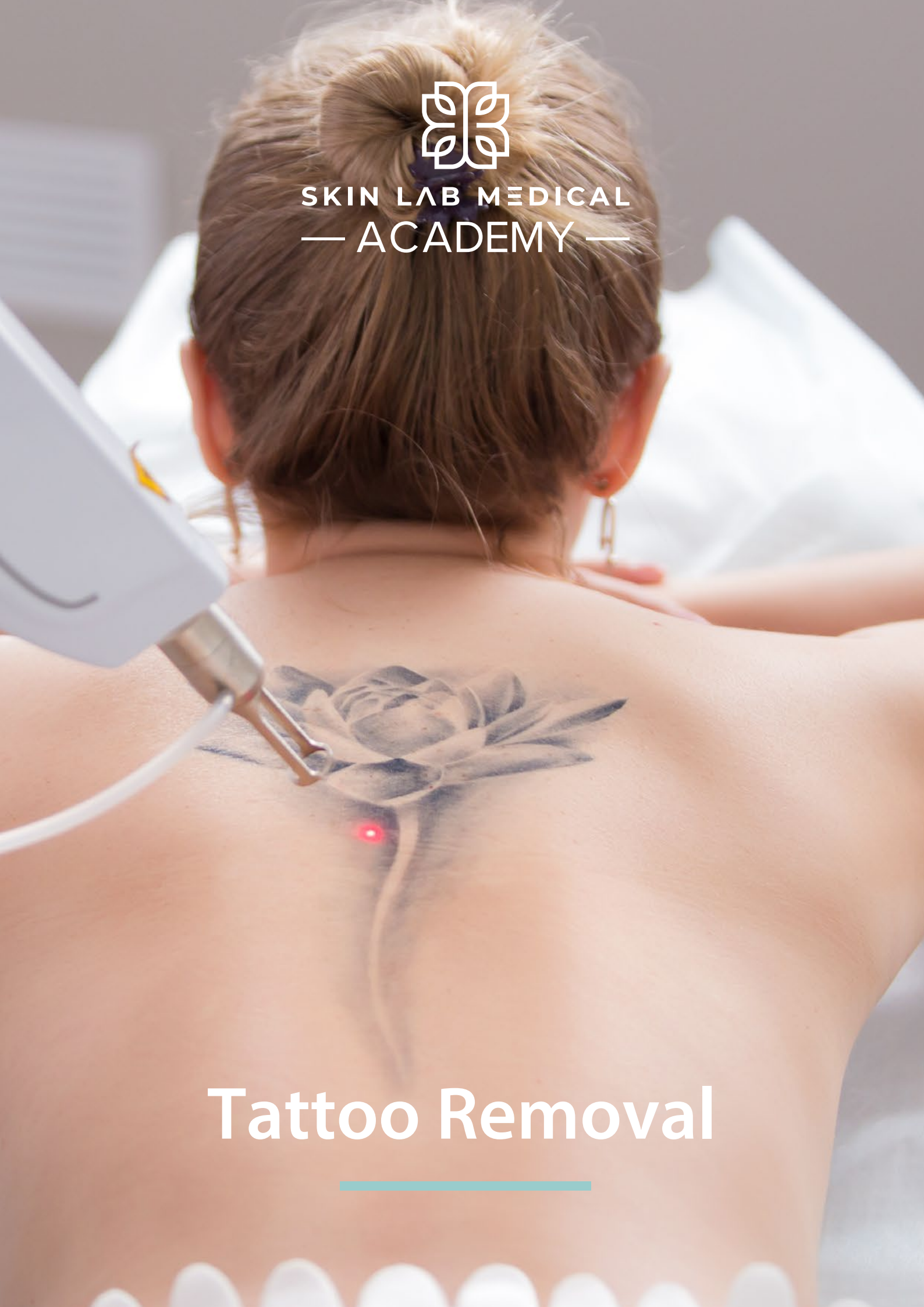




SKIN LAB MEDICAL
— ACADEMY —



Tattoo Removal

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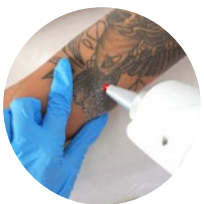
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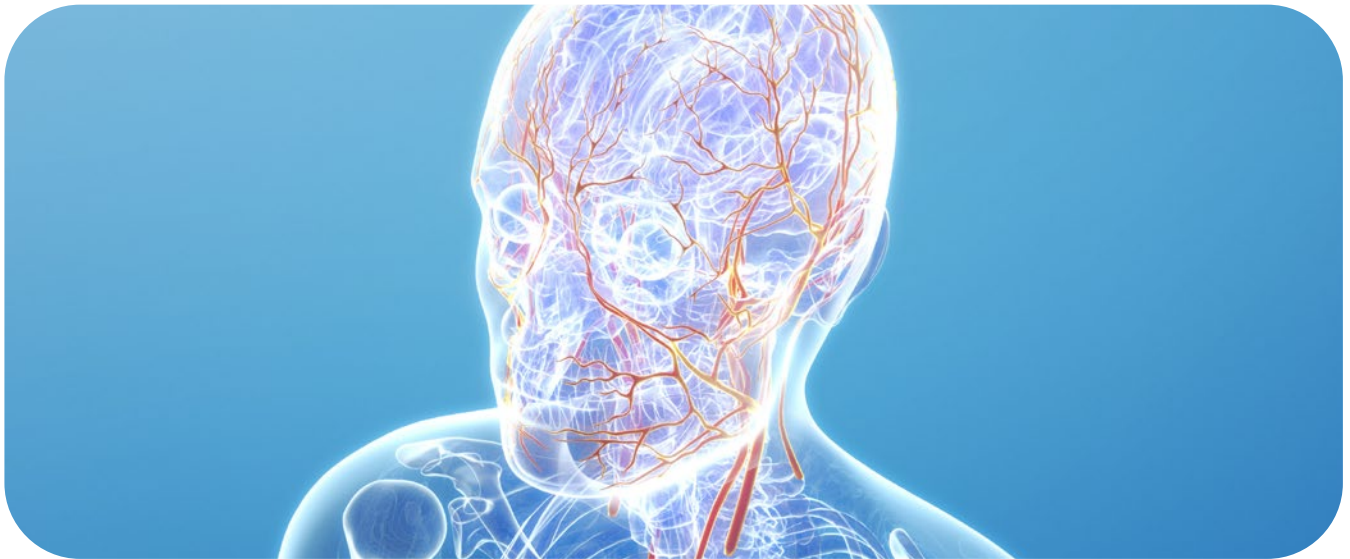
Welcome to your course!

The word LASER stands for:

LIGHT
AMPLIFICATION
STIMULATED
EMISSION
RADIATION

The laser rays are:

- A. Monochromatic – of one wavelength (one color).
- B. Coherent – waves are in the same phase focused & high intensity.
- C. Collimated – with very little divergence.



Anatomy and Physiology

The epidermis is made of five layers of different types of cells. While this may provide an excellent barrier to external agents it also hinders the progress of light through to the deeper dermis. This is due to the amount of air bubbles trapped within the epidermis. In addition the natural dirt and grease of everyday activities clogs up the epidermis. These also hinder any light trying to penetrate into the skin. It is therefore, essential to clean any treatment area to remove such dirt and grease.

Tattoo ink particles are found in the papillary dermis or reticular dermis. Dermis extends to 7mm depth, although neck and hands have a much shallower depth.

Professional tattooists insert the ink 2-3mm depth. When ink inserted into the dermis, the body's first defence mechanism, macrophages to break down.

Many inks are inorganic which means the macrophages also cannot engulf them. The body then sends in fibroblasts . Fibroblasts are responsible for the healing of a wound. They produce collagen fibres. This happens when the ink is inserted so the ink becomes enmeshed in the collagen fibres.

Collagen fibres take up to 6 months to form, until then the fibroblasts holds the ink in the dermis. This is why the tattoo will stay in the dermis almost indefinitely.

