

# Hairdressers: Exposure, effects and preventive measures

## EXPOSURE

- Hairdressers are exposed considerably more frequently than consumers to a wide spectrum of hair cosmetic products, up to 78 times (Fig. 1).
- Exposure by skin or inhalation is much higher than in consumers.
- Chemicals to which hairdressers are daily exposed may severely affect their health.

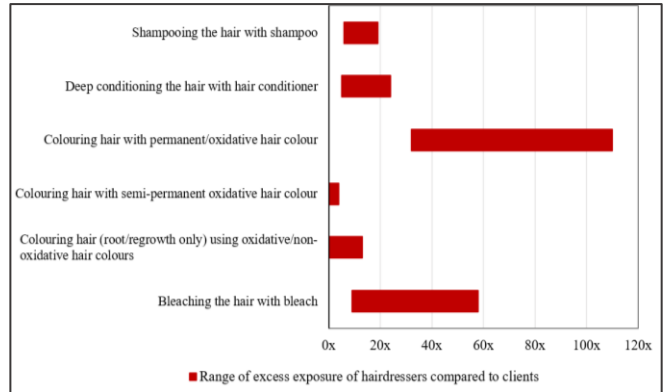


Fig. 1: Factor by which hairdressers are higher exposed than consumers (i.e., exposure factor) whilst conducting regular hairdressing activities

## HEALTH EFFECTS OF EXPOSURE

- 70% of hairdressers suffer from hand eczema at some point during their career.
- Hand eczema develops early in the career, often during apprenticeship.
- Risk to acquire contact allergy is 3 to 5 times higher in hairdressers than in the general population.
- Inhalation of hairdressing chemicals can lead to respiratory symptoms and impaired lung function.
- Bleaches containing persulphate salts are the main cause of occupational respiratory diseases in hairdressers.
- Carcinogenicity (bladder cancer) and adverse events in pregnancy and poor neonatal health are under investigation and cannot yet be ruled out.



Fig. 2: Course of hand eczema without adequate preventive measures. A) Moderate interdigital dermatitis, B) more intensive inflammation, C) Massive, chronic inflammation with painful fissures

## PREVENTION

- Prevention, aimed at the reduction of exposure, must already be part of professional training.
- The adequate use of gloves for personal protection is indispensable for hairdressers as it reduces threats to skin health and transdermal absorption of chemicals.
- Appropriate gloves need to be provided by the employer.
- Appropriate ventilation systems should be used in hairdressing salons.
- Health risk assessment, including identification of skin and respiratory allergens and irritants in the workplace, should be undertaken.

Product category	Substances	Prioritization	
		Skin	Respiratory/systemic
Bleaches	Persulfate salts: ammonium, potassium, sodium	Red	Red
Oxidative hair dyes	Toluene-2, 5-diamine (sulfate)	Red	Orange
	p-Phenylene-diamine	Red	Orange
	2-Methoxymethyl-p-phenylenediamine (ME-PPD)	Red	Orange
Cosmetic glues	2-Hydroxyethyl methacrylate (HEMA)	Red	Orange
Perms and relaxing substances	Cysteamine hydrochloride (cysteamine-HCl)	Red	Orange
	Glyceryl thioglycolate	Orange	Orange
	Ammonium thioglycolate	Orange	Orange
Detergents	Cocamide DEA	Orange	Green
	Cocamido propylbetaine	Orange	Green
	Sodium laureth sulfate	Orange	Green
Film-forming	PVP-copolymers (Polyvinylpyrrolidone (PVP))	Green	Green

Fig. 3: Most relevant product groups to focus on to ensure health and safety in hairdressing. Red marks highest urgency, orange marks urgency, and green marks the lesser urgent need for action.



**HEALTH RISK ASSESSMENT BASED ON CONSUMER EXPOSURE UNDERESTIMATES RISK FOR HAIRDRESSERS**

# Urgent need of re-thinking risk assessment in hairdressing

List of most relevant product groups in hairdressing with substances finally included into the systematic review		
Table 2	Product category	Substance(s)
1	Oxidative hair dyes/ colorants	p-Phenylenediamine (PPD; CAS no. 106-50-3) and its salts (CAS no. 624-18-0, 16245-77-5), toluene-2,5-diamine (PTD; CAS no. 95-70-5) and its sulfate (CAS no. 615-50-9), 2-Methoxymethyl-PPD (mePPD; CAS no. 337906-36-2)
2	Bleaches	Persulfate salts: ammonium, APS, CAS no. 7727-54-0; potassium, PPS, CAS no. 7727-21-1; sodium, SPS, CAS no. 7775-27-1
3	Perms and relaxing substances	Salts and esters of thioglycolic acid: glyceryl thioglycolate (GMTG; CAS no. 30618-84-9), ammonium thioglycolate (ATG; CAS no. 5421-46-5)
4	Cosmetic glues	2-Hydroxyethyl methacrylate (HEMA; CAS no. 212-782-2), ethyl cyanoacrylate (ECY; CAS no. 7085-85-0)

