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Abstract

A growing number of studies identified cleaners as a group at risk for adverse health effects of the skin and the respiratory tract. Chemical substances present in cleaning products could be responsible for these effects. Currently, only limited information is available about irritant and health hazardous chemical substances found in cleaning products. We hypothesized that chemical substances present in cleaning products are known health hazardous substances that might be involved in adverse health effects of the skin and the respiratory tract. A systematic review of cleaning products used in the Swiss cleaning sector and selected after discussing with Swiss professional cleaning companies (n=1476) to identify their most used products (n=105), was performed. Safety Data Sheets were reviewed and hazardous substances present in cleaning products were tabulated with current European and Global Harmonized System hazard labels. Professional cleaning products are mixtures of substances (arithmetic mean 3.5 ± 2.8), and more than 130 different chemical substances were identified in 105 products. The main groups of chemicals were fragrances, glycol ethers, surfactants, solvents; and to a lesser extent phosphates, salts, detergents, pH-stabilizers, acids, and bases. Up to 75% of products contained irritant (Xi), 64% harmful (Xn) and 28% corrosive (C) labeled substances. Hazards for eyes (59%), skin (50%) and by ingestion (60%) were the most reported. Cleaning products give potentially rise to simultaneous exposures to different chemical substances. As professional cleaners represent a large workforce, and cleaning products are ubiquitously used, it is a major public health issue to better understand these exposures. The list of substances provided in this study contains important information for future occupational exposure assessment studies.

Keywords: respiratory irritant, skin irritant, cleaning, exposure hazard, fragrance, glycol ether, surfactant,
solvent.

Introduction

Professional cleaning is a basic service occupation worldwide, and cleaning products are used daily in different environments, both indoors and outdoors.[1, 2] In recent years, a growing number of scientific studies have strengthened the association of cleaning work with respiratory adverse effects including asthma.[3-5] In addition, skin diseases such as hand dermatitis have also been reported.[6-8] One explanation for the observed respiratory adverse health effects among cleaning workers is chemical exposures deriving from cleaning products.[2, 9-11]

Several studies have investigated the relationship between adverse health effects, cleaning activity, and cleaning products.[12-19] Several risk factors were identified including chemical substances, application of cleaning products and cleaning activities. It was also stated that objective and more accurate estimates of occupational exposure to cleaning products are needed to better understand the adverse effects of cleaning products.[12] One major difficulty in this context is the multitude of cleaning products used, and the large number of chemical substances present in these products. Moreover cleaning products are constantly evolving because of ecological, economic and consumer demands.

Safety Data Sheets (SDSs) for professional cleaning products are made available to provide workers health hazard information regarding their substances or mixtures. The current EU classification system (Directives 1999/45/EC and 67/548/EEC) defines substances and preparations as dangerous if they are: explosive (E), oxidizing (O), extremely or highly flammable (F+, F), very toxic (T+), toxic (T), harmful (Xn), corrosive (C), irritant (Xi), sensitizing (Xn or Xi), carcinogenic (T, Xn), mutagenic (T, Xn), toxic for reproduction (T, Xn) or dangerous for the environment (N). These labels are accompanied by risk phrases (R-phrases), and typical R-phrases used for cleaning products are listed in the methods section.

To better understand the exposures to cleaning products among professional cleaners, we identified frequently used professional cleaning products in Switzerland and through a systematic SDS analysis of these products, hazardous (C, Xn, Xi) substances were identified. We plan to use these results in a future exposure study to better characterize exposures to substances presenting a health hazard among professional cleaning workers.

Methods

Selection of cleaning products

To select a representative group of frequently used cleaning products, we mailed a letter to cleaning companies located in the French and German speaking cantons of Switzerland (n=1476, Figure 1). Cleaning companies

were asked to specify cleaning activity, company size, and cleaning products used. Cleaning companies were identified from the Federal Office of Statistics using the code for cleaning companies ("Nomenclature Générale des Activités économiques" (NOGA code) (2008)). The NOGA data contained estimates about company size by number of employees. Companies were grouped into small (5 to 49 employees), medium (50 to 250 employees) and large (≥250 employees). Technical terms (both French and German) used in the cleaning sector were retrieved from the training manual used for professional cleaners in Switzerland.[20] To process the large number of responses we used the TeleForm software (Cardiff TeleForm, Version 10.5.2, San Diego, USA). The letter also included a list of cleaning products (n=488) from four major companies that manufactured, produced and/or supplied products in Switzerland. This list of cleaning products by brand names was finalized after discussions with a professional cleaning association, a medium sized cleaning company, and a training center for professional cleaners. The cleaning companies were asked to mark the cleaning products they used from the provided list, and in the case where the cleaning products they used was not listed, the company was asked to write down these names before mailing the responses back. An Excel spreadsheet was generated from TeleForm, and imported to Stata (Stata 12, Stata Corp Lp, Lakeway Drive, USA). Response rates by company size were calculated. Cleaning products marked by at least 10 cleaning companies were included in the systematic SDS analysis.

SDS analysis

SDSs for cleaning products were obtained from the companies' web sites. If SDSs were not available, products were excluded from the SDS analysis. Selected products were grouped into ten product categories; floor cleaners (FC), general purpose cleaners (GPC), polishing products (PP), carpet cleaners (CC), scale removing products (SRP), bathroom cleaners (BC), glass cleaners (GC), disinfection products (DP), kitchen cleaners (KC), and other surfaces cleaners (OSC).

