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NEW DEVELOPMENTS: FROM NANOSECONDS TO FEMTOSECONDS, FACTS AND FICTION

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An internet based survey revealed that most of tattoos are partially or complete black, followed by the use of red, blue, or green inks. As the incidence of tattooing continues to increase, so does the demand of people for tattoo removal. Due to various reasons, often aesthetic-, social- or employment-related, many tattooed individuals undergo a therapy of tattoo removal.

After tattooing into skin, the pigment particles are exclusively found intra-cytoplasmatically, lying in membrane-bound structures (heterolysosomes). To remove the tattoo colorant from skin, these pigment particles must be mobilized and pulverized at the same time. In order to destroy the particles selectively while minimizing the risk of side-effects to the skin, the use of short and intense lasers light pulses is applied so far. According to the principle of selective photothermolysis, the laser light must be absorbed in the pigment at a sufficient energy, and the pulse duration (e.g. nanoseconds) must be adapted to size of the pigment particle. Investigations of laser treated skin showed that the energy of the absorbed laser light is converted to heat. During ultra-short heating, the pigments will reach very high temperatures of several hundred degrees Celsius and may then, as proved by histology, lead to disruption of the pigment particle. The particle fragments are then removed via lymphatic or blood vessel system. Especially reduction in both pigment size and density clearly indicates tattoo colour fading that is expected by the patient and the therapist.

Unfortunately, the removal of the tattoo colour from skin frequently remains incomplete. In the past decades, laser light pulses with nanoseconds have been applied based on the assumptions of selective photothermolysis. For a short time, lasers with shorter pulse duration (picoseconds) are offered that might improve the therapeutic outcome.