious disease
  - Microbs
  - Fermentable sugars

# Antony van Leeuwenhoek



**First who observed microbes of oral cavity  
17.ct**



# Willoughby Dayton Miller (1853 -1907)

**1889** „Die Mikroorganismen der Mundhöhle“ „The Micro-Organisms of Human mouth“.

Explained dental caries as a result of decalcification (acids from microbial metabolism)

# Green Vardiman Black

(1836 – 1915)



When we will well understand reasons of dental caries, we will be able to heal it.

*(G.V. Black 1900)*

# Microbiom



**Human body**

**$10^{14}$  Living cells**

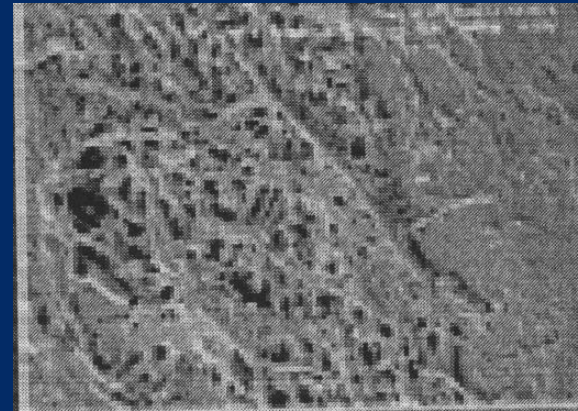
**10% Cells of human body**

**Mikcobiom**

**Oral microbiom**

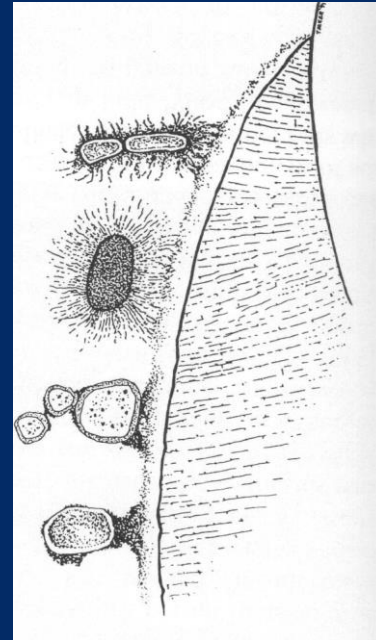
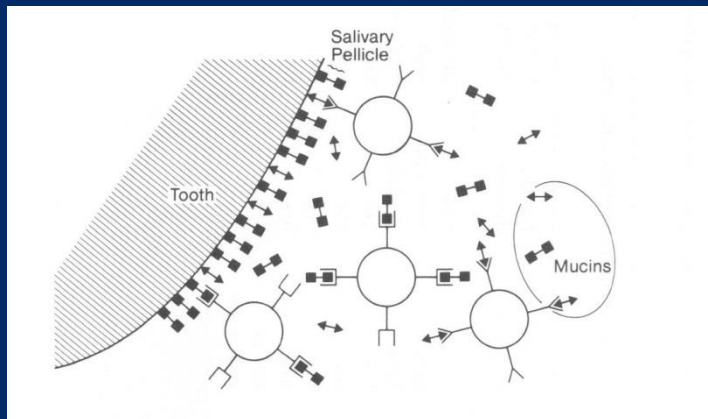
# Dental biofilm

- Pelicle–Protektivní efekt
- Pelicle–monomolekular proteinicl ayerrich on prolin and phosphatea and glycoprotein rich on sulphate
- Bind to  $\text{Ca}^{2+}$  ions of enamel
- Protective effect
  - *Erosion*
  - *Dentin hypersensitivity*
  - *Key role by remineralization*



# Biofilm

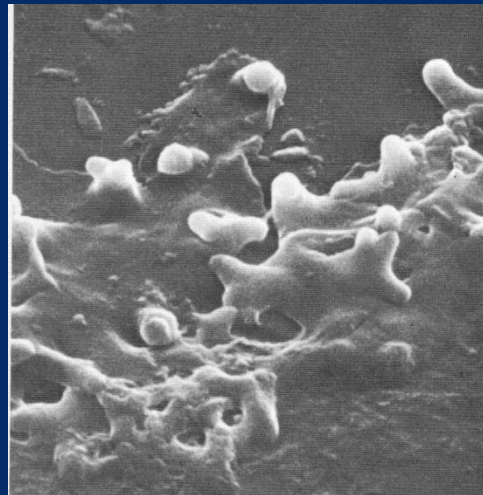
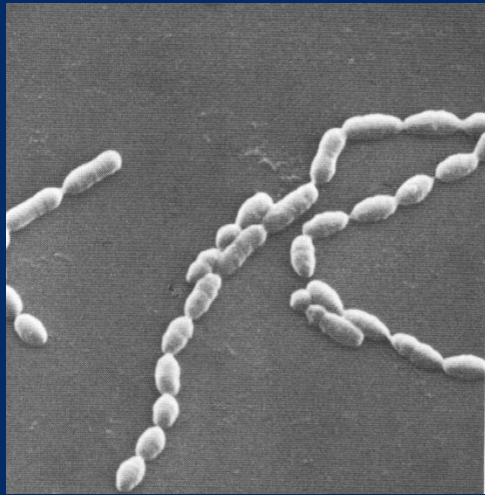
- Adherence
- *Adhezins*
- *Fimbriες*





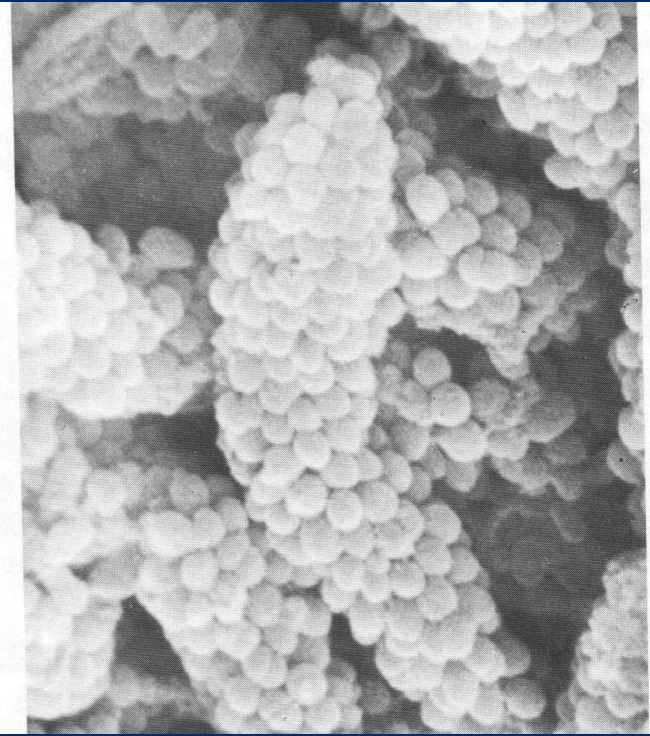
# Biofilm

- colonization
- *multiplication*
- *koaggregation*

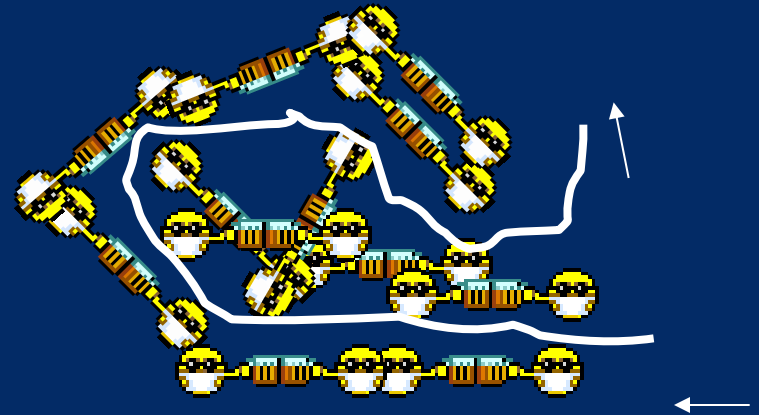
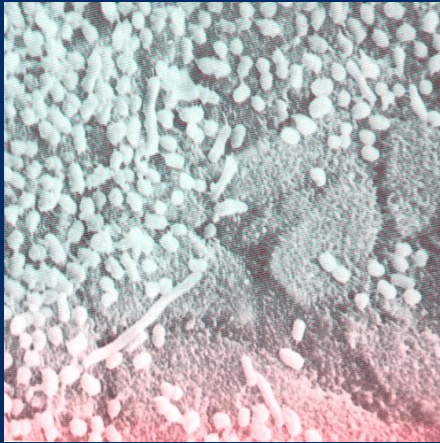


# Biofilm

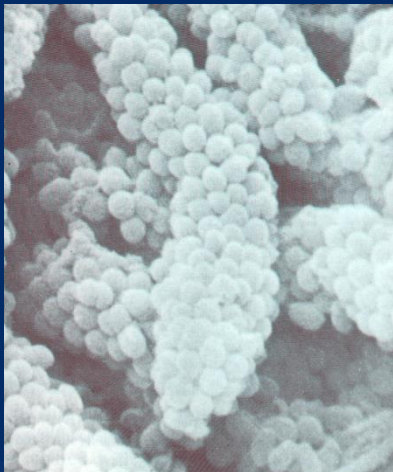
- Maturation



# Biofilm



**Higher metabolic activity**  
**Higher resistency**  
**(CHX 300x, AF 75x)**  
**Higher virulency**  
**Good conditions for survival**



# Cariogenicity

- Streptococci : mutans, sanguis, mitis, sobrinus.
- Laktobacil
- *Production of acids (acidogenity)*
- - *Production of extra aand intracelullar polysacharids*
- - *Survival in acidic environment (aciduricity)*

