

Aesthetic Laser & Intense Pulsed Light “Core of Knowledge”

E-Learning

Level 4 Course – Accredited by OCN Credit 4 Learning

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Introduction

- Please take a moment to familiarise yourself with how to find your way around this program
  - "Next" & "Previous" buttons
  - The side panel shows an Outline listing of the slides in each module

    (The slider allows you to rapidly navigate back and forth between sections if you wish to do so)
  - The "Resources" tab at the top right of the display window contains reference files and copies of all training slides
  - Please ensure you have Sound enabled on your computer

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Aims of the course

- To become familiar with lasers and intense pulsed light and how these devices are used safely in aesthetic practice
- To cover the “Core of Knowledge” topics required by insurers and various regulatory authorities in the UK

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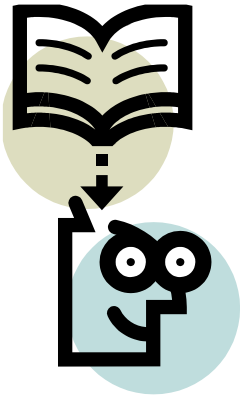
Background of participants

- This course is suitable for anyone who wishes to work with Lasers or Intense Pulsed Light
- As the background knowledge of individuals varies, some slides may cover topics with which you are already familiar
- The aim is that by the end of the course all participants will be able to understand the aesthetic devices in sufficient detail



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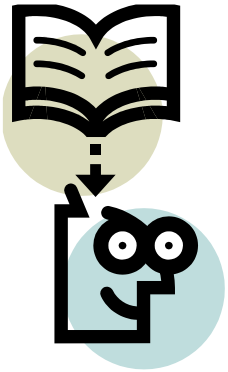
Topic Modules

- This course is divided into 8 training modules including an online Risk Assessment exercise plus a final assessment quiz.
- In total this training lasts around three hours.
- It is advisable to move progressively through each module as information in later modules may rely on an understanding of earlier sections
- It is important that you view all slides in each of the modules and do not skip any material
- Certificates will only be issued to candidates who complete the full training course and pass the assessment
- In each module earlier slides can be reviewed by using the side navigation bar



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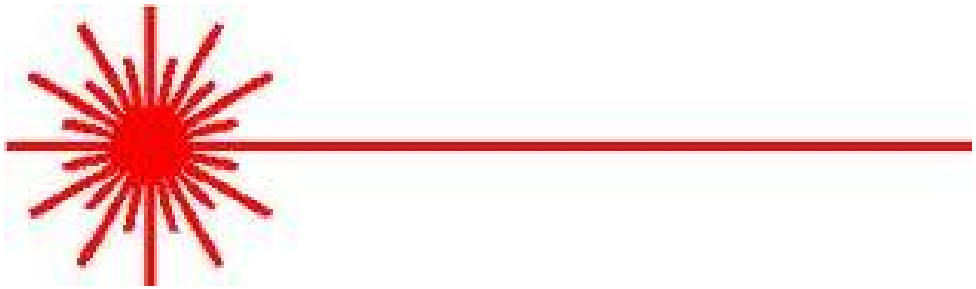
Module 1

Basic Laser Theory



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What is a laser?

The word laser is an acronym:

Light

Amplification

Stimulated

Emission

Radiation

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How a typical laser works

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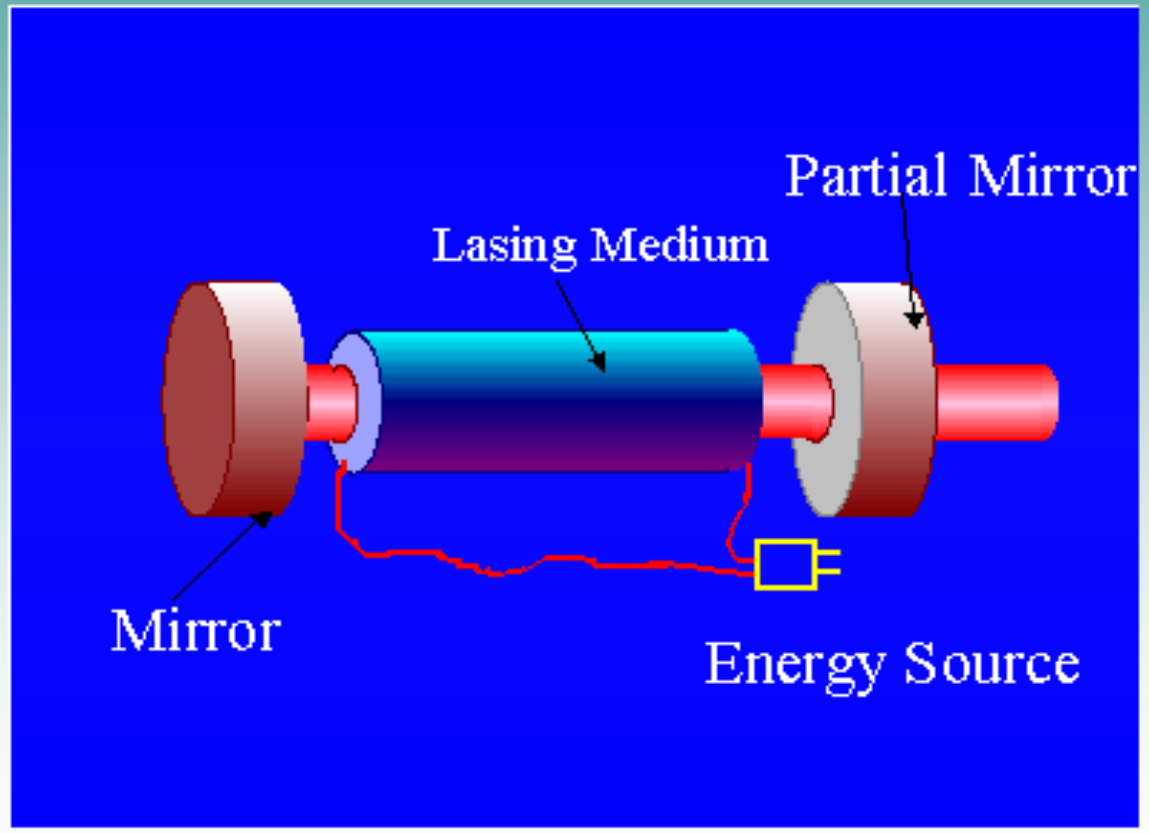
Components of a Generic Laser System



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Lasing Media

The source of the laser light can be:-

- Gas – e.g. the Carbon Dioxide laser
- Liquid State – e.g. the Pulsed Dye laser
- Solid State (crystal) – e.g. the Neodymium Yttrium Aluminium Garnet (Nd:YAG) laser

Do not worry at this stage about the long names of many of the laser crystals!

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Components of Gas, Liquid and Solid (Crystal) Lasers

The following examples have been chosen as the importance of these specific laser types will become apparent later

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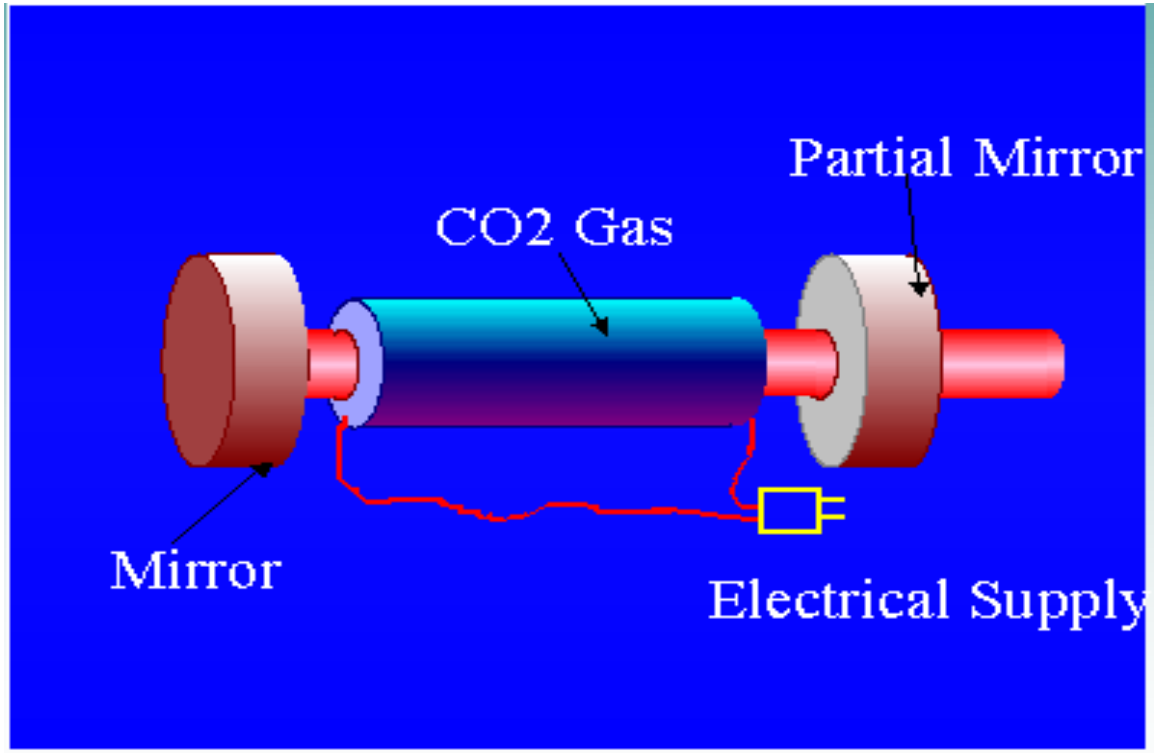
Basic Components of a Carbon Dioxide Laser



- **An example of a gas laser - one of the first lasers used in surgery**

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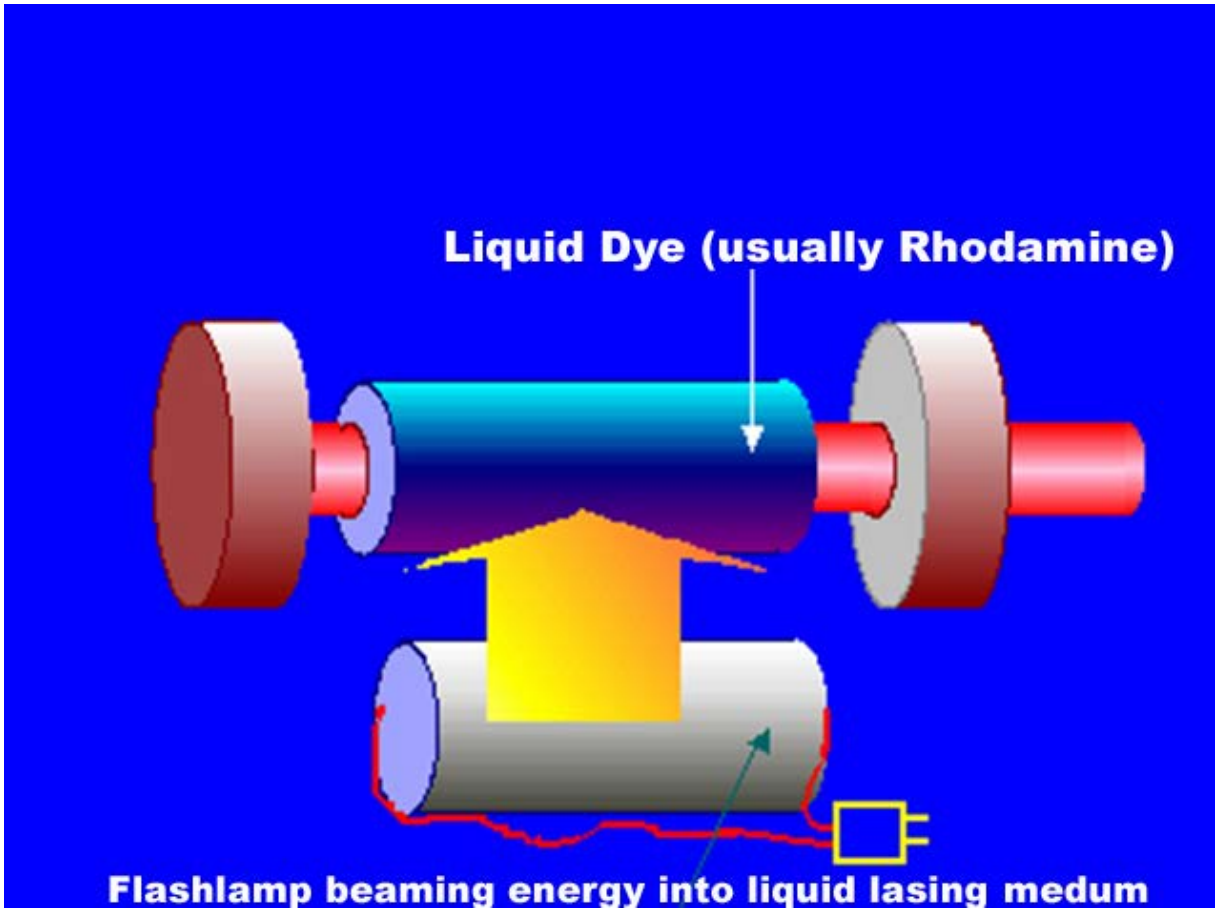
Pulsed Dye Laser



The Pulsed Dye Laser was the first purpose designed Aesthetic laser

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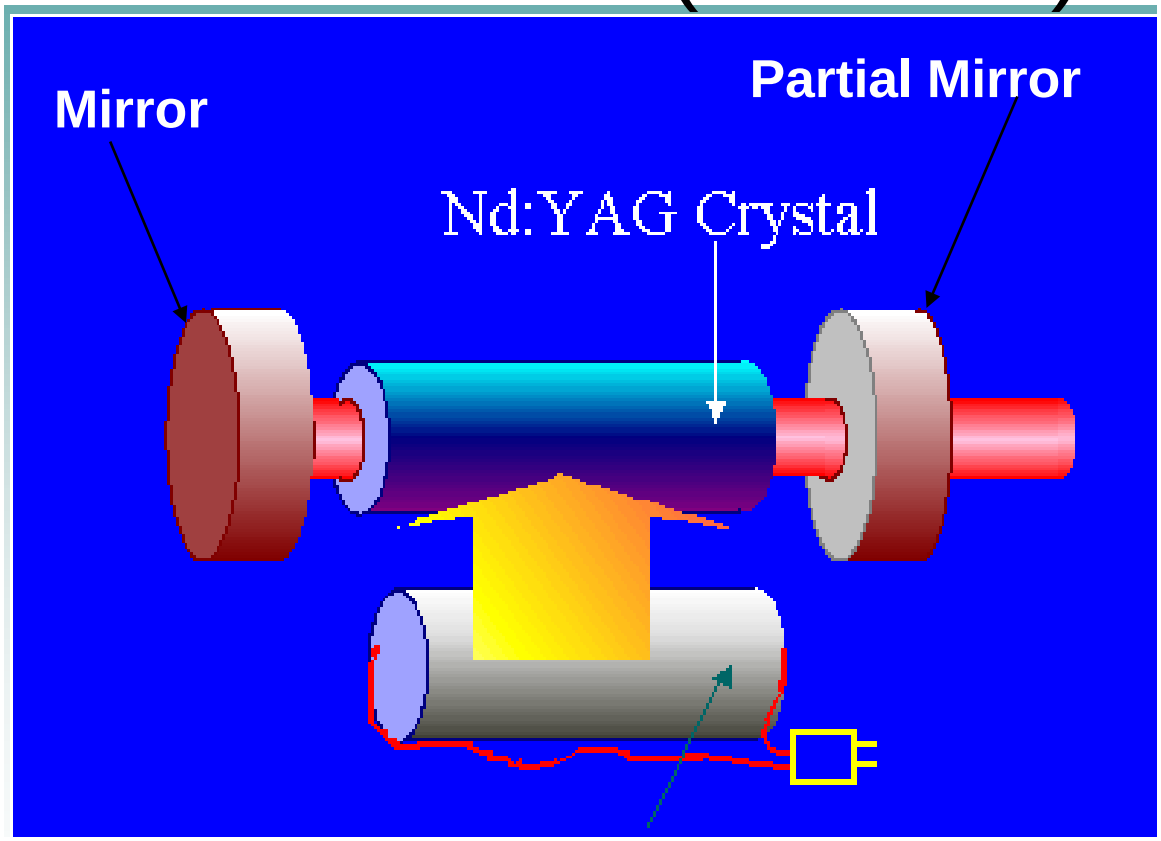
The Neodymium Yttrium Aluminium Garnet Laser (Nd:YAG)



Flashlamp delivering light energy into Nd:YAG Crystal

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Characteristics of Laser Light

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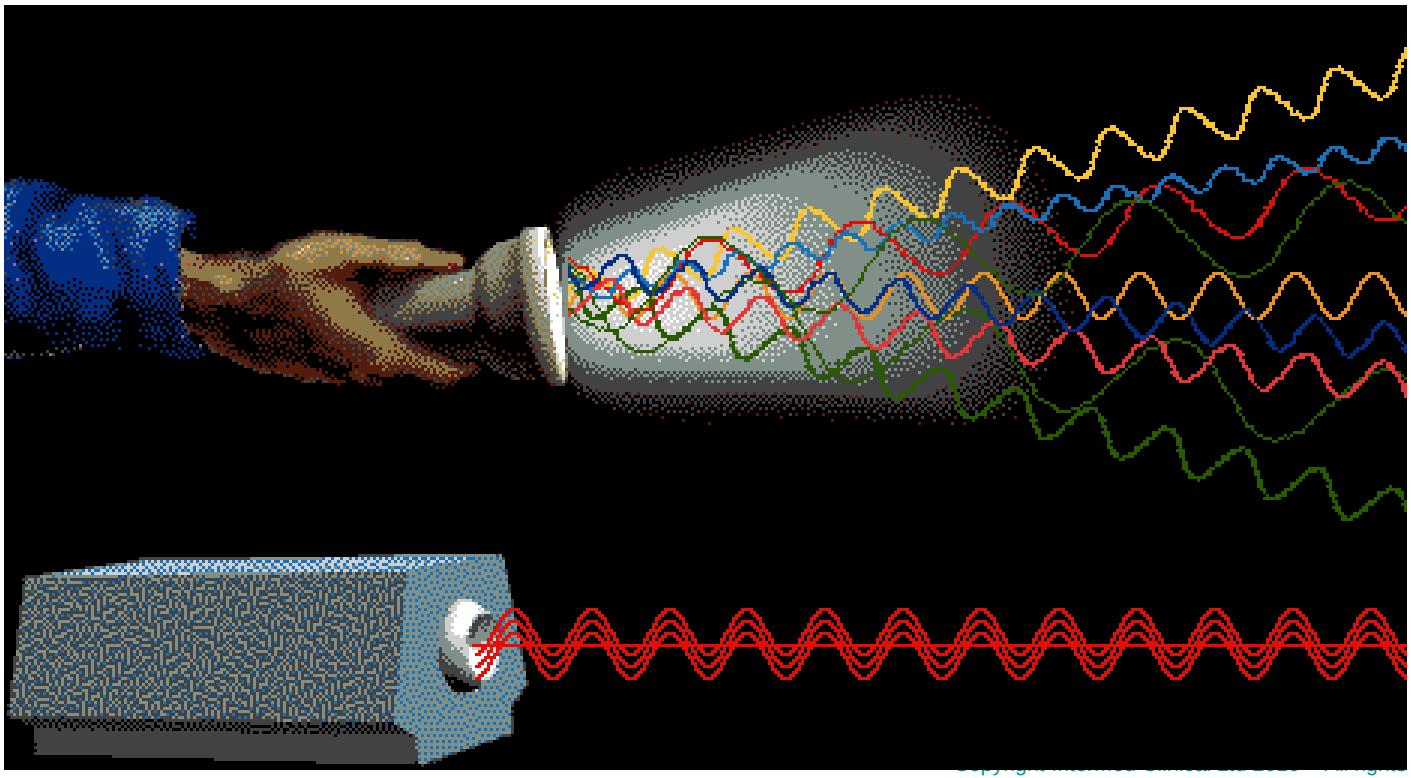
Properties of a Laser

- Collimated – highly directional
- Coherent – light waves in phase
- Monochromatic – light of a single wavelength



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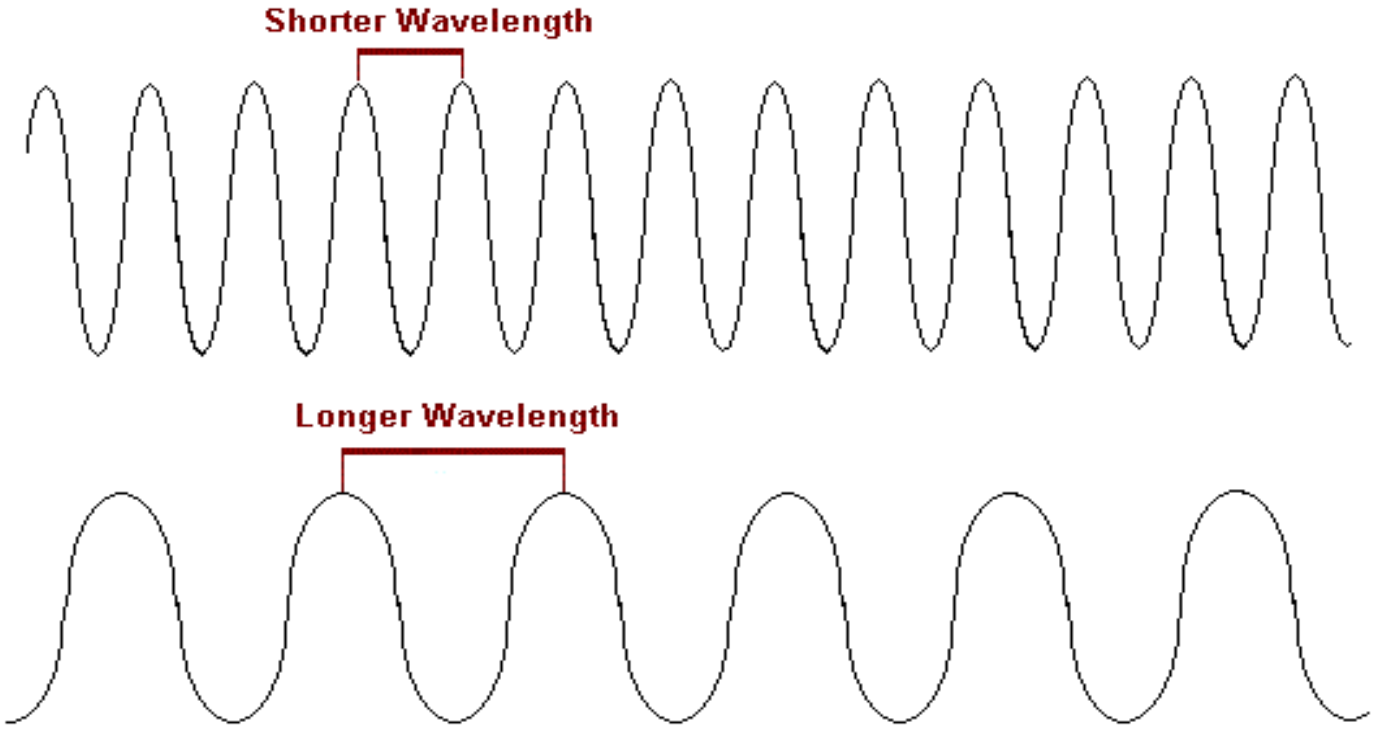
What is meant by “Wavelength”



