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Abstract	<p>Hairdressers have a lot of contact with their hands with water, irritants, and allergens. An irritative dermatitis, and even an allergic contact dermatitis, can easily occur.</p> <p>Hand eczema is a potentially severe drawback to the hairdressing profession, and an important factor on the quality of life.</p> <p>To achieve a long-lasting secondary prevention in cases of hand dermatitis the approach should focus on reduction of skin damaging factors, rather than on medical treatments. This time consuming intervention needs the combined expertise of occupational health and safety as well as dermatology.</p> <p>Patch testing is obligatory in all cases of dermatitis, but the interpretation of the results should be done carefully with respect to the relevancy and false positive or negative results.</p> <p>Patch testing with “own materials” from the hairdressers’ saloon is imperative. Knowledge of test concentrations is a prerequisite.</p> <p>Primary prevention by means of education in how to wear the right glove the right way and how to take care of their hands should be an major issue not only in the individual, but in the whole occupational group.</p>		<a href="#">AU3</a>

# Hairdressers

Harma Stenveld

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## Abstract

Hairdressers have a lot of contact with their hands with water, irritants, and allergens. An irritative dermatitis, and even an allergic contact dermatitis, can easily occur.

Hand eczema is a potentially severe drawback to the hairdressing profession, and an important factor on the quality of life.

To achieve a long-lasting secondary prevention in cases of hand dermatitis the approach should focus on reduction of skin damaging factors, rather than on medical treatments. This time consuming intervention needs the combined expertise of occupational health and safety as well as dermatology.

Patch testing is obligatory in all cases of dermatitis, but the interpretation of the results should be done carefully with respect to the relevancy and false positive or negative results.

Patch testing with “own materials” from the hairdressers’ saloon is imperative. Knowledge of test concentrations is a prerequisite.

Primary prevention by means of education in how to wear the right glove the right way and how to take care of their hands should be an major issue not only in the individual, but in the whole occupational group.

- Patch testing is obligatory in all cases of dermatitis, but the interpretation of the results should be done carefully with respect to the relevancy and false positive or negative results. 75-78
- Patch testing with “own materials” from the hairdressers’ saloon is imperative. Knowledge of test concentrations is a prerequisite. 79-81
- Primary prevention by means of education in how to wear the right glove the right way and how to take care of their hands should be an major issue not only in the individual, but in the whole occupational group. 82-86

## 2 Introduction

A hairdo is not a lifetime acquisition but a brief adventure, and there’s always another new one ahead. 87-90

With their hair style, people adapt their appearance to the social group they belong to, wish to belong to, or want to oppose. Every (sub) culture has its own hairstyle. 91-94

A good hairstyle can accentuate the color of the eyes, the skin, the clothing, and can distract from minor imperfections and so enhance a person’s confidence. 95-98

Hair is easy to paint and to shape; the natural growth makes all changes just temporary. 99-100

The influence of celebrities is huge. Together with customer desires and the marketing strategy of hair cosmetic producers, there is a dynamic interaction leading to changes in shape, shade, and length of the hair, almost every year. 101-105

Hair cosmetic producers provide the hairdresser with a great variety of chemicals to fulfill stylist and customer desires. Intense exposure of hairdressers’ skin to water and this battery of chemicals may gradually damage the skin. Hand eczema is a well-recognized, and potentially severe, drawback to the hairdressing profession. Hand eczema frequently leads to worker disability. This, together with the majority of the workers being young girls who may leave their job for marriage, motherhood, or other career, or be discharged on account of wages increases with 106-117

## 1 Core Messages

- Hairdressers have a lot of contact with their hands with water, irritants, and allergens. An irritative dermatitis, and even an allergic contact dermatitis, can easily occur. 61-64
- Hand eczema is a potentially severe drawback to the hairdressing profession, and an important factor on the quality of life. 65-67
- To achieve a long-lasting secondary prevention in cases of hand dermatitis the approach should focus on reduction of skin damaging factors, rather than on medical treatments. This time consuming intervention needs the combined expertise of occupational health and safety as well as dermatology. 68-74

118 age, explains the high turnover of workers in this  
119 profession.

---

### 120 **3 Epidemiology**

121 Hand eczema is a well-known, and potentially  
122 severe, drawback to the hairdressing profession  
123 (Borelli et al. 1965). Up to now several epidemi-  
124 ological studies confirm this common knowledge.

125 In 1991, Budde and Schwanitz (1991) reported  
126 the outcome of a questionnaire-based study  
127 among hairdressers apprentices. The question-  
128 naire was sent to 8256 apprentices, 4208  
129 (48.5%) responded, 70% reported skin damage  
130 during apprenticeship with severe skin changes  
131 in 30% of the cases. In 1994, Holm et al. (1994)  
132 published a questionnaire-based cross-sectional  
133 study to estimate the prevalence of dermatitis on  
134 the hands and/or forearm among hairdressers in  
135 Norway. Questionnaires were sent to 818 hair-  
136 dressers, 83% responded and 42% reported to  
137 suffer from dermatitis and 61% related this der-  
138 matitis to their work. Schmidt and Schwanitz  
139 (1997) reported the outcome of another  
140 questionnaire-based study. Questionnaires were  
141 sent to 4967 hairdresser apprentices, 2505  
142 (50.8%) answered. In 1420 cases (57%) skin dam-  
143 age was reported since the start of the apprentice-  
144 ship. The group of Schwanitz and Uter (1997)  
145 followed 2351 hairdressing apprentices in a pro-  
146 spective cohort study. A total of 844 (35.9%)  
147 showed signs of irritant contact dermatitis, mostly  
148 (80%) interdigitally located. Diepgen et al. used  
149 the data of insurance institutions and state medical  
150 authorities to calculate the number of cases of  
151 occupational dermatosis in hairdressers and  
152 found 242/10,000 compared to metal workers  
153 11.9/10,000 (Pilz and Frosch 1994). Smit et al.  
154 (1994) studied a cohort of apprentice hairdressers  
155 (number 74) and nurses (number 111) and found a  
156 average incidence of hand dermatitis of 32.8 cases  
157 per 100 person-years for the hairdressers, com-  
158 pared with 14.5 cases per 100 person-years for the  
159 nurses. Schaad et al. (Schaad and de Jonge 1992)