# Acidobasic dynamic in biofilm

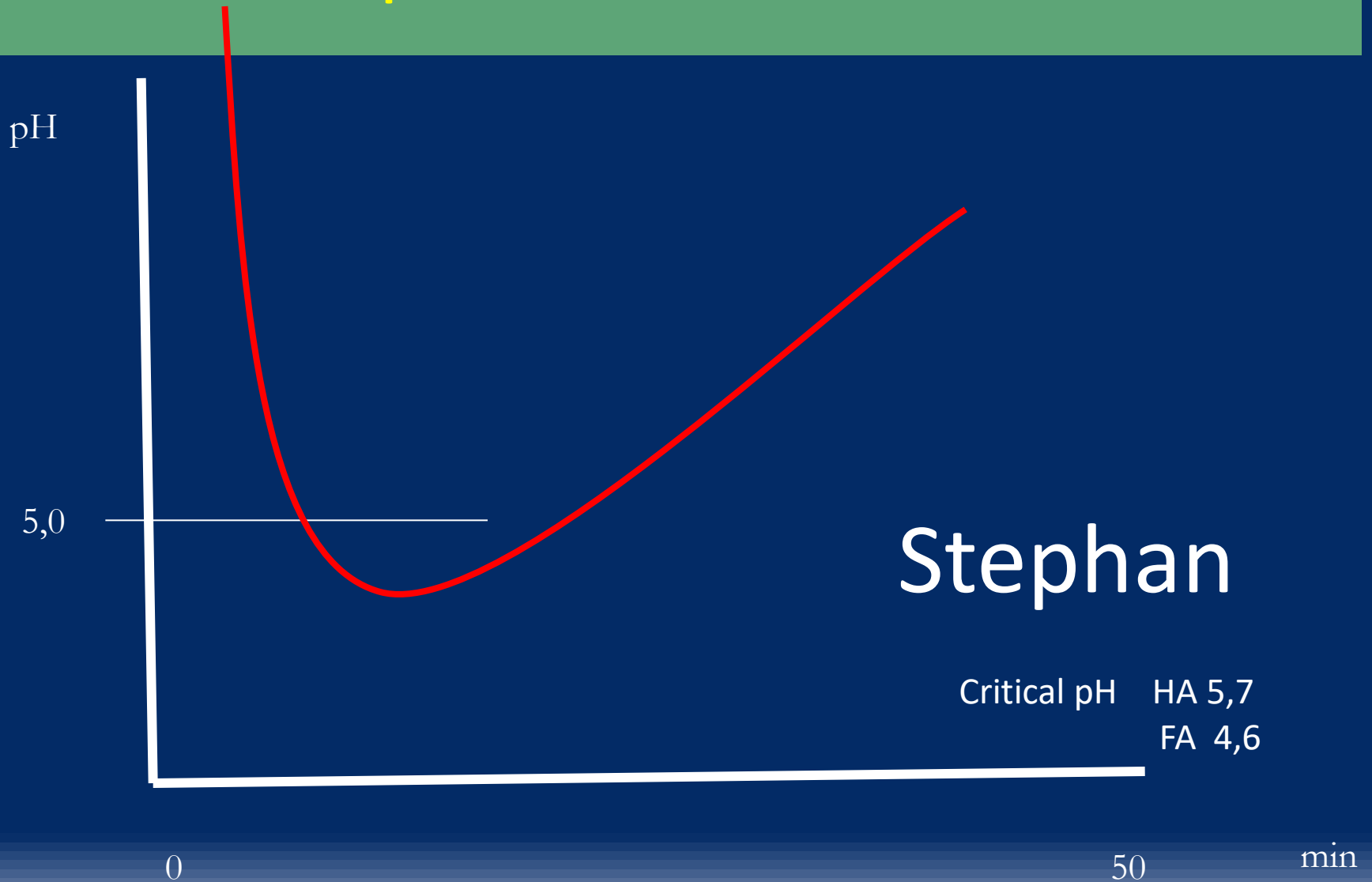
## Glykolyysis

- Lactic acid and other acids

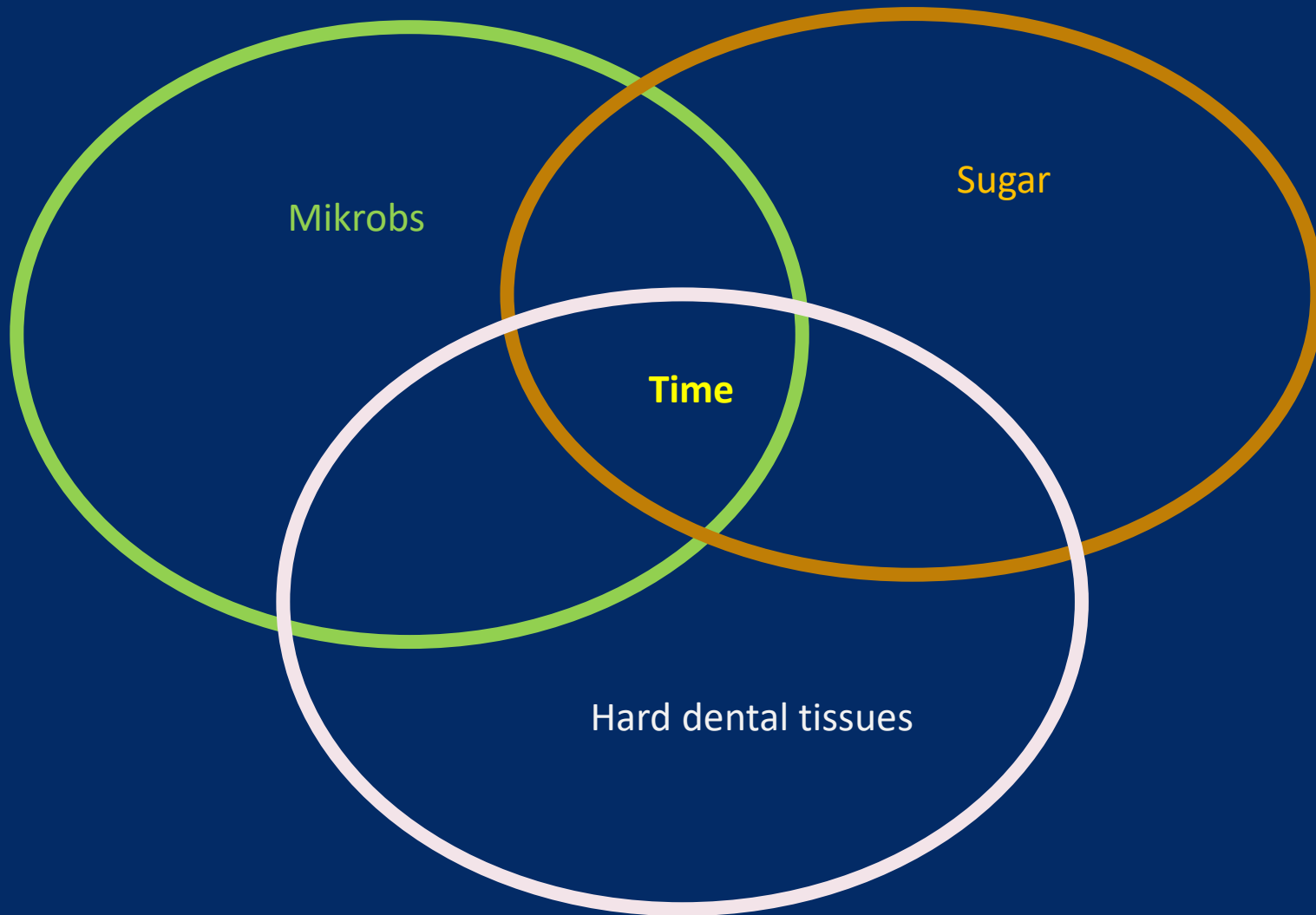
## Base production

- $\text{NH}_4^+$
- Sugars 20 – 40% - tendency to acid púroduction and decalcification

# Metabolic procedures in dental biofilm



Critical pH HA 5,7  
FA 4,6

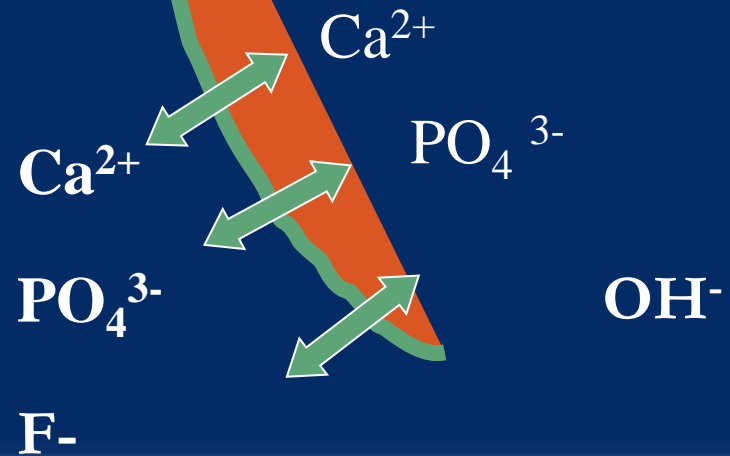
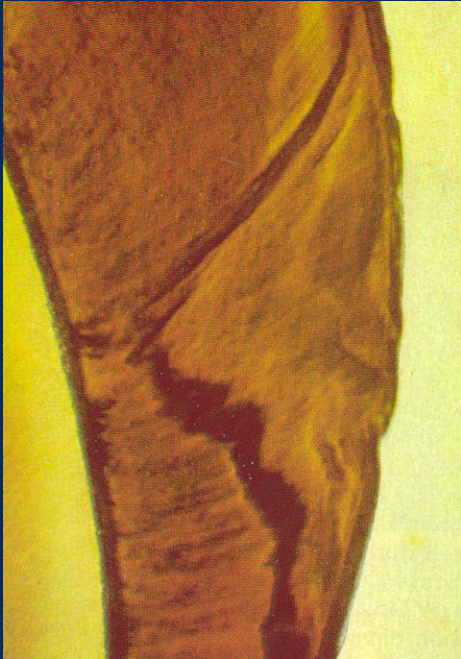


Mikrobs

Sugar

Time

Hard dental tissues

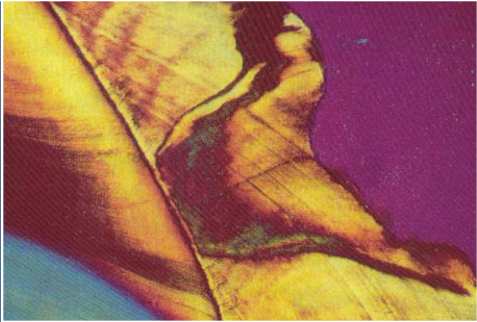
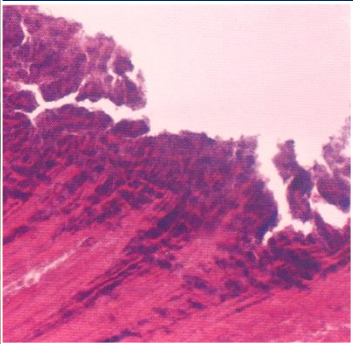




Cavitated lesion

Decalcification

Non cav



Time

# Biofilm

## **Non specific hypothesis**

- Plaque is always the reason
- **Specific hypothesis**
- Only pathogenic plaque is the causal factor

# Saliva and dental caries

700 – 800 ml. (0,3 ml), stimulated (1 ml).