- Light travels in waves
- Wavelength is distance between wave peaks measured in nanometers (nm)

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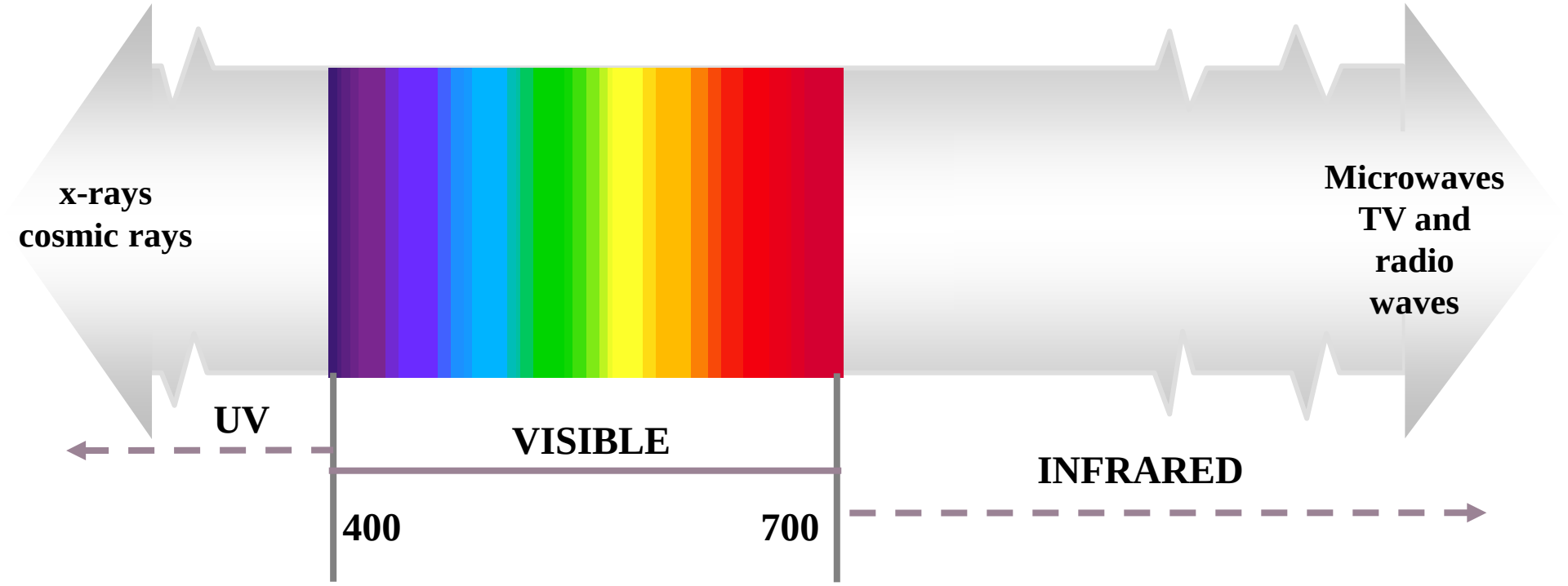
Laser Wavelength

Can be any point on spectrum

- Ultraviolet wavelengths below 400 nm are invisible to the human eye
- Infrared wavelenghts above 700 nm are also invisible to the human eye
- Most Aesthetic lasers are in visible and infra red regions of spectrum



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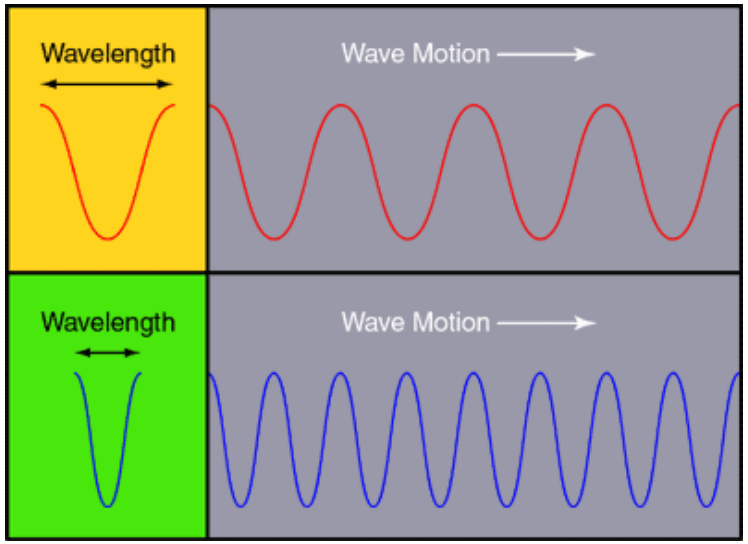
Relationship between wavelength and frequency



- Frequency is the “speed” that light waves move
- If Frequency increases then wavelength decreases and vice versa

(This change of frequency is used in one of the Aesthetic lasers we shall discuss later)

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Tissue Interactions of Laser Light

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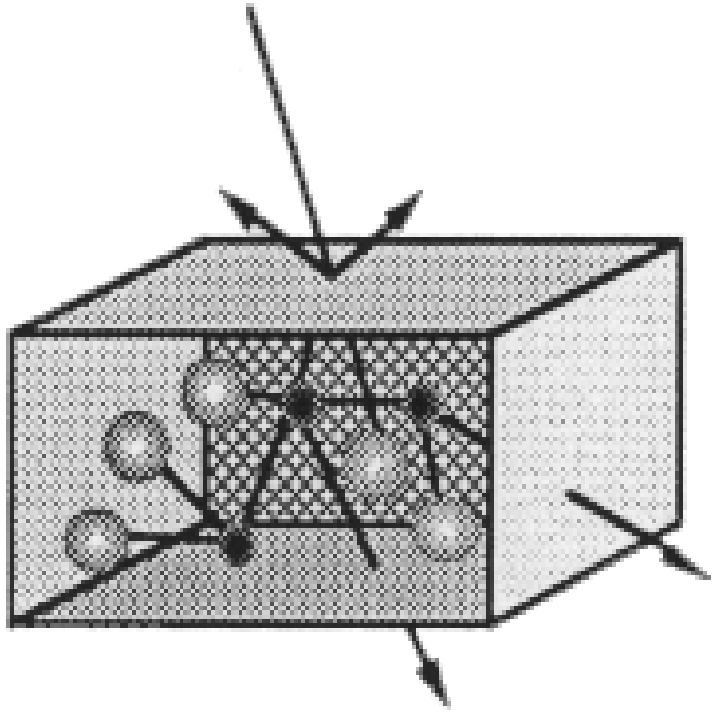
Interactions of light that can occur

- Reflection
- Refraction
- Absorption
- Scatter
- Transmission



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Mode of Action of Main Laser Types

Photothermal

- e.g. most Aesthetic Lasers & IPL

Photomechanical

- e.g. Q-switched Lasers for Tattoo Removal

Photochemical

- e.g. Active Acne Therapy and Tooth Whitening using Blue or Green Light Lasers or LED's

Photobiological

- e.g. Low Level Laser Therapy for Lipolysis

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Photo Thermal Effects

Further information

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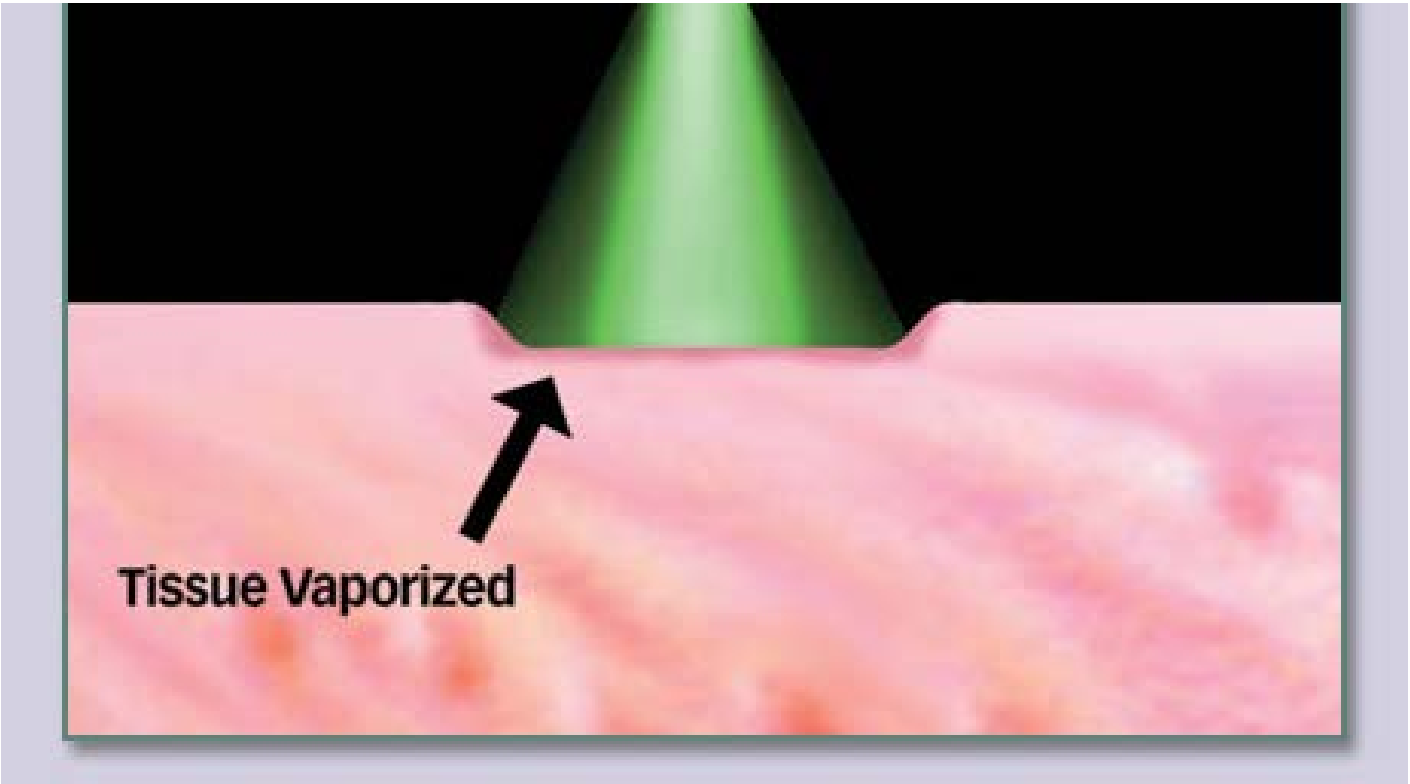
If tissue is heated above boiling point - Vaporization occurs (often referred to as Ablation)



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Tissue Coagulation

If Tissue is heated above 60 degrees Centigrade

– Coagulation occurs

This tissue is necrotic (“dead”) and will either slough away or be removed by the body’s immune system

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If heating is less than 60 degrees Tissue is de-natured i.e. injured but can recover

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Absorption of Light by Tissue Components

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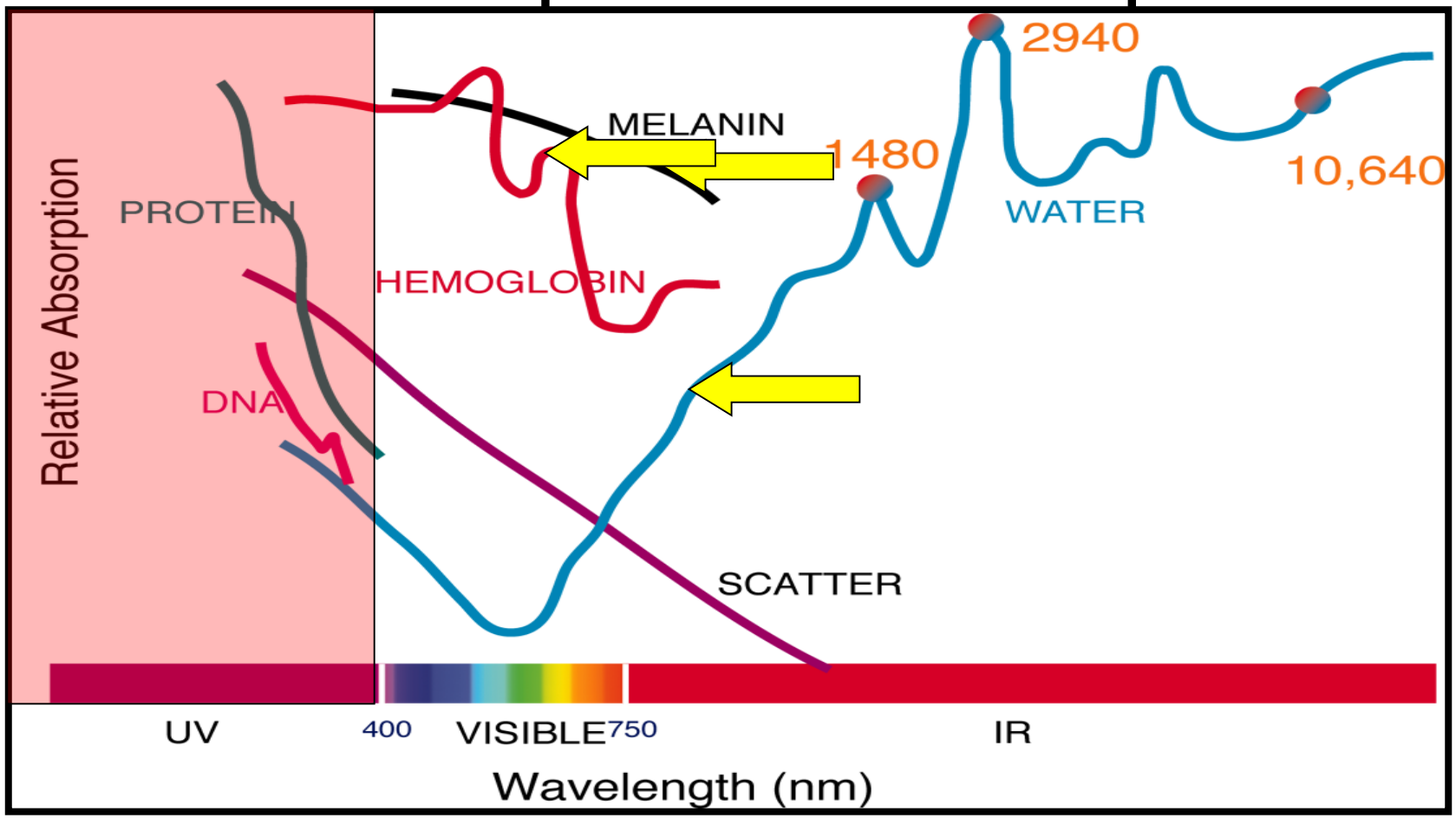
Skin Components absorption



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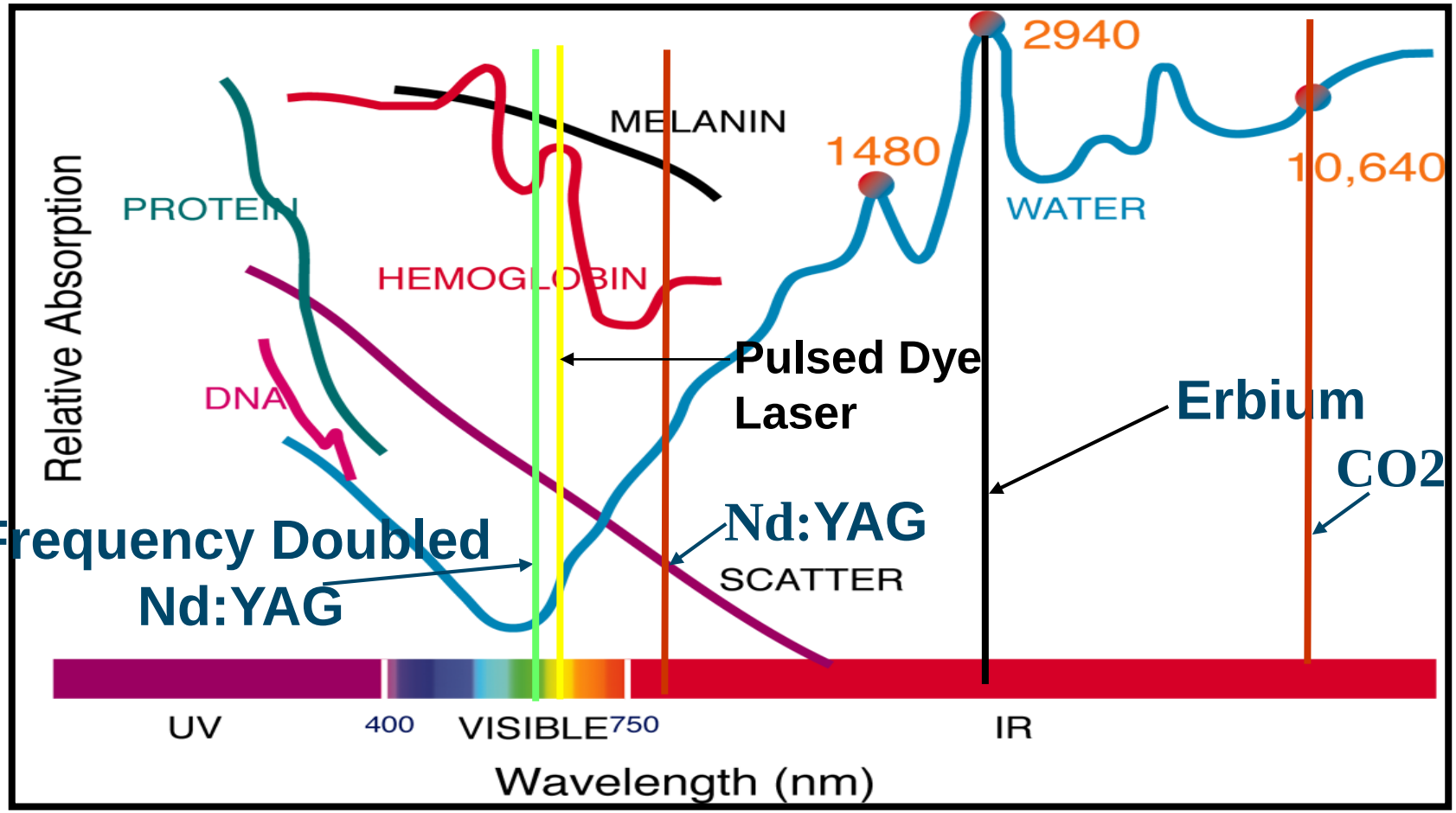
Wavelengths of certain lasers



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Frequency Doubled Nd:YAG Laser

- In the last slide you will see that it is possible to “frequency double” the infra red Nd:YAG wavelength (1064 nm)
- This creates a wavelength of 532 nm
- Note that by doubling the frequency the wavelength is halved
- Thus the invisible Nd:YAG 1064 nm becomes the 532 nm green laser

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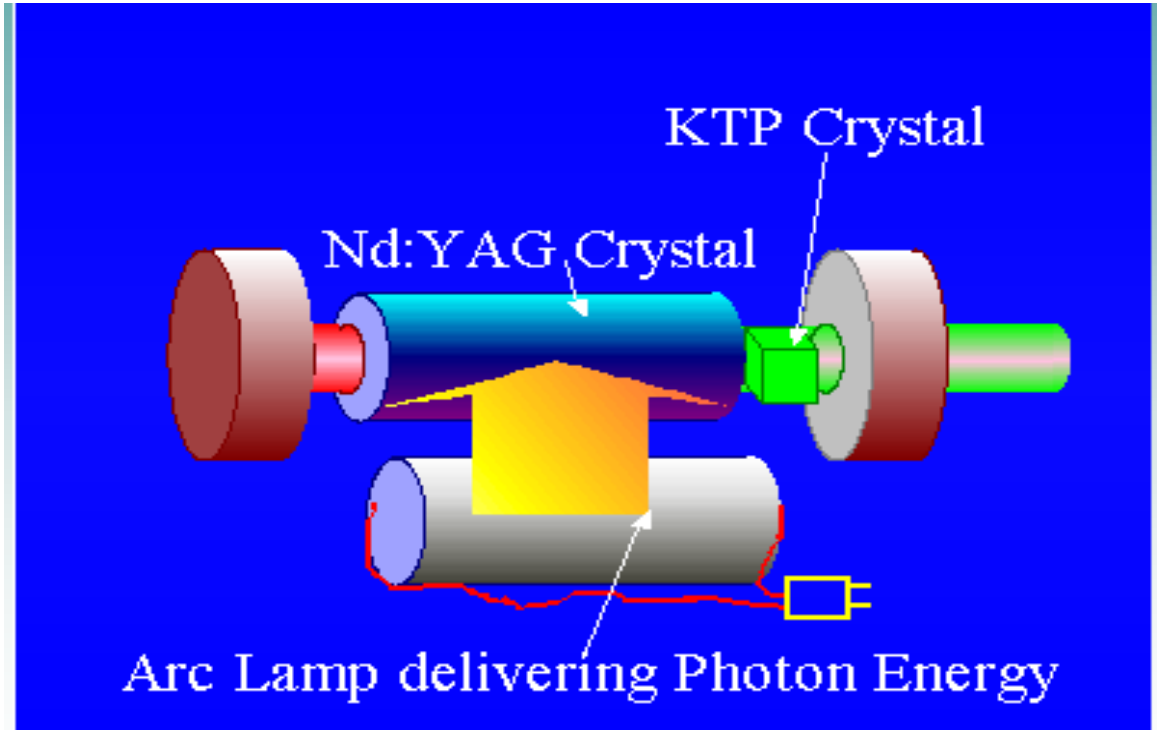
Basic components of a KTP Frequency Doubled Nd:YAG Laser



By using a frequency doubling crystal of “KTP” inserted in the infra red beam of an Nd:YAG laser the wavelength becomes a visible green beam

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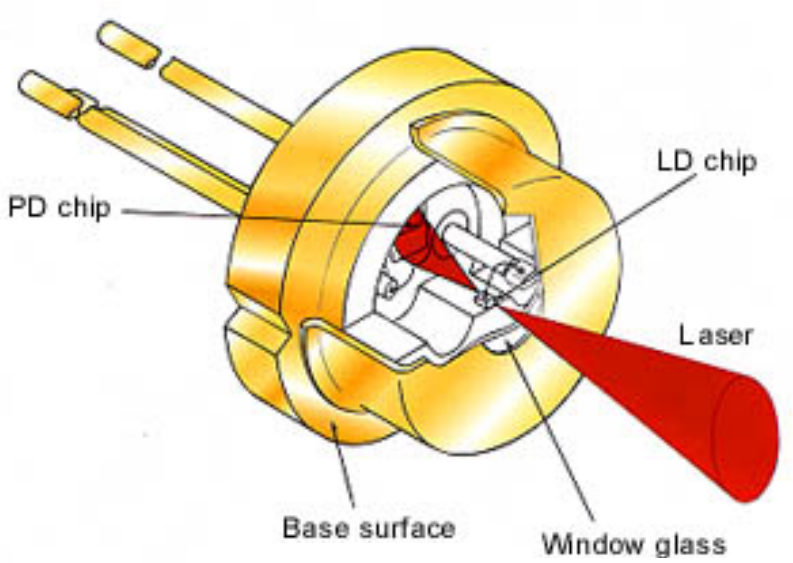
Development of Diode Lasers