160 evaluated the reasons for stopping the hairdress- 160  
161 ing apprenticeship among 872 dropouts of hair- 161  
162 dressing schools. In this study 486 (56%) 162  
163 responded, and of these 39% reported that skin 163  
164 disease was the reason for giving up. 164

165 Occupational dermatitis may cause sick leave. 165  
166 Data from the branch organization in the Nether- 166  
167 lands that monitors the administration of sick 167  
168 leave showed that with approximately 23,000 reg- 168  
169 istered hairdressers, the number of sick leave days 169  
170 due to hairdresser's eczema increased from 170  
21,050 in 1986 to 54,293 in 1991 (Schopman 171  
172 et al. 1992) and even to 56,678 days in 1992 172  
173 (Wijck 1996). 173

174 In the early 1990s, products containing glyc- 174  
175eryl monoethioglycolate were withdrawn from sev- 175  
176 eral European markets, due to their high 176  
177 sensitizing potential. Hence the incidence of con- 177  
178 tact allergy to glyceryl monoethioglycolate 178  
179 decreased, as observed by Uter c.s. et al. (2000, 179  
2006). 180

181 The incidence of sensitization to other aller- 181  
182 gens, e.g., p-phenylenediamine base, 182  
183 4-aminobenzene, ammonium persulfate and 183  
184 p-toluene diamine sulfate, remained unchanged. 184  
185 Valks c.s., even found an increase in incidence of 185  
186 contact allergy to the above mentioned (Valks 186  
187 et al. 2005). 187

188 All these studies confirm that dermatitis is a 188  
189 very common disease among hairdressers. The 189  
190 majority of the cases are affected by a slight 190  
191 chronic irritant contact dermatitis, but severe 191  
192 hand dermatitis is not uncommon and may cause 192  
193 sick leave or force hairdressers to abandon 193  
194 their job. 194

---

### 4 **Hairdressing Procedures**

195 The main causes of contact dermatitis are water 196  
197 and irritants, as well as allergens present in pro- 197  
198 fessional hair cosmetics. Hairdressers perform the 198  
199 following procedures (Draelos 1995; Gershon 199  
200 et al. 1972; Corbett 1991; Lee et al. 1988; Umbach 200  
1995). 201

202 **4.1 Cleaning**

Aim:	1. Removal of sebum, sweat components, scales of stratum corneum, hair styling products, and dirt 2. Improvement of conditioning properties, shine, vitality, volume, and elasticity
Product:	Shampoos
Procedure:	Wetting the hair with lukewarm tap water, application of shampoo, rubbing the hair and massaging the skin of the head for several minutes, rinsing out with hand shower Shampooing is usually done with unprotected hands
Ingredients:	Detergents, foaming agents, thickeners, fragrances, conditioners, softeners, preservatives

203 **4.2 Cutting**

Aim:	Styling or hygienic
Instrument:	Scissors, knife, and comb
Procedure:	Most hairdressers prefer cutting the hair when still wet. Cutting is done with the dominant hand. The serving hand guides the comb or presents a row of hair to the scissors or knife, by squeezing hair between the second and third finger of the hand and let the hair slip through these fingers till the point of cutting
Composition:	Scissors: Metal alloys, grips may be coated with synthetic polymers Knife: Metal alloys Some alloys release significant amounts of nickel

**4.3 Permanent Waving**

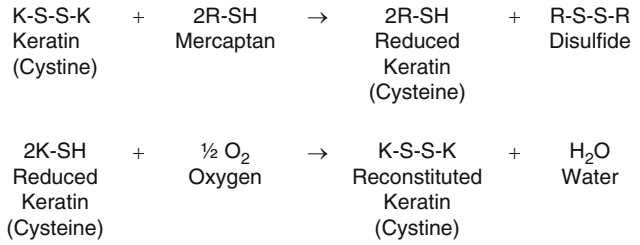
204

Aim:	Creation of long-lasting curls or waves Straightening naturally curly hair
Product:	Perm solution Dependant on the hair characteristics and desired result, the hairdresser can make a choice from different types of perm waving solutions: Acid cold wave, acid heat activated, self-regulated, exothermic, alkaline, buffered alkaline sulfite
Procedure:	A routine perm procedure has the following steps: Shampooing – Pre-treatment – Winding – Applications of solutions – Processing – Test curl – Rinsing – Blotting – Inter-treatment – Neutralizing – Post-treatment The perming process is based on reduction/oxidation of the cysteine disulfide linkages in the hair keratin filament (Fig. 1). Breaking of the disulfide linkages by reducing agents enables the re-arrangement of the keratin filament by winding. Subsequent restoring the disulfide linkages by oxidation fixes the filaments in their new position, creating a (semi) permanent wave or curl. Straightening curly hair follows the same procedure, except for winding The basic concept of softening (reduction), re-arrangement (winding), and fixing (oxidation) is supplemented with extra treatments to obtain an optimal result

