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Scriptwriter Name: Pallavi Sharma

Project Page Link: https://review.jove.com/files_upload.php?src=21524508

Title: Impact of Common Fruit Juices and Toothbrushing on the Discoloration of Primary Teeth

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

✓ Correct

2. Interview statements: Which interview statement filming option is the most appropriate for your group? **Please select one.**



Interview Statements are read by JoVE's voiceover talent.

3. Proposed interview filming date: Please indicate the proposed date that your group will self-film interviews: **03/24/2026**

When you are ready to submit your video files, please contact our Content Manager, [Utkarsh Khare](#).

Current Protocol Length

Number of Steps: 10

Number of Shots: 12

Introduction

NOTE to VO: Please record the introduction and conclusion statements

INTRODUCTION:

REQUIRED: Summarize your research focus and the main questions it aims to answer.

- 1.1. This study investigates how common fruit juices discolor primary teeth and whether brushing mitigates these staining effects.

- 1.1.1. [2.4.2](#)

~~Describe the research contexts or systems in which this protocol can be applied.~~

- 1.2. This protocol can be applied in dental research to assess discoloration and the effectiveness of oral hygiene interventions in primary and permanent teeth.

- 1.2.1. [Figure 4](#)

CONCLUSION:

~~Describe the most important consideration or challenge when performing this protocol.~~

- 1.3. Maintaining standardized conditions, including consistent brushing, daily solution renewal, and accurate spectrophotometer calibration, is critical for reliable results.

- 1.3.1. [2.5.1](#)

~~How can future studies build on this work? Describe the questions or research directions that can be investigated next.~~

- 1.4. Future studies can evaluate more beverages, pediatric medications, and preventive agents to better understand and reduce discoloration in primary teeth.

- 1.4.1. [2.9.1](#)

Ethics Title Card

This research has been approved by the Institutional Human Research Ethics Committee of the University of Health Sciences. Written informed consent has been obtained from the patients.

Protocol

NOTE: The protocol is scripted from the provided footage

2. Investigating the Color Changes Caused by Fruit Juices in Primary Teeth

Demonstrators: Merve Gul Eren, Gizem Akyildiz

- 2.1. To begin, collect a total of 80 sound primary teeth extracted due to trauma, orthodontic reasons, or excessive mobility related to natural exfoliation. Assign 20 specimens to each fruit juice group and the control group [1].
 - 2.1.1. LAB MEDIA: Figure 1.
- 2.2. After removing remaining gingival tissue and debris from the teeth, store the teeth in saline solution until the experiments begin [1]. Replace the saline solution daily [2].
 - 2.2.1. LAB MEDIA: Store_the_teeth_1.mp4: 00:00-end
 - 2.2.2. LAB MEDIA: Store_the_teeth_2.mp4: 00:00-00:25
- 2.3. Next, create a 4 by 4 millimetres square window on each specimen using red nail polish [1].
 - 2.3.1. LAB MEDIA: Creating_4x4_square_window_1.mp4: 00:07-00:24,
Creating_4x4_square_window_2.mp4: 00:00-end
- 2.4. Then, fill a container with the assigned fruit juice before conducting baseline color measurements [1]. Divide the samples into groups as presented here [2]. Place each tooth into the container labelled with its specimen number on the outside [3].
 - 2.4.1. LAB MEDIA: Placing_tooth_into_a_container_2.mp4: 00:01-00:10
 - 2.4.2. LAB MEDIA: Figure 1.
 - 2.4.3. LAB MEDIA: Placing_tooth_into_a_container_2.mp4: 00:10-end
- 2.5. Then, measure baseline color values for all groups using a spectrophotometer, recording results in Commission Internationale d'Eclairage Lab coordinates relative to a standard illuminant [1].
 - 2.5.1. LAB MEDIA: Measurement_Calibration_and_Baseline.mp4: 00:00-end
- 2.6. For staining and brushing, immerse the prepared specimens in mulberry juice, pomegranate juice, orange juice, or saline solution for the control group [1].
 - 2.6.1. LAB MEDIA: Immerse_the_prepared_specimens.mp4: 00:00-end
- 2.7. Incubate all samples at 37 degrees Celsius for 7 and 28 days, refreshing the juice daily [1].
 - 2.7.1. LAB MEDIA: refreshing_the_juice_1.mp4 : 00:14-00:29

2.8. Now, dilute each toothpaste with distilled water at a 1 to 1 weight ratio to obtain a standardized slurry that approximates intraoral dilution during toothbrushing [1].

