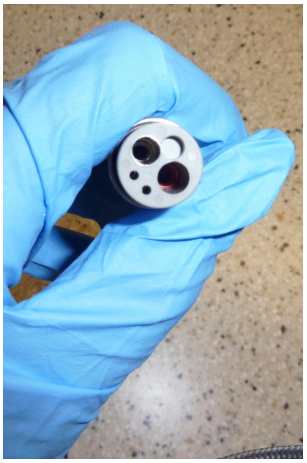
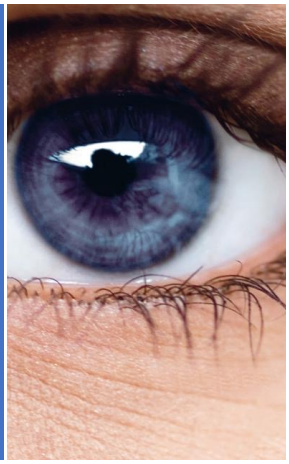


Hot Topics to Ensure Safety In Dentistry:
Dental Unit Waterlines
Eye Protection

Marie T. Fluent, DDS, CDIPC, FACD
mtfluent@gmail.com



Vermont State Dental Society
3-hour presentation
September 2025

1

Disclosures:

- Intellectual Property
  - U.S. Patent Application
- Financial Conflict of Interest
  - Salary and equity compensation from SteriLine, LLC

2

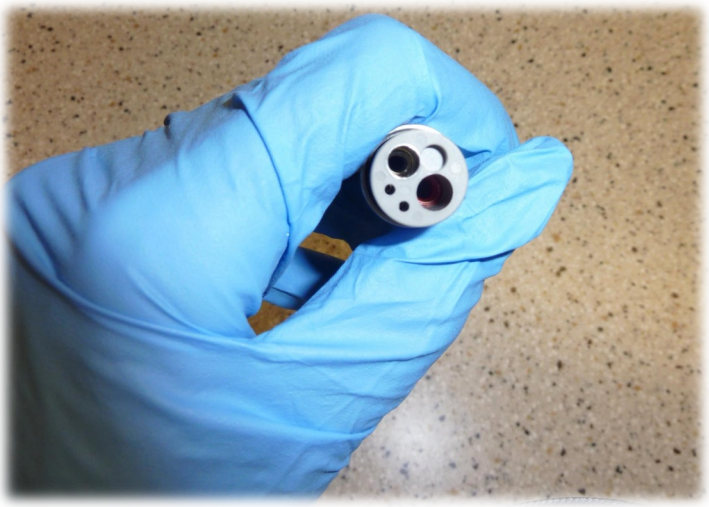
Greetings and Introductions:

Marie Fluent, DDS, CDIPC
- Infection Control Consultant
- Author
- Speaker

And YOU:

3

Dental Unit Waterlines



4

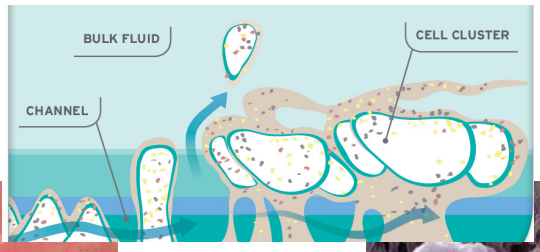
My First KNOWN Encounter With a Biofilm:

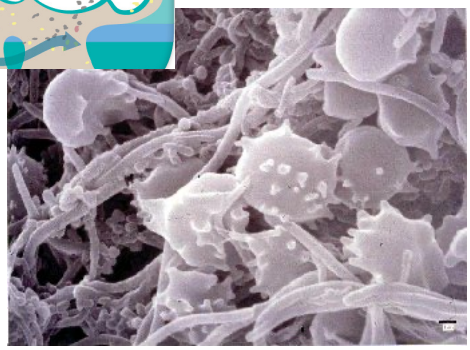
- Air/water syringe delivered discolored water
- Slowed to a dribble, then complete stop
- Repair technician notified

Image courtesy of RDH Magazine, 7-21-16

5

Biofilm Formation:





6

Biofilms Grow Rapidly In Dental Equipment: WHY?

- Small diameters of waterlines
- Increased tubing surface area to water volume ratio
- Slow water flow
- Low flow: 60-100mL/min
- In comparison: ½" pipe delivers 5000mL/min
- Water is at room temperature
- Low usage: water remains stagnant

7

CDC Health Alert Network: 10-31-2022

Nontuberculous Mycobacteria infections infections tied to contaminated dental waterlines in 2016-17, 2022

- Children received pulpotomies at pediatric clinics in GA and CA and developed:
  - Severe infections
  - Lymphadenitis
  - Osteomyelitis
  - Hospitalization
  - Surgical procedures
- Complications:
  - Permanent tooth loss, hearing loss, facial nerve palsy, incision fibrosis
- High levels of bacteria in clinics' dental treatment water

8

Standards for Dental Water for Routine Dental Procedures:

- Use water that meets Environmental Protection Agency (EPA) regulatory standards for drinking water **(fewer than 500 CFU/ml of heterotrophic water bacteria)** for routine dental treatment output water.

CDC
U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

9

What We KNOW About Dental Water Quality:

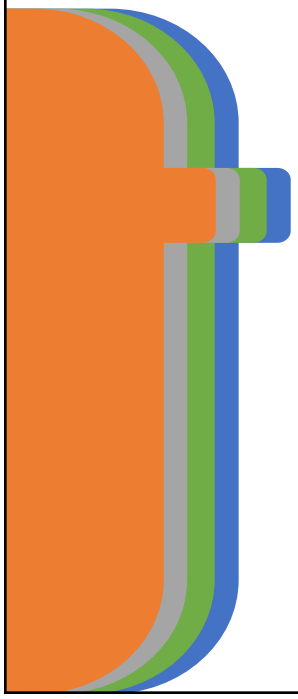
- Colony counts in water from untreated systems can exceed 1,000,000 CFU/mL (usually 10^3-10^5)
- Untreated dental units cannot reliably produce water that meets drinking water standards
- Removal of biofilm requires use of chemical germicides

10

Definitions:

Flushing:	Forcing water through a system to remove debris and sediment buildup
Purging:	Removing (emptying) all water from waterlines
Shocking:	Using a strong disinfectant to kill bacteria and biofilm from waterlines. Note: not all shocking agents remove biofilm

11



Four Steps to Waterline Maintenance:

12

1. Administrative Preparations:

- Develop written waterline program
- Education and training
- Include:
  - The WHY of waterline maintenance
  - CDC Guidance
  - State requirements
  - Maintenance protocols
  - Monitoring protocols
  - HOW to test DUWL
  - Boil water advisories
  - Resources

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2. Read IFU of Dental Unit

Look for:

- Source water recommendations
- Recommended DUWL products
- What NOT to use
- Extended periods of downtime
- Frequency of testing
- Management of water bottle
- Weekly/monthly care

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3. Select and Follow Waterline Treatment Products

Types of Dental waterline treatment products:

- Shock
- Straws/cartridges
- Daily liquid
- Central systems
- Bleach (CAREFUL here!)
- READ and follow IFUs!

15

4. Test Dental Unit Waterlines Regularly, Remediation, and Documentation:

- Test initially, then monthly
- When consistent passing results, test quarterly
- If test fails, shock and retest
- If fails again, troubleshoot and take corrective action
- If passing, resume schedule of maintenance/shock and testing quarterly
- Document results

16

Let's Take a Deeper Dive:

17

A Written Waterline Program:

- Provides clear policies and protocols
- Standard operating procedures
- Ensures compliance
- In alignment with regulations
- Minimizes risk of infections and ensures a safe dental visit
- An infection control coordinator to oversee the program
- Education and training of team members

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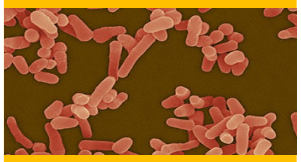
Additional CDC Guidance:

- Flush waterlines 20-30 seconds from handpieces, ultrasonic scalers, air/water syringe after each patient
- Flush waterlines 2minutes at beginning of workday
- Use sterile saline or sterile water as a coolant/irrigator in surgical procedures
- During a boil-water advisory:
  - Do not deliver water from the public water system to the patient through any dental equipment that uses the public water system.

19

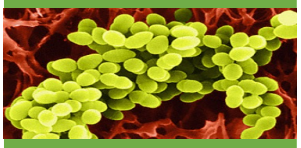
Show Me The Germs:

Legionella Pneumophilia



Non-tuberculosis Mycobacterium

Pseudomonas aeruginosa



Staphylococcus spp.