- Minute in size
- Completely solid state
- Based on wafers of crystalline material – usually Gallium Arsenide with wavelength of 810nm
- Spin off from industrial lasers
- However current technology limits each Diode to lower power than can be achieved with traditional lasers
- Therefore Diode lasers usually produced as a multi-diode array



Approx the size of a 10 pence piece

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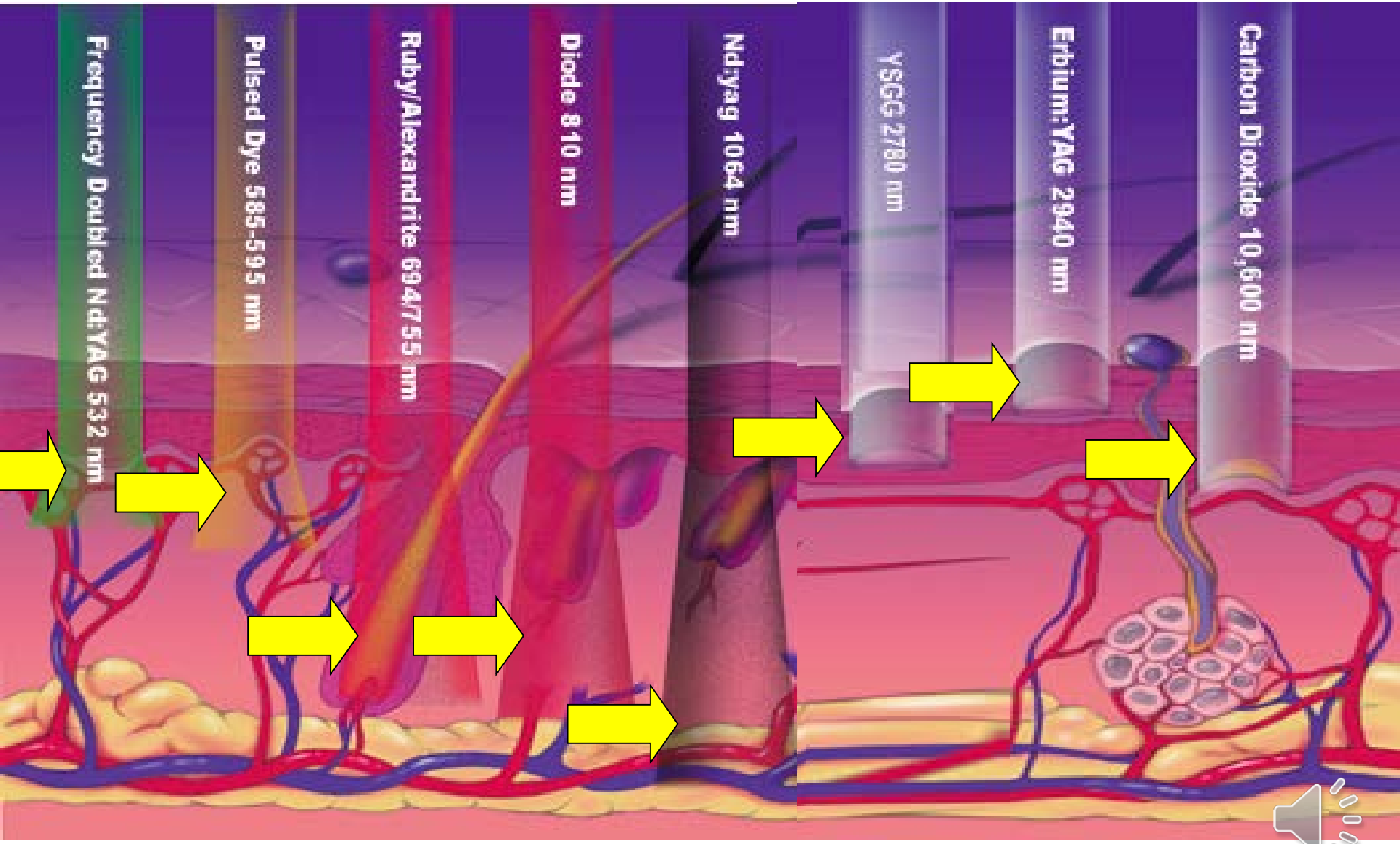
Laser Penetration in Skin



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Effects on Skin of Pulsing of Light

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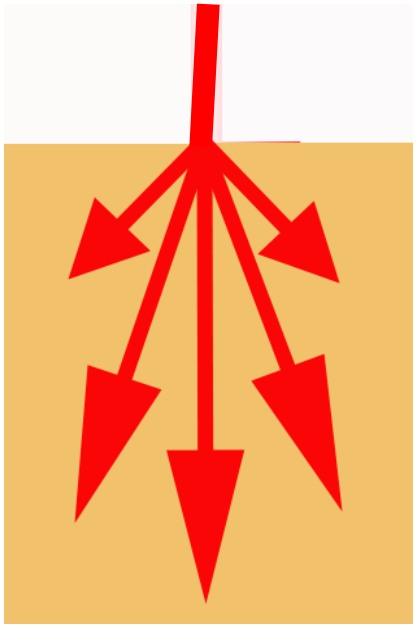
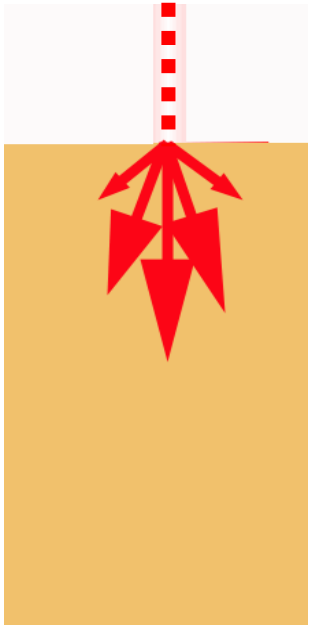
Pulsing of Light Reduces Collateral Tissue Effects

Continuous Beam



Pulsed Beam



- Pulsing reduces the “on” time of the light at the target tissue and reduces conduction of heat
- This reduces any collateral damage

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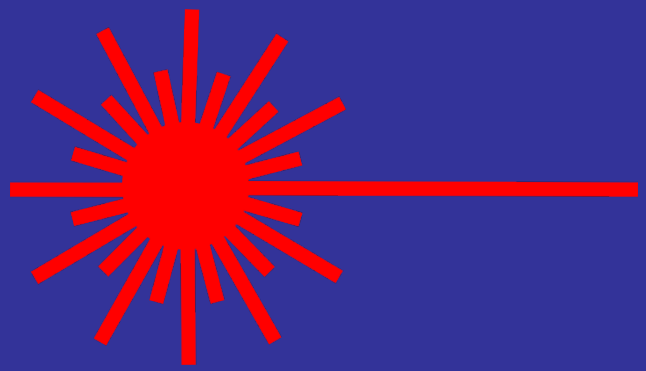
Summary of Module 1 Laser Theory

- Laser light is produced by stimulated emission
- Lasers produce single wavelengths of light
- Certain wavelengths of laser light are specifically absorbed by main tissue components
- Absorbed laser light is converted to heat
- Pulsing of laser reduces conduction of heat preserving nearby structures
- Heat either vaporizes, coagulates or denatures tissue



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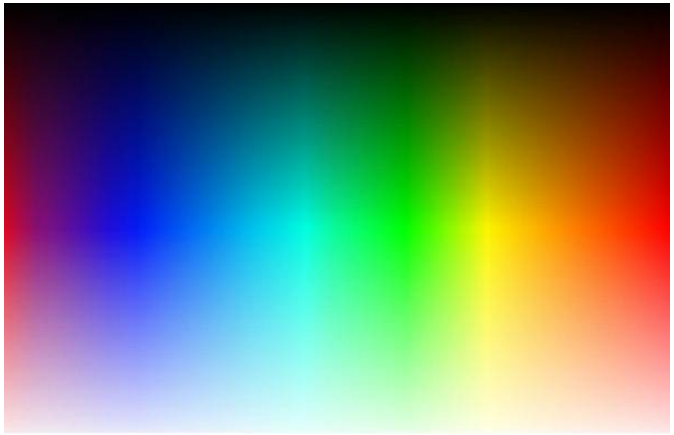
Module 2



Intense Pulsed Light (IPL) Theory

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Rationale for Development of Intense Pulsed Light

- You will recall from the last module that lasers usually produce single wavelengths of light
- Several lasers therefore needed to offer full range of treatments
- In 1990's Israeli scientist produced first IPL device with multiple aesthetic applications

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What is an IPL?

- Uses flashlamp to produce intense pulses of light
- Uses interchangeable filters to produce useful “bands” of wavelengths

  i.e. a range of wavelengths which will be absorbed by the chosen target tissue component

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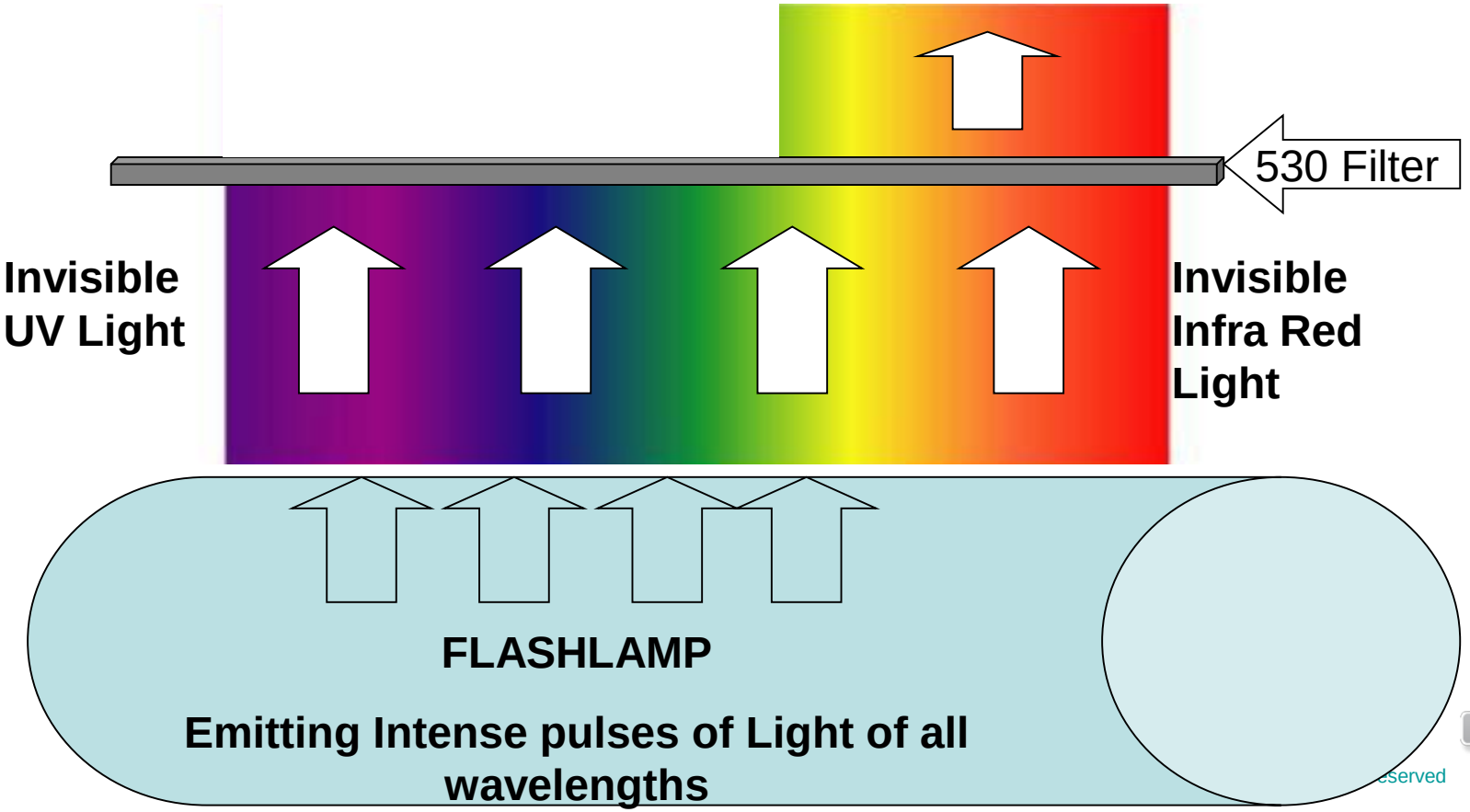
How IPL Works

Filter removes all light below it's value – in this example UV and Blue light are removed allowing Green, Yellow, Red and Infra Red light through the filter



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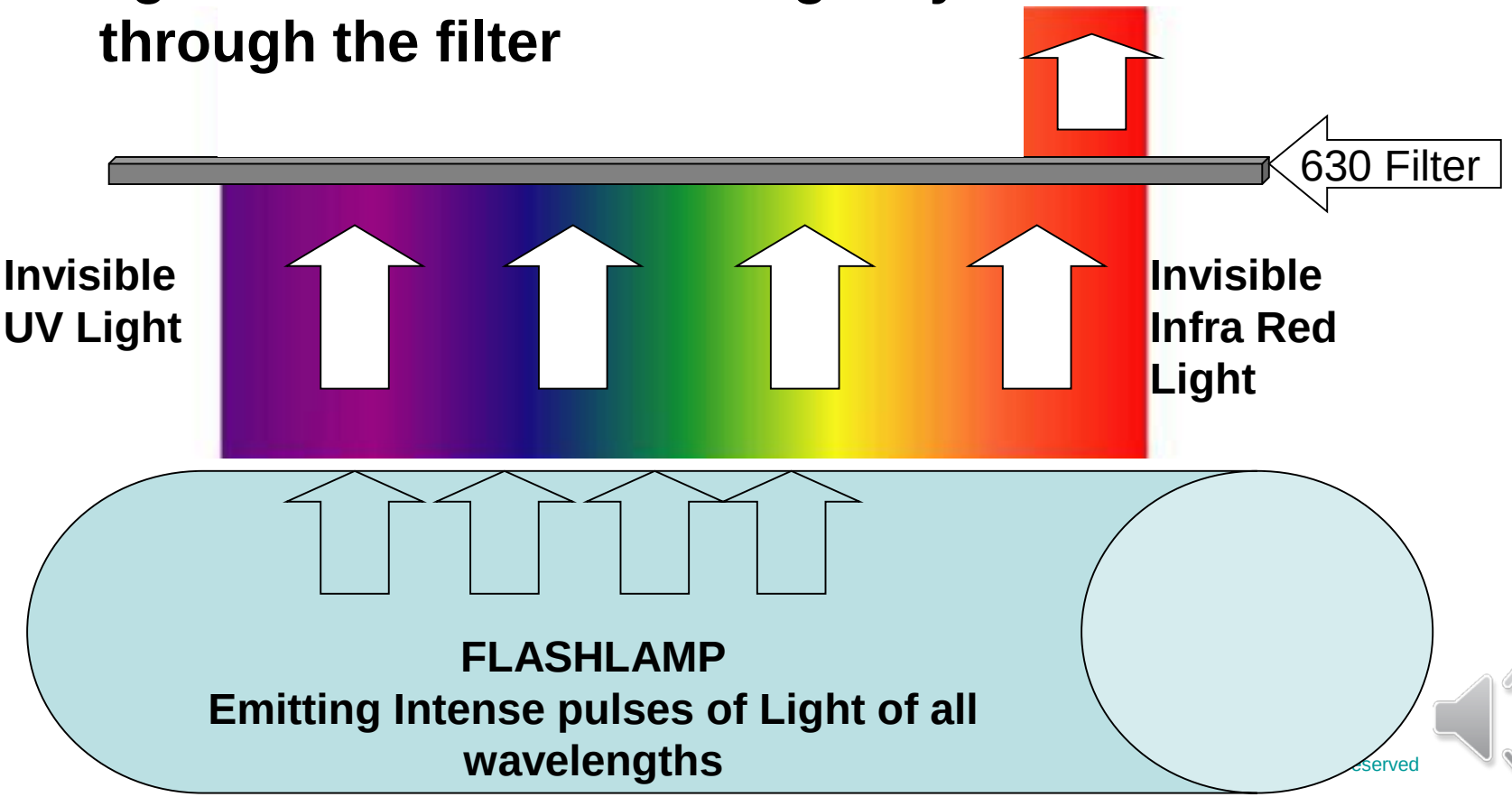
IPL using a different filter

Filter removes light below it's value – in this example UV, Blue, Green & Yellow light are removed allowing only Red & IR through the filter



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Removal of Infra-Red Wavelengths

- Most IPL machines remove unwanted infra-red light above 1200 nm by using the water flowing through the treatment head
- Some have special coatings on the optics of the treatment head which will also remove this infra red light
- Therefore you will see that most IPL machine filters are labelled with a range of wavelengths e.g. 530 -1200nm

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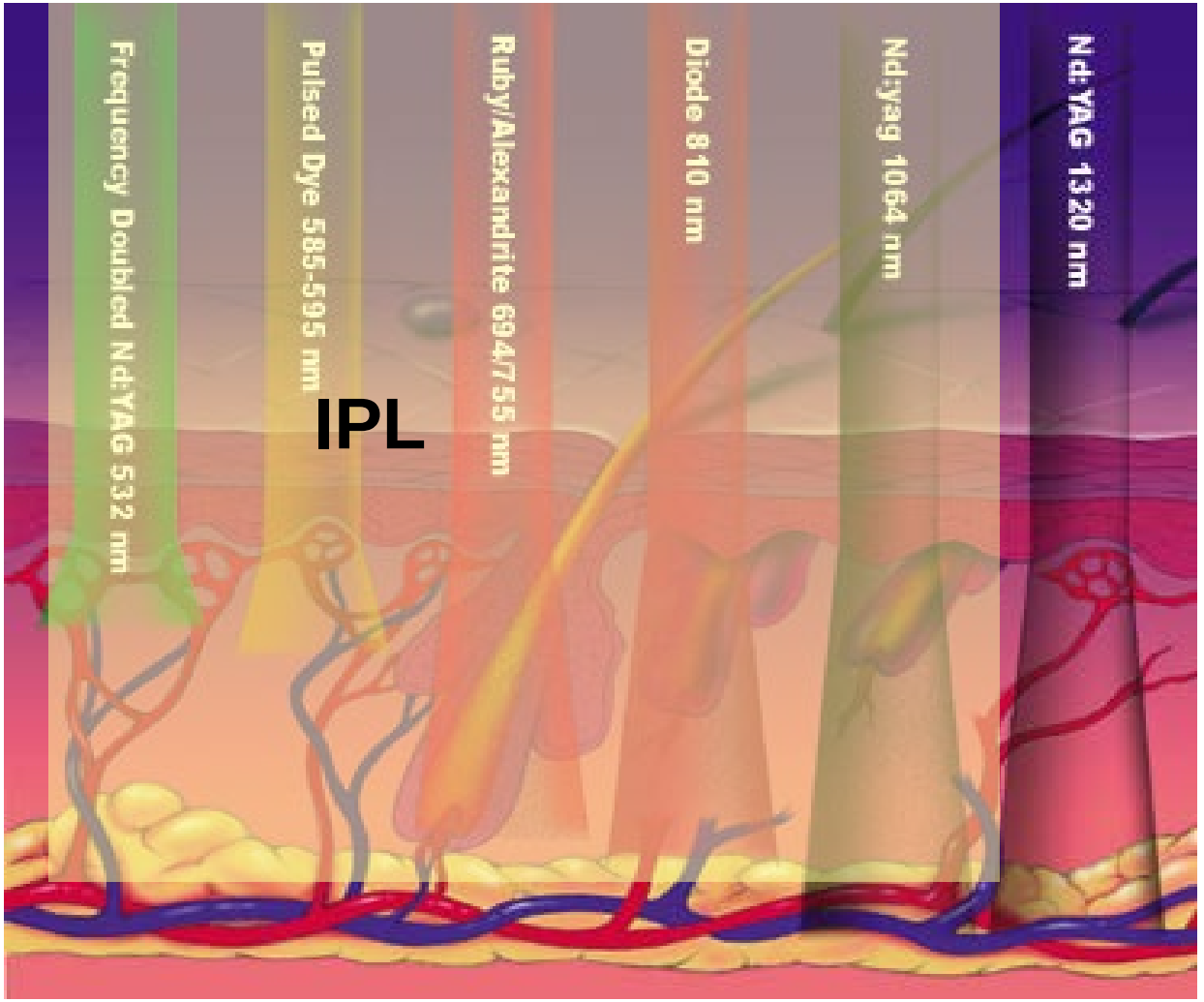
IPL Therefore Covers Wavelengths of Several Different Lasers



