



WHY ARE TEETH YELLOW?

HOW IS TOOTH COLOR ASSESSED?

## BACKGROUND

Over 85% patients ask their dental professional about whitening.

(U.S. dentalcare.com whitening study 2021)

21% have received whitening treatment from a DP in the past year

(2016 Consumer habits & practices study)

Key barriers to patients taking action?

cost, comfort, convenience





## NATURAL TOOTH COLOR

- Enamel is translucent
- Underlying dentin ranges from very white to very yellow
- Dentin continues to yellow as we age ( $\sim 0.06 b^*$  units / yr.)
- Other impacts:
  - Medications (tetracycline)
  - Trauma (blood)
  - Chromogenic food and beverage (wine/coffee)
  - Non-vital

The sources of natural tooth color include structural features of the teeth including thickness, translucency, dentin color and in the absence of staining may be dominated by genetic factors





## TYPES OF STAIN

STAIN: SOURCE OF DISCOLORATION THAT IS NOT OF NATURAL ORIGIN

### Extrinsic

Chromogenic bacteria, food drink, metallic compound exposure. Will not adhere to smooth enamel surface rather, the acquired pellicle and plaque calculus accumulates the stain. Less likely to occur with effective oral hygiene habits.

### Intrinsic

Incorporated into the matrix of the tooth structure. Structural Composition, Tetracycline, Fluorosis.

### Understanding the type of stain

Obtaining information on diet, lifestyle, behaviors, oral health habits and occupation will help practitioners identify the cause of the stain which is critical to the discussion of the best treatment options.



IMAGE SOURCE: <http://jairjp.com/JANUARY%202013/02%20SRUTHY%20PRATHAP.pdf>



Image Courtesy of P&G

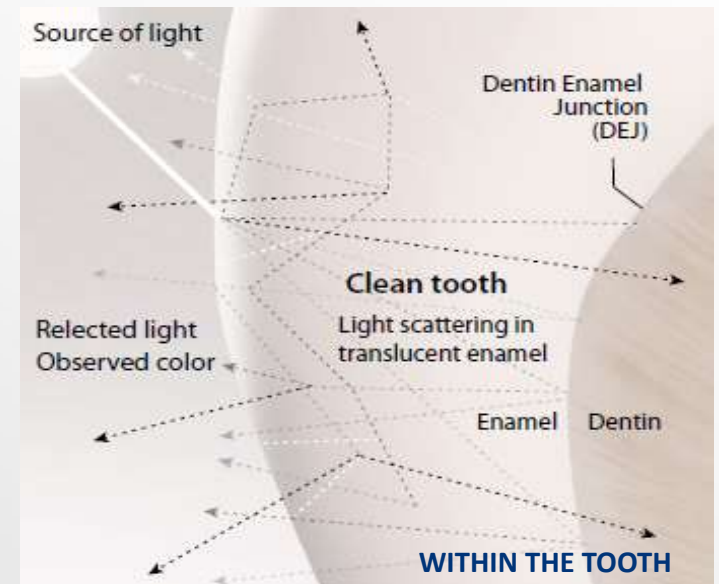


## HOW WE SEE TOOTH COLOR

Because teeth are translucent – color is observed from both on and within the teeth



**Optical properties of surface stain on enamel.**  
Light reflects off the surface with little penetration into enamel. Observed color is primarily from stain.



**Optical properties of a clean natural tooth.**  
Light penetrated translucent enamel and is scattered. Some light reflects back out. Observed color depends on absorption of wavelengths during scattering.



# ASSESSING TOOTH COLOR

Limitations such as incorporating differences in lightness, chroma and hue as well as accounting for changes seen with the entire tooth versus only certain areas of the tooth

Laboratory Shade Guides are designed for measuring for restorative materials.



Digital Image Analysis (DIA) removes subjectivity to assess changes in:

- Yellow to blue ( $\Delta b^*$ )
- Lightness - whiteness ( $\Delta L^*$ )
- Luminescence: Red to Green ( $\Delta a^*$ )