20

Other Waterborne Disease Agents:

Bacteria:

- Escherichia coli
- Vibrio cholerae
- Salmonella typhi

Viruses:

- Hepatitis A, E
- Noroviruses

Parasites:

- Acanthamoeba
- Entamoeba sp.
- Giardia
- Cryptosporidium

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IFU of the dental unit will specify SOURCE WATER to be used:

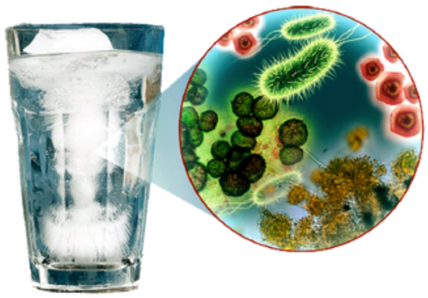
Tap or softened water (most IFUs)
Sterile water or reverse osmosis water (rarely)
Distilled or demineralized water (rarely)

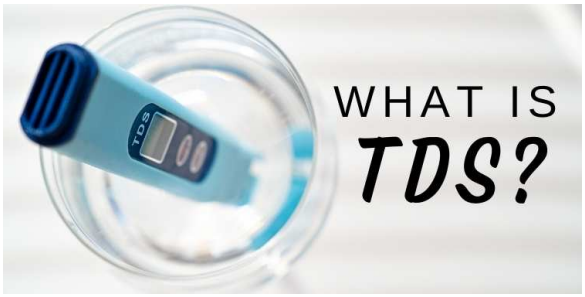
Note:
Distilled/deionized may be corrosive to copper, nickel, zinc and plated metals

Let's review water types

22

Bacterial Levels ≠ Total Dissolved Solids



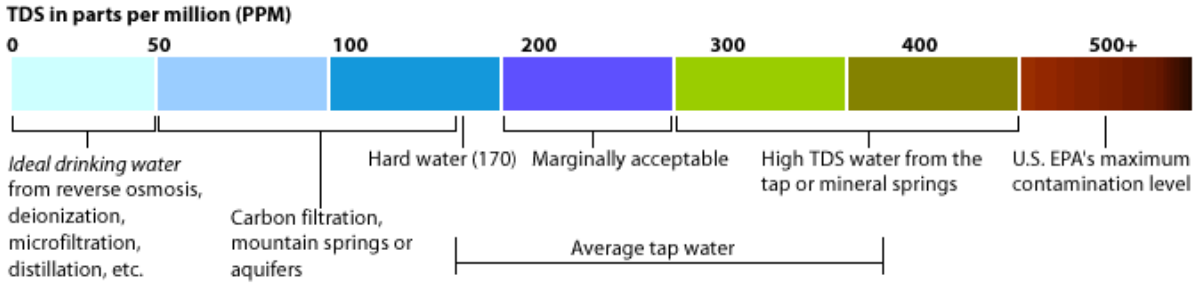


23

Total Dissolved Solids:

The quantity of dissolved substances in water including:

- **Calcium, Magnesium, Sodium Potassium Bicarbonate, Sulfate, Chloride, Nitrate, Silica, etc.**



https://www.premierwatermn.com/water-quality/water-contaminants/total-dissolved-solids/

24

"____Does NOT recommend the regular use of distilled, deionized, reverse osmosis or other ultra-pure water types".

"Long-term use of these water types may damage the delivery system and degrade the system performance."

IFU of Dental Unit

"It is MOST important to follow IFU of dental unit—END OF STORY!"

"The dental block is the "brain" of the dental unit where junctions occur. Much damage can be done to the block. Very expensive to repair or replace. If IFU is not followed, warranty will be voided"

Manufacturer's Rep of Dental Unit

25

Extended Periods of Disuse:

- If left idle, lines will re-grow biofilms
- Follow IFU of dental unit for extended downtime protocols
  - Include ultrasonic scaler and air/water syringe lines
- If separate water reservoirs, use purge mechanism

Ref: OSAP Whitepaper 2018

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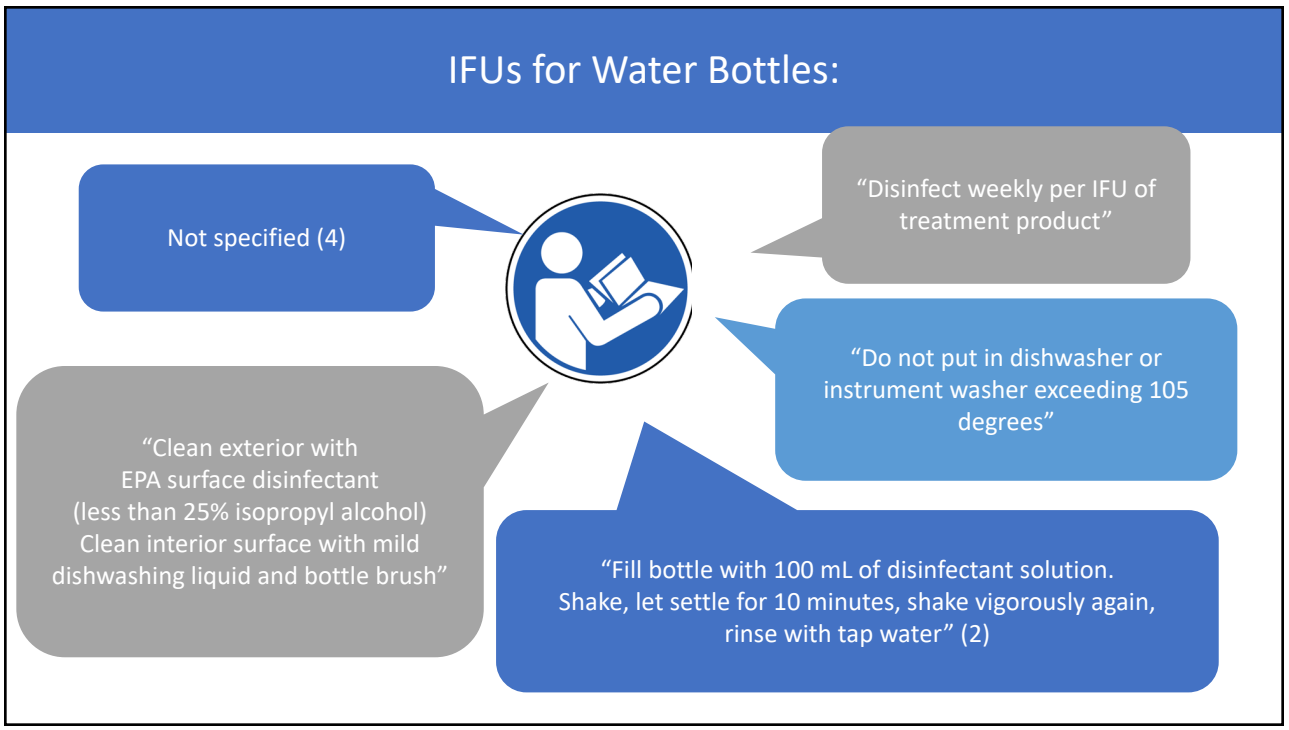
IFUs for Water Bottles:



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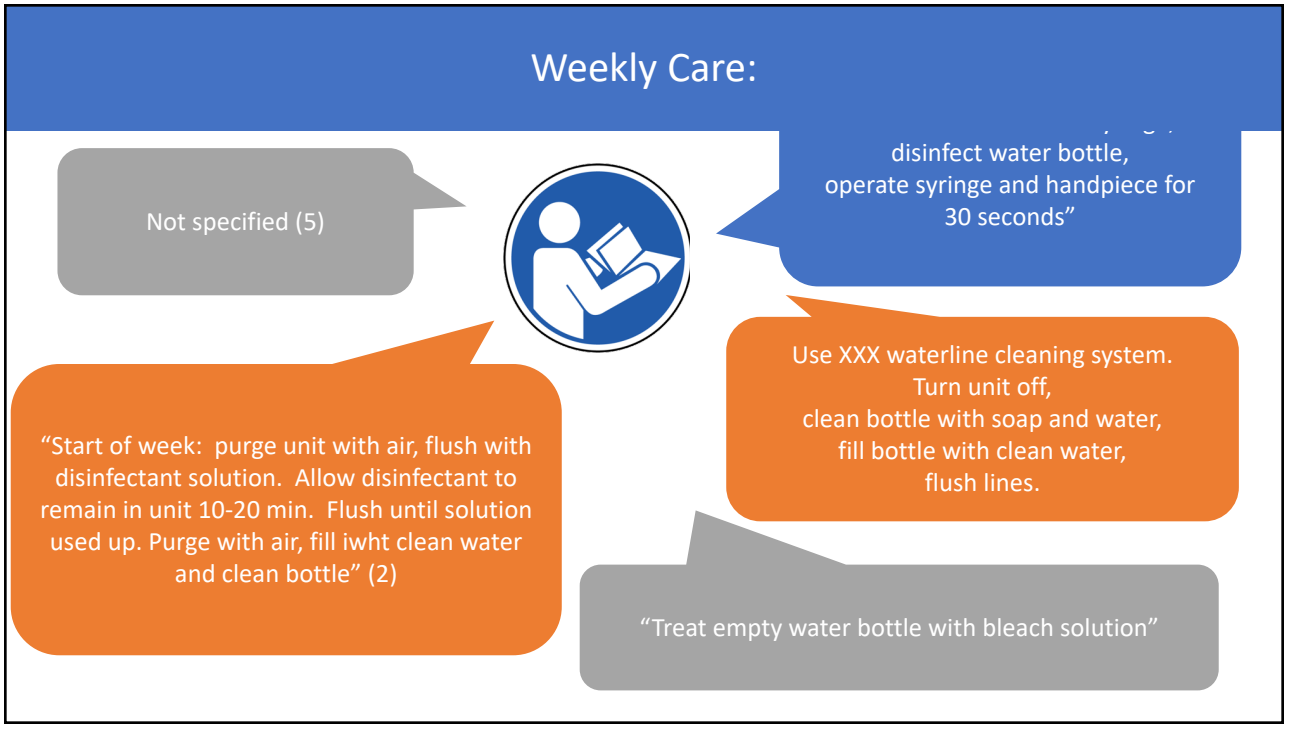
Weekly Care:



28

Treatment Approaches:

- Independent water reservoir with chemical germicides
  - Shocks: Kills (and/or removes) biofilm
  - Maintenance Products: Prevent attachment of microorganisms
- Filtration Devices
  - Biochemical filters
  - Ultraviolet or ozone systems
- Other devices or containers – slow release of chemicals
  - Iodine or Silver

Note: Consult with the manufacturer of dental unit for the recommended treatment approach

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Product Examples:

- Shock
- Straws/cartridges
- Daily liquid
- Central systems
- Bleach (CAREFUL here!)