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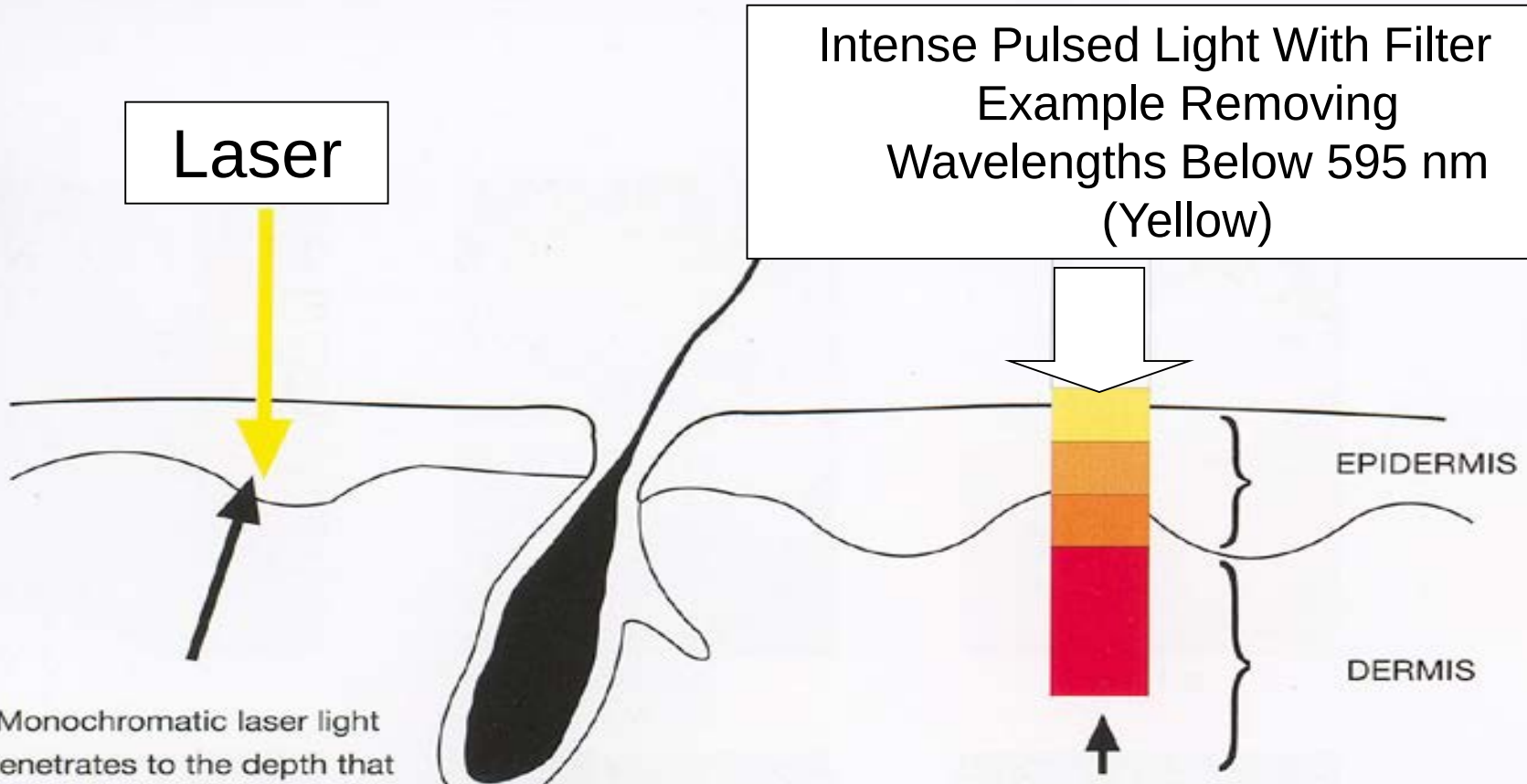
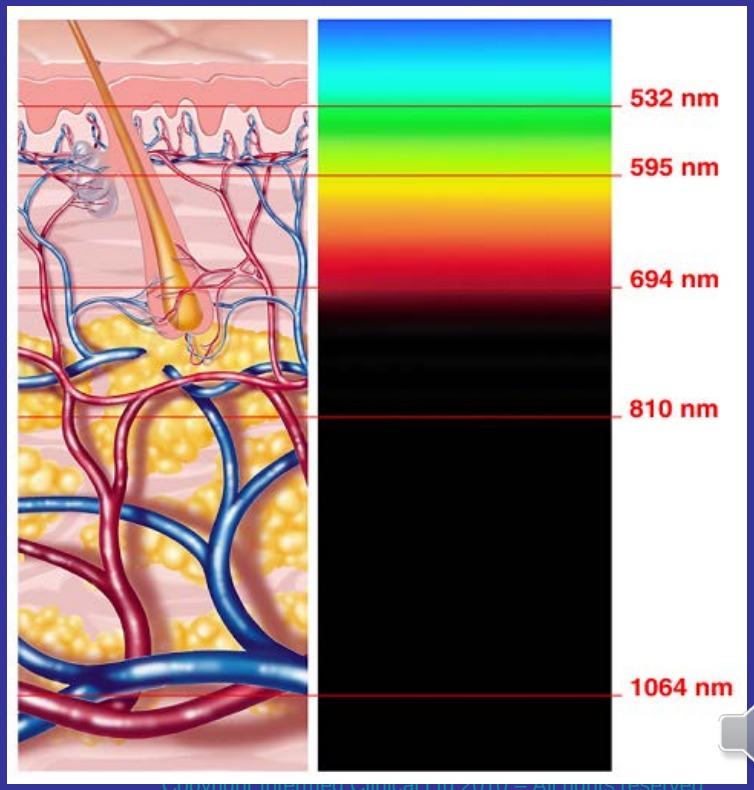
Difference between Laser & Intense Pulsed Light



Module 2 - Summary
Intense Pulsed Light (IPL) Devices

- IPL uses flashlamp to provide intense pulses of broadband light
- Filters used to select useful wavelength “bands”
- IPL more versatile than laser due to multi wavelengths
- However - potential hazard in darker skin types due to “unwanted” wavelengths



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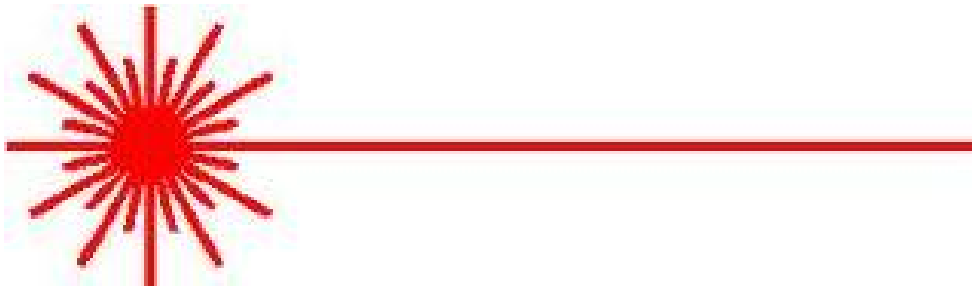
Module 3

Hazards of Light Based Systems & Precautions To be Taken

Laser & IPL Safety



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Hazards of Lasers/IPL

- Electrical Hazard
- Ocular Hazard
- Fire/Thermal Injury Hazard
- Smoke Plume Hazard

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Electrical Hazard

- All lasers and IPL devices have high power components
- For safety, the access panels and casing usually have tamper proof screws
- Only manufacturer's technicians should open casing
- Care should be taken when connecting to the electrical power socket
- Ensure Dry hands
- Avoid spillages on laser/IPL

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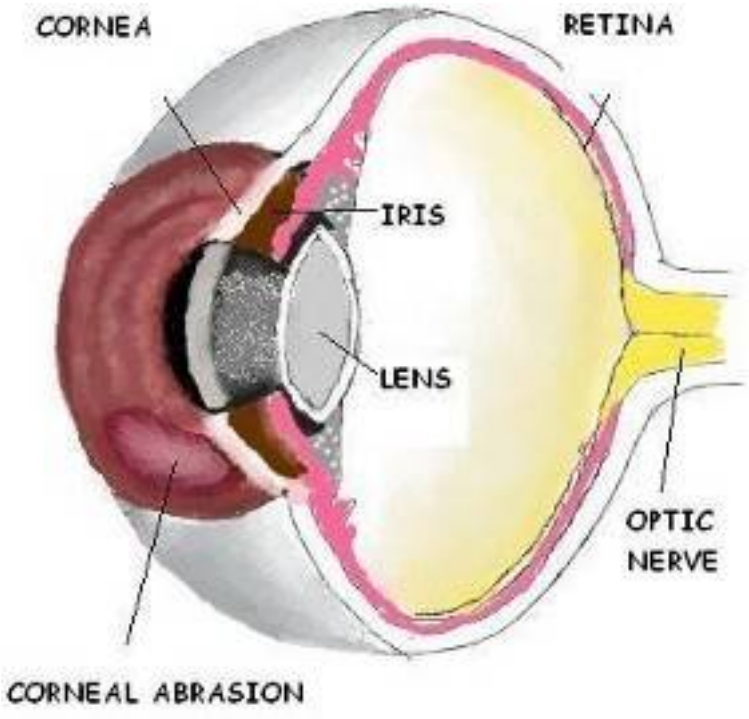
Eye Injury

- As all cells contain water, lasers that are highly absorbed by H2O, such as Carbon Dioxide and Erbium lasers, can burn the Cornea
- Or more seriously a Retinal burn, leading to permanent blindness may result from light transmitted through the Cornea from a near infra red laser such as the Nd:YAG or other visible light lasers & IPL)



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Eye Injury (Continued)

- Clients must have adequate eye protection usually in the form of fully opaque “tanning booth” goggles or metal eye shields
- The operator and all persons viewing the treatment procedure must have eye protection to prevent them receiving more than the Maximum Permitted Exposure (MPE) to the beam
- Maximum Permitted Exposure is a calculated value and takes into account wavelength and collimation of the laser beam and assumes a 10% dose of the light that would cause eye or skin injury

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Hazard Zone

- Another term used in laser and IPL safety is Nominal Ocular Hazard Distance (NOHD)
- This is the radius from the emitted laser beam where a risk of eye injury exists
- The distance will depend on the specification of laser or IPL in use
- However most Aesthetic lasers and IPL's have a handset which delivers the energy as a focused beam – beyond the focal point the beam diverges
- Most Aesthetic equipment therefore has a Nominal Ocular Hazard Distance around 4 metres
- However it is usual to designate the whole treatment room as the Controlled Area and to restrict access to this room

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Safety Eyewear

- Wavelength Specific Safety spectacles must be worn for laser type being used
- Special IPL safety spectacles for Intense Pulsed Light
- In Europe laser and IPL safety spectacles must be CE marked and conform to standard EN 207

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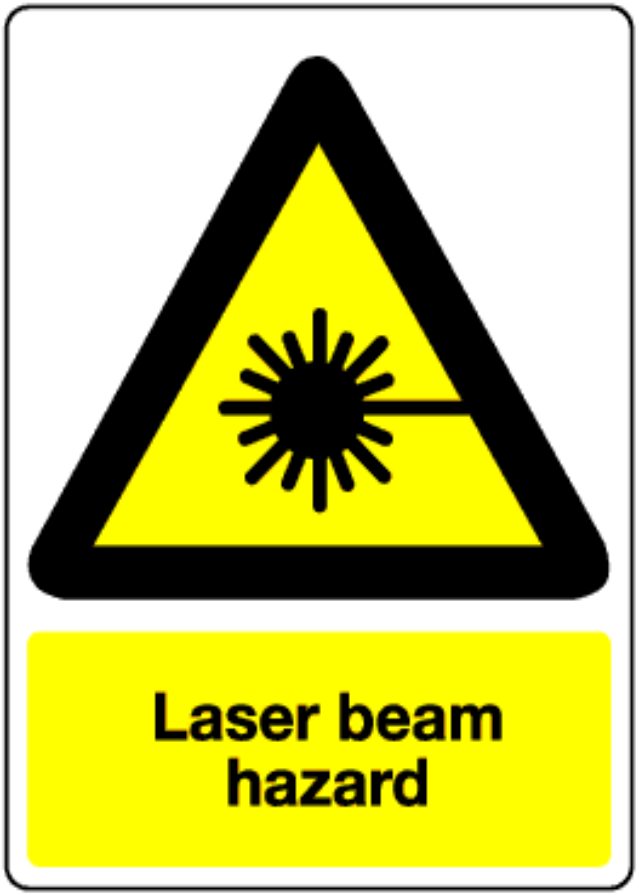
Eye Injury Precautions



- Access to laser or IPL should be restricted
- Designated Laser Treatment Room
- Warning Signs
- Good communication amongst staff essential
- Laser or IPL should be in “Stand By” mode when treatment is paused
- Key should be removed and securely stored when device not in use

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Fire/Thermal Injury

(Hazards to Staff & Clients)

- Fire extinguisher must be available
- In the case of vaporizing lasers - use of wet swabs around site to protect adjacent structures
- Non alcoholic skin preparations should be used
- Bowl of water handy to quickly dowse any ignition
- Laser / IPL should be in “Stand by” when not in use
- Laser / IPL should be aimed only at target tissue

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Smoke Hazard

- Tissue Smoke from vaporizing lasers may contain carcinogens and/or viral particles (HIV, HPV, HepB etc)
- Certain lasers that eject hairs during laser hair removal may also pose a threat
- Ablative Skin Resurfacing lasers cause plume/particles to be released from the epidermis
- Smoke evacuators with special filters are needed to remove these smoke/particles at source

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Other Safety Considerations

- The treatment room should not have any highly reflective surfaces which may reflect the laser or IPL beam
- Reflectors in spot light fittings may pose a hazard and the light fitting should either be changed or a diffuser fitted over the light to prevent laser/IPL reflections
- Windows in the treatment room should be covered during treatments to prevent the laser or IPL beam being viewed from outside
- Similarly any permanent fixtures in the treatment room that have reflective surfaces (such as a stainless steel sink) should be covered with a suitable drape during the treatment
- Coverings used should be non-flammable

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The Treatment Room

- The layout of the room should be planned to minimise risks of persons treading on or tripping on the laser / IPL power cable or water & fibre optic connections
- Warning signs must be posted outside the entrance door
- These may be commercially available illuminated signs and door locks operated by an interlock device on the laser
- A simple removable approved laser/IPL sign velcro'd to the door and a normal "bathroom" type lock is an acceptable alternative to restrict access to the treatment room

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Risk Assessment & Local Rules

- A risk assessment of your premises must be carried out taking into account all the hazards previously described
- A set of “local rules” should be produced which sets out step by step the specific safety precautions that must be carried out at your premises each time the laser or IPL machine is fired
- For example if your treatment room contains a highly reflective stainless steel sink unit – the local rules check list would include a step to cover this with a suitable drape
- It is usual for the operator to sign a copy of the check list to confirm that each step has been carried out each time the laser/IPL is used.

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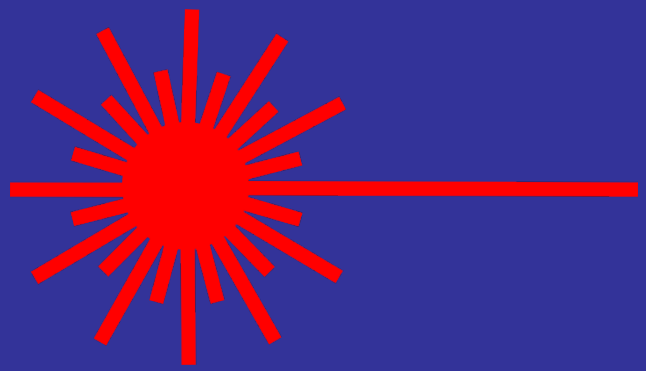
Summary Module 3
Laser and IPL Hazards/Safety

- Hazards may include Electrical, Ocular, Fire & Smoke Plume
- Emitted Wavelengths will determine type of eye injury
- Treatment rooms must have restricted access & correct warning signs
- PPE must be worn by everyone in the controlled area
- Best practice requires appointment of Laser Protection Adviser to survey equipment and premises



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Module 4
Laser & IPL Aesthetic Applications

Basic Anatomy of Skin

& How the treatments work

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Basic Anatomy of Human Skin

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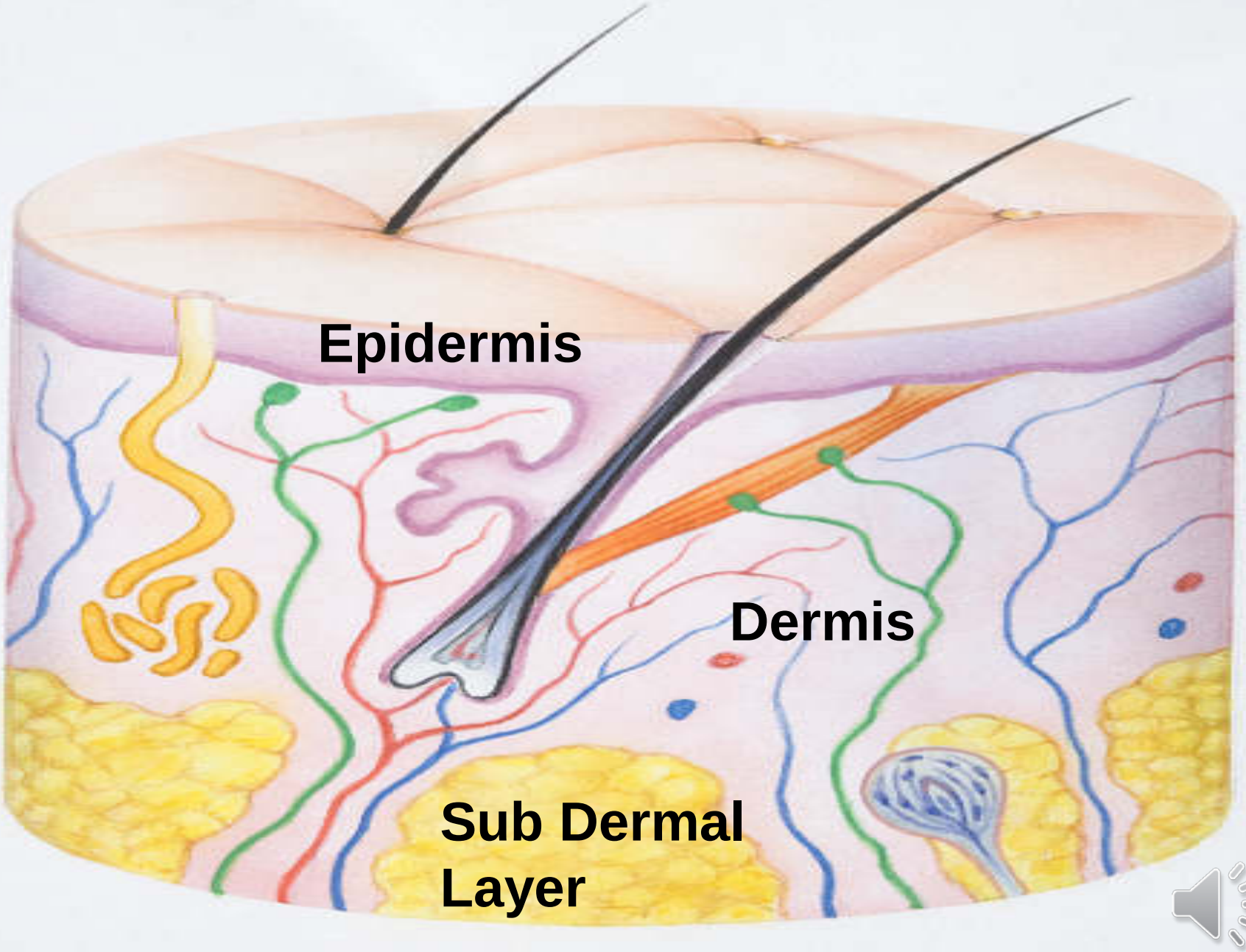
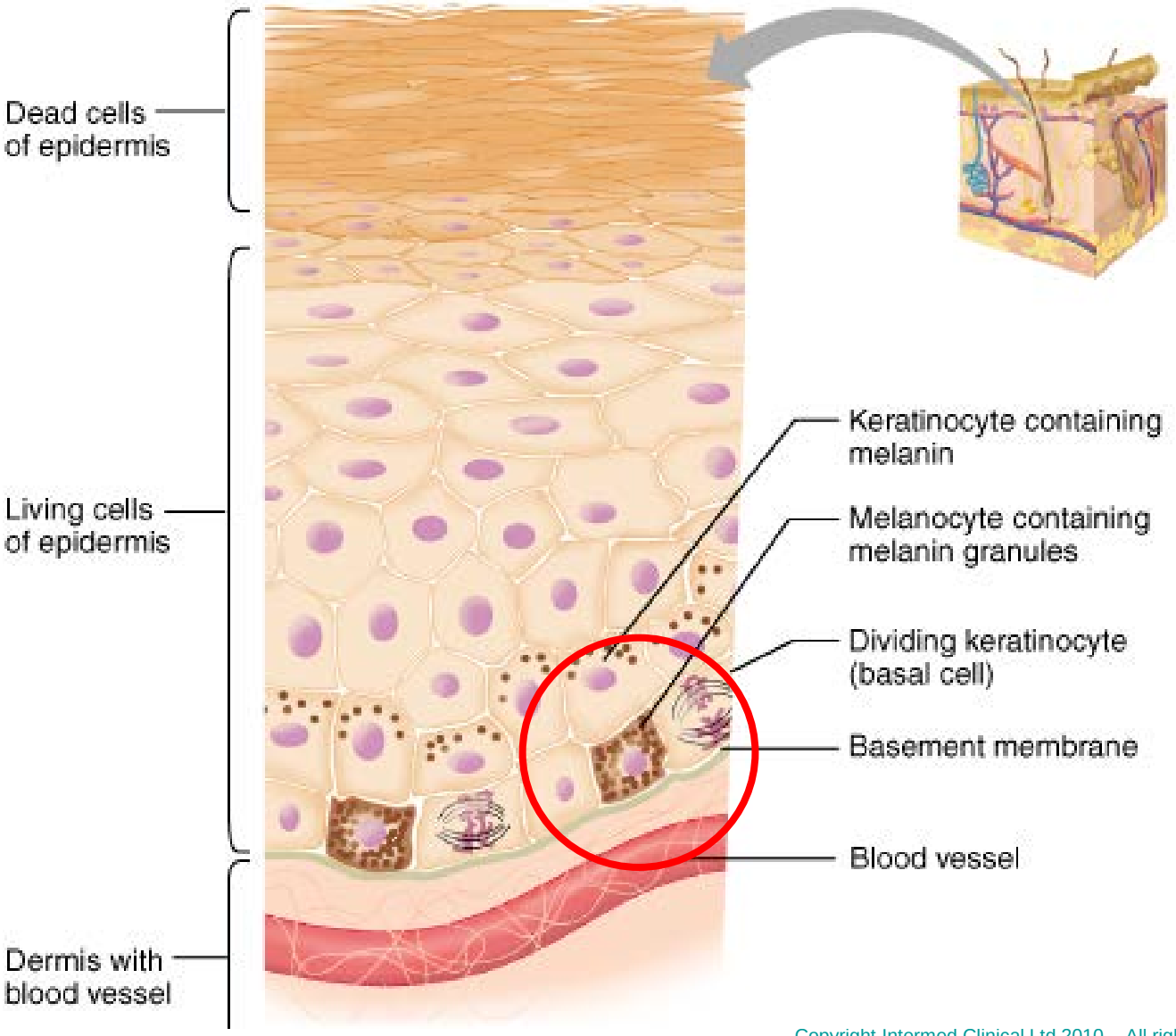

Epidermis
Dermis
Sub Dermal Layer

Epidermis



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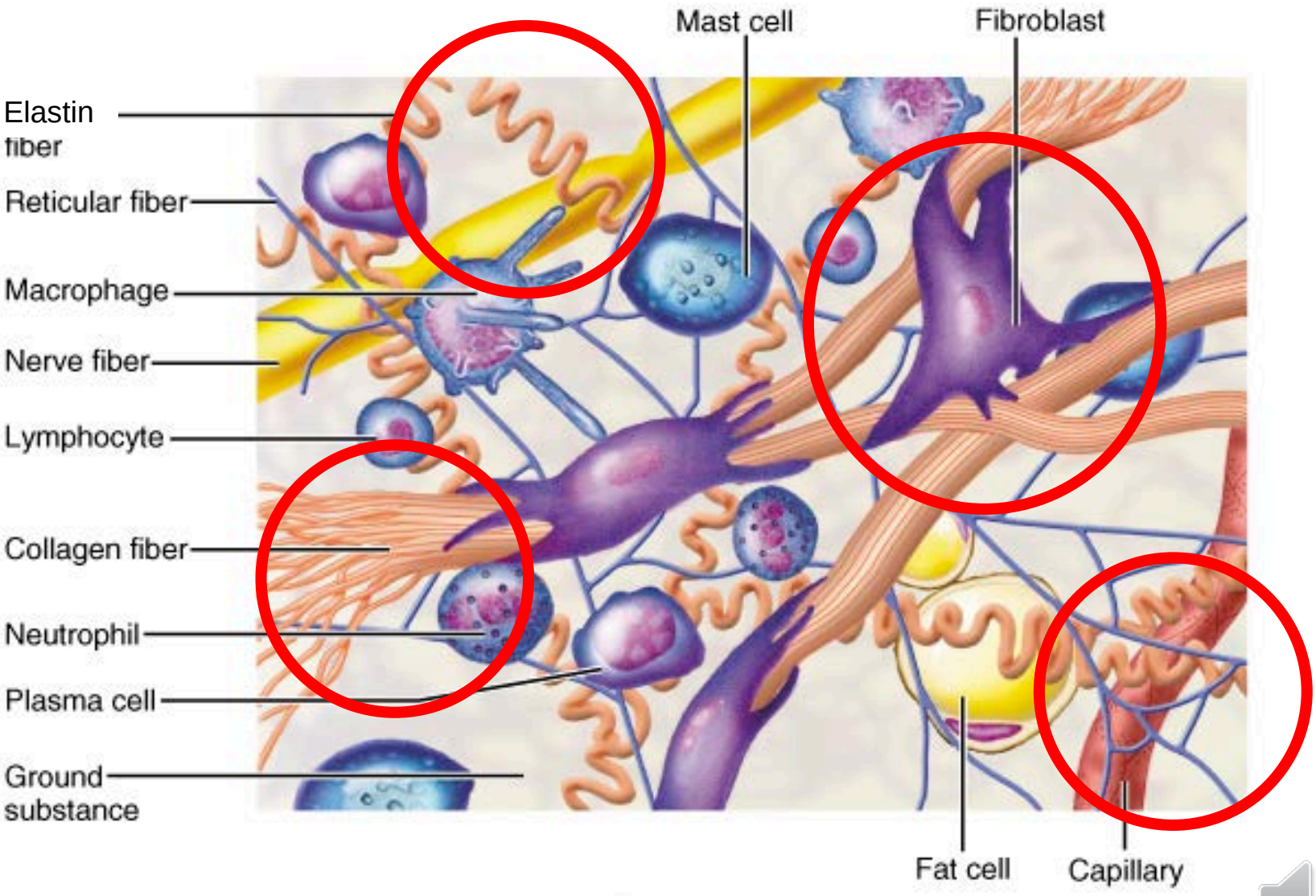
Dermis