- Product of salivary glands 700 – 800 ml.  
Klidová (0,3 ml), stimuloaná (1 ml).

## Clearance

- Microbs
- Rests of food

# Saliva and dental caries

- Minerals
- Calcium and phosphates – oversaturated solution remineralization
- Proteins
- Glykoproteins - pelicle, barrier against overgrowing of crystals on the surface

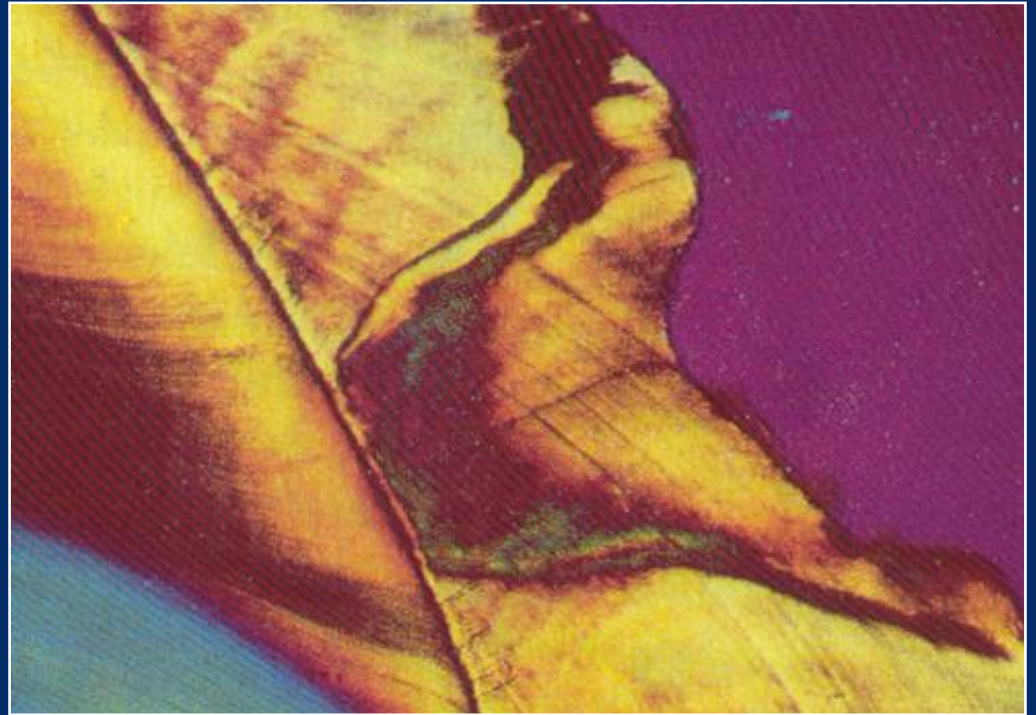
# Buffer capacity of saliva

- Bicarbonatesystem
- Phosphate system
- In saliva not in plaque

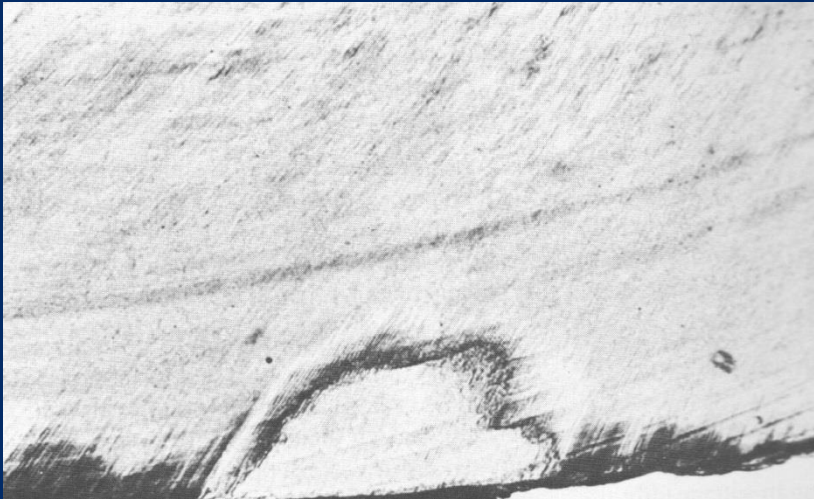
# Slina

- Klíčová role v maturaci skloviny
- V remineralizaci iniciálních kazivých lézí
- V remineralizaci demineralizovaných okrsků skloviny