A comprehensive table was created listing all substances mentioned in the SDSs under section 3. The frequency of a chemical substance's occurrence in selected products was recorded. Section 3 of SDSs is titled 'Composition/information on ingredients' and provides details about hazardous substances in the mixtures. Names, product identifier (CAS number), concentration or concentration ranges and classifications according to current danger letters and R-phrases (Directives 1999/45/EC and 67/548/EEC) as well as new hazard classes and statements (Regulation (EC) No 1272/2008) are presented in the table. This was possible because Switzerland has from December 1, 2010 to June 1, 2017 to replace the current classification system (Directives 1999/45/EC

and 67/548/EEC) with the new (Regulation (EC) No 1272/2008), meeting the requirements of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). Therefore, both the current classification and the new GHS labeling were available for this study. Additional regulations (Dir 67/548/EEC, Dir 1999/45/EC, EC 1272/2008) define substance concentration restrictions regarding the listing of substances in this section.

Fragrances often do not meet the criteria to be listed in section 3 'Composition/information on ingredients' of the SDSs. However fragrances, preservatives and others are often mentioned in section 15 'Regulatory Information' as they are subject to other regulations such as substances depleting the ozone layer ((EC) No 2037/2000, persistent organic pollutants (EC) No 850/2004 and export/import of dangerous substances (EC) No 689/2008). Names of fragrances, preservatives and other chemical substances listed under section 15 of SDSs were reported in the result section.

The fractions of cleaning products containing at least one substance listed with these symbols were counted and expressed in percentage for each of the 10 product categories. Similar results were presented for the R-phrases. R-phrases relevant in this study are: harmful by inhalation (R20), harmful in contact with skin (R21), harmful if swallowed (R22), causes burns (R34), causes severe burns (R35), irritating to eyes (R36), irritating to respiratory system (R37), irritating to skin (R38), risk of serious damage to eyes (R41), may cause sensitization by skin contact (R43), danger of serious damage to health by prolonged exposure (R48), possible risk of impaired fertility (R62), possible risk of harm to the unborn child (R63), harmful: may cause lung damage if swallowed (R65), repeated exposure may cause skin dryness or cracking (R66), vapors may cause drowsiness and dizziness (R67).The fractions of cleaning products, with at least one substance listed with the R-phrases R20, R21, R22, R34, R35, R36, R37, R38, R41, R43, R48, R62, R63, R65, R66 and R67, were expressed in percentage.

Results

One hundred and sixteen products were selected for SDS analysis and 11 products were excluded because of missing SDSs. In the 105 remaining selected products, 130 different chemical substances were listed in the SDSs reviewed. In average one cleaning product contained 3.5 (±2.8) chemical substances listed in section 3 of the SDSs. The composition of the cleaning products varied depending on their intended use, and substances we identified are listed in Table 1. Although the type of glycol ethers varied greatly across cleaning products, they were often (20% of the products) present in both small and large amounts (0.1-50% in the products). Most glycol ethers were found in polishing products (48%), scale removing products (42%), general purpose cleaners (37%)

and floor cleaners (36%), some (20%) were found in disinfection products and kitchen cleaners, and few (10 to 11%) were found in glass cleaners, bathroom cleaners, and carpet cleaners. The choice of surfactants were diverse but were present in 19 % of the products and their concentration ranges varied greatly (0.1-30% in the products). We particularly focused on ethanolamines, known for their sensitizing properties.[21] Three ethanolamines were identified: monoethanolamine, triethanolamine, and 2-diethylaminoethanol. The most frequently used was monoethanolamine, which was present in 8 products; 5 floor cleaners, (n=8), 2 general purpose cleaners, and 1 kitchen cleaner. 16% of the products contained organic solvents and the concentration ranges varied enormously (0.1-75%) making up 75% of one of the products (polishing product). Other ingredients in lower concentrations made up 18% of our substance list (Table 1): phosphates, salts, detergents, pH-stabilizers, acids, and bases. Quaternary ammonium compounds or "quats", a substance class known for sensitizing and allergic responses among cleaners, were found in 2 products in 3-10% concentrations.[2, 22].

Fragrances were commonly found in the product (27% of substances found) in low concentrations (0.01-5%), except when it also acted as a solvent (30%). Interestingly up to 91% of selected cleaning products contained at least one substance which was subject to other regulations and listed under section 15 of SDSs. In total 26 substances were found under section 15 of the SDS. Most frequently present fragrances in products were linalool (20%), butylphenyl methylpropional (16%), benzisothiazolione, (16%), hexyl cinnamal (15%), limonene (14%), methylisothiazolione (12%). Aliphatic carbohydrates, amyl cinnamal, benzyl salicylate, citronellol, formaldehyde deposit alpha mixture with 5-Chlor-2-methyl-2H-isothiazol-3-on 2-Methyl-2H-isothiazol-3-on, hydroxycitronellol, hydroxyisohexyl 3-cyclohexene carboxyaldehyde, isoeugenol, sodium hydroxymethylglycinate were present in 9 to 10% of products. Alpha-isomethyl ionone, benzyl alcohol, benzyl benzoate, cinnamal, citral, coumarin, eugenol, geraniol, glutaral, octylisothiazolinone and phenoxyethanol were present in less than 7% of products.