Tattoo is created by inserting inedible ink or pigment into the dermal layer of the skin to create a permanent marking.

Amateur tattoos homemade can be less deep limited to blue black colours and the ink is not as dense and can be easier to remove. Professional tattooing is usually deep and has dense ink concentration , may be extensive and have multi colours.

Cosmetic semi permanent

Use micro or nano pigments and not as deep, often contain oil pigments

Traumatic usually a result of road traffic accidents where someone has been dragged along the tar of the road, results depends on depth and the size of the particles.

Tattoo removal had been performed with various tools during the history of tattooing. While tattoos are once considered permanent , it is now possible to remove them with treatments fully or partially.

Some early forms of tattoo removal included the injection or application of wine, lime garlic excrement. Tattoo removal by laser was performed with continuous wave lasers initially, with q switch lasers, which became commercially available in the early 1990s. Today laser tattoo removal usually refers to the non-invasive removal of tattoo pigments using q-switched ruby laser, q switched ND:YAG and alexandrite laser.

Q-switched creates a photo acoustic shock wave to shatter the ink particles. The q-switch laser uses sapphire or diamond to hold the laser energy which builds up an enormous power before being released in a very short burst. This makes the pulse duration nano seconds or even pico seconds. Reducing the pulse energy will increase the strength at the same energy.

Q- switched systems will release a loud cracking sound when the photo acoustic shock wave is absorbed by the tattoo ink . The shock waves has a photo mechanical effect, causing the ink particles to fracture mini explosions . As the tattoo ink fragments, particles are rejected from fibres surrounding the tattoo.

Heat is released from the exploding ink. The photo acoustic shockwave causes bubbles of gas within the cells surrounding the tattoo.. These bubbles are responsible for the frosting or white blistered appearance overlaying the tattoo. Ejected particles of ink may rupture tiny blood vessels present the dermis which may cause pin prick bleeding.

Within 15-20 mins the white blistering at the skins surface becomes translucent. The ejected particles of ink from the fibres will now be engulfed by macrophages. The body flushes these particles out through the lymphatic system, following that the circulatory system. The body excretes them out through your kidneys in urine or even through your lungs and coughed into the system.

- Sometimes the ink particles can remain in the lymph nodes closest to the tattoo site.
- The fragmented ink will fade in approximately 2 weeks' time, however the skin will not heal for 6-weeks' time
- Yellow ink is the hardest to treat as does not absorb the laser well. Metallic and fluorescent ink

reflect the laser so they cannot be treated with a laser

- Nd YAG 1064nm Blue/ Black but not green
- FD Nd YAG 532nm red/brown/pink and orange
- Rugby & Alex lasers Blue/Black/ green but not red

Laser tattoo removal is a successful application of the theory of selective photo thermolysis, this depends on four factors:

- The colour of the light must penetrate sufficiently deep into the skin to reach the tattoo pigment.
- The colour of the laser light must be more highly absorbed by the tattoo pigment than the surrounding skin. Different tattoo pigments therefore require different laser colours. For example, red light is highly absorbed by green tattoo pigments.
- The time duration (pulse duration) of the laser energy must be very short, so that the tattoo pigment is heated to fragmentation temperature, before its heat can dissipate to the surrounding skin. Otherwise heating of the surrounding tissue can cause burns or scars. For laser tattoo removal, this duration should be on the order of nanoseconds. Sufficient energy must be delivered during each laser pulse to heat the pigment to fragmentation. If the energy is too low, pigment will not fragment and no removal will take place.

Q-switched lasers deliver their energy in a very particular way (very short pulse-durations which 'crack' the tattoo pigment particles) that is effectively absorbed by tattoo pigment but not very well by the surrounding tissue. Because the energy is selectively absorbed by the pigment, surrounding tissues are not heated up to such a high temperature and there is no lasting damage to the skin.

Q-switched lasers are the only commercially available devices that can meet those requirements. Several colours of laser light (measured as wavelengths of laser energy) are used for tattoo removal, from visible light to near infrared.