*(continued)*

AU4

**Fig. 1** Reduction and oxidation in perm waving [12]



Ingredients:	Reducing agents:
	Ammonium thioglycolate, diammonium thioglycolate, glyceryl thioglycolate, thiolactic acid, cysteamine, potassium sulfite
	Oxidation agents:
	Hydrogen peroxide, sodium bromate
	Alkaline and buffering agents:
	Ammonium hydroxide, triethanolamine, ethanolamine, ammonium carbonate
	Various:
	Wetting agents, conditioners, opacifiers, chelating agents, stabilizers, preservatives, and perfumes

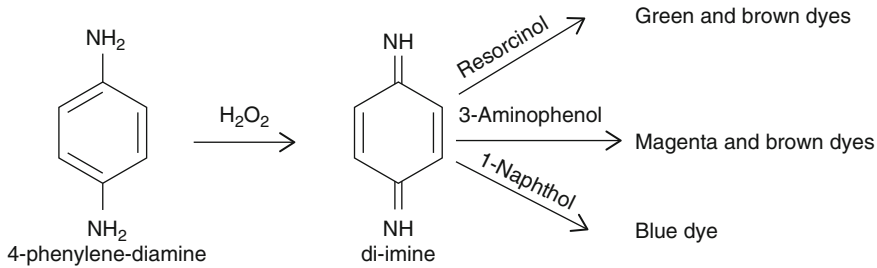
Procedure:	Gradual hair dyes require repeated application to obtain coloring of the hair shaft. These products are used for home treatment
	Temporary coloring or hair rinses are mostly applied at home in the shower after shampooing of the hair. They are often used for fancy colors e.g., with Haloween
	Semipermanent dyes are applied in a multistep procedure shampooing – Towel dry – Application of dyes – Covering with cap – Processing 5–20 min – Emulsifying – Rinsing – Conditioning – Styling
	Semipermanent dyes are washed out after five or six times shampooing
	Permanent dyes. Procedure is comparable with semipermanent dyes, but the coloring is more long-lasting and resistant to shampooing (Fig. 2)

205 **4.4 Hair Coloring**

Aim:	Hair dyes are used to cover gray hair, add colored high lights or low lights, lighten or darken the original hair, or create fancy colors
Product:	Dyes or dye precursors may be used in gels, mousses, shampoos, or lotions The coloring effect may be gradual, temporary, semipermanent, or permanent, depending on formulation of the product. Gradual and temporary coloring products are adsorbed to the hair shaft, as the pigment molecule is too large to penetrate. Semipermanent dyes penetrate the hair shaft and are retained by weak polar and van de Waals forces. Permanent coloring is achieved by oxidation and coupling of hair dye precursors in the hair shaft

Ingredients:	Gradual; lead acetate, sulfur
	Temporary; many dyes and pigments
	f.e. CI acid yellow 1, CI acid red 33, CI acid brown 19, CI basic blue 99, ferric ferrocyanide
	Semi permanent; a long list of dyes may be used
	f.e. 4-nitro-2-phenylene diamine, 2-amino-3-nitrophenol
	1,4 diamino anthraquinone
	Permanent; primary intermediates
f.e. 4-phenylene diamine, 2,5-diamino toluene sulfate, 4-aminophenol couplers	
f.e. Resorcinol, 2,4-diamino phenoxyethanol, 1-naphthol, 3-aminophenol henna	

(continued)



**Fig. 2** Color formation in permanent hair colorants [12]

206

## 4.5 Bleaching

Aim:	High lighting or blinding of hair
Products:	Blonding lotions, creams, or powders
Ingredients:	Hydrogen peroxide to damage hair melanin pigment by oxidation. The effect can be boosted by mixing hydrogen peroxide with sodium-, potassium-, or ammonium persulfate
Procedure:	Mixing ingredients – Applying – Processing (30–120 min) – Rinsing

207

## 4.6 Conditioning

Aim:	Damaged hair is harsh, brittle, difficult to comb and to style
	Conditioners restore the softness, glossy aspect, and manageability of hair
Products:	Lotions, creams, blow drying lotions, liquids, and rinses
Procedure:	Conditioners are mainly used after shampooing, coloring, blinding, or perm waving procedures
	Application of conditioners after perm waving or (semi)permanent coloring is necessary to stop the oxidation process, to adjust the pH and to restore anti-static properties
Ingredients:	f.e. Alkanol amides, glycols, lipids, hydrolyzed animal and vegetable proteins, quaternary ammonium compounds, surfactants, preservatives, fragrance

## 4.7 Styling

208

Aim:	Support a desired hair style
Products:	Sprays, mousses, gels, brillantines, pomades
Procedures:	Gels and mousses are applied to towel dried hair by combing, to achieve a thin film on the hair. Sprays are applied after styling of the hair
Ingredients:	Sprays
	f.e. Polyvinylpyrrolidone, phenyl acetate, copolymers of phenyl methylether and maleic acid hemi esters. Added are plasticizers, humectants, solvents, conditioners
	Gels
	Contain merely the same ingredients as sprays. Synthetic colors may be added
	Mousse
	Is a copolymer hair gel released under pressure from an aerosolized can. Colors may be added for highlights, may contain preservatives, fragrance
Brillantines, pomades	Contain f.e. Petrolatum, wax, mineral oil, lanolin, vegetable oil, silicone, preservatives, fragrance