Eleven substances listed in section 3 of SDSs were neither classified with danger, symbol letters and R-phrases nor with hazard classes and categories. The remaining 117 substances were classified with danger, symbol letters and R-phrases as well as with hazard classes and categories. Of these, 82 substances were listed in addition with hazard classifications and statements (GHS). Four substances were found in more than 10 products, 17 substances were found in 5 to 10 products, 38 in 2 to 4 products and 69 in 1 product.

By product categories, usually less than 40% of cleaning products were labeled corrosive (C) in section 3 of SDSs, with exception scale removing products (78%, Figure 2). Usually more than 70% of products were

labeled irritant (Xi), except for polishing products (33%), and more than 50% of products were labeled harmful (Xn), except of product category carpet cleaners (31%).

Fifteen R-phrases regarding human health were identified (Figure 3); corrosive (R34, R35), irritant (R36, R37, R38), harmful (R20, R21, R22), sensitizing (R43) and others (R41, R62, R63, R65, R66, R67). Figure 3 shows the percentages of products (all categories) that have been labeled with these R-phrases in section 3 of SDSs.

The response rate to the letter sent to cleaning companies was highest (50%) for large companies (≥250 employees), and to a lesser extent for medium (24%) and small (11%) (Figure 1). These results correspond to 25% (12,500 employees) of the total professional cleaning workforce included in the survey. However, counting the number of employees from the response letters gave >40,000 employees. This could be explained by the NOGA categories, of which the largest only states ≥1000 employees.

Discussion

Frequently used professional cleaning products contain a multitude of chemical substances with known health effects. Cleaners may therefore be exposed to mixtures of health hazardous substances during their cleaning activity.

It is important to note, that SDSs do not list all chemical substances present in a product, as regulations define substances and concentrations that have to be listed. For example, if only small quantities of common sensitizers such as aldehydes are in the cleaning products, these are not required to be listed in Section 3 in the SDS by current labeling regulations. Only if required by other regulations, these sensitizers were listed as a cleaning product ingredient under section 15 in the SDSs. Interestingly, several substances found under section 15 of SDSs can be involved in sensitizing mechanisms and/or allergic reactions.

In our study, we selected frequently used cleaning products known from cleaning companies with five or more employees. The cleaning products included were the most popular brands (four) and according to a professional association for cleaning companies in Switzerland, estimated to cover > 50% of the Swiss professional cleaning products market.

As mentioned above, we estimated that our results concern about 50% of the workforce of companies that were included in this study. This is because the large cleaning companies reported to have high numbers of employees

(above several thousands). As cleaning products of globally active cleaning products suppliers were reviewed, results are probably also relevant for other parts of the world such as the EU and the USA.

Not only is there a great diversity of chemical substances within cleaning products, but numerous companies offer hundreds of different cleaning products, which makes the task of assessing chemical substances used in professional cleaning products complicated. Indeed, responses we received, showed cleaning companies using products from 36 different product companies, and some reported that they produced their own products. Thus when investigating exposures among professional cleaners, a SDS review is a requirement. We believe our results provide important information regarding type of cleaning products used in this industry, common chemical substance classes found in these products and their health hazards. This knowledge should help in monitoring professional cleaners and their exposures to cleaning products and substances with known health effects.

The main challenges in conducting an occupational exposure assessment for professional cleaners are the great number of cleaning products available and the vast number of substances in these products. For further investigations, we recommend to focus on the 21 substances found in ≥5 products (Table 1). Especially of interest are: the recognized sensitizer monoethanolamine and glycol ethers, frequently found in cleaning products. Substances found in professional cleaning products may likely also be ingredients in cleaning products sold to the general public; however, we did not survey these products.[21] Moreover, the general public does not usually have access to SDSs, only the hazard label on the product packaging is available, thereby limiting their information regarding sensitizing and irritant substances.

Most cleaning products identified in this study were sold by global companies, selling and distributing their products world-wide. We do believe our results hold true for other industrialized countries similar to Switzerland, although the cleaning product might be given a different brand name.

Conclusion

This work contributes to efforts to better understand possible exposures scenarios to pollutants associated with the application of professional cleaning products. We found that hazardous substances in cleaning products are in particular fragrances, glycol ethers, surfactants, solvents and to a lesser extent phosphates, salts, detergents, pH-stabilizers, acids, and bases. Cleaning workers that are handling these products are therefore a group at risk for several occupational exposures. Section 15 in the SDS should be conferred as several substances involved in

sensitizing mechanisms and/or allergic reactions were also listed here. Especially glycol ethers and ethanolamines are frequently used in cleaning products, and could therefore be involved in the development of adverse health effects like irritant or sensitizer induced asthma, which was found to be increased in professional cleaners. Concerning asthma, the presence of different aldehydes as fragrances is also of special interest. The fact that beside some sensitizers like ethanolamines, mainly irritants were found, suggests that pathologies of the skin and the respiratory tract do probably also occur without mechanisms of sensitization. A simultaneous exposure to several hazardous chemical substances might be involved in these pathologies. As professional cleaners represent a large workforce, and cleaning products are ubiquitously used, including private cleaning, it is a major environmental and public health issue to better understand the exposures that may be caused by the use of cleaning products. Our list of substances provides important information about which chemicals and hazards are relevant for further investigations in this field and we plan to use these results for field exposure studies.

Conflict of interest

The authors have declared no conflict of interest.