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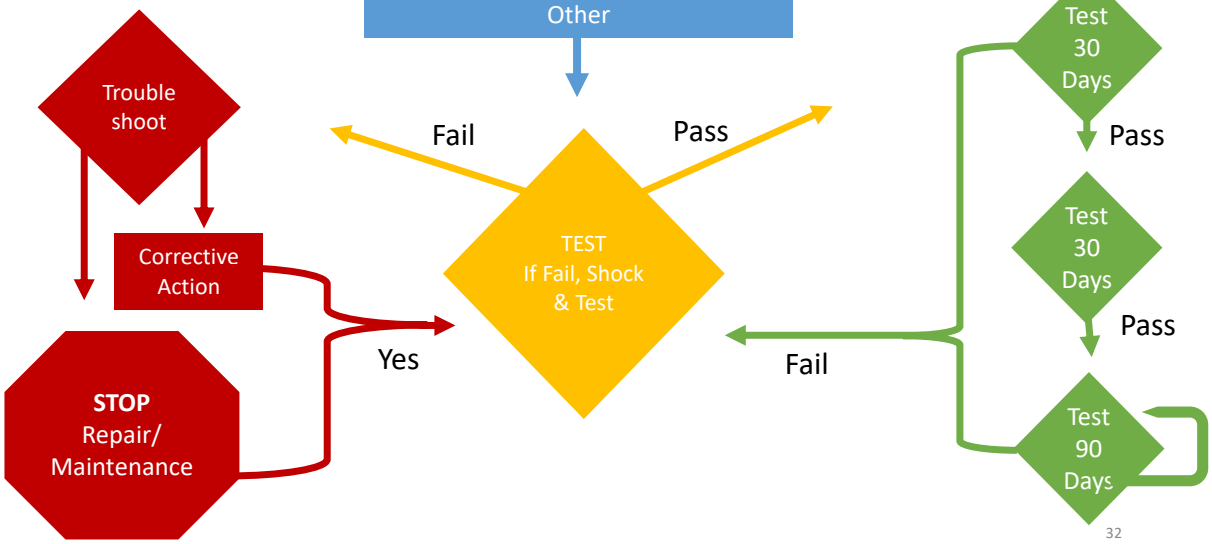
Shocking with Bleach:

- CAREFUL HERE!
- Check compatibility with dental unit
- Check with state for off-label use
- Dilution ratio
  - 5-6% bleach: 1 part bleach to 9 parts water
  - 7% bleach: 1 part bleach to 12 parts water
- Do not leave in system more than 10 minutes
- **Do not suction bleach into evacuation lines!**

31

Testing Overview:

Reasons For Testing:
Routine testing
New dental unit
New DUW products
Other



32

Testing Overview:

Reasons For Testing:
Routine testing
New dental unit
New DUW products
Other

- Lifting of boil water advisory
- Recent test failure, then repeated shocking and testing prior to reuse of dental unit
- Routine testing—one month or 3-mo interval
- Installation of new equipment
- New procedural water treatment products
- After extended periods of disuse
- After extended periods of lack of maintenance
- Following changes to manufacturer IFU or clinic protocols
- Following maintenance or repair of dental units or devices
- Changes or repair in plumbing (Georgia Board of Dentistry)

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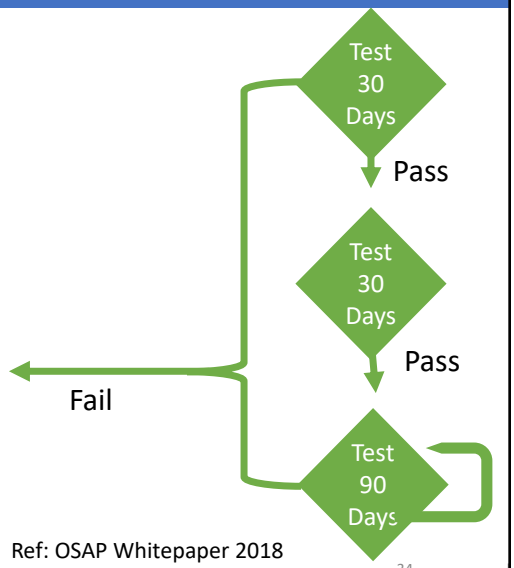
33

Testing Overview:

- Initially, monitor monthly to view trends and compliance
- For units which have a good trend, monitor quarterly
- 2 months can equal a trend
- Erratic results may indicate the need to monitor more frequently
- Retest of action limit caused action: shock then re-test (3-5 days)
- Units that have intermittent use may require more frequent testing

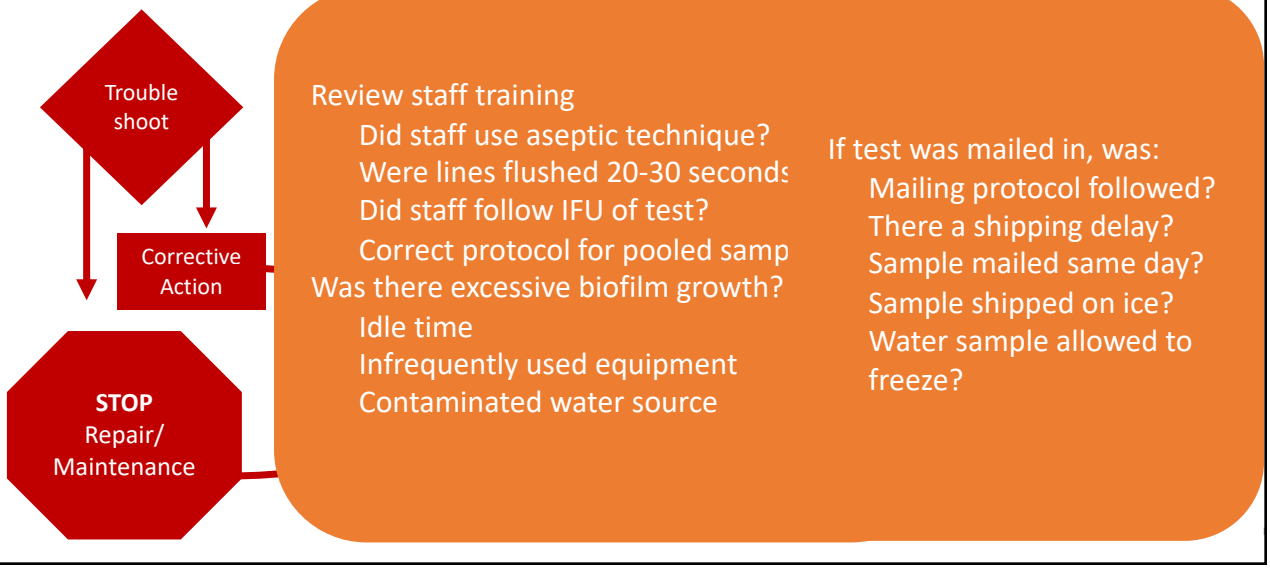


Ref: OSAP Whitepaper 2018

34

34

Testing Overview:



