ANNEX VI CHEMICAL REPORTS

For the skin sensitizing chemicals, a chemical report for each individual compound is added in this annex, when enough information was found concerning time trends and/or regional differences. Other compounds are summarized in the table at the end. Information about sources of exposure, gender, age, latency, regional differences and time trends are discussed in these reports.

For the respiratory sensitizers, chemical reports have been grouped per chemical class (comparable to Annex V), because few information is available for each individual compound. Here, the same information as for skin is reported, although information on time trends is scarce here. Additionally, information about reported symptoms is added here.

Skin sensitizers

- European patch test series
  - Colophony / abietic acid
  - Cobalt chloride
  - Formaldehyde
  - Fragrance mix
  - MCI-MI
  - Methyldibromo glutaronitrile
  - Nickel sulfate
  - Para-phenylenediamine
  - Potassium dichromate
- Balsam of Peru
  - Benzoyl peroxide / Benzoic acid
  - Benzyl alcohol / Benzoic acid
- Fragrance mix
  - Alpha-amyl cinnamic aldehyde
  - Cinnamic aldehyde + cinnamic alcohol
  - Citral
  - Coumarin
  - Eugenol
  - Hydroxycitronellal
  - Isoeugenol
  - Lyral
- Other chemicals
  - 1,2-Benzisothiazolin-3-one
  - 2,5-Diaminotoluene
  - 2-Hydroxyethyl acrylate
  - 2-Mercaptobenzothiazole
  - 3-Aminophenol
  - 3-Dimethylaminopropylamine
  - Diphenylthiourea
  - Ethylene glycol dimethylacrylate
  - Ethylenediamine
  - Glutaraldehyde
  - Glyoxal
  - Hydroquinone
  - Imidazolidinylurea
  - Lauryl gallate
  - Lilial
  - Limonene
  - Linalool
  - Propyl gallate
  - Propylene glycol
  - Tetramethylthiuram disulfde
- Table with chemicals for which only one or few reports were found

Colophony / Abietic acid
CAS: 514-10-3

Publications[#]	R phrase	LLNA*	Score of publications^	Total score
41 (1)	No records	1 (Weak)	2	2

Colophony is pine resin. 90% of colophony is abietic acid. Abietic acid and dehydroabietic acid are the main allergens in colophony [1]. Colophony is derived from turpentine. Information on this last compound is also added in this document (not in the European map and timetrend graph).

The literature search was completed for abietic acid. For colophony, no full literature search was performed, although a lot of reports were found that studied this compound. These are discussed here.

Sources of exposure
Various sources of exposure to colophony and abietic acid have been described, such as perfume, shoes, and henna tattoos. Occupational exposure has been described in woodworkers, glueworkers, metal workers, in construction industry, dentists, hairdressers, nurses, etc.

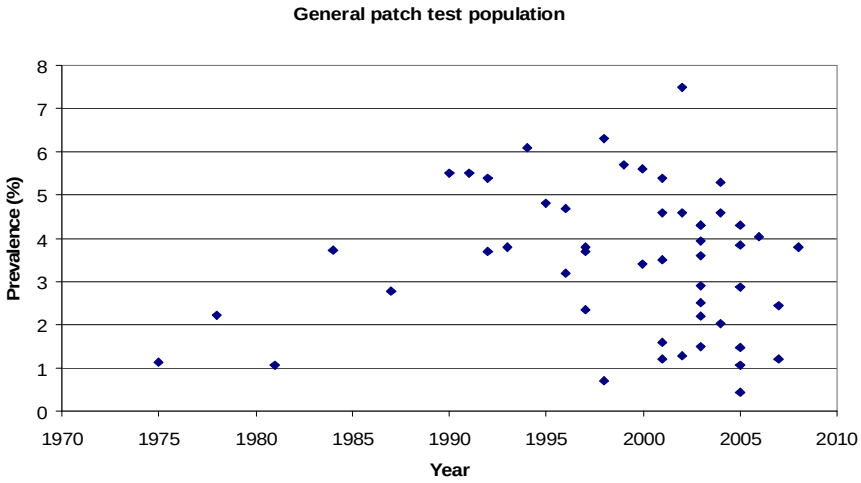
Gender
Both men and women were reported with ACD to colophony and abietic acid. One study reported a higher frequency in women [2].