Acknowledgements

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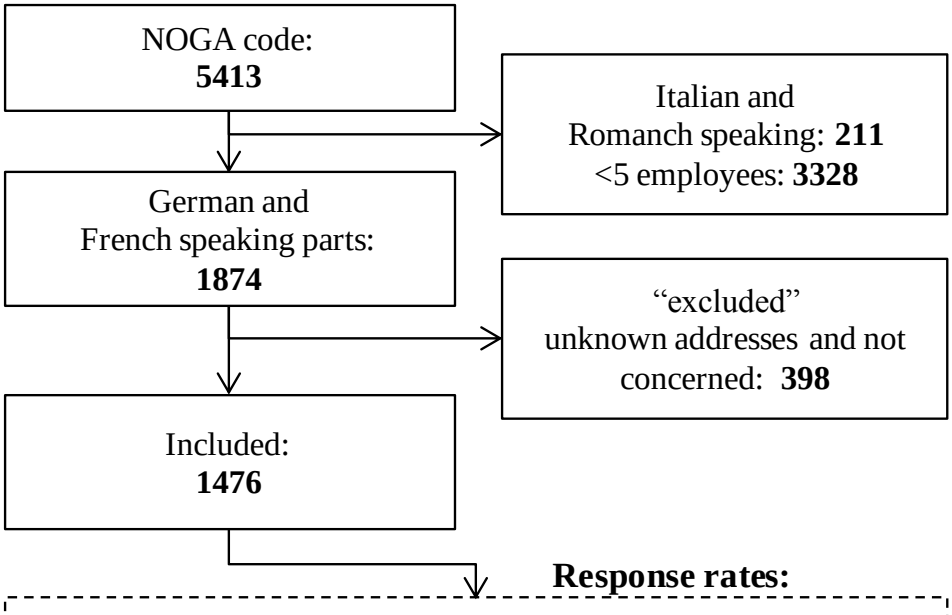
Figure 1: Mailing and response rates of the letter to cleaning companies



Response rates:

Companies:	All	Small	Medium	Large
(employees)	≥5	(5 to 49)	(50 to 249)	≥ 250
Cleaning services	1476	1291	155	30
Responses:	198	146	37	15
Response rate (%)	13	11	24	50

Figure 2: Products that contain at least one substance labeled with a C, Xi or Xn

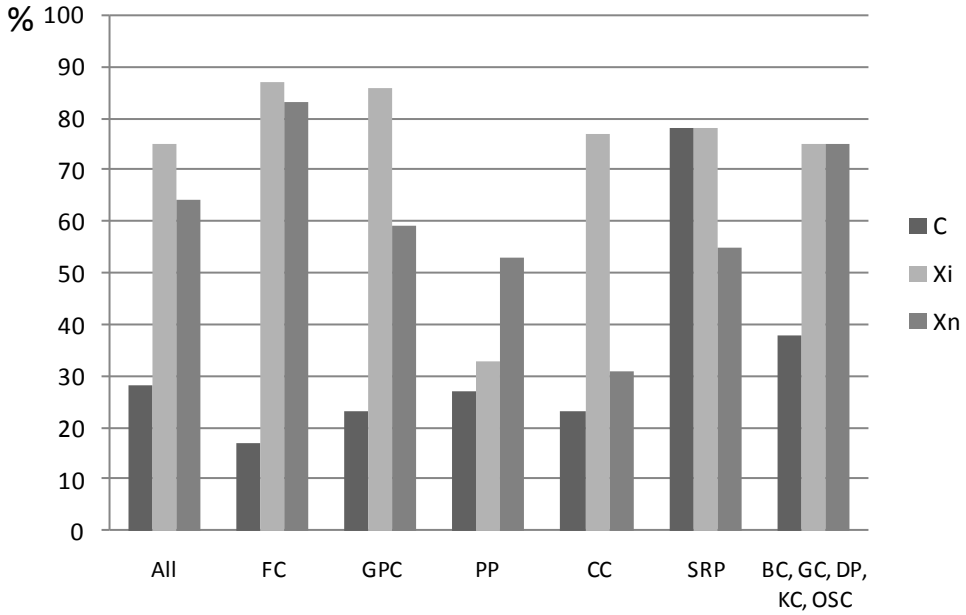


Figure 2: Percentages of products by product categories containing at least one substance labeled as corrosive (C), irritant (Xi) and harmful (Xn) in section 3 of SDSs. (FC), general purpose cleaners (GPC), polishing products (PP), carpet cleaners (CC), scale removing products (SRP), bathroom cleaners (BC), glass cleaners (GC), disinfection products (DP), kitchen cleaners (KC), and other surfaces cleaners (OSC).