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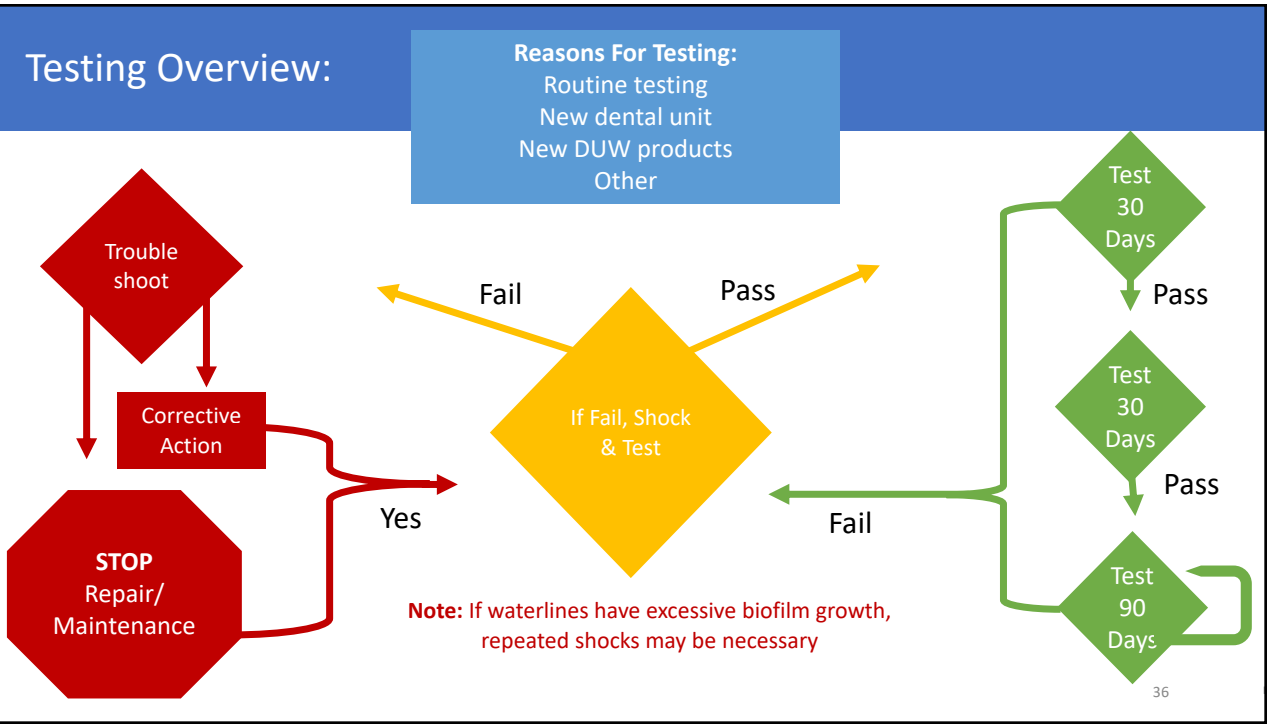
Testing Overview:



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In office Testing:

- Quicker results
- Simple reading
- Can use as screening tool
- Personnel dependent
- Limited bacterial range
- Less reliable

Mail-in Testing:

- 3rd party validation
- Consistent test analysis
- Broad spectrum
- Easy, little time
- Lag time for mailing
- Bacterial viability during mailing
- Costly

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Steps to Waterline Testing (In-office or Mail-in):

- Pre-Read IFU prior to starting process
- Flush lines 20-30 seconds prior to collecting sample
- Use aseptic technique
  - Perform hand hygiene
  - Don disposable gloves
  - Clean/disinfect areas that may come in contact with tubing
  - Do NOT contaminate interior of test sample
- Label sample with indelible marker
- Fill to fill line (CAREFULLY)
- Incubate for proper time (in-office)
- Read results in-office or mail in sample for laboratory testing
- Document results
- Take action if needed

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Mail-in Testing:

- Mail sample ASAP
  - Lab needs to receive within 24 hours
  - Do not mail on Friday, Saturday or holiday
- Do not freeze sample
- Mail on ice pack

Mail-in
DUWL Test Kit

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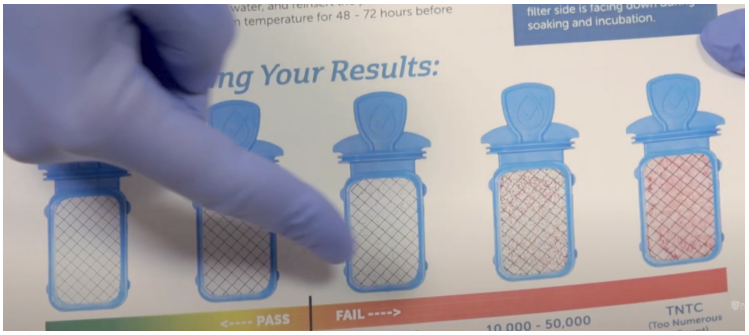
In-office Paddle Testing:

- Take sample from waterlines
- Fill to fill line, insert paddle
- Sit face down for one minute
- Pour out water
- Reinsert paddle
- Incubate undisturbed face down, room temp
- Wait for time indicated on IFU
- Read results

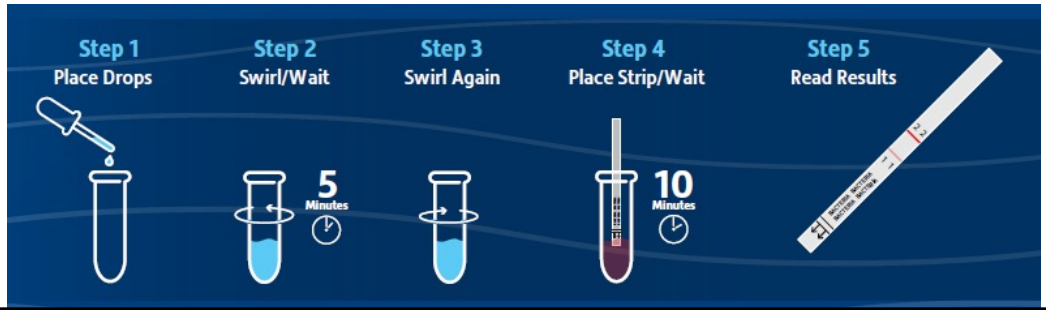


40

In-office Fast Check:

Advantages:

- Simple to use
- Fast results (15 minutes)
- Affordable
- Used as a screening tool
- ***Positive*** test result indicates microbial load exceeding 500 CFU/mL calling for further action - shocking and re-testing, or R2A lab testing for more detailed analysis



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Color Changing In-Office Test:

- Detects levels that exceed 500 CFU within 24 hours
- Simple (collect sample, seal, shake)
- Immediate neutralization (stops action of any antimicrobial agent)
  - **Read results no later than 24-hours following sampling.**

6. Check for water color change and compare against the color chart below.

Tip: Holding the test vial up against a sheet of white paper can help in determining color changes.

- **Any change from the initial blue water color indicates a microbial level in the water sample above 500 CFU/mL.**

42

DUWL Testing Log: (Maintain for 5 years)							
Test Date:	Test location: chair/ Operatory	Team member collecting sample:	Water Source:	Date of results:	Team member reading results:	Test results: (CFU/ml or pass/fail from DUWL test strip)	Corrective action taken (if applicable)
			AW syringe(s)				
			Ultrasonic scaler(s)				
			High speed handpiece(s)				
			Unused waterlines				
			Source water (or water reservoir)				
			Pooled samples: (provide details)				

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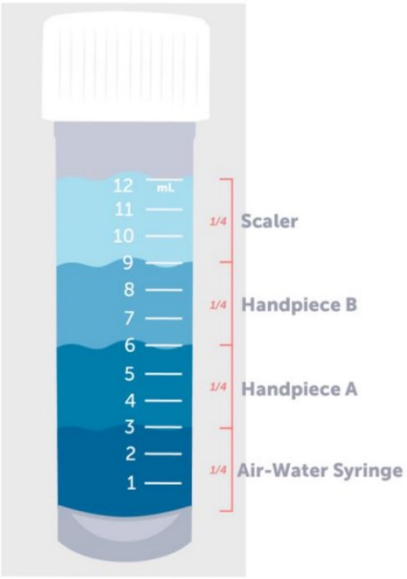
Pooled (Combined) Samples:

- Use equal amounts of water from each device
- Take sample from every line per operatory
- Test all lines every quarter
- Cost savings of 66% to 75%



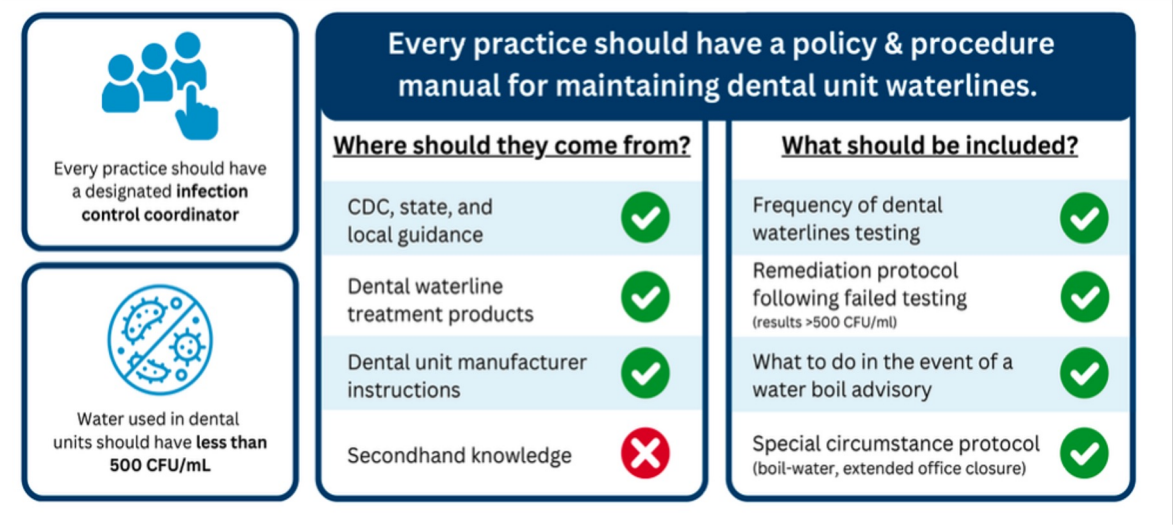
44

Pooled Sample Considerations:

- If failed test:
  - Where did the failure originate?
  - must re-test all sources again.
- Pooled samples best when achieving consistent passing results.