**Fig. 4:** List of most relevant product groups and substances in the hairdressing trade

Exposure	Hairdressers	Consumers	Exposure factor	Product	Potentially harmful substances (extract)	Exposure route
	Frequency of procedures using corresponding products (median)	Frequency of procedures using corresponding products (median)				
Shampooing/washing the hair with shampoo	5 - 12 times/day	1 time/day	6 - 13	eyelash glue	acrylates	dermal, respiratory
Deep conditioning the hair with hair conditioner	1 - 5 times/day	0.28/day	5 - 19	nail glue	acrylates	dermal, respiratory
Colouring hair with permanent/oxidative hair colour using 6-12% hydrogen peroxide (full head)	30.6 - 76.6 times/month	1 time/month	32 - 78	hair extension glue	acrylates, latex	dermal, respiratory
Colouring hair with semi-permanent oxidative hair colour using 2-3% hydrogen peroxide or non-oxidative hair colour (full head)	3 times/week	1 time/week	4	hot wax, sugaring paste	colophony, cera alba, fragrances	dermal
Colouring hair (root/regrowth only) using oxidative/non-oxidative hair colours according to previous treatment	11.5 times/month	1 time/month	13	hair styling and setting products (e.g. hairspray)	aerosols, resins, fragrances	dermal, respiratory
Bleaching the hair with bleach using mostly using 6-9% hydrogen peroxide (full head)	7.6 - 47.9 times/month	1 time/month	9 - 49	metal tools/objects (e.g. tweezers, crochet hooks)	nickel and/or cobalt	dermal

**Fig. 5:** Most common activities related to exposure to hazardous chemicals, exposure route and difference in frequency compared to consumers

**Fig. 6:** Some additional exposure sources to potentially harmful substances, including cosmetic product categories not for use on hair

## RISK ASSESSMENT

- Regulatory risk assessment for hair care product ingredients should expand to cover also occupational exposure, including both skin and inhalation exposure.
- Hairdressers are simultaneously exposed to various hazardous substances. Combined exposure needs therefore to be taken into consideration.
- Information about the hazardous properties of chemicals in hair care products, exposure route and the extent and pattern of exposure is crucial.
- Feasible and evaluated models and tools convenient for risk assessment purposes in SMEs are needed.
- Suitability of models developed for consumer exposure (e.g. ConsExpo, CEM, PACEM) should be evaluated for the occupational environment.
- High risk groups in hairdressing (e.g., pregnancy, reproductive age, neurotoxicity in young people, atotics) need to be considered specifically.

**Better risk communication and awareness-raising is needed for prevention of occupational health and safety in hairdressing!**

Uter, W et al. 2021. Protocol for a systematic review on systemic and skin toxicity of important hazardous hair and nail cosmetic ingredients in hairdressers. *BMJ Open*. 6;11(12):e050612. doi: 10.1136/bmjopen-2021-050612. Havmose, MS et al. 2022: Prevalence and incidence of hand eczema in hairdressers—A systematic review and meta-analysis of the published literature from 2000–2021. *86(4):254-265*. doi: 10.1111/cod.14048. Symanzik, C et al. 2022. Differences between hairdressers and consumers in skin exposure to hair cosmetic products: A review. *Contact Dermatitis*. 86(5):333-343. doi: 10.1111/cod.14055. Symanzik, C et al. 2022. Skin Toxicity of Selected Hair Cosmetic Ingredients: A Review Focusing on Hairdressers. *Int J Environ Res Public Health*. 21;19(13):7588. doi: 10.3390/ijerph19137588. Macan, J et al. 2022. Respiratory toxicity of persulfate salts and their adverse effects on airways in hairdressers: a systematic review. *Int Arch Occup Environ Health*. doi: 10.1007/s00420-022-01852-w. Kezic, S et al. 2022 Occupational Exposure of Hairdressers to Airborne Hazardous Chemicals: A Scoping Review. *Int J Environ Res Public Health*. Mar 31;19(7):4176. doi: 10.3390/ijerph19074176. Symanzik, C et al. 2022. Allergic contact dermatitis caused by 2-hydroxyethyl methacrylate and ethyl cyanoacrylate contained in cosmetic glues among hairdressers and beauticians who perform nail treatments and eyelash extension as well as hair extension applications: A systematic review. *Contact Dermatitis*. 86(6):480-492. doi: 10.1111/cod.14056. Babić Ž et al. 2022. Association of hairdressing with cancer and reproductive diseases: A systematic review. *J Occup Health*. 64(1):e12351. doi: 10.1002/1348-548-585.12351. Uter, W et al. 2022: Systematic review on skin adverse effects of important hazardous hair cosmetic ingredients with a focus on hairdressers. *Contact Dermatitis*. Accepted. Babić, Ž et al. 2022: Genotoxicity of oxidative hair dye precursors: A systematic review. Submitted.