209

210 **5 Clinical Picture**

211 The clinical picture is the visual outcome of sev-  
 212 eral factors: the dynamic interaction between the  
 213 chemical, physical, and mechanical properties of  
 214 the irritant, the sensitizing capacities of the aller-  
 215 gens, and the biological make-up of the exposed  
 216 skin. A great variety of factors, either belonging to  
 217 the irritant, allergen, or the involved skin, are  
 218 responsible for the degree of damage. The clinical  
 219 picture is modified by duration of the disease and  
 220 medical treatment. The spectrum of the clinical  
 221 picture varies from subjective symptoms as sting-  
 222 ing, burning, and itching to clinical signs as ery-  
 223 thema, scaling, vesicles, rhagades, dermatitis, and  
 224 frank eczema.

225 **5.1 Chronic Irritant Contact**  
 226 **Dermatitis**

227 Interdigital (web) dermatitis is often the first sign  
 228 of skin damage and affects many apprentices dur-  
 229 ing their first months in the profession. The der-  
 230 matitis may gradually spread to the back of the  
 231 hands, fingers, and wrists. At the beginning, the  
 232 skin may recover during holidays and other “free-  
 233 of-work” periods. At the other hand, weather con-  
 234 ditions like cold and wind may increase the skin  
 235 damage. Fissures and rhagades may appear, espe-  
 236 cially in the folds on the dorsum of the fingers.  
 237 Reactive edema and pain are complicating the  
 238 picture and impair the mobility of the fingers.  
 239 The barrier function of the skin is damaged,  
 240 enabling irritants and allergens an easier access  
 241 to the deeper parts of the skin, thus aggravating  
 242 the dermatitis. In the early stages of irritant contact  
 243 dermatitis, a toughening process may stop the  
 244 progress of the dermatitis and eventually “repairs”  
 245 the dermatitis without medical treatment.

246 **5.2 Mechanical Contact Dermatitis**

247 Repetitive low-grade friction induces hyperkera-  
 248 tosis. Small circumscribed hyperkeratotic plaques  
 249 may be observed on those finger parts where the

grips of the scissors and skin have long-lasting 250  
 intimate contact. 251

Freshly cut hair parts may penetrate the skin 252  
 and induce the forming of foreign body granu- 253  
 loma with sinuses. 254

**5.3 Allergic Contact Dermatitis** 255

The extension and severity of the allergic contact 256  
 dermatitis show a great variety. At one end of the 257  
 spectrum is the fingertip dermatitis on the domi- 258  
 nant hand of the master hairdresser, exposing her 259  
 fingertips to glyceryl thioglycolate while 260  
 checking the quality of the curls (test curl) 261  
 (Fig. 3). The same happens when, after applying 262  
 the hair dye with gloves, the color is checked with 263  
 bare fingers. Because this is part of a routine, most 264  
 hairdressers do not realize their contact with hair 265  
 dyes this way. At the other end of the spectrum 266  
 there is an extensive and severe eczema on hands, 267  
 wrists, forearms, neck, face, and ears of a young 268  
 hairdresser apprentice (Figs. 4 and 5). She was not 269  
 aware of the fact that her chronic dermatitis on the 270  
 fingers was caused by an allergy to hair dyes that 271  
 caused the severe extension and aggravation of 272  
 her dermatitis the days after a she herself (or a 273  
 colleague) had colored her hair! Allergic contact 274  
 dermatitis may affect every part of the hands, with 275  
 extension to wrists, underarm, neck, and face. The 276  
 localization may sometimes give a clue to a spe- 277  
 cific allergen. Dermatitis of the second and third 278  
 fingers of the serving hand is often related to a hair 279  
 color allergy, because these fingers grip the hair 280  
 and present them to the scissors during cutting 281  
 procedures after coloring. When cutting the hair 282  
 with a knife, the thumb of the dominant hand has 283  
 intensive contact with the hair. In nickel- 284  
 sensitized hairdressers, handling a pair of nickel 285  
 releasing scissors or a nickel releasing knife, the 286  
 second and third fingers of the serving hand are 287  
 exposed to the cutting parts of the scissors and a 288  
 nickel-related dermatitis occurs on these fingers. 289  
 When using a knife, the thumb of the cutting hand 290  
 is exposed. Dermatitis on the back of the hands 291  
 and around the wrists may indicate a latex allergy 292  
 caused by a latex protective glove or an allergy for 293  
 accelerators in synthetic rubber gloves. 294



**Fig. 3** Fingertip dermatitis on the dominant hand of a hairdresser caused by an allergy to glyceryl thioglycolate



**Fig. 4** Extensive dermatitis in a young hairdresser allergic to 4-phenylenediamine, after coloring her own hair



**Fig. 5** Extensive dermatitis in a young hairdresser allergic to 4-phenylenediamine, after coloring her own hair



295 Glyceryl thioglycolate–sensitized hairdressers  
 296 may show a wide spread dermatitis involving  
 297 hands, wrists, underarms, neck, and face. Ammo-  
 298 nium persulfate–sensitized hairdressers often  
 299 complain of both skin and respiratory symptoms,  
 300 because of the powdery and thereby volatile con-  
 301 stitution of the product.