# Inicial lesion



# Porosity



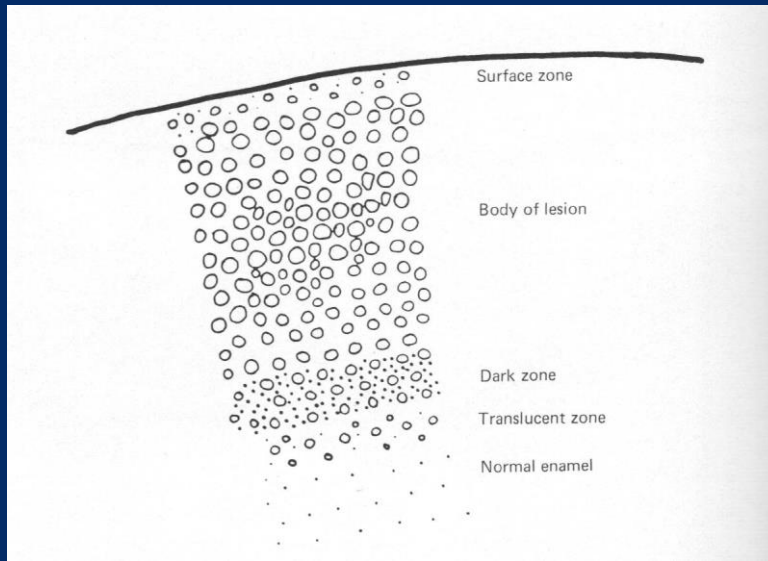
Superficial zone  
5 %

Body of lesion  
25%

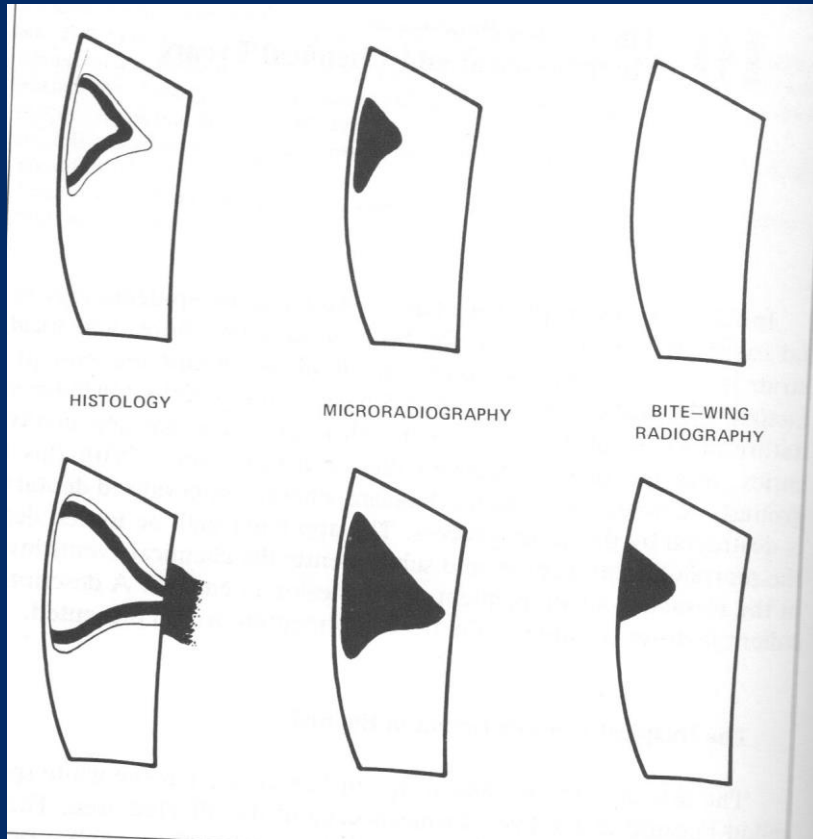
Dark zone  
2 –4%

Translucent zone  
1%

Normal enamel  
0,1%%





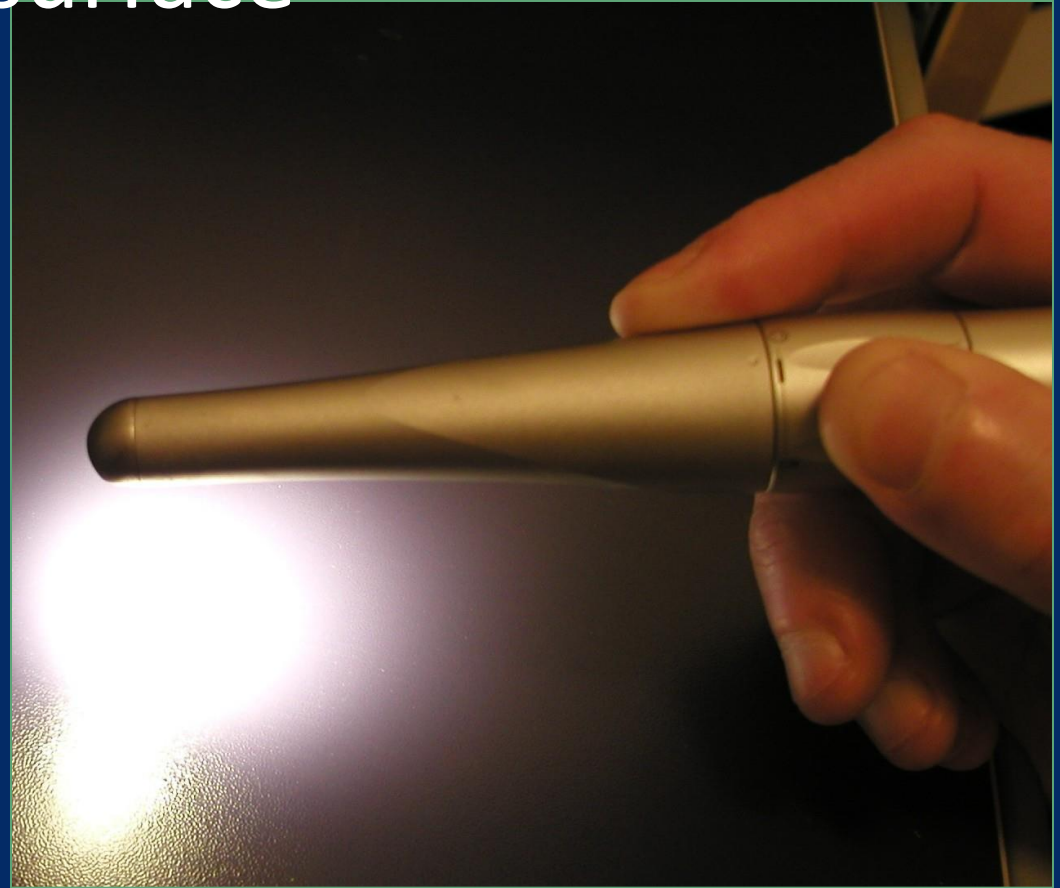
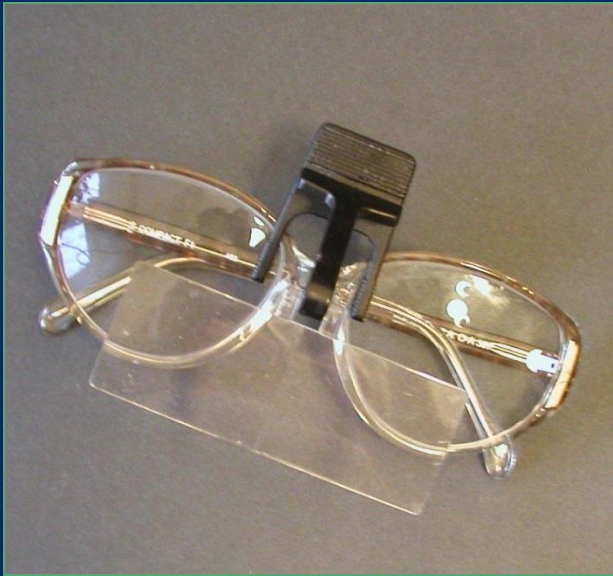


Histology x mikroradiography x BW

# Diagnosis

- Visual inspection (ICDAS)
- Radiography
- Photography
- Optical nonfluorescent methods
- Optical fluorescent methods
- Transillumination
- Measurement of electrical impedancy

# Visual inspection, magnification, dry surface

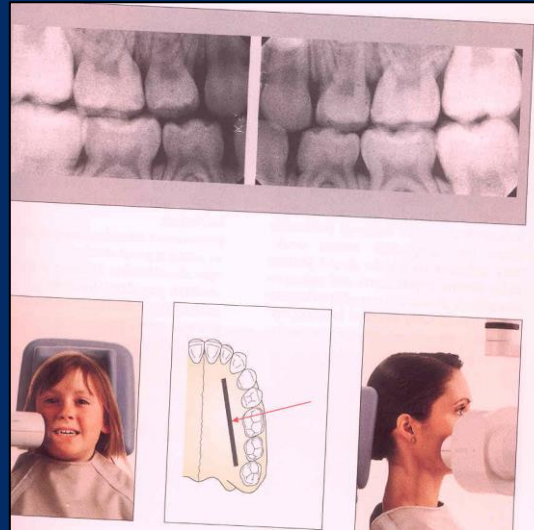
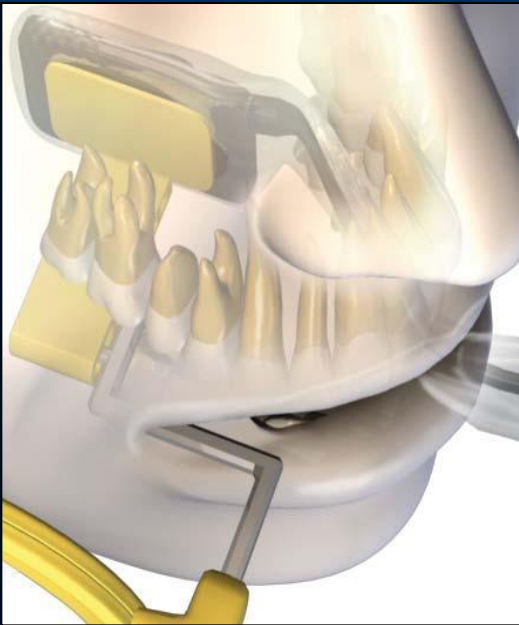


# Photography

- Good documentation and evaluation of lesion
- Flash and light can misrepresent



# Radiography

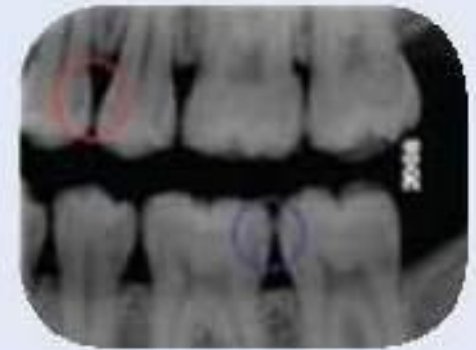
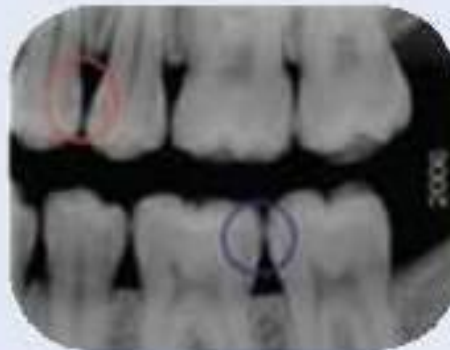


Bite wing

# Radiography

Klinické: **Identifikace** - Vyšetření: Bitewing rtg

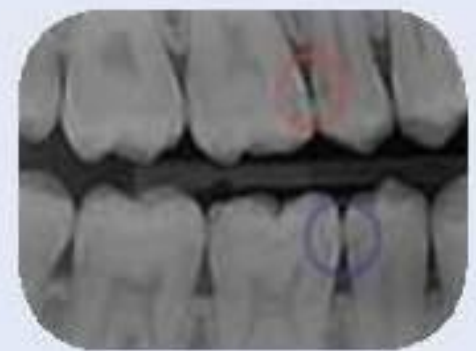
Léze skloviny		ICDAS
E1	Vnější polovina skloviny	0, 1
E2	Vnitřní polovina skloviny	1
Léze dentinu		ICDAS
D1	Vnější třetina dentinu	2
D2	Prostřední třetina dentinu	3
D3	Vnitřní třetina dentinu	4