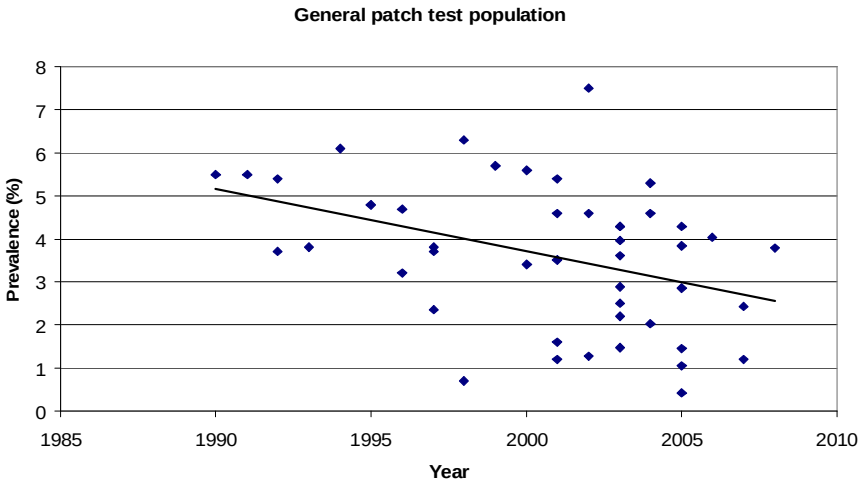
Age
Allergy to these compounds was reported in all age groups (7 months – 77 years).

Latency
Information on latency is mostly unknown. Only one case described a latency of 48 hours, after exposure to colophony in a henna tattoo.

Regional differences
Information for this compound is available for various European countries. However, none of the studies compared various countries.

Time trends
An increasing trend was reported in Bulgaria during the period 1975 – 1987 [3]. A Finnish study reported an increase in prevalence between 1995 – 1996 and 2000 – 2002 [4]. However, a Swedish study reported a decrease between 1990 and 1999 – 2001 [5]. In Belgium, a fluctuating, but generally stable trend was observed between 1990 and 2005 (data for each year available) [6].
Taken all European studies together, an increasing trend was observed until 1990 – 2000, after which a decreasing trend was observed (see graphs).





References

1. Johansen JD, Heydorn S, Menné T. Oak moss extracts in the diagnosis of fragrance contact allergy *Contact dermatitis* 2002: 46(3): 157-161.
2. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.
3. Stransky L, Krasteva M. Changing patterns of contact sensitivity in Sofia. *Dermatosen in Beruf und Umwelt* 1989: 37(6): 214-216.
4. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.
5. Lindberg M, Edman B, Fischer T, Stenberg B. Time trends in Swedish patch test data from 1992 to 2000. A multi-centre study based on age- and sex-adjusted results of the Swedish standard series. *Contact dermatitis* 2007: 56(4): 205-210.
6. Nardelli A, Carbonez A, Ottoy W, Drieghe J, Goossens A. Frequency of and trends in fragrance allergy over a 15-year period. *Contact dermatitis* 2008: 58(3): 134-141.

Cobalt chloride
CAS: 7646-79-9

Publications[#]	R phrase	LLNA*	Score of publications^	Total score
33 (11)	1 (R42/R43)	1 (Strong)	2	3

Sources of exposure
Sensitization occurs both at home and at work. Various occupational exposures are reported, such as in construction workers, hairdressers, and nurses. Exposure also occurs from shoes.

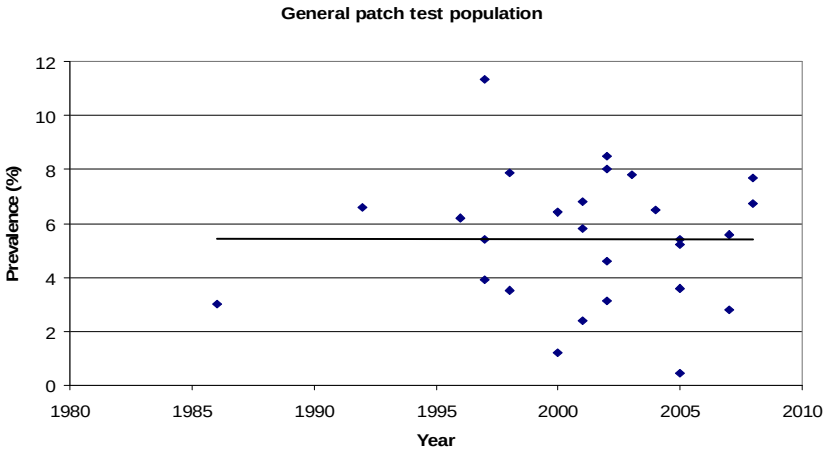
Gender
Both sexes experience allergy from cobalt chloride. One group observed higher prevalence levels in females compared to males [1].