302 **5.4 Direct Contact Reaction**

303 An underestimated cause of hand dermatitis  
 304 among hairdressers: Many hairdressers report  
 305 stinging, itch, and swelling while cutting greasy,  
 306 not shampooed hair. Prick tests with human dan-  
 307 der are nearly always negative in these cases. The  
 308 symptoms suggest that the mechanism is a  
 309 (non-immunological) direct contact reaction.

310 Immunological direct contact reaction may be  
 311 caused by type I allergies to latex protein, hydro-  
 312 lyzed animal proteins (ingredients of the styling  
 313 products), and persulfates in blonding products.  
 314 Type I allergies to latex and persulfates may cause  
 315 reactions not only on the skin but also on the  
 316 conjunctivae and the respiratory tract.

317 The clinical picture of the skin is not always the  
 318 characteristic wheal. When the type I allergy  
 319 exists for a longer period, due to scratching the  
 320 clinical picture can become that of a type IV  
 321 reaction, i.e., an eczema.

322 **5.5 Atopic Dermatitis**

323 A history or present atopic dermatitis is an impor-  
 324 tant risk-factor for the development of a work-  
 325 related hand dermatitis. Especially when they  
 326 had a hand eczema as a child. Hairdressing is a  
 327 wet work profession par excellence and an atopic  
 328 skin is an important factor in the development of  
 329 hand dermatitis in hairdressers.

**5.6 Nail Changes**

330

Brown discoloration may be caused by hair dyes 331  
 in hairdressers who neglect the use of protective 332  
 gloves. 333

Transverse ridging, onycholysis, and infil- 334  
 trated nail folds occur in fingertip dermatitis. 335  
 Nails may become soft and macerated by expo- 336  
 sure to water, detergents, and perm wave solu- 337  
 tions. Sharp cut hair parts may become 338  
 implanted under the nails. 339

**5.7 Hybrids**

340

Chronic irritant, allergic, and atopic factors may 341  
 all contribute to the development of hand derma- 342  
 titis. One factor can replace another during the 343  
 course of a dermatitis, for example, irritant der- 344  
 matitis in the beginning of the apprenticeship, 345  
 later on replaced by type IV allergies. Severe 346  
 cases of chronic hand eczema are in most cases 347  
 hybrids. 348

---

**6 Skin-Damaging Factors**

349

**6.1 Water**

350

The term “hydration dermatitis” refers to the 351  
 important role of water in the development of 352  
 irritant contact dermatitis (Kligman 1996). Water 353  
 penetrates the stratum corneum barrier, is retained 354  
 in the horny cells, and increases by swelling the 355  
 thickness of the stratum corneum with a factor 4 to 356  
 6. After exposure, the water gradually evaporates. 357

By this alternating process of swelling and 358  
 shrinking, cytokines are released. Inflammation 359  
 is induced and the proliferation and differentiation 360  
 of the keratonocytes is disturbed, further 361  
 impairing the barrier and giving easier access to 362  
 water, irritants, and allergens. 363

## 364 **6.2 Irritants**

365 Professional hair cosmetic products contain many  
366 ingredients with a capacity to irritate the skin.  
367 Important irritants are detergents in shampoos,  
368 hydrogen peroxide as oxidizing agent in perm,  
369 coloring and bleaching products, thioglycolates in  
370 perm wave solutions, and persulfates used in  
371 bleaching products.

372 Finishing the customer's hair, the waxes,  
373 hairspray, gels, etc., act as irritants on the skin,  
374 especially when the hands are not washed or just  
375 rubbed off at a (most often used and thus "con-  
376 taminated") towel.

## 377 **6.3 Dry Air**

378 Hot-air driers expose the skin of the hairdresser  
379 during styling procedures and may cause dehy-  
380 dration of the stratum corneum.

## 381 **6.4 Friction**

382 Handling of instruments (hand shower, drier, scis-  
383 sors), handling of hair, opening of packages, dry  
384 blotting of hair with towels, rubbing the hands at  
385 towels when wet and even wearing of gloves may  
386 all cause low-grade repetitive frictional forces that  
387 contribute to the course of a dermatitis.

## 388 **6.5 Gloves**

389 The use of protective gloves may contribute to the  
390 development or chronicity of a dermatitis by fric-  
391 tion, occlusive effect, and exposure of the skin to  
392 allergens present in the glove material. When  
393 gloves are too short to prevent the entry of water,  
394 shampoo, conditioner, etc., they intensify the con-  
395 tact with irritants and potential allergens.

## 396 **6.6 Allergens**

397 The skin of the hairdresser is exposed to allergens  
398 during all hairdressing; procedures and even the

use of protective gloves may, unintended, expose 399  
the skin to allergens. 400

The major sensitizers are: (Table 1) (Storrs 401  
1984; Straube et al. 1996; Conde-Salazar et al. 402  
1995; Frosch et al. 1993; Guerra et al. 1992; 403  
Peters et al. 1994; van der Walle 1997; Cronin 404  
1979; Leino et al. 1998; Kellett and Beck 1985; de 405  
Groot et al. 1995; Niinimäki et al. 1994; Pasche- 406  
Koo et al. 1996; van der Walle and Brunsveld 407  
1995; Burg et al. 1986; Pilz et al. 1994) 408