Figure 3: Products that contain at least one substance labeled with one of the selected R-phrases

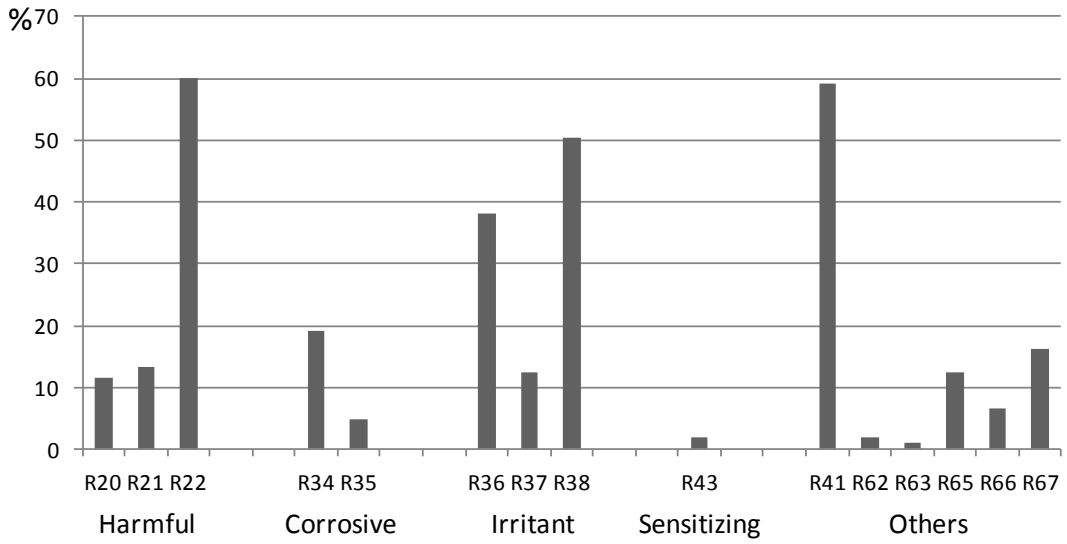


Figure 3: Percentages of cleaning products that have been labeled with corrosive (R34, R35), irritant (R36, R37, R38), harmful (R20, R21, R22), sensitizing (R43) and other (R41, R62, R63, R65, R66, R67) R-phrases in section 3 of SDSs.

Table 1: List of substances found in section 3 of SDSs of 105 selected cleaning products

Substances		EU[1]		GHS[2]		Product[3]	
Name	CAS	L[4]	R[5]	C[6]	S[7]	%[8]	N[9]
(d)-Limonene	5989-27-5	Xi N	R10 R38 R43 R50/53	Flam.Liq3 AquaticAcute1 AquaticChronic1 SkinIrrit.2 SkinSens.1	H226 H400 H410 H315 H317	0.1-1	2
(L)-(-)-Ethyl lactate	687-47-8	Xi	R10 R37 R41	EyeDam.1 Flam.Liq.3 STOTSE3	H318 H226 H335	3-10	1
1,4-Dioxacycloheptadecane-5,17-dione	105-95-3	N	R10 R51 R53	na[10]	na	<5	1
1-Methoxy-2-hydroxypropane	107-98-2	na	R10	Flam.Liq.3	H226	0.1-<10	4
1-Penten-3-one, 1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-	7779-30-8	N	R51/53	AquaticChronic2	H411	0.1-1	1
1-Propoxy-2-propanol	1569-01-3	na	R10	Flam.Liq3 EyeIrrit2	H226 H319	1-50	2
2-cis-3,7-Dimethyl-2,6-octadien-1-ol	106-25-2	F Xi	R12 R38	SkinIrrit2 Flam.Gas1 Press.Gas	H315 H220 H280	0.01-10	2
2-Diethylaminoethanol	100-37-8	C	R10 R20/21/22	SkinCorr.1B Flam.Liq.3	H314 H226	1-3	1

			R34	AcuteTox4	[H302 H312 H332]		
2-t-Butylcyclohexyl acetate	88-41-5	N	R51, R53	AquaticChronic2	H411	0.1-1	2
2-trans-3,7-Dimethyl-2,6-octadien-1-ol	106-24-1	na	R38 R41 R43	EyeDam.1 SkinSens.1 SkinIrrit.2	H318 H317 H315	0.01-0.1	1
3,7-Dimethyl-6-octen-1-ol	106-22-9	Xi N	R38 R43 R51/53	SkinIrrit2 SkinSens1 AquaticChronic2	H315 H317 H411	<0.01	1
6-Octenenitrile, 3,7-dimethyl-	51566-62-2	na	R52/53	AquaticChronic3	H412	0.01-0.1	1
Acetyl cedrene	32388-55-9	N	R50/53	AquaticAcute1 AquaticChronic1	H400 H410	0.1-1	1
Acid blue 3	3536-49-0	na	na	na	na	<0.01	1
Alanine, N,N-bis(carboxymethyl)-, sodium salt (1:3)	164462-16-2	na	na	na	na	1-<5	2
Alcohol	64-17-5	F	R11	Flam.Liq.2	H225	1-20	8
Alcohols, C10-12, ethoxylated propoxylated	68154-97-2	N	R51 R53	AquaticCronic2	H411	1-5	3
Alcohols, C10-16, ethoxylated propoxylated	69227-22-1	Xi Xn	R22 R41	na	na	5-15	1
Alcohols, C12-14, ethoxylated	68439-50-9	Xn	R22 R41	EyeDam.1 AcuteTox.4	H318 H302	1-10	5
Alcohols, C13-15-branched and linear, butoxylated ethoxylated	111905-53-4	Xi	R36/38	SkinIrrit2 EyeIrrit.2	H315 H319	1-30	6