45

Summing it Up (1):



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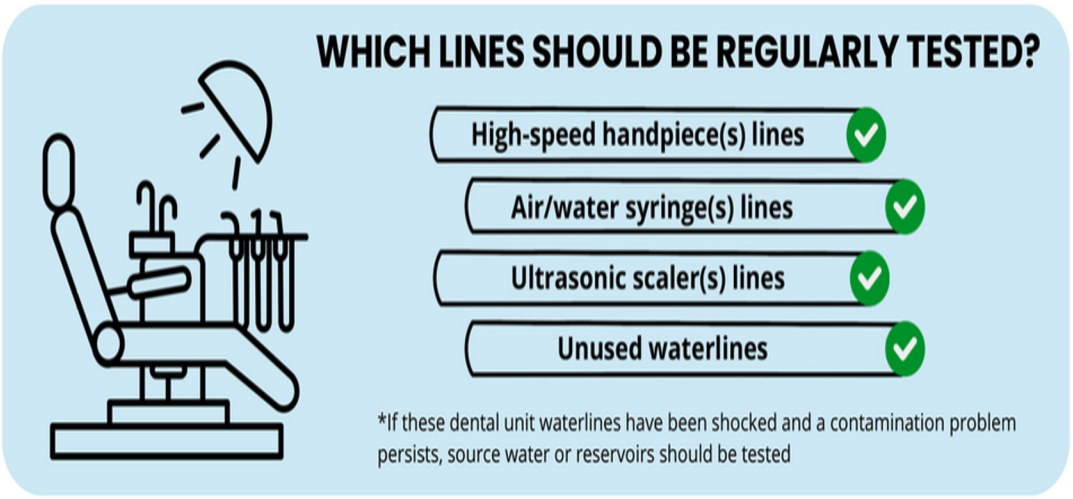
Summing it Up (2):



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Summing it Up (3):

WHEN SHOULD DENTAL UNIT WATERLINES BE FLUSHED?

- According to manufacturers' instructions
- 20-30 seconds after each patient
- 2 minutes at the end of each day
- After the final patient of the day

Additionally, **waterlines should be emptied and dried overnight** to remove as much water as possible.

WHAT TO DOCUMENT WHEN TESTING DENTAL UNIT WATERLINES

- Test date
- Location (i.e. , chair/operatory #)
- Water source
- Test results
- Waterline maintenance/shock product name
- Waterline maintenance/shock product lot #
- Pooling details* (if samples pooled)
- Name of team member sampling

*Pooling: Sampling from multiple waterlines that is then combined for testing

Source: Centers for Disease Control and Prevention: Dental unit waterline infection control guidance

48

Resources and References (1):

- American Dental Association: https://www.ada.org/resources/ada-library/oral-health-topics/dental-unit-waterlines
- 2003 CDC Guidelines for Infection Control in Dental Health Settings: http://www.cdc.gov/OralHealth/infectioncontrol/guidelines/index.htm
- 2016 Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care, https://www.cdc.gov/oralhealth/infectioncontrol/pdf/safe-care2.pdf

49

Resources and References (2):

- American Academy of Pediatric Dentists: https://www.aapd.org/resources/member/safety-toolkit/Waterline-Safety/
- OSAP Whitepaper on DUWL: https://www.osap.org/assets/docs/resources/toolkits-topics/dental-unit-water-quality-organization-for-safety-asepsis-and-prevention-white-paper-and-recommendations-2018.pdf
- Association for Dental Safety:
- https://www.myads.org/topics-dental-unit-waterlines-duwl

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Eye Safety in Dentistry

Marie T Fluent, DDS, CDICP, FACD
mariefluent.com

The picture can't be displaye

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Disclosure Statement:

Marie T Fluent

(I) have no relevant financial relationships to disclose.

52

Learning Objectives

- Describe eye protection for dental healthcare personnel and patients during all phases of the delivery of oral healthcare
- Discuss the proper fit and wear of eye protection
- Describe NIOSH recommendations to reduce eye injuries and protect against ocular infection exposures.

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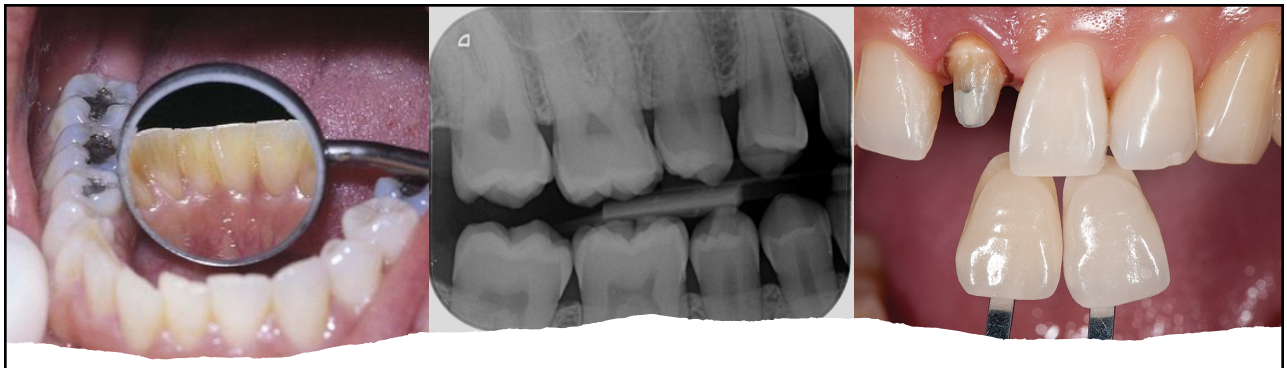

Dentistry is Visually Demanding

- Interpret radiographs
- Examinations: Intra- and extraoral
- Perform irreversible procedures
- Shade matching

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By the Numbers:

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80
The percentage of sensations we perceive through eyesight

2000
Number of workers who sustain job-related eye injury that requires medical treatment per day in US.

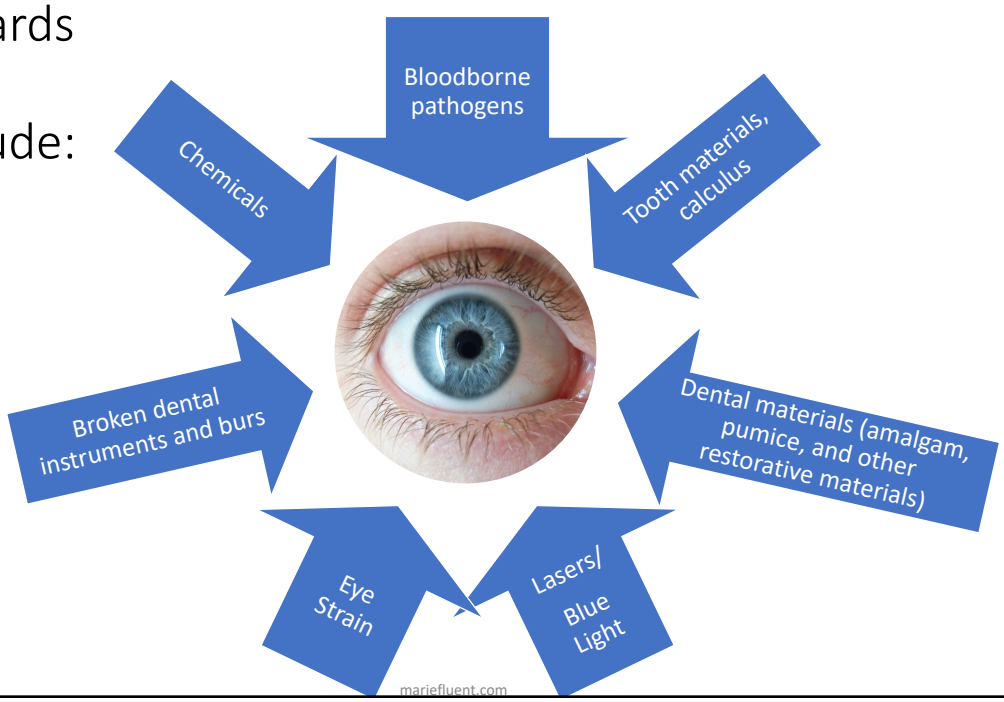
1/3
Fraction of the injuries treated in hospital EDs

100
Number of these injuries result in one or more days away from work

2
Total number of eyes we are granted in our lifetime

55

Hazards May Include:



8/18/25 mariefluent.com

56

Debris may hit eyes with a speed of:
96 km per hour
60 miles per hour

- Oner B, Ayhan NK. Goze kan ve tukuruk sıcraması sonucu gelisebilecek enfeksiyonlar. *Dis hekimliginde Klinik.* 1994;1:21–23.

