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Gel Manicures – Safety and Use

### **“To Gel or not to Gel?”**

Gel manicures have revolutionized the nail cosmetics industry, and have been largely responsible for growing the industry to a value of 8 billion dollars in 2014. Several reports suggest that as many as eighty-five percent of nail salon customers request gel manicures. Gel manicures are a relatively quick service and deliver a durable, high-shine, and long-lasting product. The one controversial step in their application is the exposure to a UV-emitting nail lamp to properly cure the product. The question remains as to whether the exposure to the UV radiation during this service is potentially harmful to the customer, and whether customers should take appropriate measures to shield their hands and feet from the potentially damaging effects of the UV radiation during gel manicures and pedicures.

Gel manicures are an option for anyone—young or old—and can be used on people with different types of nail conditions that lead to malformed or dystrophic nails that be socially or occupationally debilitating. Although gel manicures are an excellent option for beautifying the nails, it is important to be aware of the risks that can be incurred from the exposure of the UVA radiation emitted from the lamps used to cure the gel product. All lamps used to cure gels use UVA radiation to cure the gel product, and each gel formulation is manufactured to cure under a specific intensity of irradiance.

There have been several investigative reports attempting to quantify this risk for gel manicure consumers. Principal challenges in these investigations include the variability in irradiance among nail lamps by the numerous manufacturers, as well as the wide variability in exposure time nail technicians choose for their customers. There is currently no regulation of these lamps, or the exposure times, and reports have shown wide variability among nail lamps (1). UVA irradiance also varies depending on the placement of the hand in the exposure area—another measure that is not regulated from device to device or salon to salon.

An additional concern is the rise in popularity of LED nail lamps. These lamps have become popular because the curing times required are significantly shorter than the traditional UV nail lamps. The rise in popularity may also be due to the misperception of these lamps as being safer. Although many people mistakenly believe these lamps do not use UVA to cure, these lamps not only use UVA rays, they in fact use higher intensities of UVA wavelengths in order to achieve the shorter curing times. This higher intensity of UVA irradiance means that it requires less time for these lamps to potentially harm the skin.(2) In a sense, calling these lamps “LED” lamps rather than “UV” lamps is actually a misnomer, as these lamps still emit UVA rays.

In 2013, Dowdy and Sayre examined 5 commonly used nail lamps and one rarely used nail lamp (that cures only one fingernail at a time). Three lamps with fluorescent bulbs and three with LED diodes. The authors concluded that when the irradiance was measured at

the intended use distance of 1 cm from the light source hazard to skin, all 5 of the commonly used nail lamps fell into the highest risk group of lighting systems allowed to be used by the general public in unsupervised conditions: Risk Category 2 of lighting sources according to the Recommended Practice for Photobiological Safety for Lamps-Risk Group Classification and Labeling.(3) It is critical to consider that these guidelines determine safe levels of exposure based on the general population, and do not take into account individuals who may be more photosensitive by physical characteristics or due to medications or other causes of increased photosensitivity.(4,5)

In 2014, Shipp et al evaluated the UVA and UVB irradiance of 17 UV nail lamps and found great variability between devices. The authors then determined the number of visits needed to reach the threshold for DNA damage, and estimated the number of months it would take to reach this threshold—assuming the patron only went for a gel manicure every 3 months, and the exposure time during the visit did not exceed 8 minutes. The median number of visits required to reach the threshold value for DNA damage was 11.8 visits, or 35.3 months. If the group had considered that most gel customers go every 3 weeks instead of every 3 months, then the number of months it would require to reach this threshold would actually be met in just 8.8 months.(1) In addition, this is also assuming that the patron was left under the nail lamp for no longer than the recommended 8 minutes—a measure that is not regulated and that both manicurists and gel manicure enthusiasts anecdotally report is an underestimation of the actual time patrons are left under the nail lamps.

In a pivotal study by Curtis et al in 2013, the investigators evaluated UV exposure from two commonly used UV nail lamps. Using appropriate dosimeters that are capable of approximating DNA damage caused by UV irradiation, they were able to conclude that, in less than 10 minutes, a person's hands are exposed to an energy dose that is comparable to the day-long recommended limit for outdoor workers by the International Commission on Non-ionizing Radiation Protection. In this study, the investigators found that the UV nail lamps analyzed emitted over 4 times more energy within the UVA range than normal sunlight.(5,6)

Several studies have compared nail lamp exposure to UVB exposure (which is often used as a therapy for certain dermatological conditions), and even used minimal erythema dose (MED) as a comparable measure.(7) However, MED is a measure primarily of UVB exposure, and does not quantify UVA exposure. Furthermore, UVA rays are more mutagenic than UVB rays due to the increased DNA damage caused by oxidative stress.(8) UVA rays also penetrate the skin to a deeper depth and are responsible for many of the changes in the skin known as photo-aging: thinning and wrinkling of the skin, visible blood vessels, dyspigmentation, hyperpigmentation and hypopigmentation. And therefore, even from just a pure cosmetic standpoint, these UVA rays emitted from the nail lamps are not to be ignored.

There has been some resistance from the nail cosmetic industry surrounding the claims that these nail lamps may pose health risks, as if the gel manicure product is being threatened by these potential health risks. I disagree. I am a firm supporter of gel

manicures, as I believe that they are an excellent product for many nail enthusiasts. I actually recommend gel manicures, from a medical standpoint, to my patients with certain types of nail conditions. What I propose is that consumers have an easy, thoroughly protective garment that either they bring with them to the nail salon, or that nail salons consider providing for their consumers. This way, everyone wins: gel manicure consumers still receive and enjoy an excellent product while their skin is appropriately protected from the various forms of UV-induced photo-damage.

#### References:

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