2.8.1. LAB MEDIA: Brushing_Action_and_Slurry_Preparation.mp4: 00:00-00:20.

2.9. Using an electric toothbrush, brush the specimens in the brushing subgroups once a day on each surface for 5 seconds with either fluoridated or non-fluoridated toothpaste [1].

2.9.1. LAB MEDIA: Brushing_Action_and_Slurry_Preparation.mp4: 00:25-00:40

2.10. After measuring color as described earlier, calculate the color difference by determining the mean Delta L, Delta a, and Delta b values for each specimen. Then perform statistical analysis using appropriate software [1].

2.10.1. LAB MEDIA: excel-screen-video.MOV: 00:04-00:15, 00:33-00:38

Results

3. Results

- 3.1. Three-way analysis of variance showed significant effects of time [1] and juice type on discoloration [2], while brushing type approached significance [4]. The interaction terms indicated that discoloration patterns varied according to brushing condition and exposure period [5].
 - 3.1.1. LAB MEDIA: Table 1. *Video editor: Highlight the “P value(s)” cell for “t”*
 - 3.1.2. LAB MEDIA: Table 1. *Video editor: Highlight the “P value(s)” cell for “JT”*
 - 3.1.3. LAB MEDIA: Table 1. *Video editor: Highlight the “P value(s)” cell for “BT”*
 - 3.1.4. LAB MEDIA: Table 1. *Video editor: Highlight the “P value(s)” cells for “JT x BT”, “t x JT”, “t x BT”, and “t x JT x BT”*
- 3.2. Across most brushing conditions, delta 2 values were higher than delta 1 [1], with the greatest increases observed in black mulberry and pomegranate samples [2].
 - 3.2.1. LAB MEDIA: Table 1. *Video editor: Show the “Δ1 (t0-t7)” and “Δ2 (t7-t28)” columns side by side*
 - 3.2.2. LAB MEDIA: Table 1. *Video editor: Highlight the rows under “Black Mullberry” and “Pomegranate” compare the values in the “Δ2 (t7-t28)” column with the “Δ1 (t0-t7)” column*
- 3.3. In black mulberry, the fluoride-free brushed group and the non-brushed group exhibited significantly greater delta 2 values [1] compared with the fluoride-brushed group [2].
 - 3.3.1. LAB MEDIA: Table 1. *Video editor: Highlight the “Brushed-Flouride free” and “Non-brushed” row under “Black Mullberry” in the “Δ2 (t7-t28)” column*
 - 3.3.2. LAB MEDIA: Table 1. *Video editor: Highlight the “Brushed-Flouride” row under “Black Mullberry” in the “Δ2 (t7-t28)” column*
- 3.4. For pomegranate, the non-brushed group showed notably elevated delta 1 values [1]. However, orange and saline demonstrated minimal interval-related changes [2].
 - 3.4.1. LAB MEDIA: Table 1. *Video editor: Highlight the “Non-brushed” row under “Pomegranate” in the “Δ1 (t0-t7)” column*
 - 3.4.2. LAB MEDIA: Table 1. *Video editor: Highlight the rows under “Orange” and “Saline” and compare the values in the “Δ1 (t0-t7)” and “Δ2 (t7-t28)” columns*
- 3.5. Analysis of delta 3 revealed significant effects of juice type [1] and brushing type [2], while their interaction was not significant [3].

