Introduction to Lasers

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In-Office Laser Consultant for LVI

Course Outcome

Hygienists will be able to know:

- Understand Laser Physics
- Define which lasers can be used by hygienists
- Laser safety
- Indications for use
- Case Studies

Light...

- Light is made up of small particles, Photons
- Small particles move in waves
- Ordinary Light has Multiple Wavelengths
- Non-Directional
- Non-Focused

“Laser” - an acronym...

Light
Amplification by the
Stimulation
Emission of Radiation

Laser Light...

- Typically one color
- Highly Focused
- Directional
- Organized
- Efficient

Electromagnetic Spectrum

Regions (and Boundaries) Relative to Laser Emission

- Ultra-violet (1 - 349 nm)
- Visible (350 - 750 nm)
- Infra-red (750 + nm)
**Electromagnetic Spectrum**

- **Near Infrared**
- **Mid Infrared**
- **Far Infrared**
- **UltraViolet**
- **Invisible Thermal Radiation**
- **Invisible Ionizing Radiation**

**Dental Laser Wavelengths on the Electromagnetic Spectrum**

- **Alexandrite/Gd**: 750 nm
- **Argon**: 488 nm, 514 nm
- **He-Ne**: 632 nm
- **Diode**: 810 nm, 980 nm, 1064 nm
- **Nd:YAG**: 1064 nm
- **Er:YAG**: 2940 nm
- **CO2**: 10,600 nm
- **Er,Cr:YSGG**: 2790 nm

**Laser Emission Modes**

- **Continuous Wave**: always on
- **Chopped or Gated**: mechanically closed
- **Super Pulsed**:...should be Super Chopped
- **Free-running pulsed**: short bursts of energy, dependent on the excitation source in the dental laser.

**Laser Tissue Interaction**

Power Density + Duration of exposure + Amount of Cooling + Wavelength + Emission Mode + Tissue Characteristics = BIOLOGICAL EFFECT

**Modes of Use**

- **Contact Mode**: narrow deep incision
- **Non-contact Mode**: shallow broad ablation

**Approximate Absorption Curves Of Tissue Compounds**

- **Hb**: Hydroxyhemoglobin
- **Melanin**: Melanin
- **H2O**: Water
**Soft Tissue Clinical Applications**

- Gingivectomy
- Gingival troughing for impressions
- Implant Recovery
- Mucocele
- Pulpotomy
- Sterilization of Alveolus after extractions
- Frenectomy
- Tissue-ectomy
- Sulcular Debridement/Bacterial Reduction

**Biostimulation**

*Low Level Laser Therapy*

Light augments the metabolic rate of cells with compromised metabolism, but normal cells are not affected

- Stimulates blood flow, macrophages, fibroblasts, etc.
- Reduces pain receptors
- Used post surgery, hypersensitivity, TMD

**TYPES OF LASERS**

**Nd:YAG - 1064nm**

Neodymium: Yttrium Aluminum Garnet

- Soft tissue surgery
- Bare fiber delivery
- Free running pulsed, high peak power
- Commercially available since late 1990

**Diode Lasers - 810nm, 940nm 980nm, 1064nm**

Active Medium is either:

- AlGaAs (Aluminium, Gallium, Arsenate)
- InGaAs (Indium, Gallium, Arsenate)

- Soft tissue surgery
- Bare fiber delivery
- CW, Gated Modes
- New digital pulsing available on some instruments
- Lightweight and compact
- Can be used for tooth whitening
Laser Glasses with Magnification

DC International
www.fronter.com
P: (501) 337 8666
E: sales@fronter.com

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Periodontal Therapy

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Laser Settings

Decontaminate Settings, 300-400 fibers

- Diode 810-980 nm
  - .5 Watts continuous adjust as needed
  - 12-15 seconds/site
- Nd:YAG 1064nm
  - 30mJ, 50 Hz,...= 1.5 Watts adjust as needed
  - 40 seconds/site

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Other Laser Procedures for Hygienists

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Aphthous & Herpetic Lesions

- Non-Contact, non-initiated tip, CW
- HVE mandatory
- Start at low setting, .3mW and increase by .2mW every 45-60 seconds, up to 5 settings
- Place laser 2mm away from lesion
  - OR
- Start 5mm away from area and “spiral” down to 2mm away keeping setting at 1.0W

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Laser Safety

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**Class IV Lasers**
- High powered Dental Lasers
- Hazard to eyes, skin, fire, laser
- Generates air contaminants
- Hazardous plasma radiation
- LSO required
- Maximum Permissible Exposure (MPE) values for eye & skin
- Nominal Occular Hazard Distance (NOHD)
- Nominal Hazard Zone (NHZ)

**Laser Operatory**
The NHZ and the NOHD is not WAVELENGTH SPECIFIC
It is...
DEVICE SPECIFIC
See owners manual of laser to determine
If SW laser has an NHZ of 5 feet
At 4W the NHZ is NOT 4 feet

**Laser Safety**

**Combustible Gases**
Nitrous Oxide and Laser Usage
2005 ANSI standard, Z-136.3, states that Nitrous Oxide/Oxygen can be used with proper scavenger and suction techniques. However,...
And,...Ether, alcohol-based topical anesthetics, and alcohol moistened gauze should be used with caution in close proximity to the laser beam. Patients with oxygen- tanks should be left outside NHZ.

**Signs of Eye Exposure**
- Headache
- Extreme Watering
- Gritty, Sand
- Burning
- Popping noise
- Floaters
- No Pain

**High Volume Evacuation**
- To help cool site
- To remove Plume
  - carbonized tissue and blood
  - contains: Toluene, Acrolein, Formaldehyde,
  - can contain viruses and bacteria

**Laser Safety**
Laser Use Documentation
Chart notes should include:
- fiber size/spot size
- tip shape and size
- emission mode--continuous/pulsed
- energy/power setting(s)
- time of exposure
- safety glasses worn by all
**Scope of Practice and The Dental Practice Act**

The practitioner must deliver competent dental care in accordance to his or her education, training, clinical experience and scope of practice.

**Additional Resources for LASERS**

The Academy of Laser Dentistry

[www.laserdentistry.org](http://www.laserdentistry.org)

At this time we are the only unbiased international organization of clinicians, researchers and academicians for laser dentistry.

**Resources for Lasers**

Call 1-800-545-2522

[www.elsevierhealth.com](http://www.elsevierhealth.com)

**Resources for Lasers**

- NEW BOOK BY ANGIE MOTT
- SOFT-TISSUE LASERS IN DENTAL HYGIENE
  - by: Jessica Blayden & Angie Mott
  - Wiley-Blackwell
  - ISBN 978-0-470-5854-4
  - Can order through Amazon.com

**In-Office Laser Certification**

For more information regarding laser certification for Dental Hygienists using lasers, please contact Angie Mott at:

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Or by phone at (918) 231-0491

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Your next Step: Join ALD

See you in Scottsdale, AZ Feb 27-March 1, 2014
Thank You for your time!!