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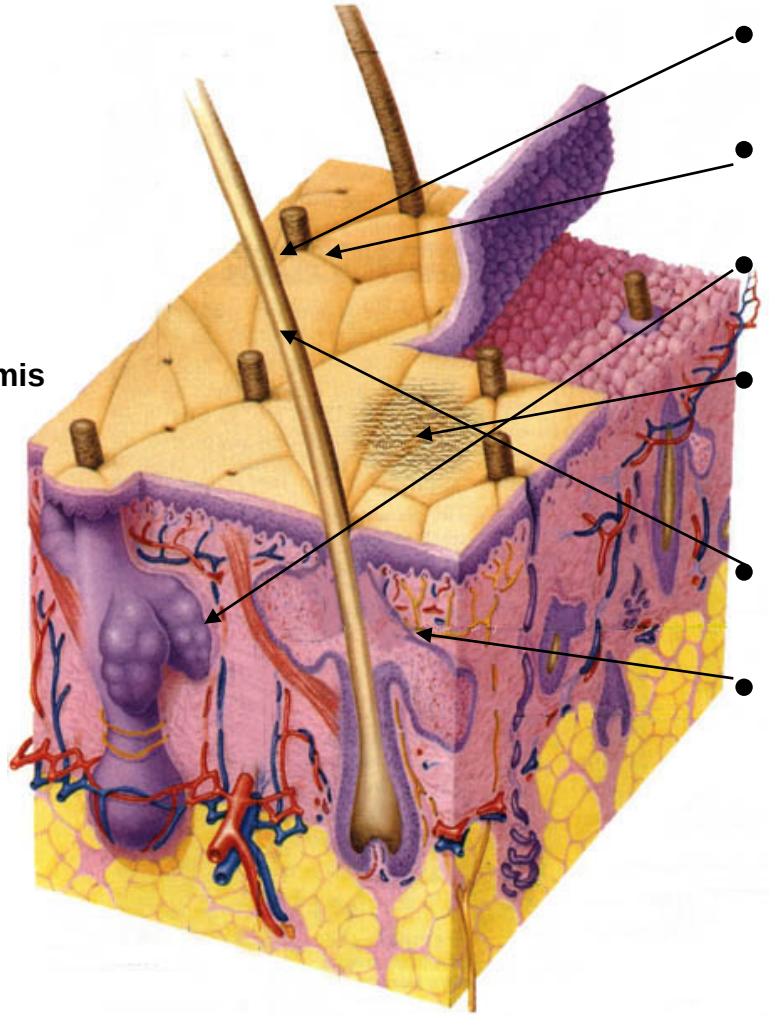
Skin Problems Suitable for Treatment



- Skin texture
- Wrinkle
- Acne
- Pigmented lesions
- Hair
- Vascular lesions

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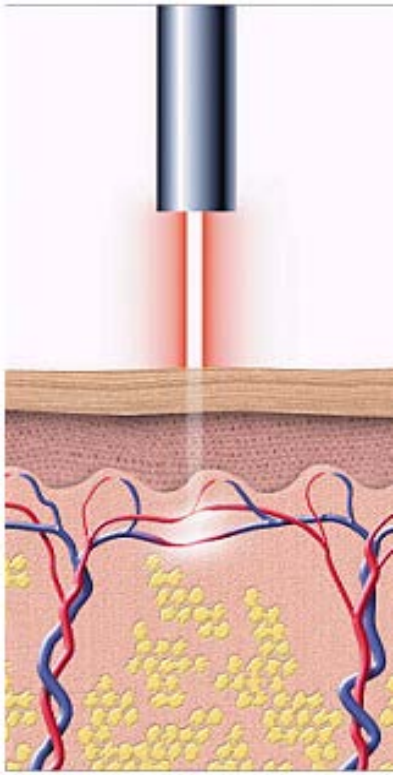
1983 Theory of Selective Photothermolysis

(Dr Rox Anderson et al – Wellman Research Laboratories, Boston USA)



- Energy must penetrate skin and be absorbed by target tissue
- Pulsing of energy must be just long enough to stay within target – no conduction to surrounding structures
- Must have sufficient energy to have desired effect on target

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Principles of Selective Photothermolysis

Photothermolysis

- **The <u>absorption</u> of light (Photons) in pigments (e.g. haemoglobin & melanin)**
- **The <u>transformation</u> of absorbed light into heat (thermo)**
- **The <u>destruction</u> (lysis) of the target cells by the high temperature**

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Additional Cooling

During Laser and/or IPL treatments there should be minimal absorption and heat production in surrounding structures not only because of pulsing of light but also by protecting the skin with cooling

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Treatments using Green/Yellow laser light or IPL

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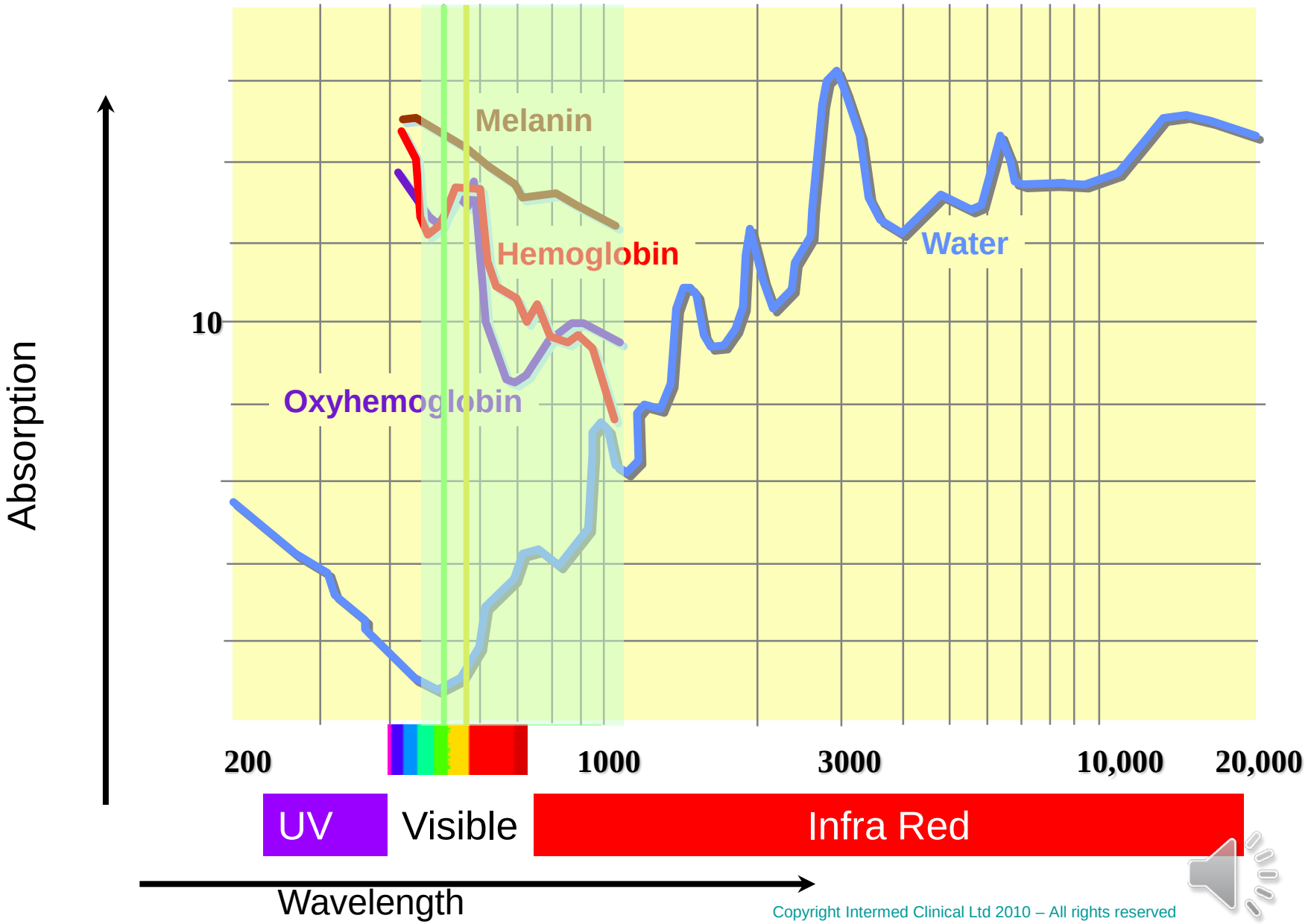
Absorption Spectrum of Main Tissue Targets



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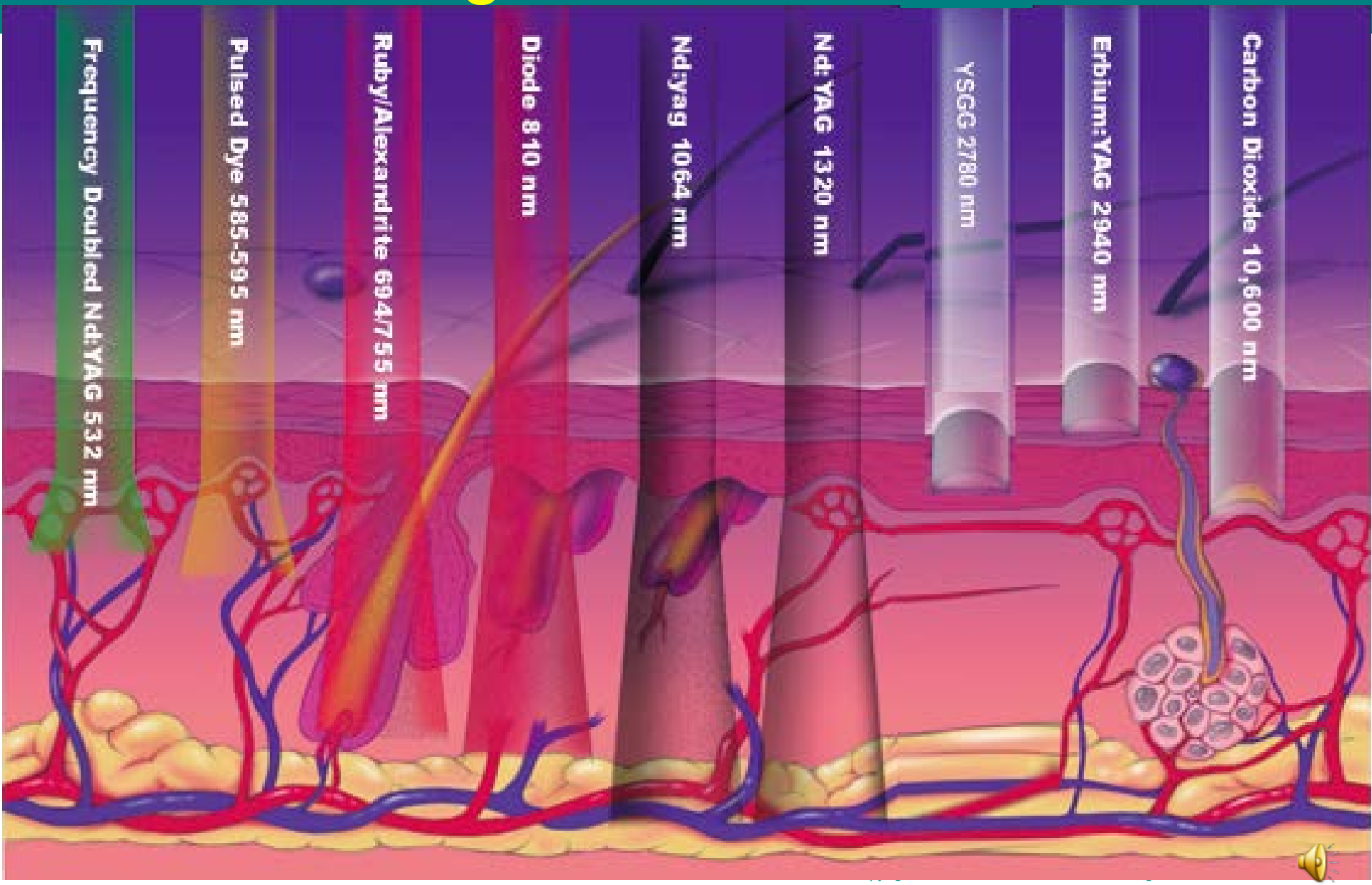
Wavelength Penetration in Skin



Green /Yellow Lasers

(KTP laser or Pulsed Dye laser)

or IPL

(with Green 520nm or Yellow 585nm Filter)

- Used for:
  - Red facial veins
  - Matted Telangiectasia
  - Superficial pigmented lesions

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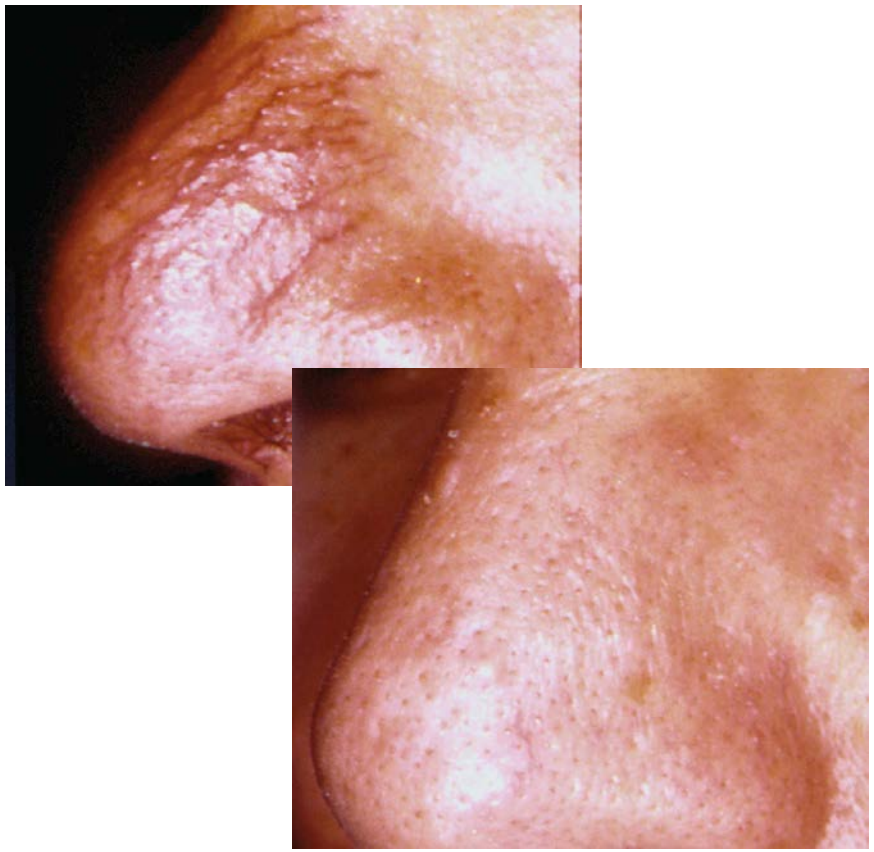
Superficial Vascular Lesion Treatments



- Handset is moved along vessels
- Skin cooled as device moves across skin
- Usually only 1 or 2 treatments needed

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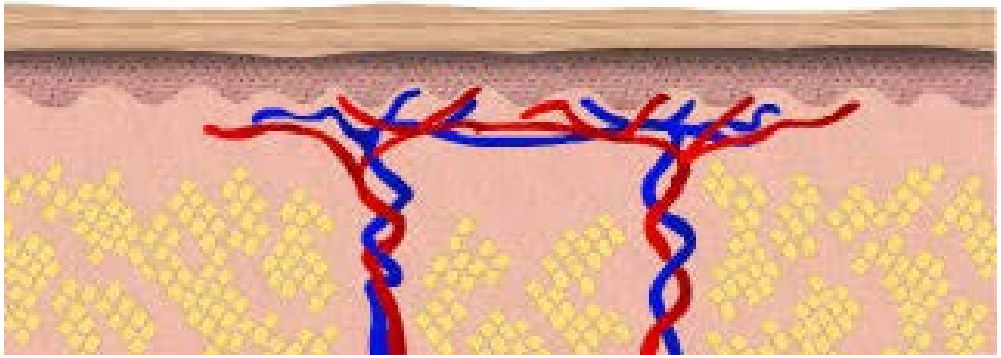
Vein Treatment Method

- Gel may or may not be applied to skin depending on equipment type
- Laser/IPL applied to treatment area
- Endpoint is vessel darkening (damage) or vessel disappearance



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Vascular & Pigmented Lesion Before & After Images

Photos courtesy of E.Vic Ross, MD

Before

After 1 Tx

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Vascular lesions cont'd

Before

After 3 treatments

Courtesy of Dr. J. Shaoul, Israel

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Spider veins

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Pigmented Lesion Treatment Examples

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After 4 treatments

Before

After 3 treatments

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Treatment of Active Acne Infection

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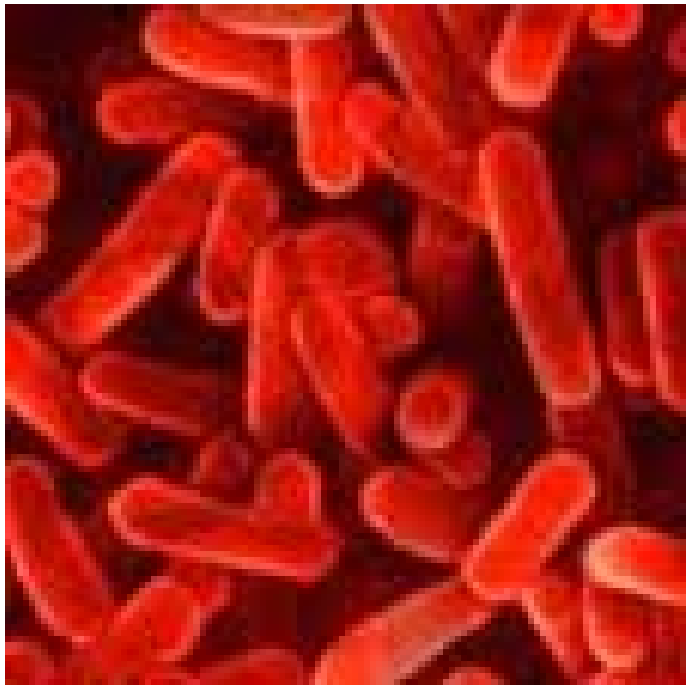
Photochemical Reaction

- Bacteria which cause Acne contain naturally occurring Porphyrins
- Porphyrin is a light sensitive molecule (sensitive to blue/green/yellow light)
- When activated the Porphyrin releases Super Oxygen (O3)
- Free radical Oxygen kills the bacterial cell



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Active Acne Treatment

- Either a KTP or Pulsed Dye Laser or IPL with Blue/Green Filter is used (420nm or 530nm)
- Low energy is used as it is a chemical reaction not requiring heat
- Secondary benefit of “drying” of sebaceous glands (where bacteria thrive)
- Also reduces redness – as in rosacea

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Acne

Before

After

Photos Courtesy of Tess Mauricio, M.D.
2 Weeks Post 4 Treatments.