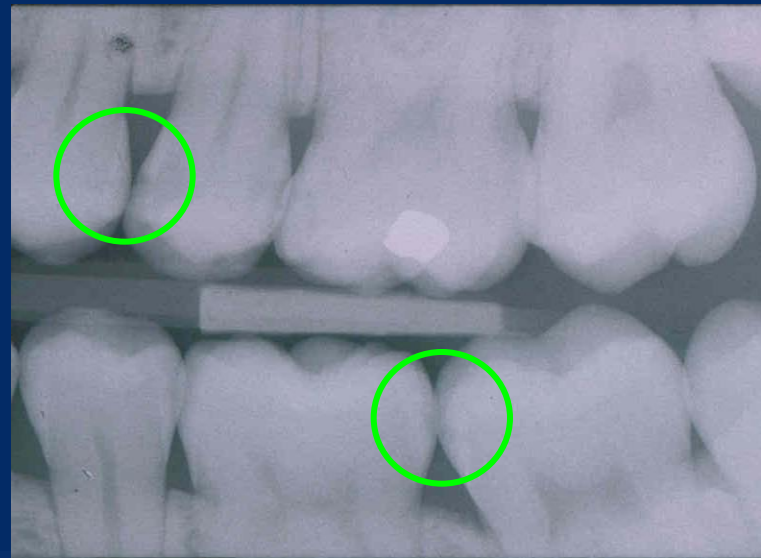
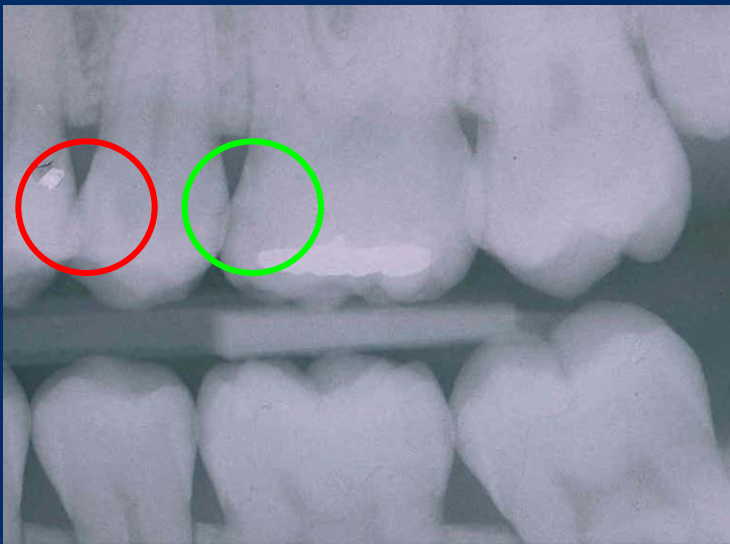
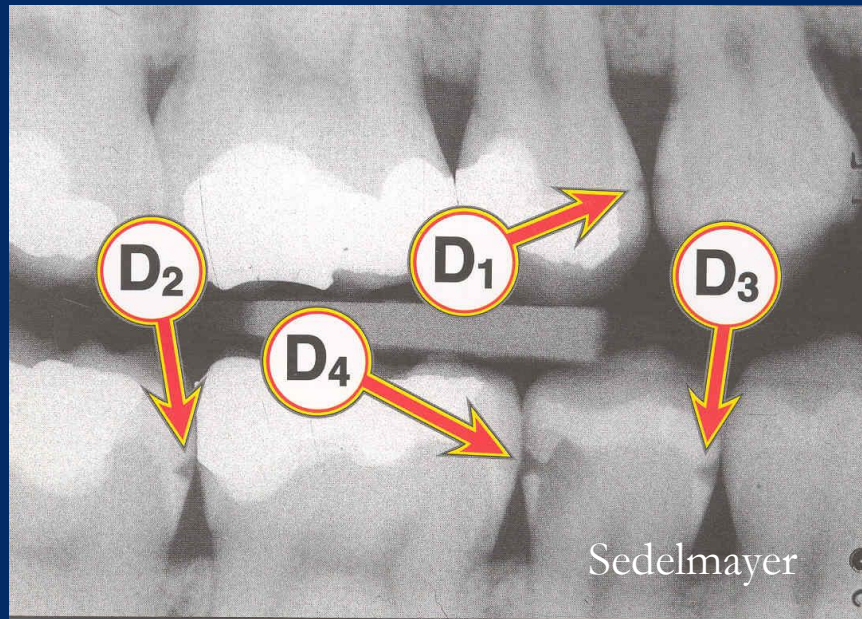
Kontrola za 2 roky u počátečních lézí D-1 (modrá) a D-2 (červená)



D-3



D-1 a D-2



# Optical non fluorescent methods

- Distorsion og lihgt (OCM)

Non invasive, various results

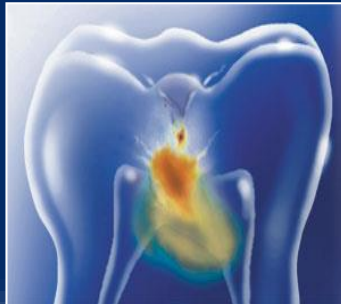


# Optical fluorescent methods

- Principle:

Absorption and irradiation back

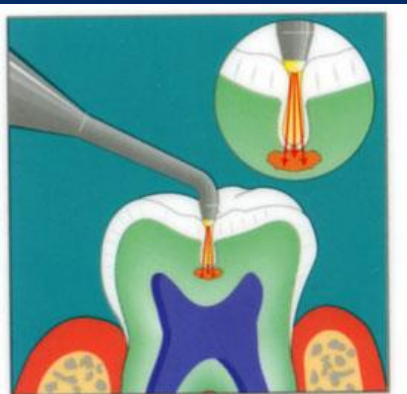
- DIAGNOdent, DIAGNOdent pen, QLF, Vista Proof



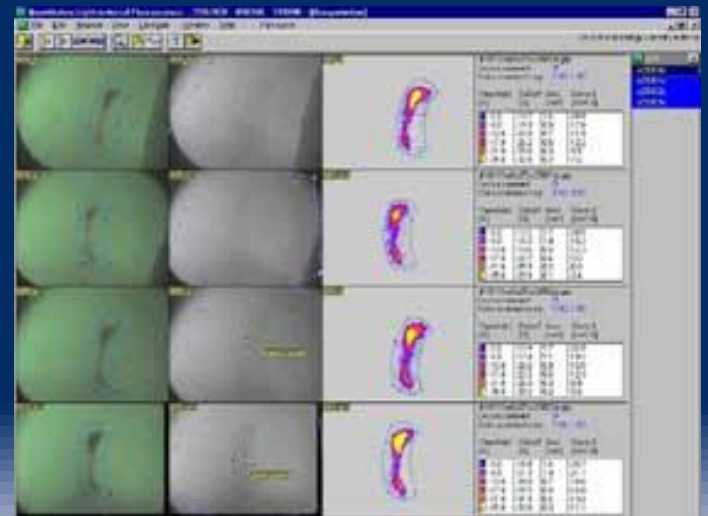
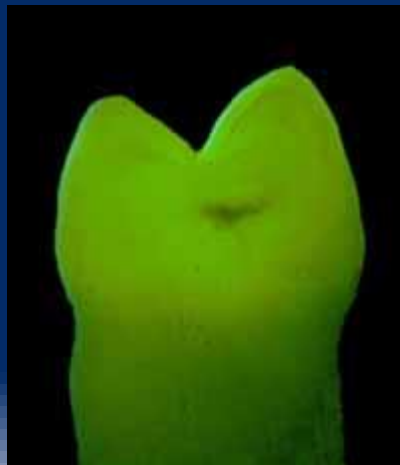
# Infračervená laserová fluorescence

- **DIAGNOdent, DIAGNOdent pen**
- Toto fluoreskující záření se zobrazuje jako aktuální a rovněž jako maximální hodnota (peak)
- Hodnoty vyšší než 24 (DIAGNOdent), vyšší než 17 (DIAGNOdent pen) – kaz
- Falešně pozitivní výsledky při nedokonale očištěném zubu

# DIAGNODENT



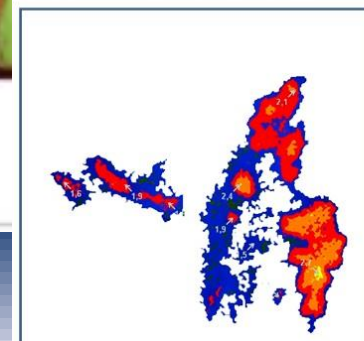
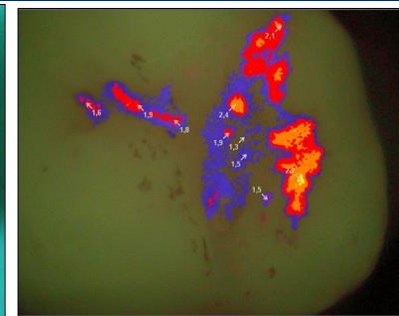
# Quantitative Light – induced Fluorescence n c y QLF



# Vista Proof

- **Intraorální kamera** využívající princip fluorescence
- Kariézně změněné plošky emitují **červené** světlo, zdravé zubní tkáně **zelené** světlo
- Software vyhodnotí poměr červeného a zeleného spektra – zdravá sklovina a kariézní léze se barevně a číselně znázorní (škála 0-4) – sledování vývoje demineralizace + záznam
- Lze znázornit i zubní plak (není nutné použít dalších prostředků)
- Novinky – **Vista Cam iX** – kamera s dvěma vyměnitelnými koncovkami (intraorální X fluorescenční)
- **SoproLife** – zhodnocení zubního kazu v diagnostickém modu + rozlišení mezi zdravou a kariézní tkání v ošetřovacím modu

