

# TATS ALL FOLKS



Mike Murphy has spent many years in the medical laser industry. His first company, Derma-Lase Limited, was borne out of clinical research in Canniesburn Hospital, Glasgow,

Scotland into the removal of tattoos and benign pigment lesions using the Q-switched ruby laser. He was involved in the original research program from 1986, and also studied the effects of the pulsed dye laser on vascular lesions (such as port wine stains). While working in the hospital Mike became the Laser Safety Officer responsible for the safe use of all the lasers within the Canniesburn Laser Suite. At the same time he had to implement the recently formed COSH regulations where they applied to lasers. In 1989 Mike and his colleagues formed Derma-Lase Ltd to sell the DLR1 ruby laser across the world with many sales in America and in South East Asia. They opened the world's first tattoo removal clinic in Glasgow using Q-switched lasers. Two years later they launched the world's first commercial Q-switched Nd:YAG laser for dermatological applications, the MultiLine. In 2002 Mike started working with PhotoNova of Sweden as a consultant. He is currently working on a report on the thermal effects of IPL pulses on tissue, in particular blood vessels. This area has not been fully explained in the literature and has led to a poor understanding of the best way to treat various skin problems using IPL systems. He plans to publish this report later in the year. He has also recently begun a new spectroscopic study of tattoo inks and their response to Q-switched laser energy.

Mike Murphy gives his View On why tattoo removal lasers are a potential danger in our beauty salons

**Recently salon owners in the UK have begun to look at offering tattoo removal services as part of their overall package. While this is a good move, generally, there are a number of issues, which should be understood by all therapists before launching into this area.**

Firstly, the only technique that has been clinically proven to remove tattoos without seriously damaging the skin is the Q-switched laser. A Q-switch is a device that essentially 'squeezes' all the laser energy into an extremely short pulse duration, typically, billionths of a second. Such short pulses do not generate thermal (heat) reactions in tissues, unlike many other lasers and all IPL systems. Instead, a different type of reaction known as the 'photo-acoustic effect' is induced. This reaction generates a shock wave, which causes the brittle tattoo ink particles to fracture into smaller fragments, which macrophages within the skin will remove over time. Secondly, IPL systems cannot produce nearly enough power to break down tattoo ink in the same fashion as with Q-switched lasers. Indeed, IPL systems cannot induce the photo-acoustic effect at all. They can only generate thermal reactions, which can lead to scar formation if used on tattoos due to damage to the adjacent collagen. The power density is absolutely critical when attempting to treat tattoos. Below a certain threshold the photo-acoustic effect will not occur and the tattoo pigment will not fragment. The graph on the opposite page shows the differences in the power density generated by various systems.

IPL systems can generate power densities between 50 watts/cm<sup>2</sup> and 2000 watts/cm<sup>2</sup> typically. If we represent 50 watt/cm<sup>2</sup> as a 1cm high point on the graph, then many lasers used in cosmetic treatments today will generate equivalent power densities of 5000 watts/cm<sup>2</sup> - a height of 100cm on this graph. However, Q-switched lasers can easily generate power densities of hundreds of millions of watts/cm<sup>2</sup> - on the graph opposite this would be represented by a point more than 150 kilometres high.



To be absolutely clear on this, each Q-switched laser pulse generates a power density 150,000 times greater than typical lasers and 15,000,000 times greater than IPL systems! It is clearly obvious how much more powerful Q-switched lasers are when compared with 'standard' lasers and IPL systems. This point must be understood by all Q-switched laser users. It is absolutely imperative that anyone using this kind of technology appreciates the power of the laser they are using. I cannot stress this enough. This is particularly important when considering the potential hazard of such lasers to the eyes – this is covered in my next point. Thirdly, the correct safety goggles or glasses **MUST** be used when utilising Q-switched lasers. This is a legal requirement in the UK and is enforceable. I have become aware that some suppliers do not supply the proper eye protection. This is doubly dangerous because not only do they not provide the proper level of eye protection, but they also allow the wearer to believe that they are protected! Every pair of safety eyewear **MUST** indicate the level of protection and must be CE marked. These are both legally required otherwise the eyewear cannot be used within the EU countries. Current regulations, known as the EN60825/207 standard, state that both the frame and the filter must be chosen according to the laser wavelengths and output power density. For pulsed lasers this means that they must offer full protection for at least 100 pulses (or 10 seconds for a continuous laser) – this applies to both the frame and the filter. The old regulations specified the optical density (OD) of the filter alone. The OD is a measure of how much light can get through the filter to the eye. It is a logarithmic scale so an OD of 1 represents a 10% transmittance while an OD of 2 is only a 1% transmittance. However, the newer European Standards incorporate a required protection level for the frames too – this is now law for all EU states. Laser safety goggles are specifically designed for particular lasers. They are not transferable. The goggles must take into account both the wavelength(s) and the output power of the laser. If you use a Q-switched Nd:YAG laser for tattoo removal then your goggles must be able to protect you from the 1064nm and 532nm wavelengths (which most Nd:YAG lasers will output) and the huge powers they generate. However, these goggles will only protect you from this type of laser. They are useless if you use a different laser. I know of a case where a very well known laser researcher damaged both of her eyes because she accidentally put on the wrong safety goggles before working with a Q-switched laser. That damage is permanent – it cannot be repaired! Q-switched lasers generate both visible and invisible laser light of immense power (as above). Even a fraction of a percentage of this power is capable of permanently damaging the eye's retina. Hence, if the wrong safety glasses/goggles are used and an errant reflection enters eye damage is almost guaranteed. All of the above must be clearly understood before even switching on a Q-switched laser. Comprehensive training must be provided to all users by authorised personnel only. Secondary training by new users should absolutely not be allowed – this is imperative to ensure safe and effective use of such lasers.

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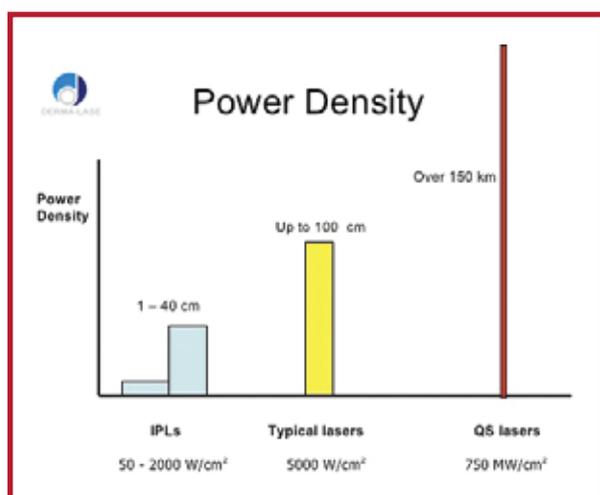
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