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Treatments using Red and Near Infra Red Lasers

(eg Ruby & Alexandrite Lasers)

or

IPL

using 690 filter

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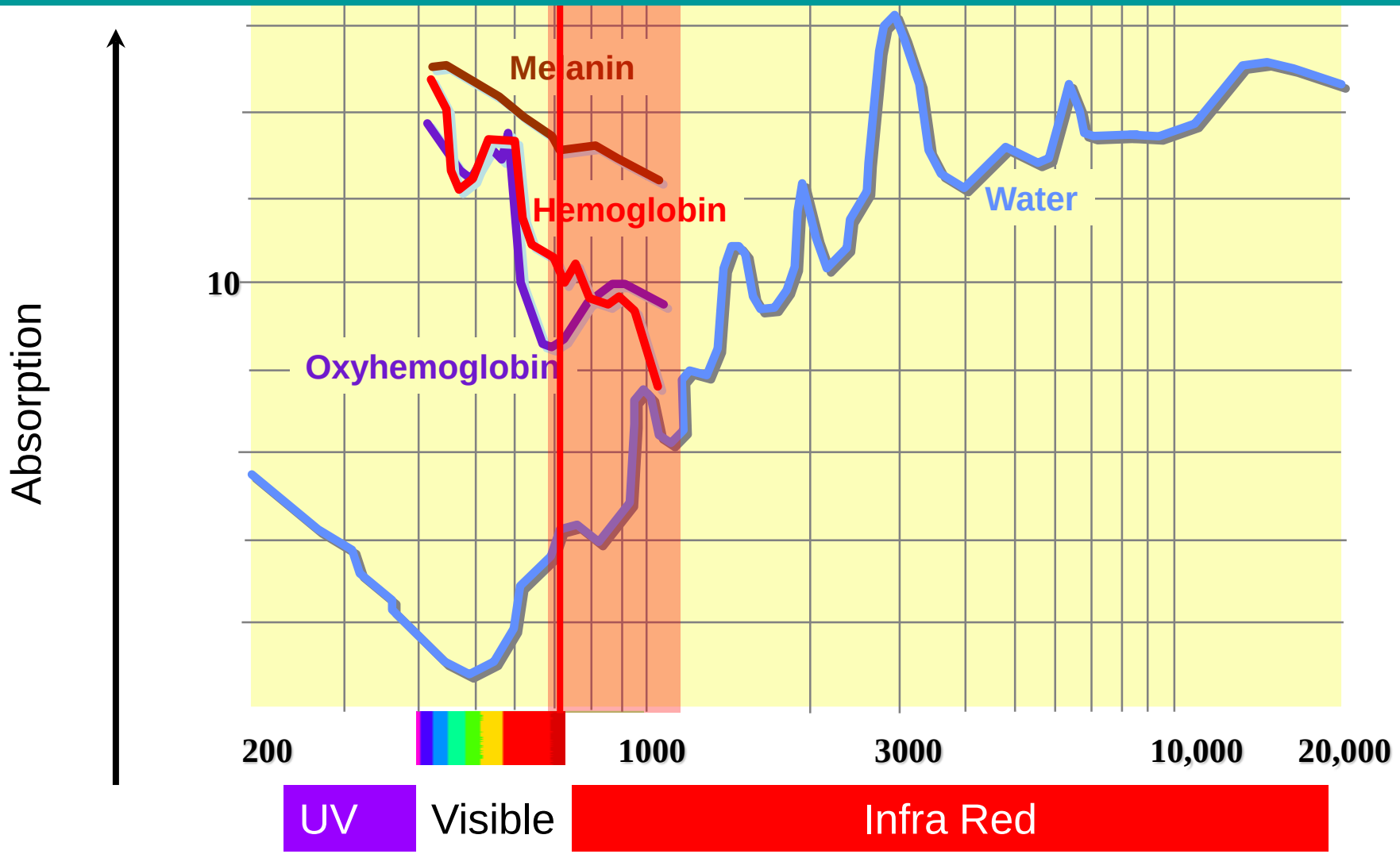
Absorption Spectrum of Main Tissue Targets



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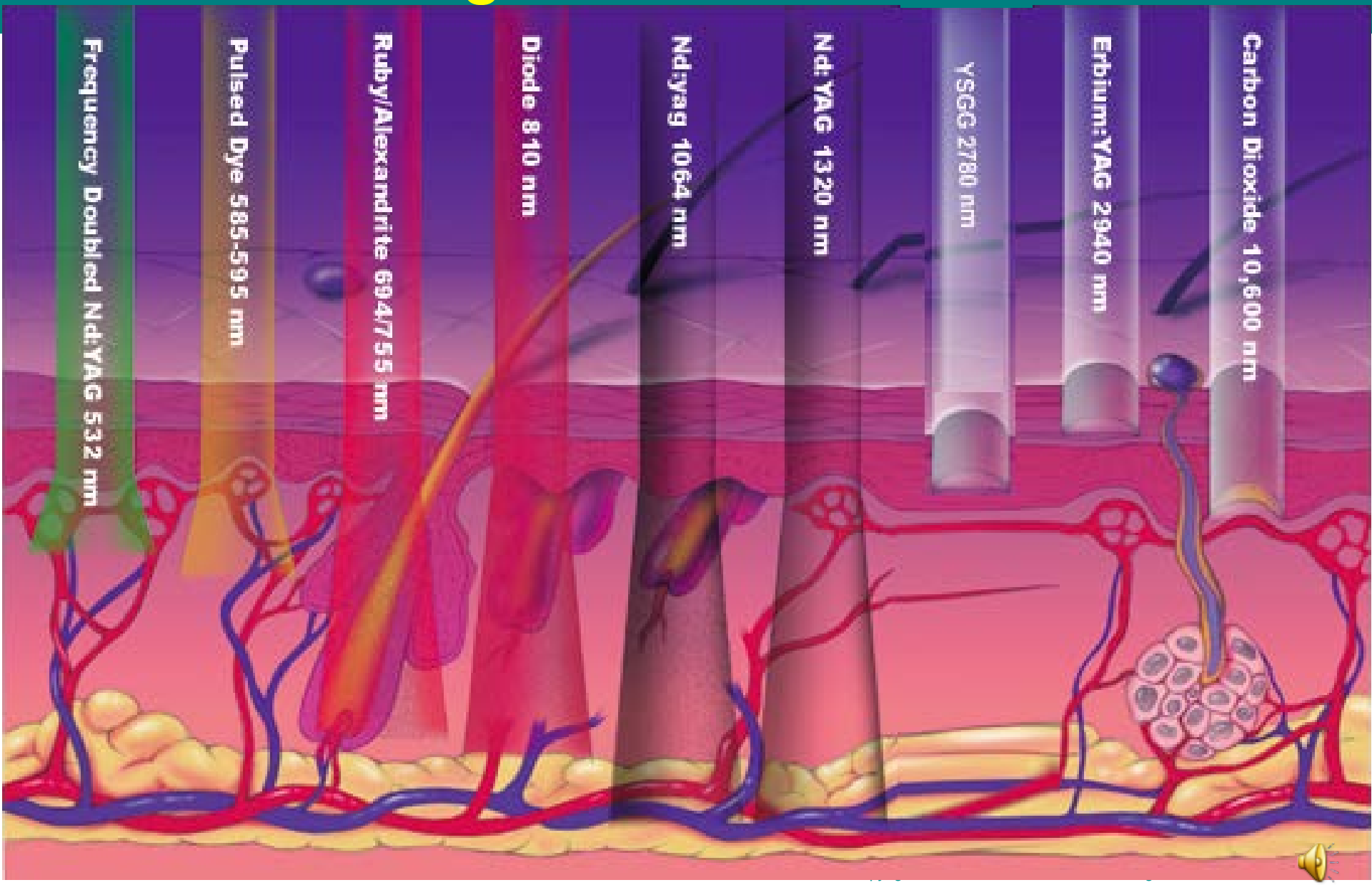
Wavelength Penetration in Skin



Hair Reduction Treatments

Using Ruby or Alexandrite Lasers or IPL

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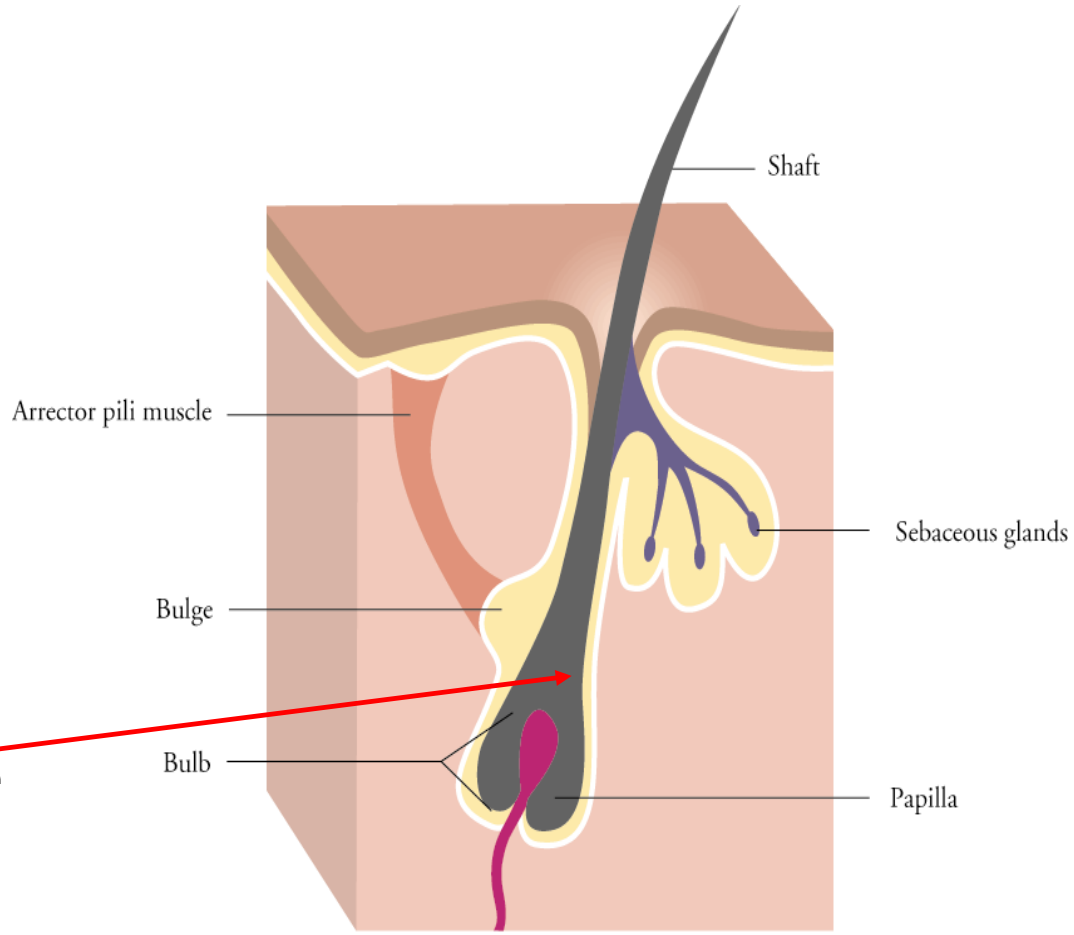
Simplified Anatomy of Hair Follicle



Melanin Chromophore

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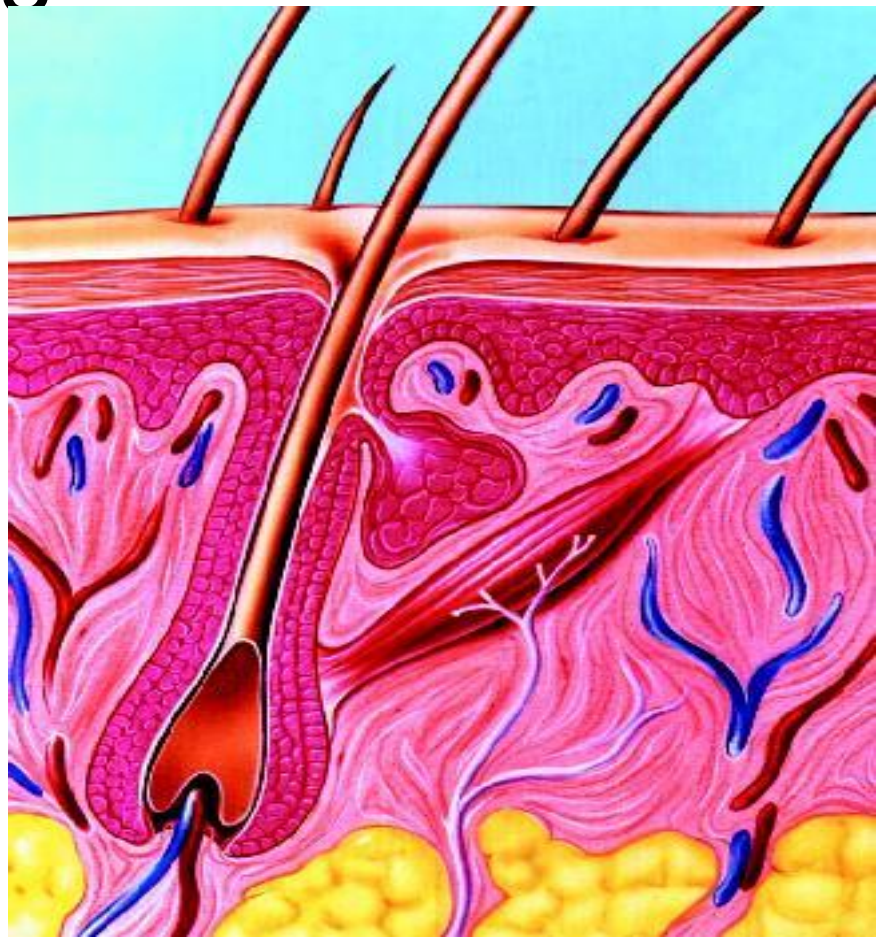
Follicle & “Bulge” can be selectively heated to reduce growth of unwanted hair



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Growth Phase Affects Outcome

- Only hairs in growing stage will be destroyed
- Series of treatments therefore carried out
- Treatments usually 4 – 8 weeks apart

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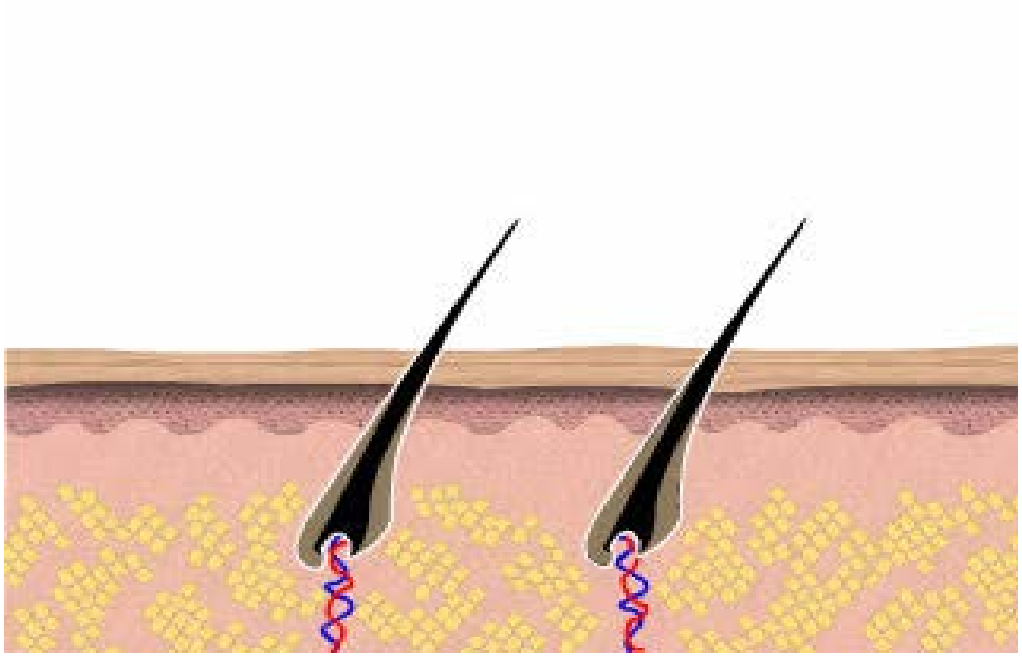
Hair Reduction Technique



- Treatment area first shaved
- Contact Gel Applied
- Laser or IPL energy delivered
- Energy is absorbed by hair melanin which transfers heat to Follicle & Bulge which are destroyed.

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Example of Hair Reduction Result (After series of treatments)

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Hair Reduction Treatment

Before

After 4 Treatments

courtesy of Dr. J. Shaoul

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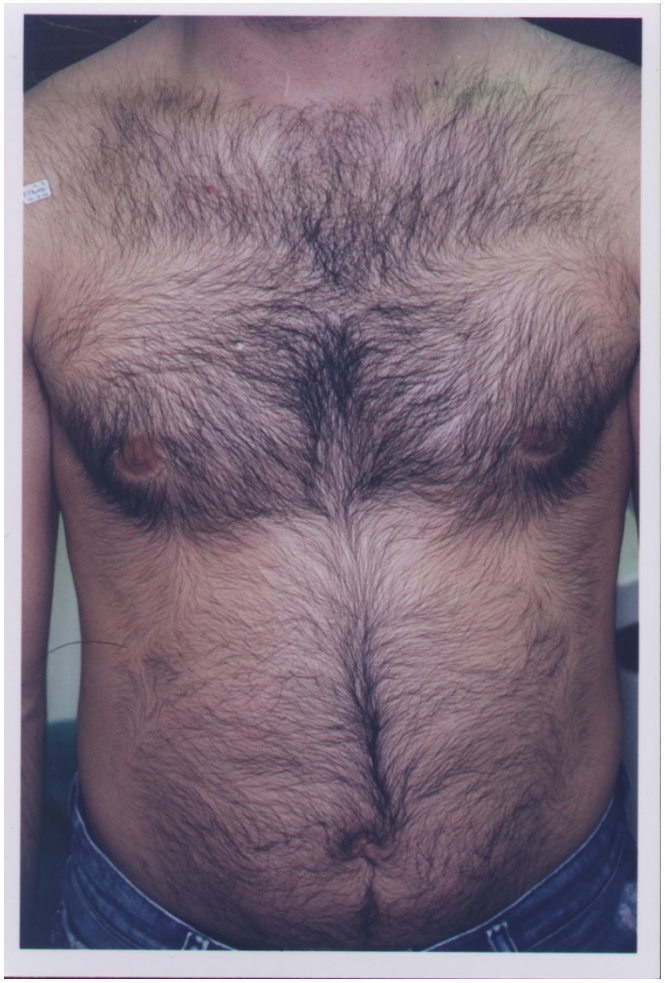
Hair Removal



Pre-treatment

6 m post 5 treatments

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Hair Reduction

- Approx 40% of growing hairs destroyed with each treatment
- Ruby, Alexandrite Lasers & IPL provide rapid coverage
- However these systems are for lighter skin types only – up to Skin Type IV

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Hazard of Skin Type

- High absorption of Ruby, Alexandrite & IPL by melanin not only in hair but in the basal layer of skin
- Therefore only suitable for lighter skin
- Fitzpatrick Skin Type 1 – IV
- Otherwise Post Inflammatory Hyper (or hypo) pigmentation may occur

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Fitzpatrick Skin Typing

Type	Typical Features	Tanning ability
I	Pale white skin, blue/hazel eyes, blonde/red hair	Always burns, does not tan
II	Fair skin, blue eyes	Burns easily, tans poorly
III	Darker white skin	Tans after initial burn
IV	Light brown skin	Burns minimally, tans easily
V	Brown skin	Rarely burns, tans darkly easily
VI	Dark brown or black skin	Never burns, always tans darkly

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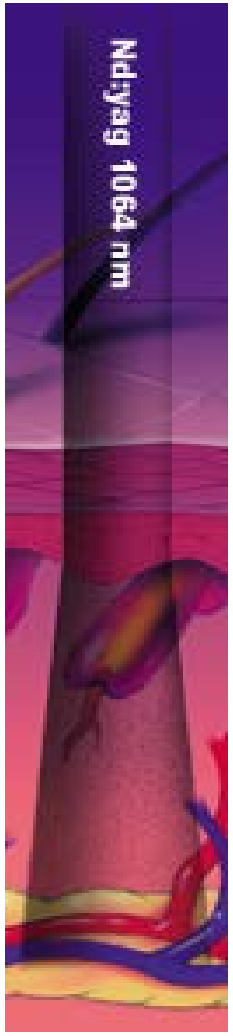
Hair Reduction in Skin Type V & VI

- The Nd:YAG laser is absorbed by Melanin but has a lower absorption than all other systems
- It also has deep penetration in skin
- It is the safest Hair Reduction laser – suitable for all skin types
- Certain Diode lasers can also be used with care to treat Type V & VI skin
- A combination system using IPL and Radiofrequency known as “E-Light” can also be used on Type V skin but not Type VI



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Long Pulsed Hair Reduction in Type V & Type VI Skin

- In order to reduce the heat absorbed in the naturally occurring Melanin in Skin Types V and Type VI, very long pulses are used
- These long pulses allow conduction of heat away from the critical Melanocytes – the structures that produce the skin's natural pigment

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Hair Reduction in Type V & VI Skin

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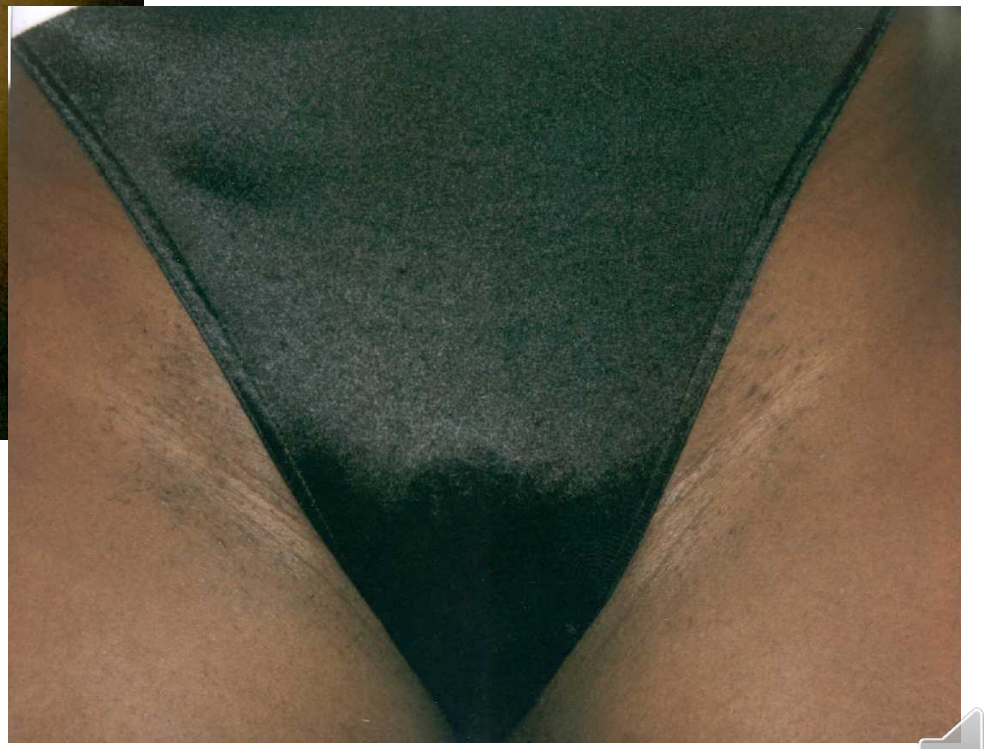

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Leg Vein Treatments Using Nd:YAG laser

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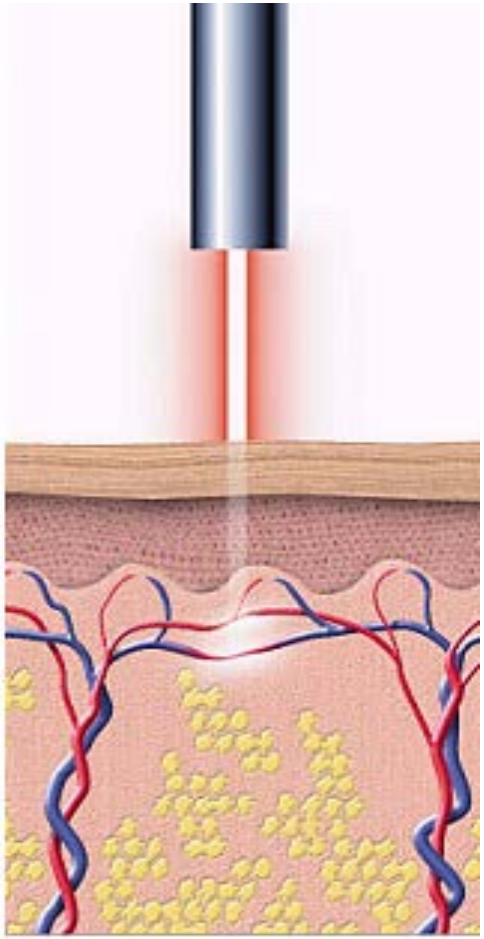
Nd:YAG advantages for Leg Veins

- Deep penetration of laser
- Nd:YAG can treat vessels up to 4mm
- Can treat “blue” veins as well as red



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NdYAG Leg Veins Treatment Example

Before and After (3 sessions)

Images Courtesy of Dr. J. Shaoul, Israel

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Sometimes you will have to refer clients elsewhere!

These varicose veins need surgery and not external laser treatments!