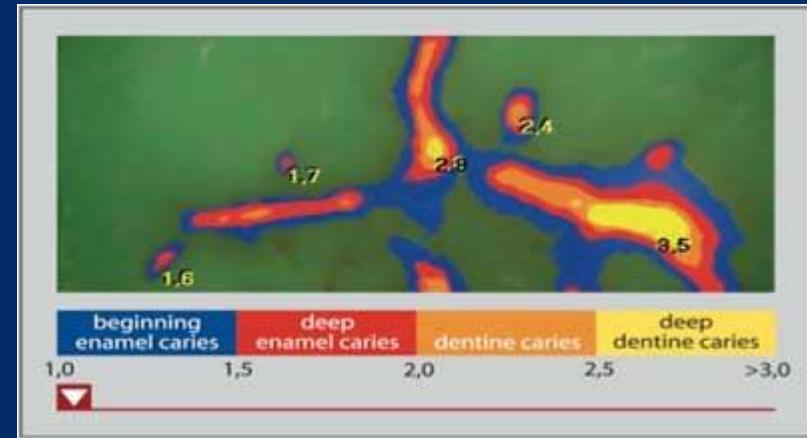
# Vista Proof



# Vista Cam iX



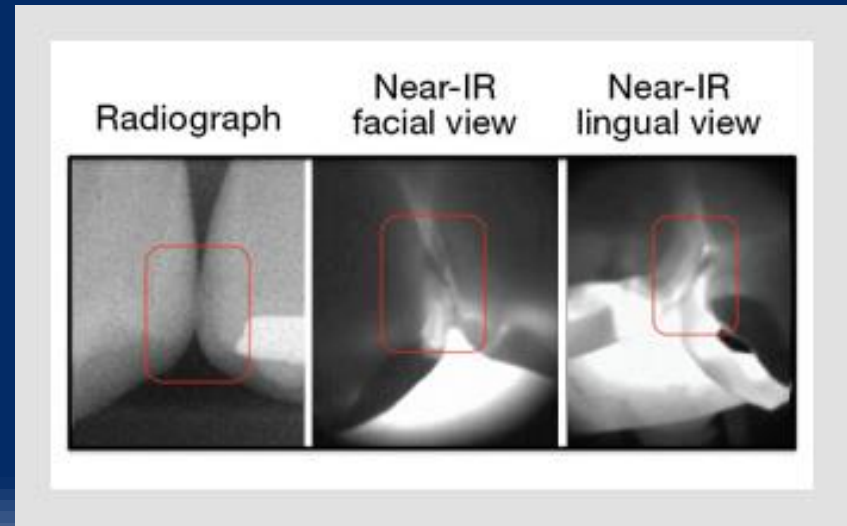
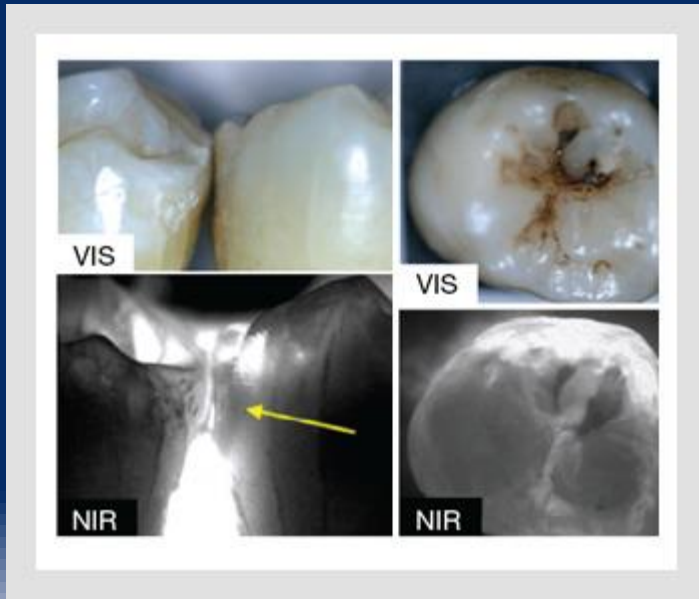
# SoproLife





# FOTI – fibre optic transillumination

## Proximal caries lesion



# DIFOTI

(Digital Fibre Optic  
Trans-Illumination)

- j bílého světla – kamera s CCD senzorem – počítač – zobrazení jako obrázek



# DIAGNOCam



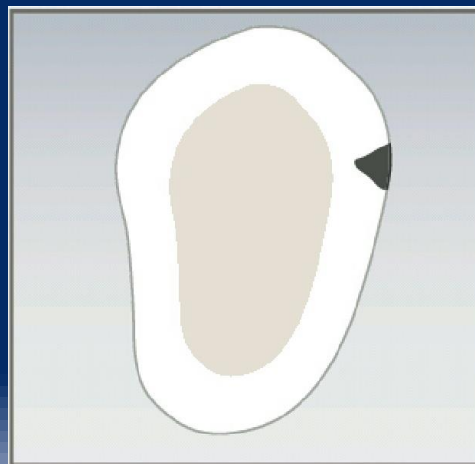
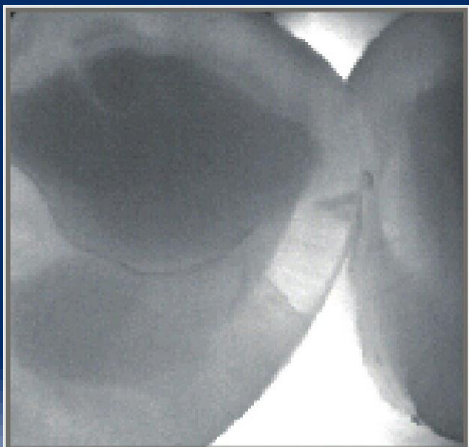
- DIFOTI (Digital Imaging Fiber Optic Transillumination)
- light(700-1400nm)
- Caries lesions and cracks—light absorption—dark spots
- (higher content of water in caries lesions – higher absorption of light)
- Documentation

# DIAGNOCam- klasifikace nálezů

- 0 –

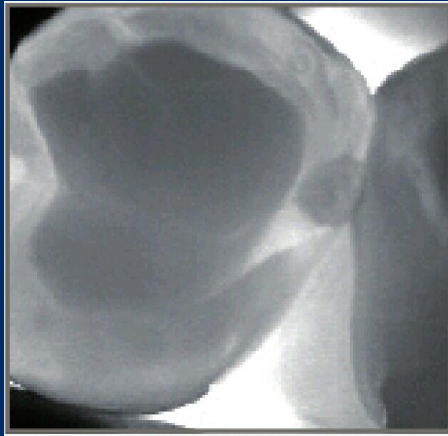


- 1.

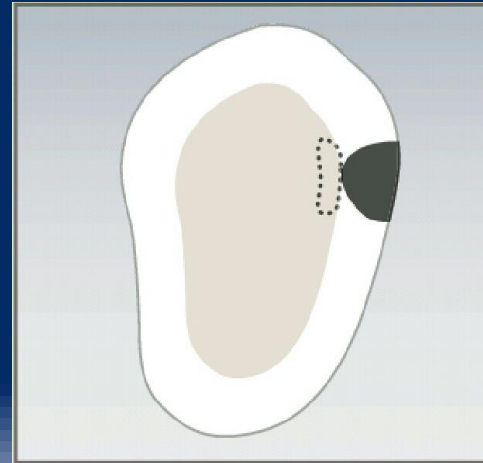
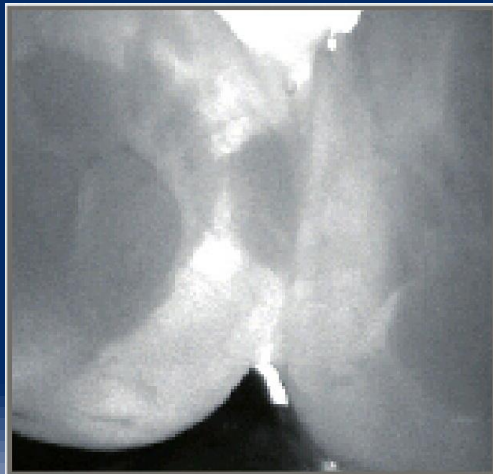


# DIAGNOCam- klasifikace nálezu

- 2- caries in enamel

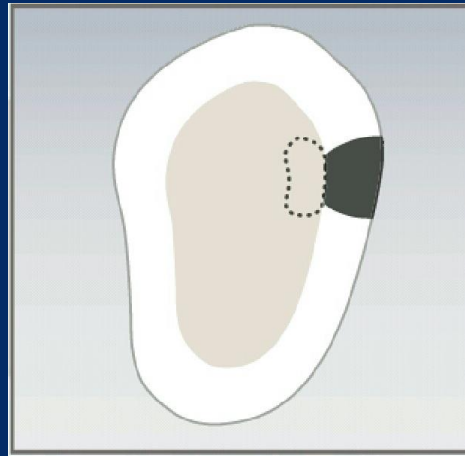
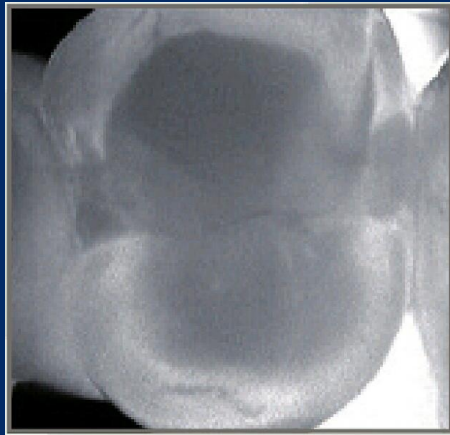


