

permanent hair dye

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Permanent Hair Dye

Oxidative colour that builds pigment inside the hair shaft. Permanent dye is the largest category in hair colour, and it is the one governed by **the strangest surviving provision in US cosmetic law** — the coal-tar hair dye exemption, which removes FDA's power to act on the safety of these products entirely, provided a specific paragraph appears on the box.

How oxidative colour works

Three things happen at once when the tube and the [Developer](#) are mixed and applied:

1. **Alkali swells the hair and lifts the cuticle** — usually ammonia, or a monoethanolamine substitute in "ammonia-free" products.
2. **Hydrogen peroxide lightens the natural melanin**, clearing space for the new colour.
3. **Small colourless precursors diffuse into the cortex** and are oxidised there, coupling into large coloured molecules that are **too big to wash back out**.

The precursors are the important part. **Para-phenylenediamine (PPD)**, **toluene-2,5-diamine (PTD)**, para-aminophenol and resorcinol are the workhorses, and they are also the reason this category has an

allergy problem.

PPD allergy

PPD is one of the most significant contact allergens in consumer products. Sensitisation is **permanent**, it builds with exposure, and reactions range from scalp itching and swelling to severe facial oedema requiring emergency treatment.

That is why **every box instructs a patch test 48 hours before every application**, and why that instruction should be followed even by someone who has coloured their hair for twenty years — sensitisation can appear at any point.

The **highest-risk exposure is black henna temporary tattoos**, which contain PPD at concentrations far above what hair dye uses and applied directly to skin. A single black henna tattoo can sensitise someone for life, after which hair dye becomes unusable. See [Henna](#).

The coal-tar exemption

Written into the FD&C Act and still in force. **FDA cannot act against a coal-tar hair dye on the ground that it is adulterated by a harmful ingredient**, so long as the label carries this caution and adequate patch-test directions:

Caution - This product contains ingredients which may cause skin irritation on certain individuals and a preliminary test according to accompanying directions should first be made. This product must not be used for dyeing the eyelashes or eyebrows; to do may cause blindness.

The exemption is why hair dye ingredients receive less FDA scrutiny than any other cosmetic ingredient class, and why the warning appears verbatim on every box.

It does not extend to eyelash and eyebrow dyes — see [Eyelash and Eyebrow Dye](#).

Where it sits in the rules

Cosmetic — FDA primary category **(07) hair colouring preparations**. Coal-tar hair dye colour additives are **exempt from the colour additive approval requirement** under the same provision, which makes this the least premarket-controlled corner of US cosmetics.

The EU is the opposite. Hair dye substances are assessed by the Scientific Committee on Consumer Safety and listed with concentration limits in **Annex III**; **PPD is restricted to 2% in the ready-to-use preparation**, mandatory warnings are prescribed, and a long list of dye substances appears in **Annex II** as prohibited. Several dyes usable in the US are not permitted in the EU.

The persistent question of whether hair dye use is associated with bladder or haematopoietic cancers has been studied extensively; the evidence is mixed and strongest for **occupational exposure among hairdressers** rather than for personal use.

Using it

Patch test 48 hours before, every time. Gloves, always. Ventilate. Do not use on eyebrows or lashes. Do

not mix with other chemical services on the same day. Do not use a box dye over a hair colour remover or a metallic-salt "colour restorer" without professional advice — that combination can generate heat and destroy hair.

Shelf life

Unopened, two to three years, and the date matters — precursors oxidise slowly in the tube and developer loses strength. **Once mixed, use immediately and discard the remainder.** Never store mixed dye in a closed container: it continues to react and generate gas.

Related

- [Hair Colour](#) — the shelf this sits on, and the rest of it.
- [Cosmetics](#) — what the label is legally allowed to say, and the full catalogue.
- The rest of *Colour* — [Demi-Permanent Hair Colour](#) · [Semi-Permanent Hair Colour](#) · [Temporary Hair Colour](#) · [Hair Tint](#) · [Hair Gloss](#) · [Hair Chalk](#) · [Hair Colour Spray](#) · [Root Touch-Up](#).
- [Developer](#) — the other half of the mixture.
- Regulatory statements here follow the FDA and EU sources listed on [Cosmetics](#), read 16 August 2026.