

“Shiny” nails, but not without risk! ^[1]

Press release from the French National Academy of Medicine

April 28, 2023

In the last 10 years, the nail sector has experienced a very significant boom. In 2010-2011, more than 87% of nail salons reported to use an ultraviolet (UV) lamp (1). International nail market is growing by 9.5% in value and is expected to reach 13 billion euros by 2024. Many specialized sites and blogs have appeared on the web. Throughout France, specialized institutes in nail beauty and "nail bars" are growing. Nails account for 15% of the beauty market (2) and it now affects all ages from 17 to 90 years.

Among the most important attractions of nail art, is semi-permanent nail polish, which has the advantage over traditional nail polish of lasting to 2 or 3 weeks. However, its application requires a lamp combining UV (at least 48 watts) and light-emitting diode (LED) to dry and fix each of the four layers of varnish applied. Unfortunately, these lamps emit UV type A rays (UVA), which penetrate deep into the skin and are known to promote aging, and especially the development of skin cancers. The International Agency for Research on Cancer has classified UVA as a group 1 carcinogen (3).

In 2022, a summary of the side effects induced by semi-permanent varnishes identified three types, all in women: allergic skin reactions (66 cases, 70.5%), nail mechanical damage (23 cases, 26.1%) and three cases of UV- induced skin squamous cell carcinoma (3.4%) (4). The favoring role of "nail" UV lamps in the induction of these skin cancers was mentioned as early as 2009 (5).

UVA rays are known to damage skin cells DNA by producing oxygen free radicals, which induce mutations at the origin of cancers in these cells. The particularity of UVA is to always induce the same type of mutations. Their identification in skin cancer cells makes it possible to speak of an "UVA signature" of these cancers. A recent experimental study (6) consisted of applying a UV lamp, emitting UVA, and used to dry nail polish, to three types of skin cells: mouse embryonic fibroblasts, fibroblasts and human keratinocytes. This showed that irradiation of the three types of cells by a UV "nail" lamp induces mutations typical of UVA. It provides concrete evidence on the carcinogenic risk of using these lamps in nail care.

Concerning the use of semi-permanent nail polish, the risk seems above all to be linked to three factors: the young age at the start of use on average at 20; the close frequency of exposure on average 5 to 6 times a year, or even more with the development of home lamps); exposure over several years. The cumulative effect of UVA exposure is the major risk. It can be aggravated by the terrain (clear skin, immunodepression).

In this context, the National Academy of Medicine recommends to :

- Apply sunscreen with an indicated UVA protection, approximately 20 minutes before exposing the hands to UV/LED lamps;
- Establish a census of the number of UV/LED devices sold each year, in order to be able to estimate the evolution of the market and to attach a written message of warning and recommendations to each lamp purchased;
- Develop information campaigns for the general public and the professionals concerned, underlining the risk linked to a continuous application of semi-permanent varnishes throughout the year, in particular for people with a light phototype;
- Carry out epidemiological studies to assess the risk of skin carcinoma induced by the frequent repetition of this type of irradiation over a long period.

References

- Nails Magazine (2012) 2011-2012, Industry Statistics. <http://www.nailsmag.com/page/70218/market-research>
- Epidemiology and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence-SEER 9 Regs Research Data, Nov 2018 Sub (1975-2016) - Linked To County Attributes - Total U.S., 1969-2017 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released April 2019, based on the November 2018 submission.
- IARC Classification <https://www.cancer-environnement.fr/fiches/publications-du-circ/classification-des-substances-cancerogenes/>
- Litaïem N. *et al.* Side effects of gel nail polish: a systematic review, Clinics in Dermatology, 2022; 40: 706-715.- MacFarlane D.F. *et al.* Occurrence of nonmelanoma skin cancers on the hands after UV nail light exposure. Arch Dermatol. 2009; 145: 447-9
- Zhivagui M *et al.*, DNA damage and somatic mutations in mammalian cells after irradiation with a nail polish dryer, Nature Communications, 2022; 276: 1-14. Published on line : January 17, 2023

[1] Press release from the Academy's Rapid Communication Platform.