- 3 - caries in enamel and dentin

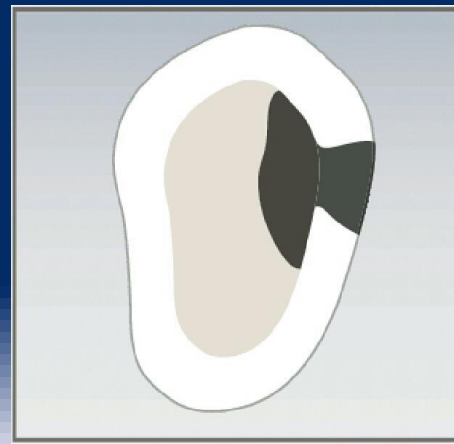


# DIAGNOCam- klasifikace nálezu

- 4 - kaz ve sklovině zasahující do dentinu – použít minimálně invazivní metodu

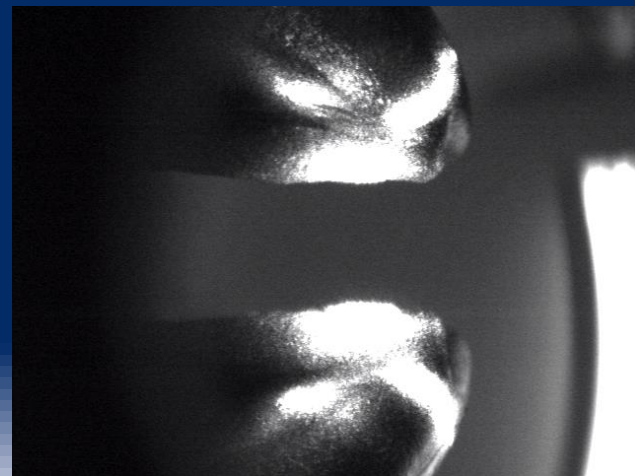
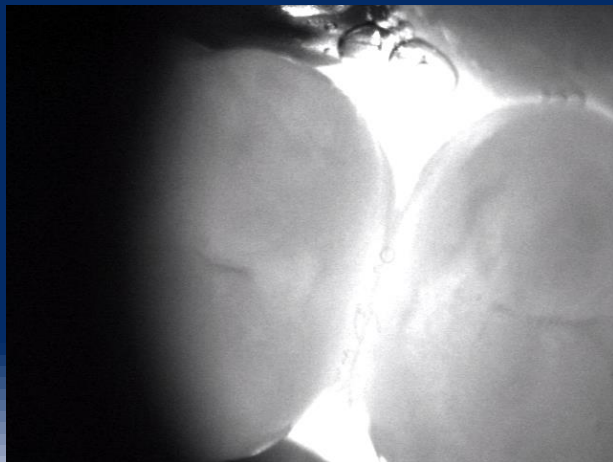
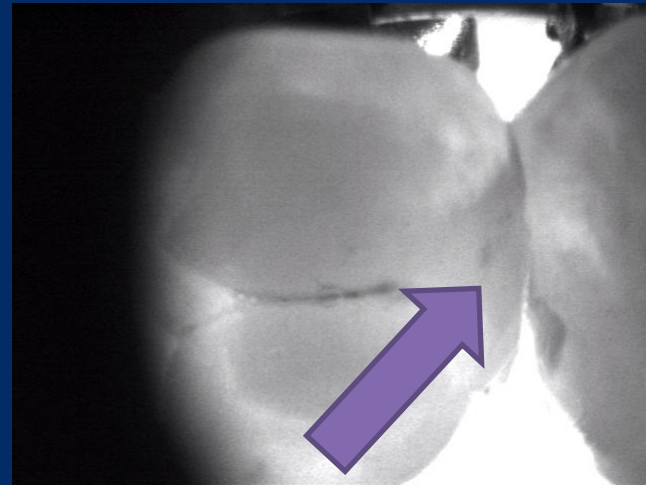
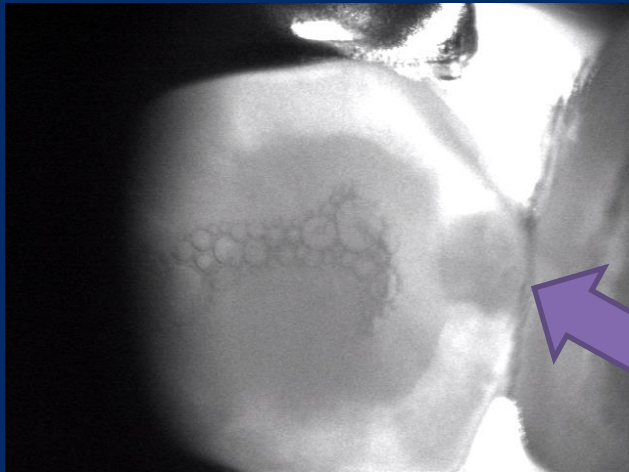


