Evaluating the Necessity of Plastic Wrapping for Infection Control in Dental Units

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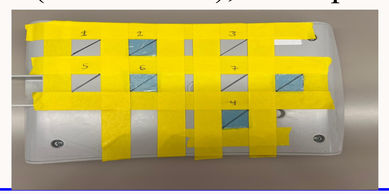
Abstract:
Dental practices must balance effective infection control with environmental sustainability. Plastic wraps, recommended by the CDC to reduce cross-contamination, generate significant waste. This study tests whether disinfectants alone can offer sufficient microbial control, aiming to reduce reliance on plastic barriers without compromising patient or staff safety.

Background & Objectives:
Green dentistry encourages reducing environmental impact. Plastic barriers, though common in infection control, raise sustainability concerns. This study examines if disinfectants can replace plastic covers, aligning infection control with eco-friendly practices.
Aim: To assess whether plastic wrapping is essential for infection control in dental units or if disinfectants alone are sufficient.
Hypothesis: The hypothesis (H1) is that plastic wrapping is not necessary for infection control in dental units when effective disinfectants are used.
The null hypothesis (H0) is that plastic wrapping is necessary to maintain adequate infection control in dental units.

Method:
This is an *in vitro* study conducted in a controlled, sterile environment under a biosafety hood.
Test surface: Dental X-ray unit, decontaminated using AdvantaClear™ disinfectant wipes (2-minute contact time).
Surface divided into 8 sections (2 cm × 2 cm), each split for intra-group comparison.



Experimental Procedures:
A *Staphylococcus aureus* strain (ATCC 480) was cultured on blood agar and incubated at 37°C for 24 hours. Colonies were suspended in phosphate-buffered saline and adjusted to OD_{600} = 0.1 (~10^7–10^8 CFU/mL).

A dental X-ray unit was decontaminated using AdvantaClear™ disinfectant wipes. A 2 µL suspension of *S. aureus* was applied to relevant groups (3, 4, 7, 8). Plastic barriers were applied to Groups 2, 4, 6, and 8; disinfection was applied to Groups 5–8.

Group	Plastic Cover	S. aureus	Disinfection
1	No	No	No
2	Yes	No	No
3	No	Yes	No
4	Yes	Yes	No
5	No	No	Yes
6	Yes	No	Yes
7	No	Yes	Yes
8	Yes	Yes	Yes

Surface Protein Residue Test: The Pro-Clean™ Surface Protein Residue Test was performed on all eight surface samples (Groups 1 to 8). Each test area was evaluated for color change at 1, 5, and 10 minutes, with color intensity indicating protein contamination levels as follows:
Green: No protein detected
Gray: Mild residue (~20 µg protein)
Light Purple: Moderate residue (~50 µg protein)
Dark Purple: High residue (~80 µg protein).

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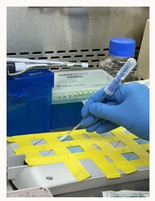
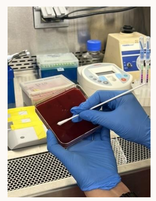
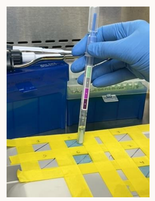
Microbiological Analysis :
A sterile swab will be used to collect a sample from the other half of each test area, which will then be streaked onto a blood agar plate to evaluate and confirm the presence or absence of bacterial contamination

Results: **Groups 1, 2, 5, 6, 7, and 8** remained **green** at all three time points (1, 5, and 10 minutes), indicating no detectable residual protein contamination.
In contrast, **Groups 3 and 4** showed progressive color changes. By the **5th to 10th minute**, both groups exhibited a **gray to light purple** hue, suggestive of **moderate protein residue presence**.

Microbiological Confirmation
Groups 1, 2, 5, 6, 7, and 8 demonstrated **no bacterial growth**, confirming effective disinfection or absence of contamination.
Groups 3 and 4 showed **visible colony growth**, verifying the presence of *Staphylococcus aureus* and supporting the surface residue test results.

Conclusion: Plastic barriers alone offer no added protection without disinfection. Effective disinfectants may eliminate the need for plastic wrapping, supporting more sustainable clinical practices.

Future Directions:
Repeat testing on other dental chair surfaces is recommended to confirm consistency. Further clinical studies and eco-friendly alternatives should be explored to guide sustainable infection control.