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Skin Rejuvenation

Using multiple wavelength lasers or IPL

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Skin Rejuvenation

- Treatment for Fine Lines and Sun Damage
- Treats face, chest, neck and hands
- Return immediately to work
- Can be performed over a lunch hour
- Typically several treatments are needed

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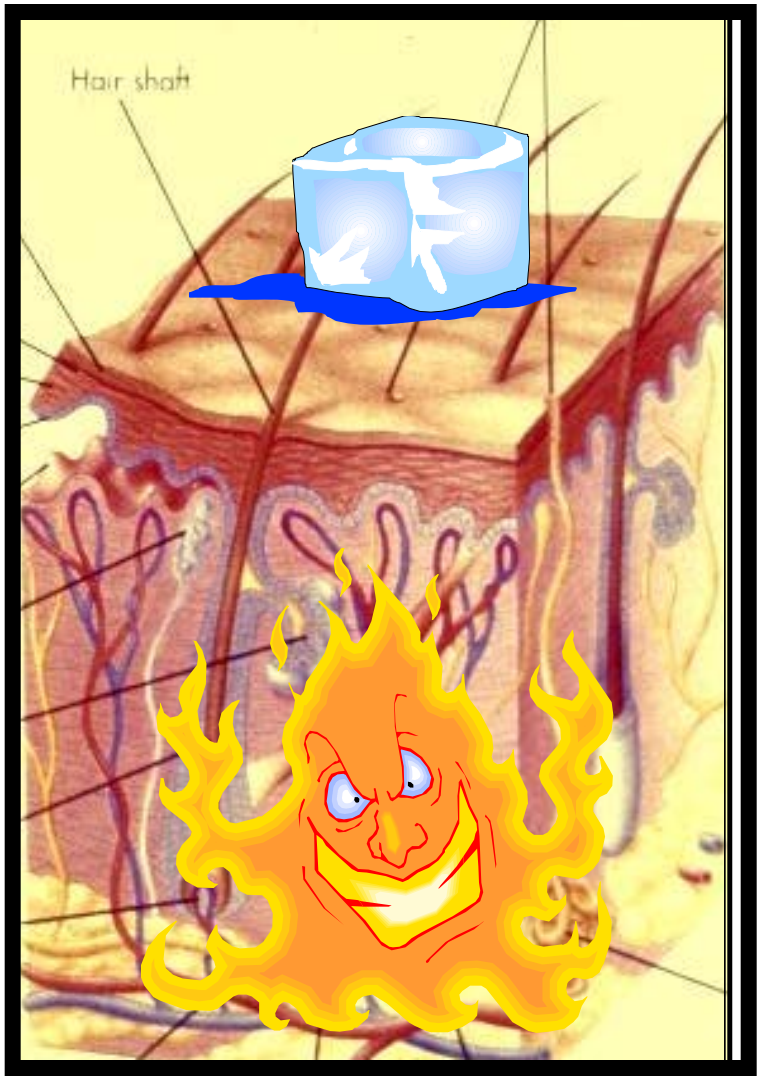
Concept



a) Heating superficial and deeper skin dermal structures

b) While simultaneously cooling the superficial skin

c) Stimulating a reparative process resulting in new collagen and elastin

With no injury to the skin!

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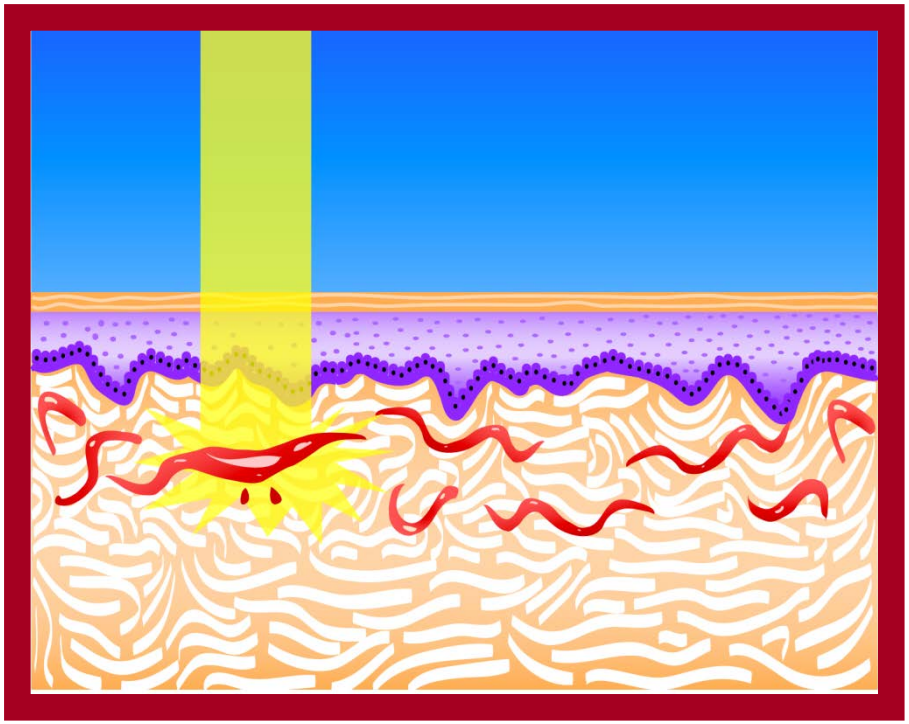
Step A - Visible Green/Yellow Light from Laser or IPL

- Target superficial blood vessels
- Injury causing release of inflammatory mediators
- Stimulate fibroblast to increase collagen



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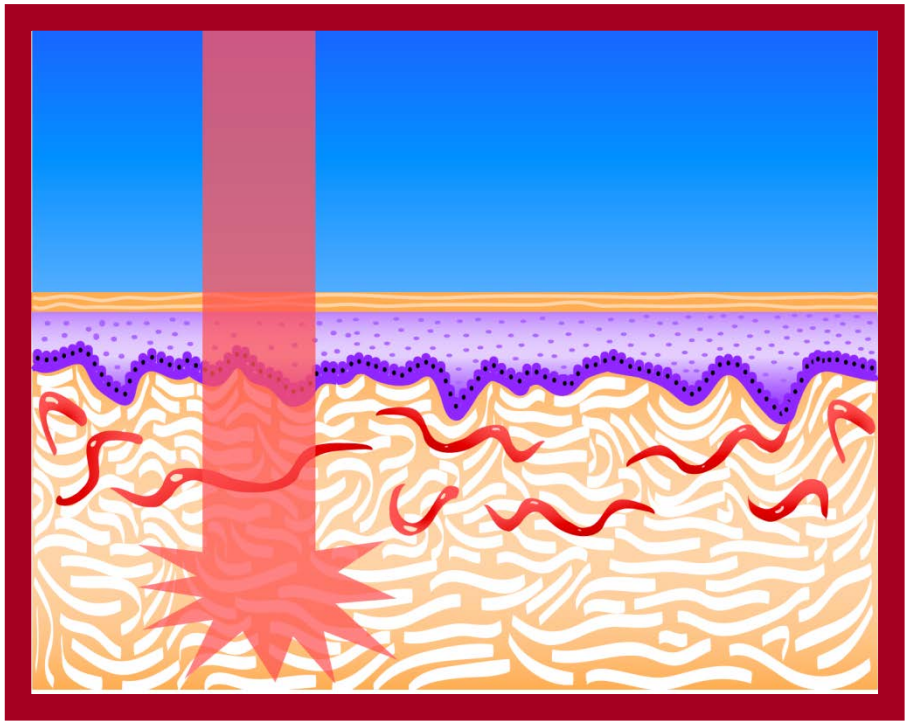
Step B – Use longer Nd:YAG or IPL

- Non- selective heat in dermis
- Sub-threshold injury to dermal structures
- Causing reparative process
- Stimulating collagen reformation



Collagen formation a function of an inflammatory reaction

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Synergistic effect

Three effects:

1. Removal of vascular/pigmented blemishes
2. Stimulation of mediators/fibroblasts leading to collagen remodelling
3. Direct stimulation of collagen with some immediate tightening plus longer term collagenesis

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Rejuvenation Examples

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Sun Damage

Before

1 month post 2 Tx

Photo Courtesy of Christine Lee, M.D.

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Photos courtesy of: M. Christine Lee, MD

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Rejuvenation Cont'd

Photos courtesy of: Steven Dayan, MD

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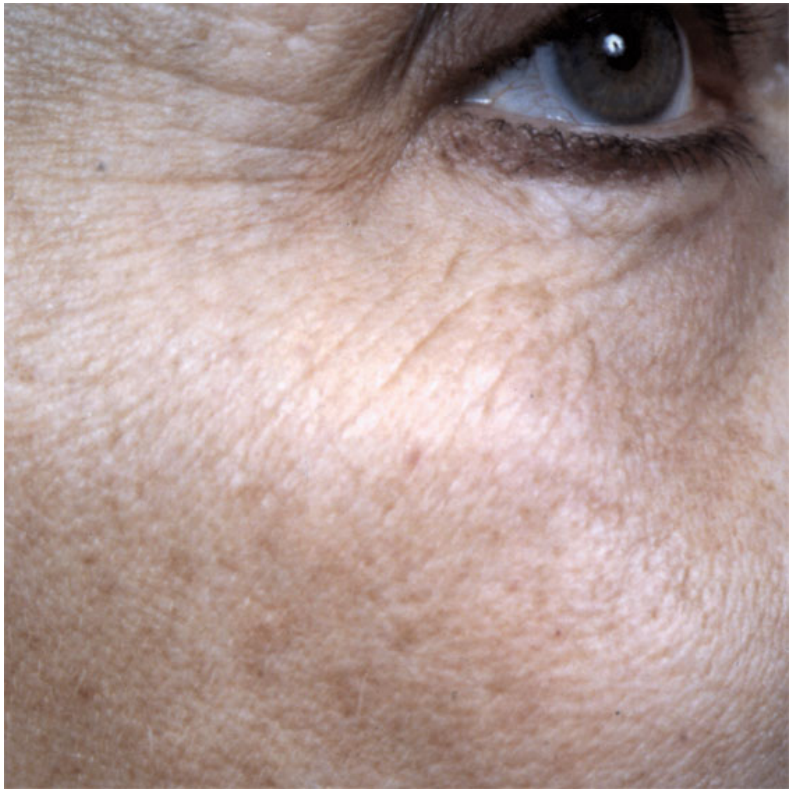
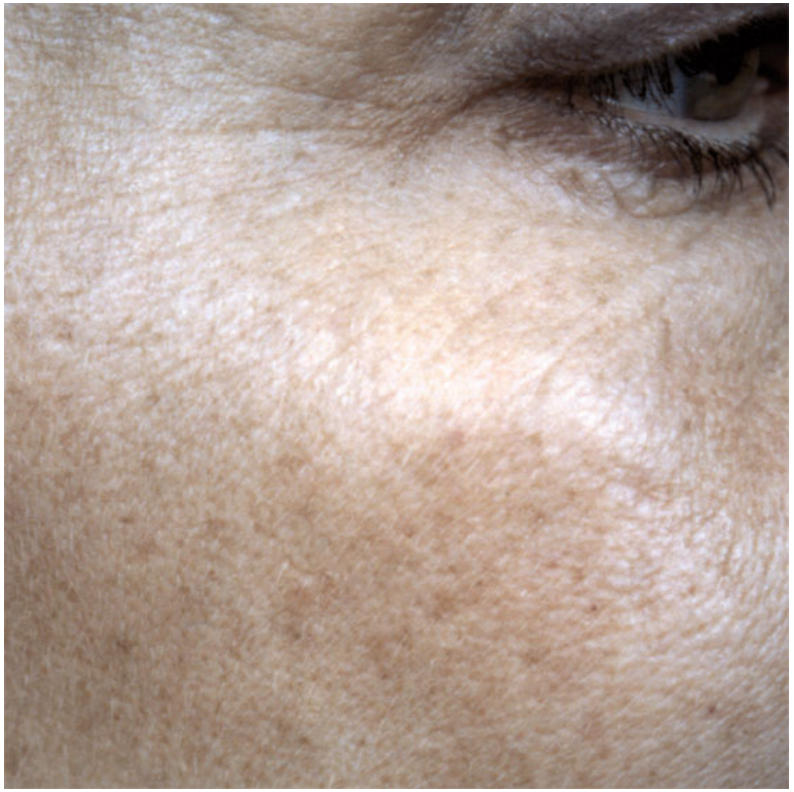
Rejuvenation – “Crows Feet”





Photos courtesy of: Steven Dayan, MD

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Skin Resurfacing

Using Ablative and Fractional Techniques

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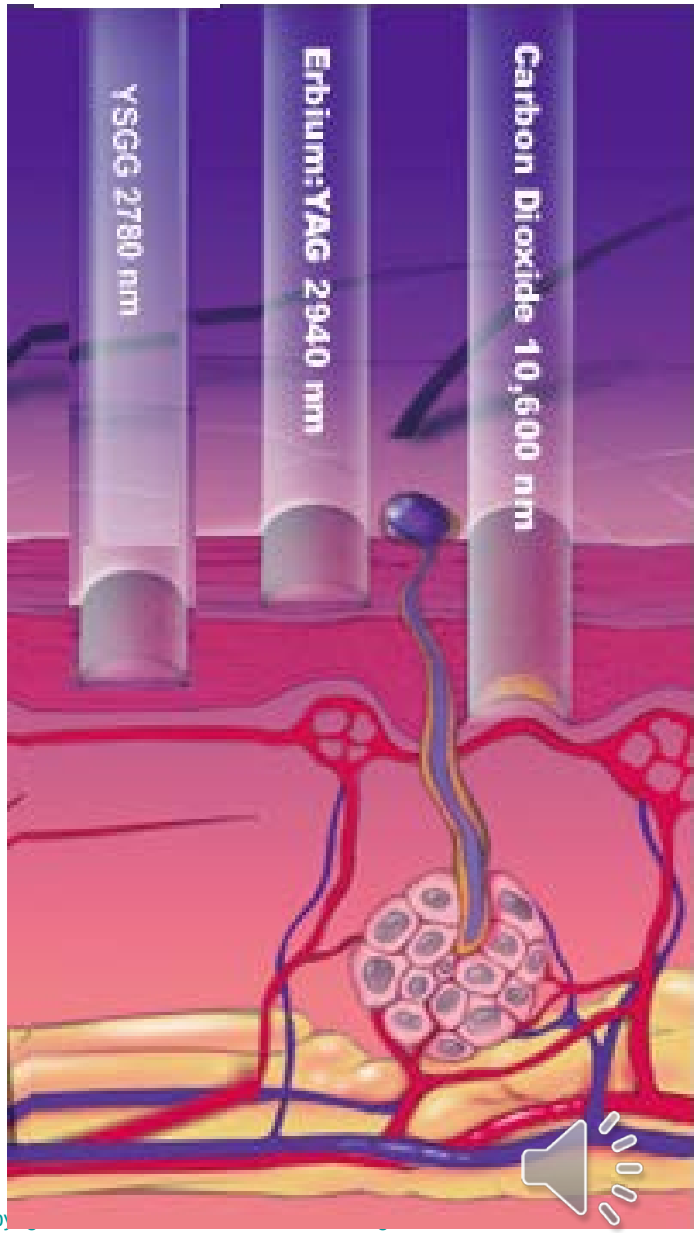
Resurfacing Lasers

- Resurfacing depends on high water absorption as all cells contain water
  - Carbon Dioxide Laser
  - Erbium YAG Laser
  - Yttrium Scandium (YSGG) Laser - a newly developed wavelength)



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Original Resurfacing Technique

- Used pulsed CO2 laser to remove facial Epidermis down to Papillary Dermis
- Procedure performed under Anaesthesia or Sedation in full Operating Theatre
- Needed Post Operative Occlusive Dressings

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Development of Erbium lasers

- Later Erbium YAG lasers used with very shallow depth of penetration – approx 5 microns
- Erbium technique can be performed in an “office”
- However usually requires a series of treatments
- Results similar to a chemical peel

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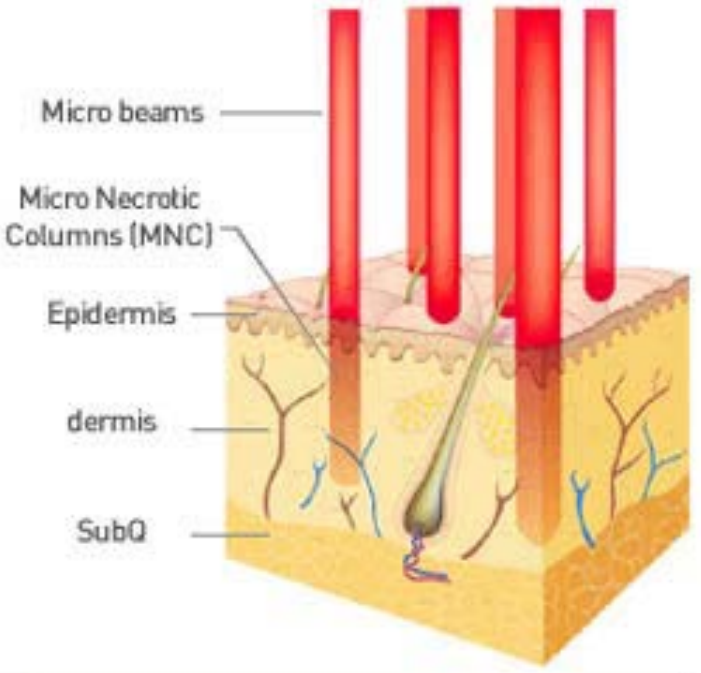
Development of Fractional CO2 Laser

- Instead of removing the whole facial epidermis – a computer produced scanned pattern of pinpoint penetrations is carried out.
- These cause micro thermal zones in the skin causing a wound healing process and new collagen production
- Again this technique usually needs a series of treatments



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Latest Yttrium Scandium Gallium Garnet Laser (YSGG)

- This ablates the skin but leaves a protective coagulated layer to avoid the necessity for dressings
- Usually only requires one treatment with short client “down time”
- A “Fractional” version of this wavelength is also available

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Example of YSGG Resurfacing

Photo courtesy of
Barry DiBernardo, MD

160 mJ, Density 2, 2 Passes (3 passes in perioral area).

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Laser Tattoo Removal

How it works

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Q – switched Lasers

- By using a Q-switch the laser energy is delivered in an extremely short pulse (nanoseconds)
- The energy is absorbed so quickly in the tattoo ink that if the energy setting is correct the tattoo ink is mechanically broken down into small fragments
- These fragments are removed by the body's immune system
- Usually a series of treatments is needed

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Usual Wavelengths Used

- Nd:YAG 1064 and it's frequency doubled 532 nm wavelengths are suitable for blue, black, red, pink, orange and brown inks but not green
- Ruby and Alexandrite lasers are suitable for Blue,Black and Green Inks but nor red/pink/orange or brown
- Please note that these lasers are special Q-switched versions
- The non- Q-switched versions of these lasers cannot be used for tattoo removal

NB: IPL must never be used on Tattoos

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Difficult Tattoos

- Yellow inks and other light colours are the hardest to remove due to poor absorption

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Skin Type Considerations

- The tattoo removal laser is capable of interfering with the naturally occurring melanin in dark skinned clients
- It is important to limit the treatments to clients of Skin Types I to Skin Types IV only
- Permanent light or darker areas may occur on the skin of Type V or Type VI skin clients if you treat them.

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Usually several treatments needed

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Summary - Module 4 Aesthetic Applications

- Aesthetic Light Based Applications depend on the absorption of the wavelengths of light used and also the pulsing characteristics of the device. Both wavelength and pulse duration must be chosen to match the relevant tissue target
- Skin type of the client is a very important consideration which decides whether the treatment can go ahead and which wavelength / type of equipment is suitable

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Module 5
Regulatory Issues

Control of Lasers and IPL devices in the UK

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New Training Needed

- Following the disastrous ‘PIP Breast Implant Scandal’ of 2012 a government sponsored commission was set up to study the problems inherent in the cosmetic treatment industry
- The outcome was published in 2015 in a 2 part report which has been provided in the “Resource” files of this course
- Although the report covers a wide range of treatments ranging from ”Skin Peels”, “Needling”, “Dermaroller” plus “Botox” and “Fillers”, for the participant studying this Aesthetic Laser and IPL course the main outcomes are:-
  - Users performing Laser or IPL Hair Removal or Skin Rejuvenation will require a **Level 4 qualification in *‘Laser and Light Treatments for Hair Removal & Skin Rejuvenation’***
  - Users performing Tattoo Removal will require a **Level 5 qualification in *‘Laser Tattoo Removal’***
  - It should also be noted that only “medics” are allowed to carry out other laser and IPL treatments such as vascular and pigmented lesions
- These new training requirements are in addition to other regulatory requirements outlined on the following slides…….

Regulated Classes of Laser and IPL

- Lasers are classified as to the degree of risk they pose from Class 1 to Class 4
- The lowest risk, Class 1 lasers, can be safely viewed indirectly, without eye protection.
- As the risks become greater the Classification increases
- Aesthetic lasers are designed to “damage” target tissues and so dependent on the laser type they will fall into either **Class 3b or more usually Class 4**
- **All IPL devices are included in Class 4**
- In the UK, Class 3b and Class 4 Lasers plus all IPL devices are controlled by various regulatory bodies……

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Non-Medical versus Medical Uses

- In England, users performing simple cosmetic, non-medical/non-surgical treatments no longer have to register with the Care Quality Commission under the Health & Social Care Act 2008
- Instead local councils are responsible for overseeing establishments offering such treatments
- A similar system of Local Council/Local Health Board control operates in Scotland
- In Wales all laser and IPL users are required to register with Health Inspectorate Wales (HIW)
- In N. Ireland all laser and IPL users must register with the Regulation and Quality Improvement Authority (RQIA)

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Laser and IPL Use – Local Requirements

- Beauty Salons, Clinics and Spa's where lasers and IPL's are used for Hair Removal, Skin Rejuvenation or Tattoo Removal need to contact their local Environmental Health Officers to check that they meet the required standards
- Requirements currently vary from council to council but it is usual for your E.H.O. to expect you to show evidence of:-
  - A risk assessment of your treatment room
  - "Local Rules" which set out the precautions to be taken every time the laser/IPL is used and which overcome any hazards identified in the risk assessment
  - "Core of Knowledge" training
  - Operational / Manufacturer training on the equipment which should also include knowledge of any contra-indications of the treatment
  - A Level 4 Course in Laser and Light Treatments for Hair Removal and Skin Rejuvenation
  - A Level 5 Course in Laser Tattoo Removal for users offering
- Some local councils issue a "Special Treatment" licence to establishments that meet their requirements

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Laser and IPL Use – Local Requirements (Continued)

- Some councils require laser/IPL users to employ a Laser Protection Advisor to carry out the risk assessment and write the “local rules”
- Other councils allow the owner (often in conjunction with the equipment manufacturer) to produce these documents themselves
- Some councils insist that the user appoints the services of an “Expert Medical Practitioner” (who is a Physician, Surgeon or Dentist with at least 5 years laser or IPL experience) to write a safe treatment protocol and to provide advice when required

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Registration in Wales or Northern Ireland

- A series of core business quality standards and policies must be in place
- Need to hire a “Laser Protection Advisor” to survey your premises and equipment, to produce a risk assessment and to write “local rules”
- Need to hire an “Expert Medical Practitioner” to check and sign off treatment protocols that will be used
- Users must show evidence of both Manufacturer Training and “Core of Knowledge” training
- All staff must have Criminal Records Bureaux checks
- It is unknown at this stage whether HIW or RQIA will require the Level 4 & 5 qualifications
- After applying for registration an inspection of your premises will take place and a “fit person” interview with the owner carried out.
- Annual inspections thereafter