### 6.6.1 Reducing Agents 409

- Glyceryl thioglycolate (GTG), reducing agent 410  
in perm solutions with a pH 5–6; "acid perms." 411  
Very popular in the 1980s in many Western 412  
countries. Strong allergen. German producers 413  
of professional hair cosmetics agreed in 1995 414  
with the organization of hairdresser's 415  
employers to stop the use of GTG in perm 416  
wave solutions. GTG has the tendency to 417  
cause a strong allergic contact dermatitis 418  
which easily spreads to the arm, neck, and face. 419
- Ammonium thioglycolate (ATG): The use 420  
dates back to the 1930s as the first reducing 421  
agent in cold wave solutions, alkaline perms in 422  
the range of pH 8–9. Has low sensitizing 423  
capacity. The irritant capacity, combined with 424  
the alkalinity of the solutions, may induce irri- 425  
tant reactions on the scalp of the clients. 426
- Thiolactic acid, becoming popular as a replace- 427  
ment for GTG. Used by a few producers. 428
- Cysteamin. Increasingly popular as replace- 429  
ment for GTG and ATG. 430

### 6.6.2 Hair Dyes 431

Primary intermediates and couplers used in semi- 432  
permanent and permanent hair coloring 433  
procedures. 434

Allergies were described to f.e. 435

- 4-phenylene diamine 436
- 2,5-diamino toluene sulfate 437
- 2-nitro-4-phenylene diamine 438
- 5-aminophenol 439
- 4-aminophenol 440
- 4-aminodiphenylamine 441
- resorcinol 442

t1.1 **Table 1** Allergens

t1.2	Allergens	Test concentration/vehiculum		Type I	Type IV
t1.3	Glyceryl thioglycolate	1.0%	Pet		x
t1.4	Ammonium thioglycolate	1.0%	Pet		x
t1.5	Cysteamine	0.5%	Pet		x
t1.6	Thiolactic acid	0.3%	Aq		x
t1.7	4-phenylene diamine	1.0%	Pet		x
t1.8	2,5-diaminotoluene sulfate	1.0%	Pet		x
t1.9	2-nitro-4-phenylene diamine	1.0%	Pet		x
t1.10	3-aminophenol	1.0%	Pet		x
t1.11	4-aminophenol	1.0%	Pet		x
t1.12	4-aminodiphenylamine	0.25%	Pet		x
t1.13	Henna	1.0%	Aq	1.0% pet	x
t1.14	Ammonium persulfate			2.5% pet	x
t1.15	Potassium persulfate	1.0%	Pet		x
t1.16	Sodium coco hydrolyzed animal protein	2.0%	Aq	2.0% pet	x
t1.17	Resorcinol	1.0%	Pet		x
t1.18	Cocamidopropyl betaine	1.0%	Aq		x
t1.19	3-dimethylaminopropylamine	1.0%	Aq		x
t1.20	Formaldehyde	1.0%	Aq		x
t1.21	Paraben mix	16.0%	Pet		x
t1.22	Methyl dibromo glutaronitrile	0.5%	Pet		x
t1.23	2-bromo-2-nitropropane-1,3-diol	0.5%	Pet		x
t1.24	2,5-diazolidinyl urea	2.0%	Pet		x
t1.25	Imidazolidinyl urea	2.0%	Pet		x
t1.26	Quaternium 15	1.0%	Pet		x
t1.27	Methylchloroisothiazolinone (and) methylisothiazolinone	0.01%	Aq		x
t1.28	Thiuram mix	1.0%	Pet		x
t1.29	Mercaptobenzothiazole	2.0%	Pet		x
t1.30	Carba mix	3.0%	Pet		x
t1.31	Latex	5 mg/ml		Pure	x
t1.32	Human dander	5 mg/ml			x
t1.33	Nickel sulfate	5.0%	Pet		x
t1.34	Fragrance mix	8.0%	Pet		x

443 **6.6.3 Henna**

444 Hair dye derived from the dried leaves of  
 445 *Lawsonia inermis*. May cause immunological  
 446 direct contact reactions.

447 **6.6.4 Blonding Agents**

448 Ammonium persulfate: Used to booster the oxi-  
 449 dative effect of hydrogen peroxide in hair  
 450 bleaching procedures. May induce type IV and  
 451 type I allergies.

452 Clinical symptoms include contact urticaria,  
 453 dermatitis, rhinitis, and asthma.

454 Cross reacts with potassium persulfate and  
 455 sodium persulfate.

456 **6.6.5 Cocamidopropyl Betaine**

457 Amphoteric surfactant, increasingly popular as  
 458 ingredient of shampoos and liquid soaps, induces  
 459 type IV allergies. Patch test reactions are difficult  
 460 to interpret due to irritant reactions, especially on  
 461 dry atopic skin. The impurity dimethylamino pro-  
 462 pylamine seems to be the major allergen.