Alcohols, C16-18 and C18-unsatd., ethoxylated	68920-66-1	Xn N	R22 R38 R41 R50	EyeDam.1 AquaticAcute1 AcuteTox.4 SkinIrrit.2	H318 H400 H302 H315	1-3	1
Alkanes, C9-12-iso-	90622-57-4	Xn	R10 R53 R65 R66	na	na	30-75	2
Alkylalkoholalkoxylat	na	Xi	R36 R38	SkinIrrit2 EyeIrrit.2	H315 H319	1-10	4
Alkylalkoholethoxylat	na	Xi Xn	R22 R41	na	na	<5-15	2
Alkyletherphosphatesodiumsalt	na	Xi	R36 R38	na	na	1-5	1
alpha-D-Glucopyranoside, 2-ethylhexyl	125590-73-0	Xi	R41	EyeDam.1	H318	3-10	1
Alpha-isomethylionone	127-51-5	Xi	R43 R52/53	SkinSens1 AquaticChronic3	H317 H412	0.1-1	1
alpha-Methyl-4-(1-methylethyl)benzenepropanal	103-95-7	Xn N	R38 R43 R51/53 R62	Repr.2 SkinIrrit.2 SkinSens.1 AquaticChronic2	H361 H315 H317 H411	0.1-1	1
alpha-Terpineol	98-55-5	Xi Xn	R22 R41 R38	SkinIrit.2	H315	0.01-15	3
Amides, coconut oil, N-(2-((sulfosuccinyl)oxy)ethyl), sodium salts	68784-08-7	Xi	R41	na	na	na	1

Ammonium hydroxide	1336-21-6	C N	R34 R50	SkinCorr.1B AquaticAcute1	H314 H400	0.01-1	3
Amyl salicylate	2050-08-0	N	R51/53	na	na	<5	1
Anethole, trans	4180-23-8	N	R51/53	na	na	<5	1
Aromatic naphtha, type I	64742-95-6	Xi Xn N	R10 R37 R53 R65 R66 R67 R51	na	na	0.1-1	1
Benzaldehyde	100-52-7	Xn	R22	na	na	na	1
Benzenesulfonic acid, (1-methylethyl)-, sodium salt (1:1)	28348-53-0	Xi	R36	EyeIrrit.2	H319	1-10	6
Benzenesulfonic acid, 4-C10-13-sec-alkyl derivs.	85536-14-7	C	R22 R34	SkinCorr.1C AcuteTox4	H314 H302	3-10	1
Benzenesulfonic acid, mono-C10-13-alkyl derivs., compds. With ethanolamine	85480-55-3	Xn	R22 R38 R41	EyeDam.1 AcuteTox.4 SkinIrrit.2	H318 H302 H315	3-10	1
Benzenesulfonic acid, mono-C10-13-alkyl derivs., sodium salts	90194-45-9	Xn	R22 R38 R41	EyeDam1 AcuteTox4 SkinIrrit.2	H318 H302 H315	3-10	1
Benzyl acetate	140-11-4	Xi	R36/37/38	SkinIrrit.2 EyeIrrit.2 STOTSE3	H315 H319 H335	10-20	1
Benzyl alcohol	100-51-6	Xn N	R20/22 R36	EyeIrrit.2 AcuteTox.4	H319 [H302	1-20	5

					H332]		
Benzyl benzoate	120-51-4	Xn N	R22 R51/53	AcuteTox4 AquaticChronic2	H302 H411	1-3	1
Benzyl salicylate	118-58-1	Xi N	R43 R51/53	SkinSens1 AquaticChronic2	H317 H411	0.1-1	1
beta-Pinene	127-91-3	Xn N	R65 R50 R53	SkinCorr.1B EyeDam.1 AcuteTox4 AquaticAcute1	H314 H318 H302 H400	na	1
Butane	106-97-8	F+	R12	Flam.Gas1 Press.Gas	H220 H280	15-75	5
Butanedioic acid, sulfo-, 1-ester with N-(2-hydroxyethyl)dodecanamide, disodium salt	25882-44-4	Xi	R36/38	SkinIrrit2 EyeIrrit.2	H315 H319	3-10	1
Butoxypropanol	5131-66-8	Xi	R36/38	SkinIrrit2 EyeIrrit.2	H315 H319	1-30	5
C11-15 Pareth-20	68131-40-8	Xi Xn	R22 R41	na	na	1-5	1
C12-15 Pareth-11	68131-39-5	Xi Xn N	R22 R41 R50	EyeDam.1 AquaticAcute1 AcuteTox.4	H318 H400 H302	0.1-15	5
Camphene	79-92-5	F Xi N	R11 R36 R50 R53	SkinCorr.1B EyeDam.1 AcuteTox.4 AquaticAcute1	H314 H318 H302 H400	na	1
Citral	5392-40-5	Xi	R38 R43	SkinIrrit2 SkinSens.1	H315 H317	0.01-0.1	1

Citric acid	77-92-9	Xi	R36	EyeIrrit.2	H319	1-30	9
Coconut acid	61788-47-4	Xi	R36/38	SkinCorr.1B EyeDam1 AcuteTox4 AquaticAcute1	H314 H318 H302 H400	na	2
Coumarin	91-64-5	Xn	R22 R43	AcuteTox3 SkinSens.1	H301 H317	0.1-1	1
Cyclohexanol, 4-(1,1-dimethylethyl)-, 1-acetate	32210-23-4	N	R51/53	AquaticChronic2	H411	0.1-<5	3
Deceth-4	26183-52-8	Xi Xn	R22 R41	na	na	1-15	9
Decyl D-glucoside	54549-25-6	Xi	R36	na	na	1-5	2
D-Glucopyranose, oligomeric, decyl octyl glycosides	68515-73-1	Xi	R41	na	na	1-5	1
Diethylene Glycol Monoethyl Ether	111-90-0	Xi	R36	SkinCorr.1B EyeDam.1 AcuteTox4 AquaticAcute1	H314 H318 H302 H400	1-10	14
Diethylene glycol monomethyl ether	111-77-3	na	R63	na	na	na	1
Diethylene glycol mono-n-butyl ether	112-34-5	Xi	R36	EyeIrrit.2	H319	5-30	3
Dimethyl ether	115-10-6	F+	R12	na	na	50-75	1
Diphosphoric acid, tetrapotassium salt	7320-34-5	Xi	R36	EyeIrrit.2	H314	1-3	1
Dipropylene glycol monomethyl ether	34590-94-8	na	na	na	na	1-20	11
Disodium phosphate	7558-79-4	na	na	na	na	0.1-1	1