Registration Help is Usually Available from Equipment Suppliers

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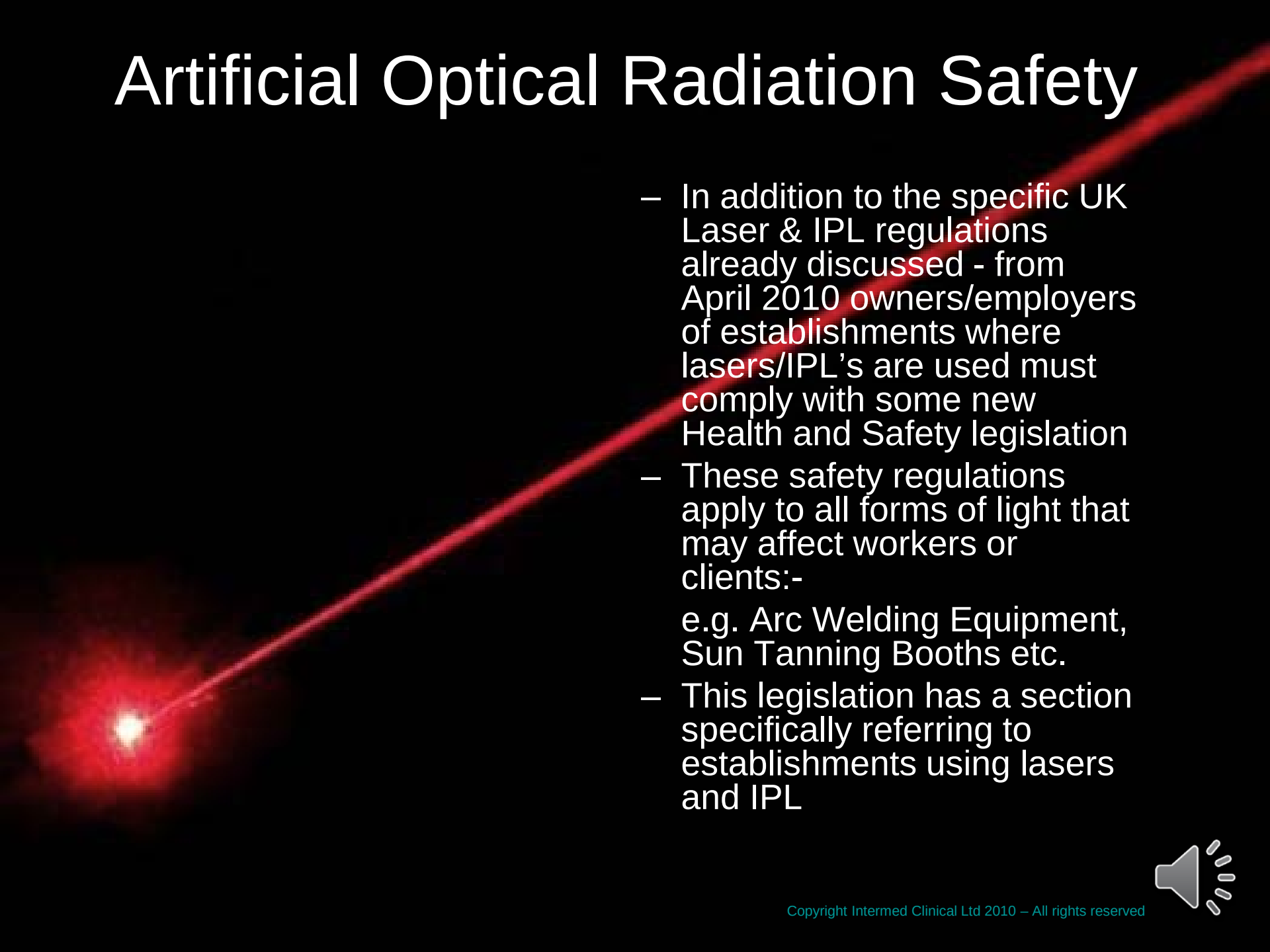
Artificial Optical Radiation Safety



- In addition to the specific UK Laser & IPL regulations already discussed - from April 2010 owners/employers of establishments where lasers/IPL's are used must comply with some new Health and Safety legislation
- These safety regulations apply to all forms of light that may affect workers or clients:-

  e.g. Arc Welding Equipment, Sun Tanning Booths etc.
- This legislation has a section specifically referring to establishments using lasers and IPL

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HSE Guidelines for establishments where Laser or IPL are used

- Risk assessments should be carried out & specialist advice may be needed
- Provide face shields, goggles or other protective eyewear and coveralls etc
- Provide gloves where appropriate (it is recognised that thin nitrile gloves may be needed for dexterity and that these will offer limited protection against laser burns)
- Designated treatment rooms with restricted access
- Curtains around equipment
- Workers must be at a distance from patients who are exposed
- Provide information and training
- Display appropriate warning signs
- Monitor and enforce use of control measures
- If any workers are over-exposed, provide medical examination and consider whether follow-up health surveillance is appropriate

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Health Protection Agency Safety Guidelines

- Detailed safety guidelines applying to the Health & Safety Executive AOR legislation have been produced by the Health Protection Agency
- Broadly speaking these follow the “Core of Knowledge” syllabus.

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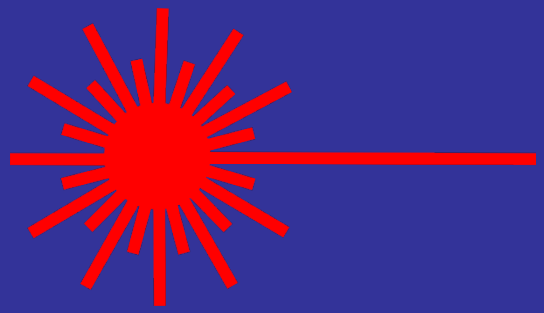
Summary Module 5 Regulatory Issues

- Local Councils regulate Beauticians and Tattooists who carry out simple cosmetic treatments – such as laser hair removal and laser tattoo removal
- In Wales & N. Ireland or any clinic offering medical or surgical laser treatments:-
  - Must register with Regulatory body such as HIW in Wales or RQIA in N. Ireland or Care Quality Commision in England
- Laser/IPL managers and/or owners must also ensure that they comply with HSE guidelines on “Artificial Optical Radiation Safety”



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Module 6
Equipment Management

Equipment Checks, Maintenance, Quality Assurance

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Installation

- The manufacturer or supplier of your equipment should have installed your laser or IPL and checked initial performance
- If you have installed the system yourself you must make sure
  - that the power supply is the correct phase and voltage
  - that the fuse rating of the supply is adequate – some systems draw more amps than the usual domestic 13 amp circuit
  - that any water cooling tank has been correctly filled with no air locks
  - that all hoses etc are connected properly
  - that there are no water leaks
- These checks should be carried out before each use

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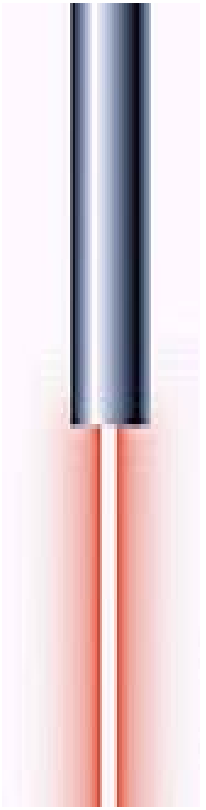
Output Specifications

- Your supplier should give you a copy of the specifications of the system when installed
- This should show the actual measured output of the laser compared to the manufacturers specifications
- If your system has a calibration mechanism then you should check this each time the system is used
- These calibration systems usually emit a known level of light which is measured by a built in power meter
- If the device fails to deliver the energy within specifications an error message is displayed and the system requires servicing
- It is also possible to buy a separate power meter which allows the user to keep track of the performance of a system which may not have built in calibration
- It should be noted that the flashlamps in IPL systems deteriorate with each shot fired and after a certain number of treatments will no longer function properly
- Regulatory bodies may review maintenance logs etc during their inspection



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Other Equipment Checks

- The safety equipment used with the laser and IPL should be regularly checked
- Safety Spectacles in particular should be checked for scratches and cracks as these could potentially allow laser or IPL light to damage the wearers eyes
- Fibre Optic cables carrying laser light to the hand piece should be checked for cracks as laser light may escape from these as well as being emitted from the hand piece. (This should show up as a reduced calibration)
- Cleanliness of the hand piece crystal coupling should be checked as any cracks, dirt or hairs may cause a build up of heat and burn the client
- The hand piece cooling temperature should be regularly checked to ensure client comfort during treatment

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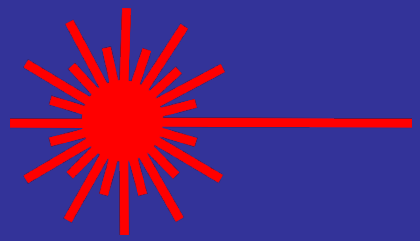
Summary of Module 6 Equipment Management

- Equipment should be regularly calibrated by manufacturer or user
- Calibration and Maintenance logs should be kept
- Ancillary equipment such as safety spectacles should be stored correctly and regularly checked for flaws
- Treatment Heads should be kept clean
- Fibre optic cables etc should regularly be checked for “leaks” of laser light
- Cooling system temperature should be monitored



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Module 7
The Practicalities

Pre-treatment, Treatment and Post-treatment Considerations

Suggested Protocols

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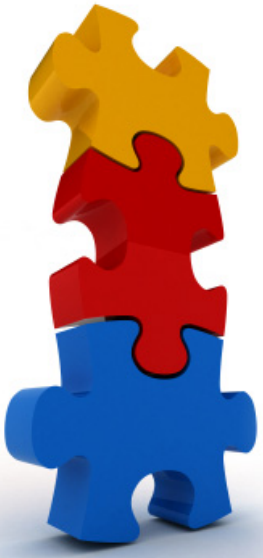
Suggested Protocol for New Client

- Client completes a Skin Typing form in order that you can accurately determine their Fitzpatrick skin type
- Patient reviews your Practice Consent Form
  - A standard form should be prepared by your solicitor to minimise your legal risks
  - It should cover the treatments you offer and state any risks involved
  - It should be read by the client in advance of treatment and only signed during the Consultatio in the presence of the Operator



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Client Attending For Repeat Treatments

- These clients should be given a new Skin Typing form and a new Consent Form before each treatment
- They may have been sunbathing and temporarily increased their Skin Type

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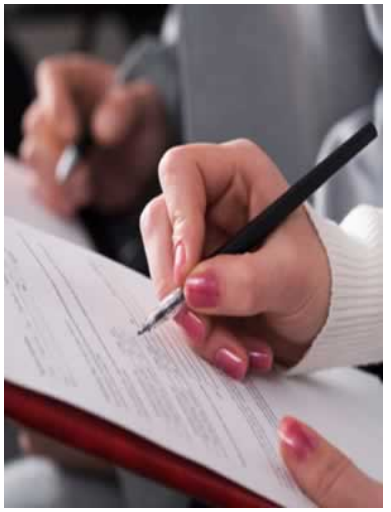
The Consultation

- During the Consultation the Practitioner should go over the the Skin Typing Form with the client and should discuss any medical history which may preclude a client from treatment.
- Contra-indications include:-
  - Pregnancy
  - Diabetes
  - Herpes
  - Immuno deficiency or Auto immune disease
  - Anticoagulant therapy
  - Certain antibiotics which increase sensitivity to Light
  - Certain herbal remedies which increase light sensitivity such as St John's Wort and Fever Few
- A proposed treatment plan should be discussed and entered on a Client record card being careful to note the Skin Type adjusted for any sun tan etc
- For known patients any changes from previous visits should carefully be noted and the treatment plan adjusted accordingly



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Managing Expectations

- The expectations of the Client should be managed – i.e. they should fully understand the nature of the expected results and the gradual improvement usually requiring a series of treatments.
- It is better to “undersell” and have the client very pleased with the results than to oversell and create disappointment

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Treatment Consent

- The Consent Form should be signed by the Client after any questions have been answered.
- It is important to obtain consent for each treatment visit – making sure the forms are correctly dated

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Preparing the room

- The Treatment Room should be prepared in terms of restricting access, posting mandatory warning signs, provision of the correct eye safety wear, closing blinds, covering reflecting surfaces etc.

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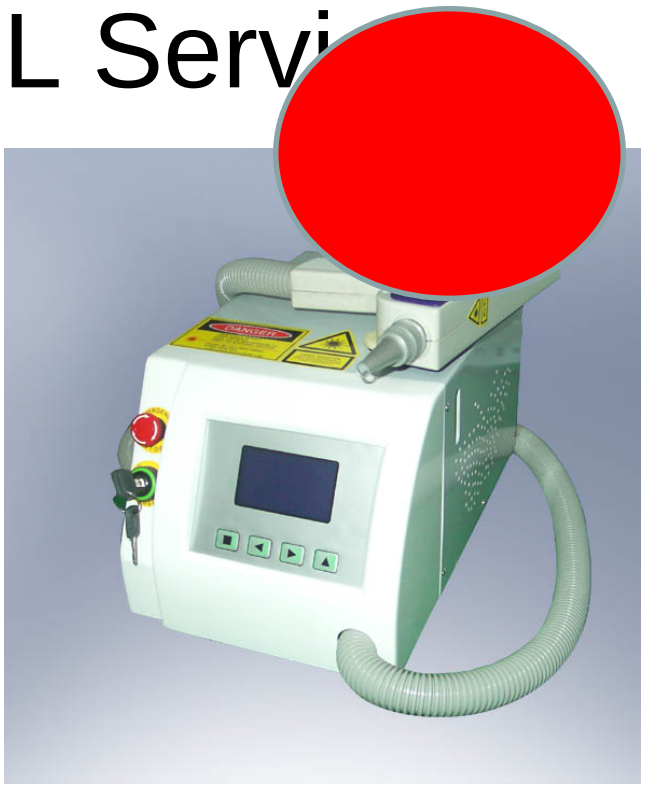
Special Note for Mobile Laser/IPL Servi

- Mobile laser/IPL operators should carry materials with them such as warning signs, fire resistant drapes, adhesive tape etc to cover reflective surfaces and make the client's home safe for the treatment
- Also ensure that you carry a supply of distilled water, tubing and funnel etc to maintain your machine's cooling system



A portable Tattoo Removal Laser

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Preparing the machine

- The Laser or IPL machine should be started and warmed up in line with the manufacturer's manual and all recommended instrument checks carried out
- Particular care should be taken to ensure that any chilled hand piece(s) have cooled sufficiently before treatment begins.
- Any ice crust or condensation that builds up on the treatment head should be wiped away before use

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Further Set up for the machine

- If using IPL ensure the correct filter is in place:

  From the previous information in Module 4 you will recall:
  - that the 420 nm or 530 nm filter is suitable for Active Acne
  - 530 nm, 585nm, or 595nm filters are optimal for facial redness/facial veins/rejuvenation plus pigmented lesions,
  - that a 695nm filter is usually used for hair reduction and/or collagen stimulation

  NB Your IPL may have slightly different filter values but will be in the same range
- Set the IPL or Laser to the correct patch test settings for the treatment concerned but do not yet press the "Ready" button – keep the system in "Standby"
  - The manufacturer or supplier of your laser or IPL should have provided suggested settings for different skin types when the machine was installed.

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Understanding the controls

The main variables that can usually be set on a machine by the user include:-

Spot Size – the treatment beam diameter in mm. In lasers this may be user variable but with IPL the treatment head is usually a fixed rectangular window. Sometimes different size IPL treatment heads can be fitted

Fluence in Joules/cm2 – the treatment energy delivered to a given area of skin (see next slide for explanation)

Pulse Number – the number of pulses that will be delivered to the skin

Pulse Duration (sometimes called **Pulse Width**) – the “on” time of the pulse usually measured in milliseconds (ms)

Delay or **Interval** - the “off” time or gap between pulses. Again usually measured in milliseconds

Frequency or **Repetition Rate** - the number of pulses per second. Often displayed in Hertz (Hz).

1 Hz = 1 pulse per second

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What is meant by “Fluence”

- **Power** is measured in Watts (like a light bulb)
- **Energy** takes Time into account and is measured in Joules i.e. 1 Joule = 1 Watt per Second
- In order to give clients consistent treatments the size of the treatment area must also be taken into account
- Therefore, it is usual to record the energy in Joules per square centimetre delivered by the laser or IPL

  e.g. 40 J per cm2 - this is known as **Fluence**

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Client Preparation

- If the treatment is for Hair Reduction or if there is excessive hair covering an area to be treated for another condition then the area to be treated should be shaved
- This is best done with a disposable razor or electric trimmer
- No plucking/waxing or depilation creams should be used before treatment
- After shaving it is again best to cleanse the treatment area to make sure no hairs are left on the surface of the skin

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Client Preparation

- Before treatment all make up should be removed thoroughly by washing with soap and water
- Oily skin may need a more thorough cleanse
- A non-alcoholic skin cleanser may be used but this should itself be removed and the skin dried
- At this time a Client pre-treatment photograph should be taken paying particular attention to lighting and distance
- Photographic “before and after” images should be kept in case of any later client dispute concerning outcomes
- Make sure that the clients eyes are covered properly by opaque safety goggles and that everyone else who may be in the room is wearing the correct safety spectacles

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Patch Testing

- The manufacturer documentation should suggest the settings to be used for test patches
- These are usually carried out at increasing energy levels until the desired end-point is reached
- The site chosen for these tests should be in a non-conspicuous area such as behind the ear but always in the same body area as the proposed treatment
- The client notes must record the positions and settings for the test patches.

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Patch Testing - Continued

- Depending on the equipment contact gel should be used to cover the skin to a depth of around 2 mm over the test areas
- The laser or IPL should now be set to “Ready”
- The hand piece should be applied to the surface of the skin and using the lowest of the three chosen settings, fired whilst firmly in contact with skin
- The reaction of the client should be judged not only from the physical appearance of the test patch but also by how they feel –
  - did they feel anything at all?
  - did they have any pain?
  - was it tolerable?
- The system should be placed in “Standby” and the settings increased for the second test patch
- The laser or IPL is then switched back to “Ready” and the system fired for the second patch
- This process is repeated for the third patch
- Continually obtain feedback from the client as you deliver the energy to these test areas

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Patch Test Results

- It is usual to check the test patches after 10 – 15 minutes to check the immediate skin response before the client goes home.
- Clients return for a review of their test patches and for an initial treatment at a later date. The interval before review and treatment will vary with the type of treatment and the skin type of the client
- Darker skin type clients may have a delayed skin response and their test patches should be given sufficient time in case this develops.
- Type V or VI clients must only be attempted if you have suitable equipment for dark skin

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Settings - Continued

- When at the correct settings it is normal to have slight erythema (redness) which should disappear within hours.
- If there is no redness then the settings may be too low (especially if the client feels no heat sensation during treatment)
- Oedema (slight swelling) may also occur but should disappear within hours.
- The test treatments may cause discomfort but should be tolerable
- If the redness or oedema is severe or takes too long to disappear then the settings are probably too high and should be reduced.

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Test Patch Results

- If any pigmentary changes such as “greying” of the skin occur then the settings are definitely far too high as this indicates a burn and should be treated accordingly
- Great care should be taken in choosing settings for dark skin test patches as skin burns can cause long term (sometimes irreversible) pigment changes. You must have suitable equipment if you wish to treat darker skin.
- The dark skin type patients should phone in any delayed response reactions that occur

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Treatment

- Once the correct treatment settings have been determined from the test patches then the full treatment should be carried out at these settings
- Keep checking how the patient feels as you fire the shots
- Work methodically over the treatment area
- Remember to reduce settings slightly when over thin skin areas such as neck, back of hands and also when over bony areas (which may reflect heat back into tissue)

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Treatment (Continued)

- After each main pulse move the treatment head to the new treatment position overlapping the previous treatment by about 10%
- Make sure there is good contact with the skin before firing
- The tracks in the contact gel (if used) will show you where you have been
- Do not be tempted to use a marker pen to mark out the treatment area as this can cause burns. (If you use any guide marks make these with a white pencil)
- Mask any problem areas (such as pigmented moles) from the beam as these will absorb the energy and cause pain
- Moles and pigmented lesions are classed as Medical Treatments and must only be treated by a Physician or Surgeon.

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Treatment Technique (Cont'd)

- After firing about 6 times in a row wipe the treatment head to clear away any build up of gel or debris
- Then make sure there is enough gel on the skin before continuing
- If the client feels uncomfortable during the treatment or severe redness/swelling occurs – stop and investigate
- Lower settings if necessary

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Completion of Treatment Session

- Continue the procedure until the whole of the area chosen for treatment has been covered
- Gently remove any gel with tissues
- A cold compress will help reduce any immediate redness/swelling
- The settings used and areas treated should be recorded on a treatment form which should be kept with the client's records
- A post-treatment client photograph may be taken at this time for your own records
- The treatment heads should be wiped clean and stowed safely
- The machine may or may not be switched off at this time dependent on further client appointments but should always be put in the "Standby" mode if still switched on.

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Post Treatment

- Any recommended post treatment creams/lotions may be applied at this time
- Aloe Vera is typically used
- The patient should be advised to stay out of the sun for several weeks and to use a sun protective cream (at least SPF30)

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Incidents - Complaints

- If there are any adverse reactions to treatments then these should be fully investigated in terms of settings used, compliance with post treatment recommendations etc
- These incidents should be logged and recorded
- Similarly any complaints should be dealt with promptly, logged and recorded.

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Module 7 Practicalities Summary

- Develop standard forms and protocols for your own practice
- Always have the client complete a skin typing questionnaire and sign a consent form
- Discuss any medical history that may be relevant
- Set realistic expectations during consultation
- Become familiar with the controls and settings of your laser or IPL
- Remember, in general terms, darker skin requires less energy (fluence) but longer pulse durations
- Determine individual client settings by carrying out test patches
- Only put the laser or IPL in “Ready” mode when actually firing the system
- During treatment, maintain good skin contact using gel where appropriate to enable effective skin cooling
- Make sure client understands and follows post treatment skin care regime

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Summary of topics covered that will be assessed

1. Basic Laser Theory
2. IPL Theory
3. Hazards of Laser/IPL
4. Basic anatomy of the skin & How the treatments work
   - Vascular & Pigmented Lesion Treatments
   - Active Acne treatment
   - Hair Reduction
   - Skin Rejuvenation
     - Wrinkle & Fine Lines/Collagen Stimulation
   - Skin Laxity Treatment
     - Deeper wrinkles/skin folds
   - Skin Resurfacing
     - Ablative and Fractional Techniques
5. Regulatory Issues
6. Equipment Management
7. Practical Issues

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Assessment

- The online Assessment starts automatically following these introductory slides – please note that there is no audio commentary during the assessment questions.
- For security you will be asked to enter your name and e-mail address before the assessment loads
- The assessment requires you to select answers to various multiple choice and ‘True’ or ‘False’ questions.
- Remember for many questions there may be several correct choices
- When you have made your selections click the “Answer” button at the bottom of each slide.
- The system will give you immediate feedback as to whether your answer was correct, partially correct or incorrect.
- It is suggested that you make a note of any question that you get wrong before moving to the next so that you can later review the relevant sections of the course and if need be resit the assessment.
- Please note that the questions used in the Assessment are randomly selected from a large pool of questions so no two assessments will be the same

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Certificate

- Once you have completed all questions of the following assessment the system will display your score and whether you have successfully passed or failed.
- If you do not pass at the first attempt do not be disheartened – remember you can access the course many times during the 2 months allowed and can resit the assessment until you pass during this 2 months access period
- The Course Administrator is able to monitor the time you have spent viewing each slide and is also copied with your assessment result.
- If you have successfully passed, your details will be forwarded to the Open College Network who will prepare and issue your Level 4 certificate.

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Course Materials For Future Review

- Copies of the course slides and various reference documents are provided in the **“Resources”** tab shown at the top right of the training presentation window
- You may view, print or download these for your future use

Warning! Please remember to view and download the course materials before your online access to the course expires.

Thank you for completing the Aesthetic Laser & IPL E-learning



We wish you success in your Laser/IPL practice!

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