57

Case Scenario #1:

While manual scaling, a dental hygiene student was hit in her eye with calculus	Immediate referral to ophthalmologist	After 3 days:	Recovery:
• Student rinsed eye with clean water • (how long?) • Irritation continued	• Diagnosis: episcleritis with corneal abscess/ulceration • Treatment: corneal scraping, Rx antibiotics and anti-inflammatory meds • Antibiotic Eyedrops and eye ointment • Sunglasses when outdoors	• Corneal scraping repeated • Steroids added to medication	• Returned to routine activities in 1 month • Complete recovery in 3 months

Bhatsange A, Sharanabasappa J, Deshmukh S, Varma S. Ocular injury during scaling: Are we protecting ourselves?. J Int Clin Dent Res Organ 2016;8:133-6

58

Case Scenario #2:

Female DDS injured in right eye with debris during caries removal

- Was wearing personal eyeglasses as PPE
- Rinsed eye with water "couple of times"
- Developed irritation and foreign body sensation
- 3 days later: redness, pain, inability to open fully, yellow discharge, malaise, Diffuse swelling

Ophthalmology appointment:

- Diagnosis: Bacterial Blepharitis
- Tx: antibiotic ointment, eye drops, lubricating eye drops for one month
- Avoid cosmetics, apply warm compresses
- Infection was resolving, but was reinfected at one week

Complete recovery in one month

https://joii-journal.springeropen.com/articles/10.1186/s12348-020-00211-5

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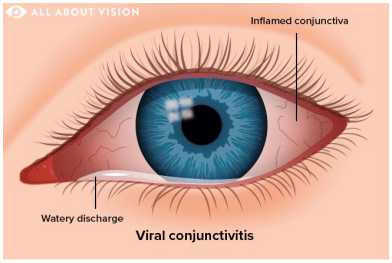
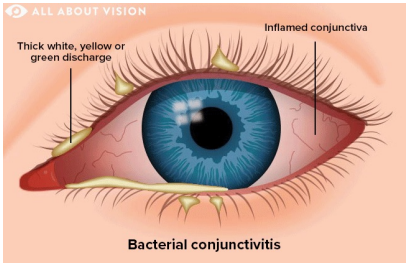
VIRAL Conjunctivitis



- Most common form
- Extremely contagious
- Spread through respiratory droplets, swimming pools, personal items
- Can develop with cold/flu
- Typically, in both eyes
- Develops watery discharge
- Antibiotics NOT effective

BACTERIAL Conjunctivitis



- Highly contagious
- Typically caused by staph/strep
- Usually in one eye
- Spread by respiratory droplets and direct contact (hands)
- Develops thick discharge
- Typically clears up itself (1-2 weeks) , but may need antibiotic eye drops

60

Recommended Work Restrictions for Communicable Diseases in Healthcare Workers

Post-Exposure	Work Restrictions	Durations
Conjunctivitis (Bacterial)	Exclude from work .	Until discharge (constant tearing) ceases and for 24 hours after effective treatment is initiated.
Conjunctivitis (Viral)	Exclude from work if experiencing tenderness in front of ears (preauricular lymphadenopathy) temperature ≥100° F, work restrictions recommended by a physician, or eye drainage.	If adenovirus conjunctivitis is diagnosed, may return to work only when medically cleared by a physician (may remain infectious up to two weeks).

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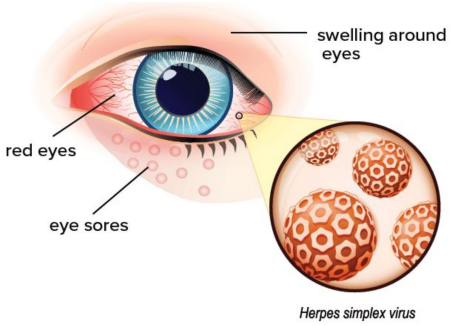
Herpes Simplex Virus (HSV) Keratitis:

- Infection of the cornea
- Caused by HSV
- Generally, heals without damaging the eye
- More severe infections can lead to scarring of cornea or blindness

Symptoms:

- Eye pain/redness, blurred vision, sensitivity to light, watery discharge, foreign object sensation
- Recurrence common



Herpes simplex virus

Basics of HSV Keratitis: https://www.cdc.gov/contactlenses/viral-keratitis.html#:~:text=What%20is%20HSV%20(Herpes%20Simplex,of%20the%20cornea%20or%20blindness.

62

Patients with Active Oral Herpes Infection:

- Postpone elective treatment until lesions heal
- Perform only urgent treatment
- Minimize aerosol-generating procedures, capture aerosols
- PPE: Wear protective goggles/face shields for DHCP
- For long procedures, perform hand hygiene and change gloves periodically
- Provide eye protection to patient
- Patient education: Causes and transmission of herpes labialis

Eye-related trauma and infection in dentistry
J Istanb Univ Fac Dent. 2017; 51(3): 55–63.
Published online 2017 Oct 2. doi: 10.17096/jiufd.60117

Image from Harvard Health

63

Agencies that Impact Eye Safety in Dentistry:

Agency	Role	Mission:
CDC (Centers for Disease Control and Prevention)	Advisory	National public health agency
OSHA (Occupational Safety and Health Administration)	Regulatory	Ensures safe working conditions for workers
ANSI (American National Standards Institute) ISEA (International Safety Equipment Association)	Standard Setting	Promotes **VOLUNTARY** consensus standards and conformity of assessment systems
NIOSH (National Institute for Occupational Safety and Health)	Research	Conducts research and makes recommendations for prevention of work-related injury and illness

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CDC Guidance:

Protective eyewear with side shields or a face shield should be worn by DHCP during procedures and patient care activities likely to generate splashes or sprays of blood or body fluids

Protective eyewear for patients shields their eyes from spatter or debris generated during dental procedures

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OSHA® Standards for Eye Protection:

1910.133(a)(1) The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

1910.133(a)(2) The employer shall ensure that each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.

The employer shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or protective lenses.

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NOTE the Language:

"The Employer shall ensure…"

"Appropriate" eye protection…

Burden of compliance is placed on the employer!

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ANSI/ISEA Z87.1 Standard:

ANSI
American National Standards Institute

Standards for Occupational and Educational Personal Eye and Face Protection Devices.

Emphasizes the importance of wearing the right protection for the specific job performed or "matching the protector to the hazard."

New Standard: ANSI/ISEA Z87.62-2021

First federal guidance to standardize eye and face protection against bloodborne pathogens and debris.

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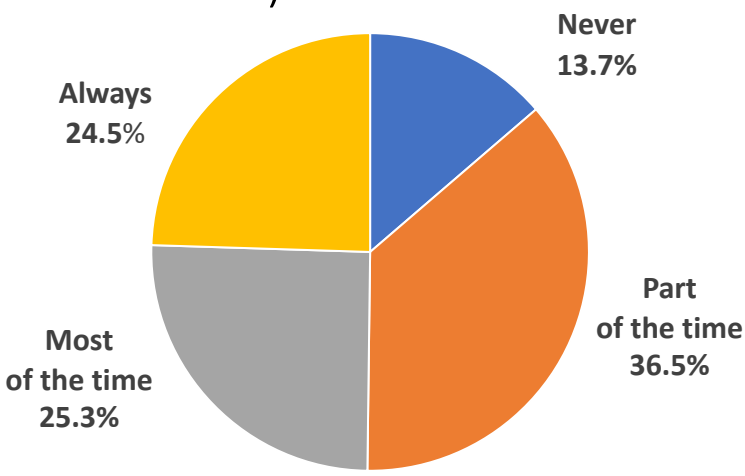
Compliance With Eye Protection: (Dental Personnel)



Int Dent J
. 2020 Oct 29;67(6):371–377. doi: 10.1111/idj.12324

69

Ocular Accidents among Endodontists:

- Ocular accidents reported by 73% of participants
- Amalgam and NaOCl foreign bodies most frequently associated
- 16% sought medical care
- No permanent eye damage reported
- 82% wore adequate eye protection
- Those with increased years in practice and use of magnification associated reduced risk

Int Endod J. 2013 Aug;46(8):710-9. doi: 10.1111/iej.12048. Epub 2013 Jan 21

70

Bottom Gap:

- A breach in modern medical masks
- Created by space between lower rim of medical glasses and top edge of mask
- Included research and development of masks/goggles with gap modifications
- NIOSH noted report, investigated further, replicated studies
- Worked with ANSI to propose new regulation for protective eyewear

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A Solution to Close the Gap:

Can be worn with loupes
Does not affect line of vision
- Distortion, fogging, glare
- (common in face shield usage)

https://www.dentaleconomics.com/practice/article/14298859/eye-safety-in-dentistry-the-unintended-dental-entrepreneur-with-an-injured-eye, November 2023

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OSHA Compliant Safety Glasses (With Side Shields, and flat Ear Loop Mask):

