Nail glues: risk of severe thermal burns

The application of false nails requires the use of powerful glues, in particular cyanoacrylate glues. Their increasingly widespread domestic use can be responsible for serious injuries, especially deep thermal burns, as reported by Poison Control Centres. Due to differing risk and warning messages on packaging, consumers need to be better informed of the risks, in particular when cyanoacrylate glue gets on textiles/clothes in contact with skin.

The alert

In November 2020, French Poison Control Centres (PCCs) reported two serious cases of burns caused by nail glue.

The first case involved a 20-month-old girl. Glue had dripped on her cotton tee-shirt and then burned through onto her left wrist. The child immediately experienced a deep second-degree burn on this site that required a skin graft.

The nail glue, sold commercially, was a cyanoacrylate glue containing ethyl cyanoacrylate and polymethylacrylate. The product's label included prevention messages, in particular "Keep away from textiles. Contact with clothes can damage them and generate enough heat to burn the skin below them. If the product splashes on clothes, gently remove the affected clothing. If skin bonding occurs, do not pull apart; instead, wash with plenty of soapy water and then gently separate".

The second case involved a two-year-old girl who had played with a nail glue. The product spilled onto the hand and forearm of the child who was probably wearing a cotton long-sleeved pyjama top. The pyjama top adhered to the skin of her hand and the middle and ring fingers, which became stuck together. The mother was able to detach the fingers with cold water. The child developed a second-degree burn on the palm and back of one hand. As the outcome was satisfactory, the graft initially considered did not end up being necessary. According to the child's mother, the nail glue packaging did not include any particular warnings.

Nail glues are cosmetic products. These alerts were therefore sent to the French National Agency for Medicines and Health Products Safety (ANSM), which is charge of cosmetovigilance in France.

A chemically well-explained mechanism that is nonetheless not widely known by clinicians

Direct skin contact with cyanoacrylate glue is generally not serious. However, in the event of splashes through primarily cotton or wool clothing, the polymerisation reaction of the glue is chemically catalysed, i.e. amplified by the fabric: the reaction's acceleration causes instant heat release, inducing a skin burn.

The high fluidity of nail glue can enlarge the area of skin contact by diffusion through garment fabric and thus increase the area of skin burn.

In the scientific literature, around 20 cases have been reported to date; they have almost exclusively involved children. One of the most recent publications described the case of a two-year-old boy who had played with a bottle of nail glue. The product accidentally got onto his hands and cotton tee-shirt at chest level, causing a second-degree burn. Since the surface area of the burn ended up being small, a skin graft was not necessary [1].

An Australian team published the case of a four-year-old girl who had received a skin graft on her leg after cyanoacrylate superglue had splashed onto her cotton trousers. The same team conducted an experimental study to measure the temperatures generated after the splashing of cyanoacrylate glue onto cotton: 90 seconds after application, the measured temperature was 91°C. It took more than three minutes for the temperature to drop below 40°C [2].

What do existing regulations say?

In France as well as in Europe, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, known as the CLP Regulation, applies. Mixtures containing substances classified for their toxicity must include hazard pictograms and labelling corresponding to their toxic effects. For example, ethyl cyanoacrylate is classified as a Category 2 skin and eye irritant.

On the packaging of mixtures containing cyanoacrylates, the CLP Regulation additionally provides EUH202 hazard labelling which reads: "Cyanoacrylate. Danger. Bonds skin and eyes in seconds. Keep out of the reach of children". However, this labelling does not take into account the highly likely mechanism of burning in the event of accidental spillage on clothes.

For their cosmetic uses, some compounds such as ethyl cyanoacrylate and ethoxyethyl cyanoacrylate are among the common cosmetic ingredient names used (https://ec.europa.eu/growth/sectors/cosmetics/cosing_en). They are used as film-forming agents (formation of a continuous film on the skin, hair or nails as in nail polish, for example) or binding agents (nail glue, for example). Regulation (EC) No 1223/2009 of the European Parliament and of the Council on cosmetic products therefore states that the packaging of products containing them must indicate their presence.

In Canada, several warnings have been issued, especially in 2020, for bottles of cyanoacrylate glue intended for DIY activities, which did not comply with the Canada Consumer Product Safety Act. These products did not provide information on the risk of burns by direct contact or were not equipped with a child protection mechanism (opening of the product exclusively with a tool not supplied with the container [3]).

An essential reminder of precautions to be taken

Several factors are encouraging the use of cyanoacrylate nail glues at home: growing trend and trivialisation of nail application strengthened by a decrease in visits to professional nail salons in the context of the current pandemic. Therefore, the practice of applying false nails at home seems widespread.

These nail glues are sold freely in shops (speciality stores, large retail outlets, etc.) and on the Internet. Many different products are thus available on the market and for some of them, statements indicating the risk of direct or indirect burns through clothes are unclear or even non-existent, which does not comply with the regulatory requirements.

The number of serious burns from splashes on fabric, reported to the PCCs, is low but it underestimates the real picture: in fact, when it comes to burns, the primary care provider is an emergency department, whether specialised or not, or a general practitioner. The PCCs are not generally consulted.

With the aim of preventing serious burns, manufacturers should therefore consider reinforcing precautionary messages in the event that these products are used at home. A recent publication reported a second-degree burn on the foot of a young woman who had accidentally spilled nail glue on her cotton pyjamas; a skin graft was necessary. The young woman had not been aware of the risk of serious burns in case of splashing on fabric and wrongly thought that this situation was less serious than the direct splashing of glue onto skin. The authors of this publication stress the need to better inform consumers of the risks, which are too often overlooked [4].

Clearer and more visible labelling could enable consumers to be better informed of the steps to be taken in case of splashes, such as immediately applying cold soapy water to limit the surface area and depth of the burn.

Lastly, as provided for in the European regulations, these products should not be left unattended and must be kept out of the reach of children.

Cyanoacrylate glues are also used for other purposes such as modelling and have the same characteristics (large bottles, glue with low viscosity, quick setting). Therefore, our recommendations also apply to these products and the corresponding population.

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References

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