- 5 – kaz rozšířený do dentinu – použít invazivní metodu



# DIAGNOCam





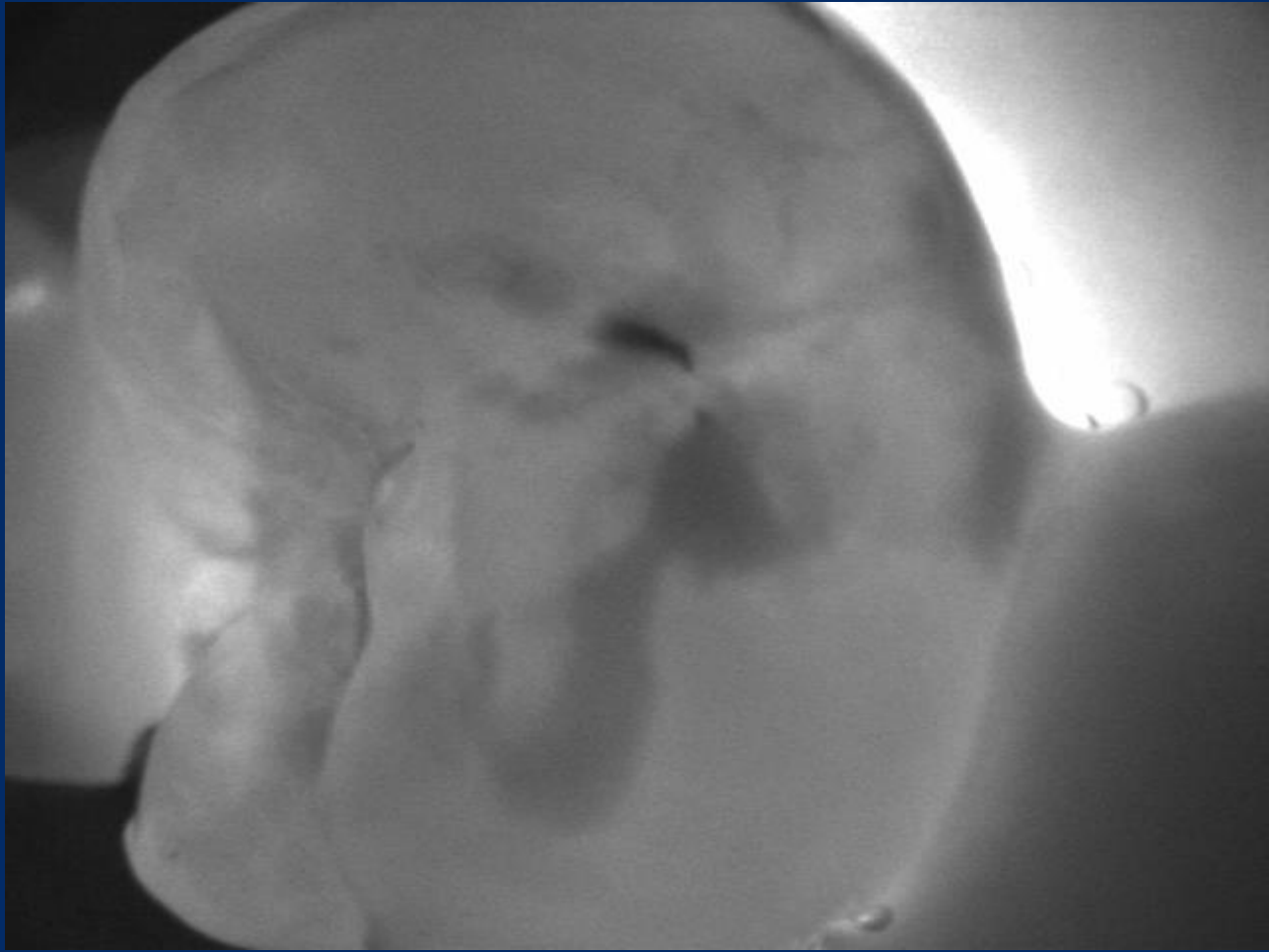


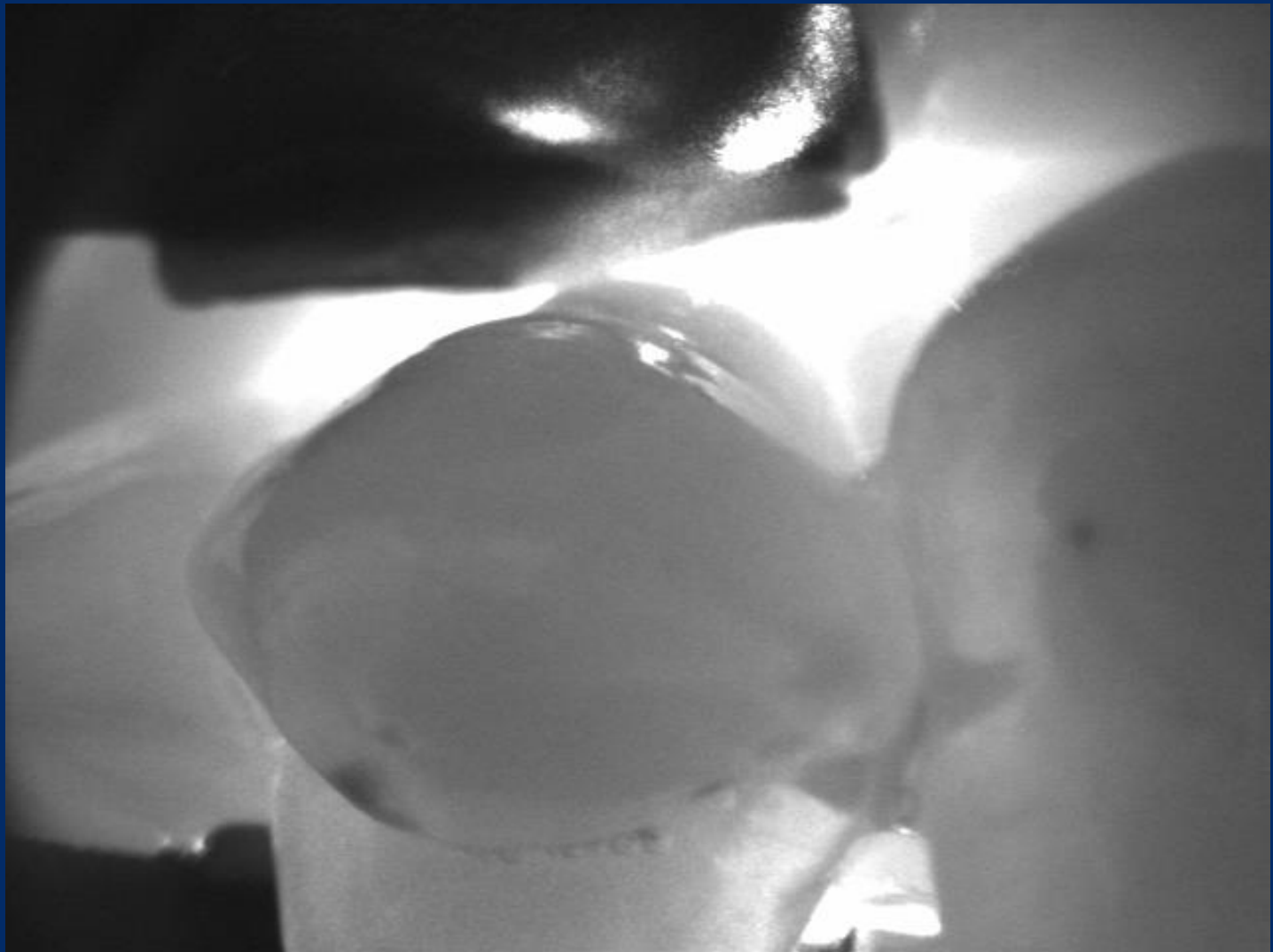


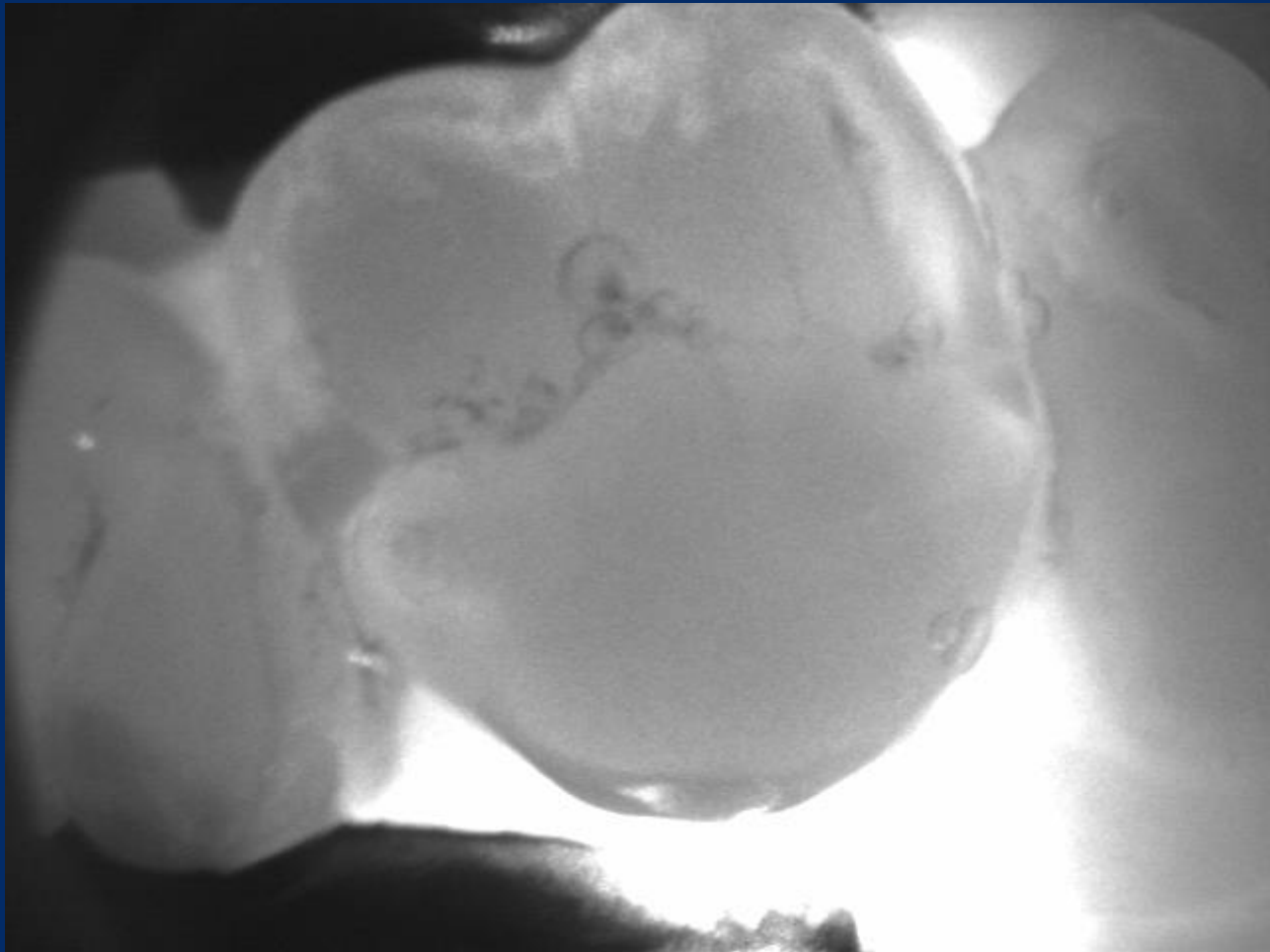
Diagnocam



Bitewing





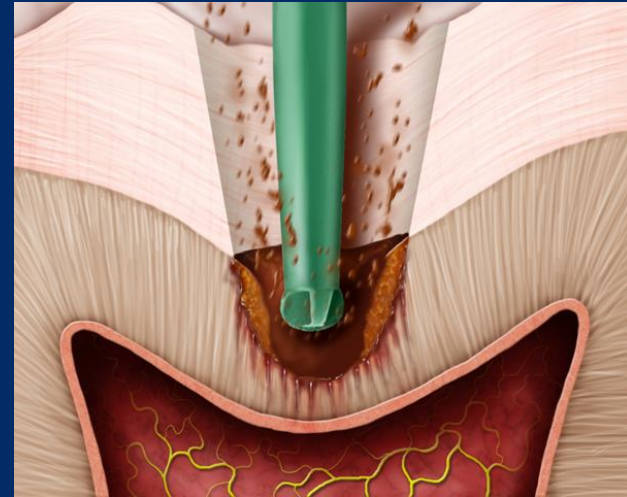


# Transiluminace pomocí optického vlákna- FOTI

- Přístroje k diagnostice aproximálních kazů (KaVo DIAlux probe)
- + vyšší senzitivita než RTG snímek a opakovatelnost vyšetření
- - necitlivost přístroje na léze kolem výplní a nemožnost zhotovovat snímky a dokumentovat stav



# Measurement of electrical resistancy



# Pit and fissure caries

- Class I. acc. to Black

Caries danger area

Special morphology

Special structure of enamel



# Diagnosis

ICDAS—INTERNATIONAL CARIES DETECTION  
AND ASSESMENT SYSTÉM



# ICDAS—INTERNATIONAL CARIES DETECTION AND ASSESMENT SYSTEM



- **ICDAS(2002)**–6 code, later **ICDAS –II** –4code
- ☐ Caries lesions in pit and fissures, smooth surfaces, roots and enext to fillings –**CARS** (Caries Associated with Restoration and Sealants)
- Blunt probe
- Clean and dry surfaces, time of observation 5 s
- <http://www.icdas.org/courses/english/index.html>

# ICDAS

Before assesment

Clean and dry teeth surfaces

Blunt probe

5 seconds observation



# ICDAS – criteria

- 0 no changes observed



# ICDAS - criteria

- 1.- first visual changes observed on dry surface only (opaque, white, brown)



# ICDAS - criteria

- 2. – first visual changes on wet surfaces



# ICDAS - criteria

- **3** – enamel is still present, zone of decalcification is out of fissure, dentin is affected



# ICDAS - criteria

- 4 – dark colour around the fissure (grey, blue, brown), enamel can be broken





# ICDAS - criteria

- 5 – cavitated lesion



















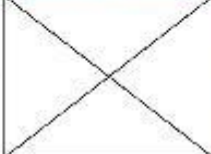



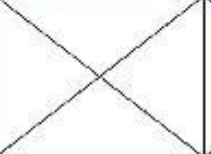
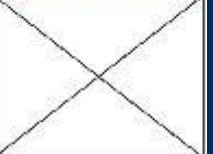


# ICDAS - kritéria

















- 6 – large cavitation



# UniViss – universal scoring system (occlusal surface)

Universal Visual Scoring System for pits and fissures (UniViSS occlusal)						
Second step: Discoloration Assessment	First step: Lesion Detection & Severity Assessment					
	First visible signs of a caries lesion	Established caries lesion	Microcavity and/or localised enamel breakdown	Dentin exposure	Large cavity	Pulp exposure
	Score F	Score E	Score M	Score D	Score L	Score P
Sound surface (Score 0)	No cavitations or discolorations are detectable.					
White (Score 1)						
White-brown (Score 2)						
(Dark) Brown (Score 3)						
Greyish translucency (Score 4)						

# UniViss (smooth surface)

Universal Visual Scoring System for smooth surfaces (UniViSS smooth)						
Second step: Discoloration Assessment	First step: Lesion Detection & Severity Assessment					
	First visible signs of a caries lesion	Established caries lesion	Microcavity and/or localised enamel breakdown	Dentin exposure	Large cavity	Pulp exposure
	Score F	Score E	Score M	Score D	Score L	Score P
Sound surface (Score 0)	No cavitations and/or discolorations are detectable					
White (Score 1)						
White-brown (Score 2)						
(Dark) Brown (Score 3)						
Greyish translucency (Score 4)						

# Classification acc to Black



# Classification acc to Black



# Classification acc to Black



# Classification acc to Black





# Classification acc to Black



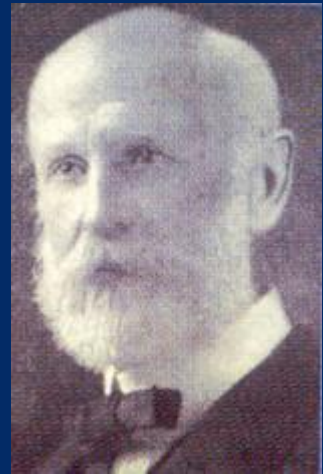
# Classification of dental caries Mount and Hume

- Location
  - 1.Occlusal
  - 2. Proximal
  - 3.Cervical
- Size
  - 1.Small
  - 2. Medium
  - 3. Big
  - 3.Large

# Occlusal caries

- ICDAS 0 – 1 : observation
- ICDAS 2: observation or preventive filling
- ICDAS 3 – 4: filling therapy

# Preparation



- Preparation is an instrumental treatment of carious tooth that leaves the rest of the tooth that is restorable, resistant and that prevent the origin of dental caries at the same surface.