Figure 8

Figure 13

Figure 15

https://www.dentistryiq.com/dental-hygiene/infection-control/article/16350523/eye-safety-in-dentistry

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Mask with full-face shield (without eyewear under mask/shield combination):

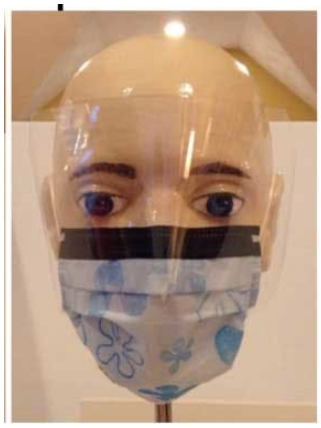

Figure 9

Figure 10

Figure 12

https://www.dentistryiq.com/dental-hygiene/infection-control/article/16350523/eye-safety-in-dentistry (April 2015)

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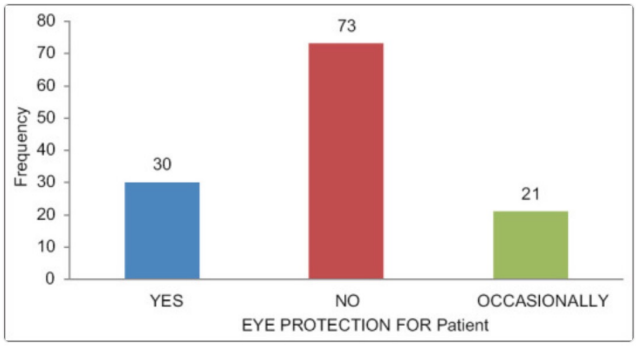
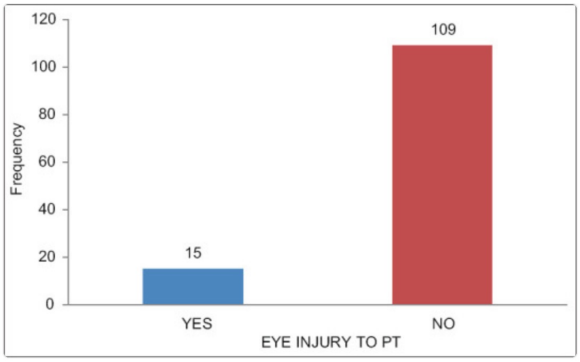
Evaluation of Eye Safety in Dental Office

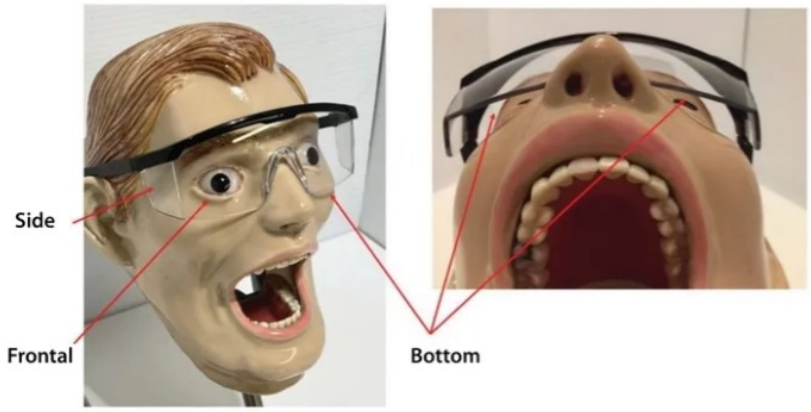




Indian J Occup Environ Med. 2024 Apr 10;28(1):38–40. doi: 10.4103/ijoem.ijoem_28_23

75

On to the Patient:
Bottom Gaps on Mannequin:
(Patient wearing safety goggles with side shields)



Arsenault, Comprehensive Study Evaluating Dental Patient Eye Safety with a Focus on Biological and Physical Hazards, Journal of Massachusetts Dental Society, Volume 73, Number 3, Fall 2024

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Bottom Gaps on Mannequin: (wearing safety goggles with side shields)

After Removal of goggles with side protection

No protective eyewear worn

Arsenault, Comprehensive Study Evaluating Dental Patient Eye Safety with a Focus on Biological and Physical Hazards, Journal of Massachusetts Dental Society, Volume 73, Number 3, Fall 2024

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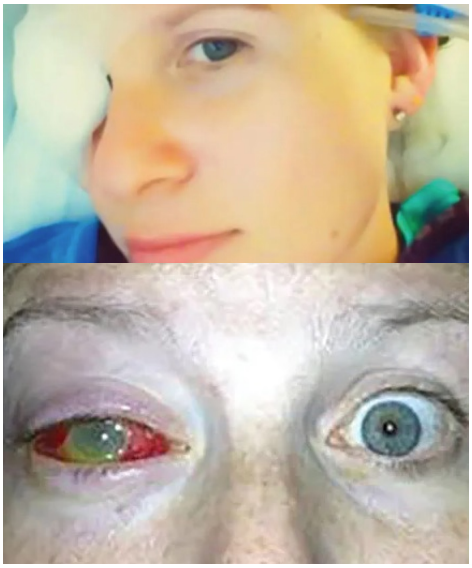

Jenn's Vision:

- Victim of eye injury now patient advocate
- No "regulations" for patient eyewear, but is a best practice
- Note: many states mandate compliance with CDC Guidelines, so now may be considered regulatory.

https://www.rdhmag.com/patient-care/article/16409763/jenns-vision-victim-of-eye-injury-turns-into-advocate-for-eyewear-for-dental-patients

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FAQ:

Since we don't have standardized eye safety protocol for patients, What eye protection should patients wear?

"DHCP are strongly advised to prioritize appropriate eye or face protection for all patients undergoing dental procedures."

"Specifically, adherence to ANSI Z87.1-compliant eyewear standards and measures to mitigate bottom gap exposure should be enforced for optimal patient safety."

Arsenault, Comprehensive Study Evaluating Dental Patient Eye Safety with a Focus on Biological and Physical Hazards, Journal of Massachusetts Dental Society, Volume 73, Number 3, Fall 2024

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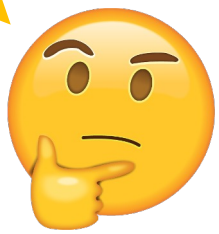
FAQ:

What if my patient is already wearing protective eyewear?

Aren't eyeglasses enough protection for patients?



"Patients with prescription glasses still need protective eyewear since their own eyewear doesn't offer sufficient protection from splashes or spattering."

ADA
American
Dental
Association®

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When it comes to providing patients with protective eyewear, the recommended maxim is patient

"first on, and last off"

This means that the patient should don protective eyewear immediately upon sitting in the dental chair and that the eyewear should remain in place until the patient is ready to exit the operatory.

ADA American Dental Association®

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Chemical Injury Case Scenario:

- Dental Assistant
  - Was preparing operatory
  - Pushed on syringe of etchant to release clogged canula
  - Was not wearing protective eyewear (was not involved in patient care)
- Etch splashed in eye of assistant
- What happened next?

82

Emergency Eye Wash: OSHA Standard 29 CFR 1910.151 (c)

- Eyewash equipment for emergency use where eyes may be exposed to injurious corrosive materials
- Flush for a minimum of 15 minutes—then seek medical help
- Temperature should be tolerated
- Should be installed 10 seconds from hazard
- Eyewash equipment required to be inspected annually

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Highlights from ANSI Z3858.1-2014 Compliance Checklist for Eyewash Stations:		
	Controlled, low velocity flow for both eyes, not injurious to user	5.1.1
	Spray heads protected from airborne contaminants	5.1.3
	Delivers at least 0.4 gallons of water per minute	5.1.6, 5.4.5
	Hands-free stay-open valve activates in 1 second or less	5.4.4
	Located 10 seconds (55 feet) from hazard (on same floor level, unobstructed travel path)	5.4.2; B5
	Tepid water (60-100 F)	5.4.6; B6
	Training: proper use and location	5.5.4
	Maintenance (activate at least weekly) Inspection annually	5.5.2 5.5.5

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If an Occupational Eye Injury Occurs:

Assess injury:

- Splash: Irrigate immediately for 15 minutes
  - Chemical Exposure: Follow Safety Data Sheet
  - Chemical and Bloodborne pathogen exposures: immediate referral for evaluation and post-exposure management
- Penetrating injuries: Assess, immediate referral to qualified health care professional

Immediate Referral to qualified health care professional

Incident report

Follow up, post-exposure evaluation, documentation, recordkeeping

https://www.ada.org/resources/practice/practice-management/eye-safety-in-the-dental-office

85

Blue Light Hazard:

- Photochemical damage to retina caused by short-wavelength radiation from 400-500 nm.
- Most damaging wavelength 420-455nm
- This is the wavelengths of most dental curing lights
- Can damage the light-sensing cells (photoreceptors) in retina
- Children more susceptible
- ALL humans are exposed to excessive blue light

Fluent, Ferracane, Mace et. al. Shedding Light on a Potential Hazard: Dental light curing units, 2019