Ethylene glycol	107-21-1	Xn	R22	AcuteTox.4	H302	1-20	5
Ethylene glycol monomontanate	73138-45-1	na	na	na	na	3-10	1
Ethylene glycol mono-n-butyl ether	111-76-2	Xi Xn	R20 R21 R22 R36 R38	SkinIrrit.2 EyeIrrit.2 SkinSens.1 AcuteTox.4	H315 H319 [H302 H312 H332],	1-20	4
Eugenol	97-53-0	Xi	R36 R43	EyeIrrit.2 SkinSens.1	H319 H317	0.1-1	1
Fatty acids, coco, 2-(2-butoxyethoxy)ethyl esters	91031-83-3	Xi	R36	na	na	1-5	1
Fatty acids, coconut oil, potassium salts	61789-30-8	Xi	R36/38	EyeIrrit2 SkinIrrit.2	H319 H316	1-5	3
Fatty acid amides	na	Xi	R38 R41	na	na	<5	1
Galaxolide	1222-05-5	N	R50/53	AquaticAcute1 AquaticChronic1	H400 H410	0.1-1	1
Genapol X 080	9043-30-5	Xi Xn	R22 R41 R51 R53	EyeDam.1 AcuteTox.4	H318 H302	0.1-5	3
Heptane	142-82-5	F Xn N	R11 R38 R50/53 R65 R67	Flam.Liq.2 Asp.Tox.1 AquaticAcute1 AquaticChronic1 SkinIrrit.2 STOTSE*	H225 H304 H400 H410 H315 H336	5-20	2

Hydrocarbons, terpene processing by-products	68956-56-9	Xn N	R51/53 R65	Asp.Tox.1 AquaticChronic2	H304 H411	0.01-1	3
Hydroxyacetic acid	79-14-1	C	R34	na	na	1-5	1
Isobutane	75-28-5	F+	R12	Flam.Gas1 Press.Gas	H220 H281	3-20	2
Isoeugenol	97-54-1	Xn	R21/22 R36/38 R43	SkinIrrit.2 EyeIrrit.2 SkinSens.1 AcuteTox.4	H315 H319 H317 [H302 H312],	0.1-1	1
Isopropyl alcohol	67-63-0	F Xi Xn	R11 R20/21/22 R36 R36/38 R67	Flam.Liq2 EyeIrrit.2 STOTSE	H225 H319 H336	1-75	16
Laurylamine dipropylenediamine	2372-82-9	C N	R22 R35 R48/22 R50	AcuteTox.3 SkinCorr.1A STOTRE2 AquaticAcute1	H301 H314 H373 H400	0.1-1	1
Lilial	80-54-6	Xi Xn N	R22 R38 R43 R62 R51/53	Repr.2 Acute Tox4 SkinIrrit.2 SkinSens.1 AquaticChronic2	H361 H302 H315 H317 H411	<0.01	1
Linalool	78-70-6	Xi	R38, R43	SkinIrrit2, SkinSens.1	H315, H317	0.01-3	2
Lyral	31906-04-4	Xi	R43 R52/53	SkinSens1 AquaticChronic3	H317 H412	0.1-1	1

Methanesulfonic acid	75-75-2	C	R34	SkinCorr.1B	H314	3-10	1
Mineral Oil	8012-95-1	Xn	R65			5-15	1
Monoethanolamine	141-43-5	C Xn	R20 R21 R22 R34 R37	SkinCorr.1b STOTSE3 EyeDam1 AcuteTox4	H314 H335 H318 [H302 H312 H332]	1-15	8
Naphtha (petroleum), heavy alkylate	64741-65-7	Xn	R10 R53 R65 R66	AcuteTox.3 Asp.Tox.1 Flam.Liq.3 AquaticChronic4	H331 H304 H226 [H413 EUH006]	>75	1
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Xn	R10 R65 R66	na	na	3->30	3
Natriumlaurylethoxylsulfate	na	Xi	R38 R41	na	na	<5	1
Non-ionic tensides	na	Xi Xn N	R22 R38 R50	na	na	5-30	2
n-Octyl-polyoxyethylene	27252-75-1	Xi	R41	na	na	1-5	1
Oxirane,methyl,polymer and oxibane, butyl ether	9038-95-3	Xn	R22	AcuteTox4	H302	3-10	2
PEG-10 Tridecyl ether	24938-91-8	Xi N	R41 R50	EyeDam1	H318	1-15	5
PEG-15 Cocoate	61791-29-5	Xi	R36	na	na	1-5	2
Pentapotassium triphosphate	13845-36-8	Xi	R36/38	na	na	5-15	1