463 **6.6.6 Formaldehyde**

464 Most professional hair cosmetic products do not  
 465 contain formaldehyde. Positive reactions to form-  
 466 aldehyde are frequently observed in hairdressers.  
 467 The relevance is sometimes questionable, but may

468	be related to the use of formaldehyde-releasing	occupational exposure to nickel (Pilz et al.	503
469	preservatives.	1994). The importance of nickel allergy in the	504
		pathogenesis of hand eczema was overestimated	505
470	<b>6.6.7 Fragrances</b>	in the 1970s and 1980s.	506
471	Hair cosmetics are “marked” with a characteristic		
472	scent. It is difficult to determine if a fragrance	<b>6.6.14 Hydrolyzed Animal</b>	507
473	allergy in a hairdresser is caused by professional	<b>and Vegetable Proteins</b>	508
474	or private exposure.	These compounds are used as hair conditioners	509
		and may induce immunological direct contact	510
475	<b>6.6.8 Preservatives</b>	reactions.	511
476	The producers of professional hair cosmetics use		
477	the same preservatives as other producers for non-	<b>6.6.15 Human Hair</b>	512
478	professional skin care products.	Type I allergies to human dander occur among	513
		hairdressers and may in some cases explain the	514
479	<b>6.6.9 Latex</b>	itch, edema, and vesicles that occur during cut-	515
480	May induce type I or type IV allergies. Sensitizing	ting. But hairdressers may experience these symp-	516
481	occurs by the use of latex protective gloves which	toms and react negatively to prick tests with	517
482	contain a high level of free protein, especially the	human dander.	518
483	powdered ones.		
		<b>6.6.16 Rare Allergens</b>	519
	<b>6.6.10 Mercaptobenzothiazole</b>	In the past allergic reactions were reported to	520
484	Sensitization is induced by mercaptoben-	pyrogallol and Captan, a fungicide. These com-	521
485	zothiazole compounds in glove material.	ound not allowed anymore in hair color	522
		products.	523
486	<b>6.6.11 Thiuram Compounds</b>		
487	Sensitization is induced by thiuram compounds	<b>6.7 Allergy Tests</b>	524
488	used in glove material.		
		Allergens are an important factor in the develop-	525
489	<b>6.6.12 Carbamate Compounds</b>	ment and sustaining of dermatitis among hair-	526
490	Sensitization is induced by carbamate compounds	dressers. Very often however, they are a cofactor.	527
491	used in glove materials.	Patients as well as doctors may easily over-	528
		estimate the importance of patch and prick testing	529
492	<b>6.6.13 Nickel</b>	and may become disappointed when they think	530
493	The prevalence of nickel allergy among women in	they have found the cause of the dermatitis, but	531
494	general is high. It is even higher under young	the dermatitis does not clear when avoiding the	532
495	women at the start of their apprenticeship as hair-	allergen. Patch testing is obligatory in all cases of	533
496	dresser. This higher prevalence is likely to be	dermatitis, but the interpretation of the results	534
497	caused by their preference for jewelry at young	should be done carefully with respect to the rele-	535
498	ages (Burg et al. 1986). Since September 2004, in	vancy and false-positive or false-negative results.	536
499	Europe, it is not allowed to have a higher release	Relevant positive reactions are important to	537
500	of nickel in jewelry than 0.5 µg/cm <sup>2</sup> /week. This	design a tailor-made management and treatment	538
501	will probably contribute to a lower sensitization	plan for the patient and are a prerequisite to	539
502	grade. Hairdressers have no increased		

540 motivate or force producers to optimize the safety  
 541 of their products.

542 **6.8 Management and Treatment**

543 Sick leave and job change are still popular “ther-  
 544 apeutic” tools used by doctors and hairdresser to  
 545 cure occupational dermatitis. Hand dermatitis is  
 546 caused by the summation of a variety of skin-  
 547 damaging factors related to product ingredients,  
 548 packages, application and preparation procedures,  
 549 the use of protective gloves, and adequate skin  
 550 care. Analysis of hair cosmetic products and  
 551 observation of hairdressers at work reveal that  
 552 neither the hair cosmetic producer nor the hair-  
 553 dressers consider safety the major issue of hair-  
 554 dressing (Holm 1994). To achieve a long-lasting  
 555 secondary prevention in cases of hand dermatitis,  
 556 the approach should focus on reduction of skin-  
 557 damaging factors, rather than on medical treat-  
 558 ments. This requires the combined expertise of  
 559 occupational health and safety and dermatology  
 560 (van der Walle 1994a, b, c; Uter et al. 1997)

561 To help you decide whether a reaction is irrita-  
 562 tive or allergic, you can apply sodium lauryl sul-  
 563 fate (Löffler et al. 2005). This irritant will almost  
 564 always give a reaction, the grade of which informs  
 565 you about the susceptibility of the skin to irritants  
 566 and, as mentioned above, can help you interpret  
 567 weak positive and possibly irritative reactions.

568 The following strategy has proven to improve  
 569 the results (see also Table 2).

Step 1	a. Evaluate the burden of skin-damaging factors, as shampooing, application and rinsing of perm solutions, colors, and bleaching agents
	b. Evaluate the safety of the preparation procedure of hairdressing chemicals
	c. Evaluate the use of protective gloves
	d. Perform dermatological investigation with special attention to localization and clinical picture
	e. Evaluate the atopic constitution
	f. Perform type I and type IV allergy tests focused on well-known allergens in hairdressing products
Step 2	Make a diagnosis and create a rank order of major and minor causative factors and keep in mind that (a) irritant factors in many cases make

(continued)

	a major contribution to the dermatitis in hairdressers and (b) not all positive patch tests are relevant for the management of the dermatitis
	Keep it as simple as possible for the patient
Step 3	Combine the information of step 1 and step 2 and design a strategy which contains the following items: a. Reduction of irritants b. Replacement or avoidance of allergens c. Protection d. Skin care
Step 4	Evaluate whether your instructions and advice are understood and applied in the right way. Repeat when necessary
Step 5	It takes time for the hairdresser and her employer to organize and establish all the good advices. In the meantime medical treatment is required to support recovery of the skin damage. Consider the use of PUVA-therapy in this period. Some hairdressers will require a more long-lasting medical treatment to counter-balance the skin-damaging effects of the profession and to control flare-ups of atopic dermatitis
Step 6	Do a follow-up! Give the hairdresser a call after 3 months to evaluate the situation of the skin, and, even more important, to emphasize the importance of continuing working in the way you have advised. Because, when their skin looks “normal” again, the hairdressers will easily go back to their “old” way of working, for that is the easiest way for them to work

570

571

572 Be cooperative and help each other in the salon  
 573 to follow the instructions. You will get used to it in  
 574 no time!