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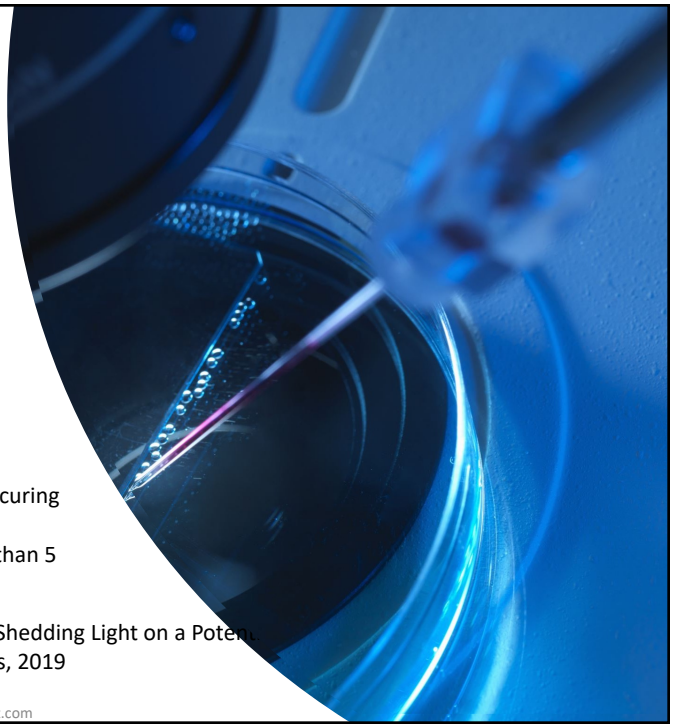
Dental Personnel Exposure to Blue Light:



Everyday life:

- Sunlight
- Lighting: LED and Fluorescent
- Electronic devices
- Computers

Dentistry:

- Dental Curing Lights
  - In one study, DHCP spend 240 hours per year curing resins
  - 53% of dentists use LED headlamps for more than 5 hours per day
- Operatory light
- Microscopes ?

Fluent, Ferracane, Mace et. al. Shedding Light on a Potent Hazard: Dental light curing units, 2019

87

Chronic Exposure to Blue Lights:

Can damage and/or cause death of light-sensing cells (photoreceptors) in the retina

Damage is accumulative

Implicated in retinal degenerative diseases such as age-related macular degeneration (AMD)

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LED Curing Lights:

- Dominate the market
- Are much more intense
- Emits in blue wavelength region (430-480nm)
- Can cause soft tissue burns
- The threshold of high-power LED curing lights is unknown

Year:	Output:
1970-1990	400-600 mw/cm2
1990's	1000 mw/cm2
Early LED's	1500 mw/cm2
Highest output LED today	6000 mw/cm2

urce: Ultradent website, Valo Cordless, Technical Details

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How Do YOU Protect YOUR Eyes When Using Light Curing Units:

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Type of Eye Protection	Advantages	Disadvantages
Orange shield attached to light guide	• Can be adjusted to protect operator	• Small surface area • Cannot protect DDS and assistant at same time • May restrict access of the light • Consider additional protection for assistant
Orange goggles with side protection	• Provides optimum protection • Allows for hands free protection	• Inconvenient if using loupes
Antiglare cones that fit on tip of LCU	• Easy to use • Hands free protection	• May obstruct view/prevent ideal placement of light tip • Can increase distance between tip and tooth • Cone may easily slip, not provide protection
Paddles	• May provide adequate coverage for DDS and assistant	• Requires an extra hand
”Look away” method	• NONE! • NOT recommended!	• User often glances at operative field • Cannot monitor location of light tip

8/18/25 mariefluent.com

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FDA U.S. FOOD & DRUG ADMINISTRATION

Considers curing lights to be CLASS II medical devices

- Capable of posing moderate risk to patient and /or user
- Must meet approval standards before being sold in US
- Protective eyewear included, MUST meet standards for safety and efficacy!

Protective eyewear purchased after market:

- Not supplied with the curing light
- Considered CLASS I (low risk to patient/user)
- Not required to submit proof of efficacy and safety!

8/18/25 mariefluent.com

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Best Practice for Eye Protection During Light Curing:

KNOW THE PHOTO INITIATOR IN YOUR DENTAL MATERIALS

MATCH THE DENTAL LIGHT CURING UNIT TO YOUR DENTAL MATERIAL

MATCH THE PROTECTIVE EYEWEAR TO YOUR CURING LIGHT

ENSURE YOUR PATIENT WEARS THE SAME LEVEL OF EYE PROTECTION

Fluent, Ferracane, Mace et. al. Shedding Light on a Potential Hazard: Dental light curing units, 2019

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Eyewear Safety During Non-Patient Care:

Instrument Reprocessing:

- CDC: "Wear appropriate PPE when handling and reprocessing contaminated patient equipment"

Environmental Surfaces

- CDC: "Establish an area outside of the operatory where PPE can be donned and doffed appropriately and safely"

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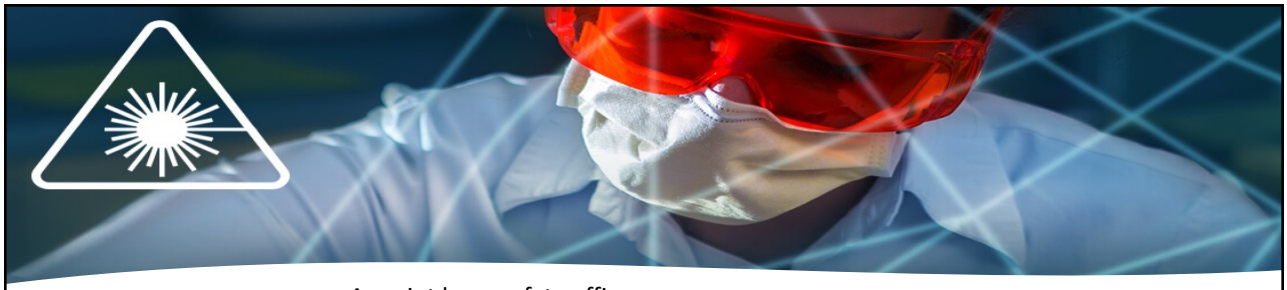

Eyewear for Laser Safety:

- Appoint laser safety officer
- Read laser guidelines and IFU
- DHCP receive comprehensive laser safety training
- **Wear laser-specific eyewear per IFU**
- **No scratches, chips or cracks in lenses**
- **Provide laser eye protection for all clinical personnel AND patient**
- **Eyewear is "first on, last off" for ALL personnel in operatory and patient**
- Post "warning sign" on door of operatory to prevent anyone from entering room without proper eyewear

Wallace, Angie, Laser Safety Eyewear: It's nonnegotiable; Dentistry iQ, March 2023

96

ADS Callout:

INFECTION CONTROL In Practice
ADS Association for Dental Safety
Vol. 23, No. 5 October 2024

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Disposable or Reusable?

- Disposable:
  - Ensure disposable eyewear meets safety standards
  - If Face shield is worn, a mask is still required
- Reusable:
  - Clean and disinfect between patients based on manufactures' IFU
  - Follow instructions for use to prevent film buildup and prevent scratching

Questions to ask:
- Is impact-resistant eye protection needed and provided for the procedure?
- For DHCP and the patient?

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Cleaning Loupes (Eyewear):

DO:

- Perform hand hygiene
- Follow IFU
- Rinse debris with few droplets of water
- Use microfiber lens cloth
- Apply cleaning solution to cloth
- Keep in protective case
- Cover optical loupes

DO NOT:

- Use cloth not approved by IFU
- Use products not approved by IFU
- Submerge in water/solutions
- Apply cleaning solution directly
- Place in autoclave

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"Safety" Eyewear:

Buyer Beware!

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Ideal Protective Eyewear:

- **Conforms with ANSI Standards for impact resistance**
- **Full coverage**
- **No gaps**
- **Side protection**
- **Comfortable**
- **Great visibility!**

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Take Away Points:

- Education and training for dental personnel: What, where, when to wear
- Spread the word
- Get an eye exam
- Patient protection should match the level of protection as DHCP
- Protection during light curing and laser procedures is nonnegotiable!
- “Mind the gaps” between mask and eyewear
- Personal eyewear and contact lenses are NOT considered PPE

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Resources:

- American Dental Association: https://www.ada.org/resources/practice/practice-management/eye-safety-in-the-dental-office
- 2003 CDC Guidelines for Infection Control in Dental Health Settings: https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5217a1.htm
- 2016 Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care, https://www.cdc.gov/dental-infection-control/media/pdfs/2024/07/safe-care2.pdf

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Resources cont.

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Strassler H. 2011. The physics of light curing. Compendium, July/Aug, Volume 32, Issue 6

Strassler, Howard E. and Price, Richard B. 2014**.** Understanding Light Curing, Part 2: Delivering Predictable and Successful Restorations. Retrieved from https://www.dentalcetoday.com/courses/165%2FPDF%2FDT_June_14_174_fnl.pdf

Wallace, Angie, Laser Safety Eyewear: It's nonnegotiable; Dentistry iQ, March 16, 2023

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