Phenol, 2-methoxy-4-propyl-	2785-87-7	Xi	R36 R43	EyeIrrit.2 SkinSens.1	H319 H317	0.1-1	1
Phenoxyethanol	122-99-6	Xi Xn	R22 R36	AcuteTox.4 EyeIrrit2	H302 H319	1-10	5
Phosphoric acid	7664-38-2	C	R34	SkinCorr.1B Met.Corr.1	H314 H290	5-30	4
Poly(oxy-1,2-ethanediyl), alpha-(1-oxo-9-octadecenyl)-omega-hydroxy-,(Z)	na	Xn Xi	R22 R41	AcuteTox.4 EyeDam.1	H302 H318	1-3%	1
Poly(oxy-1,2-ethanediyl), alpha-(2-propylheptyl)-omega-hydroxy-	160875-66-1	Xi	R41	EyeDam1	H318	3-10	1
Poly(oxy-1,2-ethanediyl), alpha-isodecyl-omega-hydroxy-	61827-42-7	Xi Xn	R22 R41	na	na	1-15	3
Poly(oxy-1,2-ethanediyl), alpha-sulfo-omega-hydroxy-, C10-16-alkylethers, sodium salts	68585-34-2	Xi	R38 R41	EyeDam.1 SkinIrrit.2	H318 H315	1-15	4
Poly(oxy-1,2-ethanediyl), alpha-tridecyl-omega-hydroxy-, branched	69011-36-5	Xn	R22 R41	EyeDam1 AcuteTox.4	H318 H302	1-20	14
Polymerdispersion	na	na	na	na	na	na	2
Polyoxyl 20 cetostearyl ether	68439-49-6	N	R41 R50	na	na	0.1-1	1
Potassium hydroxide	1310-58-3	C Xn	R22 R35	na	na	1-5	1
Propane	74-98-6	F+	R12	Flam.Gas1 Press.Gas	H220 H280	1-30	6
Quaternary ammonium	68424-85-1	C	R21/22	SkinCorr.1B	H314	3-10	2

compounds, benzyl-C12-16-alkyldimethyl, chlorides		N	R34 R50	AquaticAcute1 AcuteTox.4	H400 H302		
Silicic acid, disodium salt, pentahydrate	10213-79-3	C Xi	R34 R37	SkinCorr1B STOTSE3	H314 H335	1-15	3
Silicon dioxide	7631-86-9	na	na	na	na	0.1-1	1
Sodium 2-butoxyethyl sulphate	67656-24-0	Xi	R36/38	na	na	1-5	1
Sodium benzoate	532-32-1	na	na	na	na	0.1-1	1
Sodium carbonate	497-19-8	Xi	R36	EyeIrrit.2	H319	1-3	1
Sodium chloride	7647-14-5	C	R34 R37	SkinCorr.1B Met.Corr.1 STOTSE	H314 H290 H335	0.01-10	2
Sodium Ethasulfate	126-92-1	Xi Xn	R22 R38 R41	EyeDam.1 SkinIrrit.2	H318 H315	1-5	4
Sodium Hydroxide	1310-73-2	C	R35	SkinCorr.1A	H314	0.01-10	3
Sodium sulfate	7757-82-6	na	na	na	na	0.01-0.1	1
Solvent naphtha (petroleum), heavy arom.	64742-94-5	Xn N	R51/53 R65 R66 R67	Asp.Tox.1 STOTSE3 AquaticChronic2	H304 H336 [H411 EUH006]	0.1-1	1
Solvent naphtha (petroleum), medium aliph.	64742-88-7	Xn	R10 R56	na	na	25-50	1
Sulfamic acid	5329-14-6	Xi	R36/38 R52/53	SkinIrrit2 EyeIrrit.2 AquaticChronic3	H315 H319 H412	3-15	5
Sulfonic acids, C13-17-sec-	85711-69-9	Xi	R38	EyeDam.1	H318	1-15	8

alkane, sodium salts			R41	SkinIrrit.2 SkinCorr.1b AcuteTox.4 AquaticAcute1	H315 H314 H302 H400		
Sulfuric acid, mono-C10-16-alkyl esters, sodium salts	68585-47-7	Xi	R38 R41	EyeDam.1 SkinIrrit.2	H318 H315	3-10	1
Sulfuric acid, mono-C12-14-alkyl esters, sodium salts	85586-07-8	Xi	R38 R41	na	na	na	1
Sulfuric acid, mono-C12-16-alkyl esters, sodium salts	73296-89-6	Xi	R38 R41	na	na	5-15	1
Terpinolene	586-62-9	Xn N	R10 R51/53 R65	na	na	<5	1
Tri(2-butoxyethyl) phosphate	78-51-3	na	na	na	na	1-5	4
Triethanolamine	102-71-6	Xi	R36/38	na	na	1-5	1
Water	7732-18-5	na	na	na	na	50-75	2
Waxmixture	na	na	na	na	na	na	1

Table 1: [1]Directives 1999/45/EC and 67/548/EEC, [2]Regulation (EC) No 1272/2008, [3]Information about amount and frequency in selection of professional cleaning product, [4]Danger letter, [5]Risk-phrase, [6]Hazard class, [7]Hazard statement, [8]Amount of substance in selected professional cleaning products, [9]Number of selected professional cleaning products that contain the listed chemical substance, [10]not available(na).

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"Hazardous substances in frequently used professional cleaning products"

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