575 Helping the hairdresser with an occupational  
 576 hand dermatitis is time consuming and requires a  
 577 team of experienced occupational health experts  
 578 and occupational dermatologists to design and to  
 579 implement a tailor-made management program.

580 **6.9 Prevention and Prognosis**

581 Safe hairdressing procedures are a prerequisite for  
 582 a successful “treatment” and are based on safe  
 583 products and procedures, together with adequate  
 584 protection and knowledge about skin-damaging  
 585 factors. Motivation and skills of the employee,

12.1 **Table 2** Safe hairdressing practice

12.2	<b>Take notice of the following instructions and help each other to practice them!</b>	
12.3	1	Skin care of the hands before, during and after work
12.4	2	Protection of the hands during work
12.5	3	Wearing of jewelry
12.6	4	Cleaning of instruments and materials
12.7	1	Skin care of the hands
12.8		Wash the hands as little as possible, in most cases rinsing with lukewarm water will be sufficient; afterwards drying with a clean dry (paper) towel, not with a hot-air drier. The same at home
12.9		Use a water-resistant skin cream every morning before going to work. Use the ointment several times during the morning and afternoon for extra protection
12.10		Dry your hands regularly. Use a dry towel or tissue
12.11		Use a skin-care cream in the evening
12.12	2	Protection of the hands during work
12.13		Hands have to be protected with gloves during certain activities. Wear the gloves briefly and never use them twice. Never let water get into the glove. When this accidentally happens, pull off the glove, dry your hands, and pull on a new glove!
12.14		Use gloves for
12.15		Hair washing
12.16		Preparation, applying, checking and washing out hair bleach
12.17		Preparation, applying, checking and washing out hair dyes
12.18		Setting a perm
12.19		a. Mixing and applying the solutions
12.20		Take care to clear away the package first and pull off the gloves afterwards
12.21		b. Checking a test curl
12.22		c. Washing out and neutralizing
12.23	3	Wearing of jewelry
12.24		Many young women get nickel allergy by wearing metal earrings. In the hairdressing profession, an allergy to nickel may have serious consequences, so don't wear earrings that release nickel. Use earrings made of synthetic materials, stainless steel, silver or gold
12.25		Get rid of jewelry, watches, and metal parts of clothing (zippers, buttons) that cause dermatitis
12.26		Do not wear rings and bracelets during your work, because the skin will stay wet under this jewelry
12.27	4	Cleaning of instruments and materials
12.28		After every perm-setting, rinse the wash-bowl, the taps and your tools carefully with water
12.29		Remove the spoiled bleaching powder immediately with a moistened towel. Wear gloves!
12.30		After work-time, clean the carriages, tools, work-baskets, wash-bowls, handles and control panels of the hair-driers
12.31		Use a mild household detergent for cleaning

586 the employer, colleagues, doctor, and staff are  
 587 modifying factors. Early intervention is of utmost  
 588 importance to prevent the development of contact  
 589 allergies and/or a chronic self-perpetuating  
 590 eczema. Focusing mainly on medical treatment  
 591 contributes to a worse prognosis as was confirmed  
 592 in a follow-up study among 150 hairdressers.  
 593 Schopman et al. evaluated (1992) the outcome  
 594 among 150 hairdressers on sick leave due to occu-  
 595 pational hand eczema and under treatment of der-  
 596 matologists in the Netherlands. After 1 year,

99 (66%) had left the profession due to the chronic 597  
 character of the eczema. 598

That changing the focus from the "treatment" 599  
 to "the introduction of safe hairdressing proce- 600  
 dures" can be successful was confirmed by 601  
 Schmidt and Schwanitz (1997) who observed a 602  
 decrease in incidence of hand dermatitis from 603  
 70% in 1989 to 57% in 1994 among hairdressers 604  
 due to the start of a campaign to use protective 605  
 gloves. 606



607 Van der Walle and Brunsveld (van der Walle  
608 1997) published the results of a special hair-  
609 dresser's clinic. This clinic was started by the  
610 Dutch organization of employers to improve the  
611 prognosis of hairdressers with hand dermatitis by  
612 focusing the "treatment" on the introduction of  
613 safe hairdressing procedures in the salon. In  
614 1994/1995 260 hairdressers visited the clinic and  
615 in 173 (66.5%) recovery was achieved and the  
616 chance on a successful return for hairdressers  
617 with long-lasting sick leave due to hand eczema  
618 increased with a factor 4 after consulting the  
619 clinic, compared to a group of hairdressers with  
620 severe hand eczema who did not visit the clinic  
621 (Wijck 1996).

622 In 2008/2009, the results were comparable  
623 (own figures).

624 Primary prevention must focus on pre-school  
625 counseling (atopy!), introduction of safe hair-  
626 dressing procedures, the correct use of protective  
627 gloves, and continued pressure on manufacturers  
628 to improve the safety of their products.

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