- 3.5.1. LAB MEDIA: Table 2. *Video editor: Highlight the “P value(s)” cell for “JT”*
- 3.5.2. LAB MEDIA: Table 2. *Video editor: Highlight the “P value(s)” cell for “BT”*
- 3.5.3. LAB MEDIA: Table 2. *Video editor: Highlight the “P value(s)” cell for “JT x BT”*
- 3.6. Total color change was greatest in black mulberry and pomegranate [1] and significantly exceeded that of orange and saline across all brushing conditions [2].
 - 3.6.1. LAB MEDIA: Table 2. *Video editor: Highlight the “Black Mullberry” and “Pomegranate” row across all 3 brushing columns*
 - 3.6.2. LAB MEDIA: Table 2. *Video editor: Highlight the “Orange” and “Saline” row across all 3 brushing columns*

1. Orthodontic
Pronunciation link: <https://www.merriam-webster.com/dictionary/orthodontic>
IPA: /ˌɔːr.θəˈdɑːn.tɪk/
Phonetic Spelling: or·thuh·don·tik
2. Exfoliation
Pronunciation link: <https://www.merriam-webster.com/dictionary/exfoliation>
IPA: /eksˌfoʊ.liˈeɪ.ʃən/
Phonetic Spelling: eks·foh·lee·ay·shuhn
3. Gingival
Pronunciation link: <https://www.merriam-webster.com/dictionary/gingival>
IPA: /ˈdʒɪŋ.dʒə.vəl/
Phonetic Spelling: jin·juh·vuhl
4. Saline
Pronunciation link: <https://www.merriam-webster.com/dictionary/saline>
IPA: /ˈseɪ.laɪn/
Phonetic Spelling: say·line
5. Spectrophotometer
Pronunciation link: <https://www.merriam-webster.com/dictionary/spectrophotometer>
IPA: /ˌspek.troʊ.foʊˈtɑː.mə.tə/
Phonetic Spelling: spek·troh·foh·taa·muh·ter
6. Commission Internationale d’Eclairage
Pronunciation link: No confirmed link found

IPA: /kə'mɪʃ.ən ,ɪn.tə.næʃ.ə'nɑ:l ,deɪ'klɛrɑ:ʒ/

Phonetic Spelling: kuh·mish·uhn in·ter·nə·shuh·nal day·kleh·rahzh

7. Illuminant

Pronunciation link: <https://www.merriam-webster.com/dictionary/illuminant>

IPA: /ɪ'lu:.mə.nənt/

Phonetic Spelling: ih·loo·muh·nuhnt

8. Incubate

Pronunciation link: <https://www.merriam-webster.com/dictionary/incubate>

IPA: /'ɪn.kju:.beɪt/

Phonetic Spelling: in·kyoo·bayt

9. Intraoral

Pronunciation link: <https://www.merriam-webster.com/dictionary/intraoral>

IPA: /,ɪn.trə'ɔ:r.əl/

Phonetic Spelling: in·truh·or·uhl

10. Fluoridated

Pronunciation link: <https://www.merriam-webster.com/dictionary/fluoridated>

IPA: /'flʊr.ə ,deɪ.tɪd/

Phonetic Spelling: floor·uh·day·tid

11. Statistical

Pronunciation link: <https://www.merriam-webster.com/dictionary/statistical>

IPA: /stə'tɪs.tɪ.kəl/

Phonetic Spelling: stuh·tis·ti·kuhl

12. Variance

Pronunciation link: <https://www.merriam-webster.com/dictionary/variance>

IPA: /'ver.i.əns/

Phonetic Spelling: vair·ee·uhns

13. Discoloration

Pronunciation link: <https://www.merriam-webster.com/dictionary/discoloration>

IPA: /dɪs ,kʌl.ə'reɪ.ʃən/

Phonetic Spelling: dis·kuh·luh·ray·shuhn

14. Interaction

Pronunciation link: <https://www.merriam-webster.com/dictionary/interaction>

IPA: /,ɪn.tə'æk.ʃən/

Phonetic Spelling: in·ter·ak·shuhn

15. Pomegranate

Pronunciation link: <https://www.merriam-webster.com/dictionary/pomegranate>

IPA: /'pɑ:.mə ,græn.ɪt/

Phonetic Spelling: paa·muh·gran·it

16. Mulberry

Pronunciation link: <https://www.merriam-webster.com/dictionary/mulberry>

IPA: /'mʌl ,ber.i/

Phonetic Spelling: muhl·beh·ree

17. Specimen

Pronunciation link: <https://www.merriam-webster.com/dictionary/specimen>

IPA: /'spes.ə.mən/

Phonetic Spelling: spes·uh·muhn

18. Slurry

Pronunciation link: <https://www.merriam-webster.com/dictionary/slurry>

IPA: /'slʌ:.i/

Phonetic Spelling: slur·ee