



# NO PAIN – NO GAIN

Mike Murphy gives his View On laser and light based 'pain free' hair removal

**R**ecently I have seen more and more hair removal systems claiming to be 'pain-free', particularly the home-based units. This always makes me wince! It clearly shows that the manufacturers/suppliers do not understand how light energy destroys hair follicles.

The bottom line is – no pain, no gain! It's as simple as that. If your patient does not feel something then nothing will happen. The reason for this is due to simple biology. The dermis contains pain-temperature nerves which register temperatures up to around 45°C. Beyond that they send pain signals to the brain to indicate excessive temperatures.

The mechanism behind hair removal is the irreversible denaturation of the follicle germ cells. If hair germ cells are exposed to a temperature of 45°C they will need to maintain that temperature around for 288 seconds (just under 5 minutes) to ensure complete denaturation of the proteins within. Only then will the hair follicle die permanently.

The relationship is quite simple - successful tissue reactions occur when the temperature and time combination is right. In practice this means the longer the pulselength the lower the temperature required. For a 1ms pulse you need to achieve a temp of approx. 81°C, and for a 50ms you need approx. 69°C, to achieve irreversible protein denaturation. (These calculations assume a constant heating over the duration of the pulselength.) The temperature achieved within the tissues is dependent on the energy density and wavelengths used.

I often refer to the 'zone of good results' (see figure). This is the zone where the correct combination of temperature and time occur and, hence, good results should always occur. As an example, think about boiling eggs. We all know that to boil the perfect egg you need to cook it at a suitable temperature for a sufficient time. Cooking tissue is exactly the same – we want to achieve the permanent denaturation of the target's proteins, without damaging the surrounding tissues.

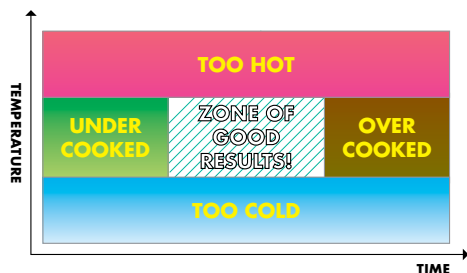
However, the problem is that patients generally want a pain-free treatment. This can result in many patients not returning for subsequent treatments. The answer to this problem is proper skin cooling during the treatment. The best way to achieve this is by contact surface cooling using a sapphire tip. Sapphire is four times more conductive than quartz (which many IPL system use).

Proper contact cooling will draw out heat from the dermis and epidermis much more efficiently than air cooling or cold gel alone. As long as the sapphire tip is sufficiently cold, I suggest around 5°C, then the pain can be successfully mitigated while still achieving good results. Post-treatment cooling is also a good idea. It helps to soothe the patient's skin and reduces erythema and oedema.

The bottom line is, if your patient does not feel something during treatment by laser/IPL then they will most likely not achieve the desired result. The existing hair may fall out but a new one will grow in, over time. The follicle will remain viable.

**Sorry, but it really is a case of – no pain, no gain!**

The zone of good results



Mike Murphy is a physicist/bioengineer who has been involved in medical laser research since 1986 and in the commercial sector since 1989. His original research group developed the scar-free removal of tattoos by Q-switched ruby laser in Canniesburn Hospital, Glasgow. He now runs training courses on IPL systems and aesthetic lasers and their applications. [www.dermalase.co.uk](http://www.dermalase.co.uk)