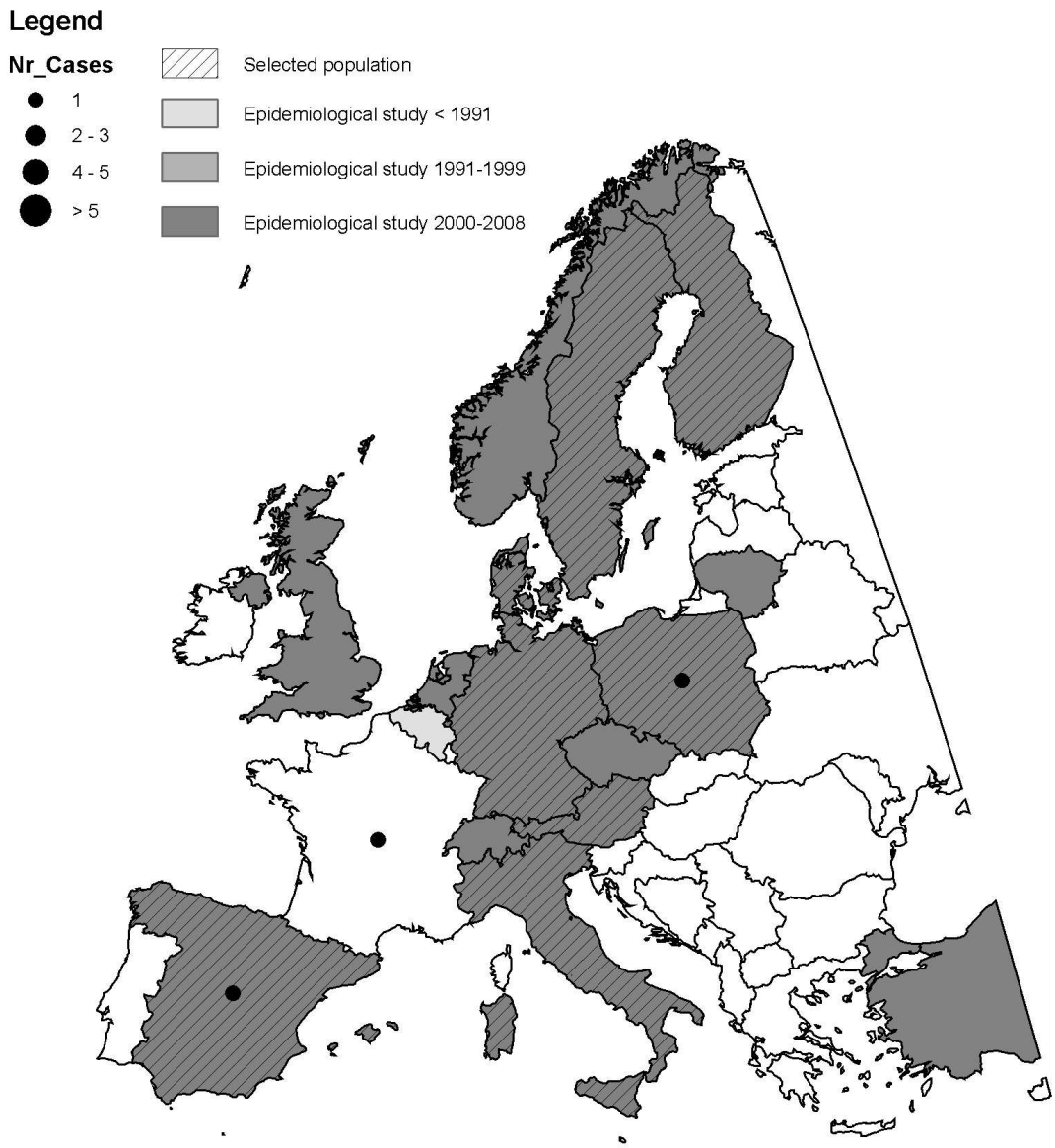
Age
Cases in all age groups have been reported.

Latency
No data on latency have been reported.

Regional differences
The European Surveillance System of Contact Allergies (ESSCA) Writing Group reported that the highest sensitization prevalence for metals could be found in Italy, while the lowest were observed in Denmark [2]. An overview of published data is shown on the map below.

Time trends
In Denmark, an increase in prevalence was observed between 1986 (3.0%) and 1998 (3.5%) [3]. In Finland, an increase was observed between 1996 (6.2%) and 2002 (6.8%) [4]. Only in Sweden, a decrease was seen between 1993 (6.6%) and 2001 (6.4%) [5].




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

References

1. Christensen JM, Poulsen OM. A 1982-1992 surveillance programme on Danish pottery painters. Biological levels and health effects following exposure to soluble or insoluble cobalt compounds in cobalt blue dyes. *The Science of the total environment* 1994: 150(1-3): 95-104.
2. The European Surveillance System of Contact Allergies (ESSCA): results of patch testing the standard series, 2004. *J Eur Acad Dermatol Venereol* 2008: 22(2): 174-181.
3. Johansen J, Menne T, Christophersen J, Kaaber K, Veien N. Changes in the pattern of sensitization to common contact allergens in denmark between 1985-86 and 1997-98, with a special view to the effect of preventive strategies. *The British journal of dermatology* 2000: 142(3): 490-495.
4. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.
5. Lindberg M, Edman B, Fischer T, Stenberg B. Time trends in Swedish patch test data from 1992 to 2000. A multi-centre study based on age- and sex-adjusted results of the Swedish standard series. *Contact dermatitis* 2007: 56(4): 205-210.

Formaldehyde
CAS: 50-00-0

Publications#	R phrase	LLNA*	Score of publications^	Total score
40 (3)	1 (R43)	1 (Strong)	2	**3**

Sources of exposure
Exposure occurs both at home and during occupation. Hair dye is often the source, but also dental personnel, nurses, and construction workers show allergies to formaldehyde.

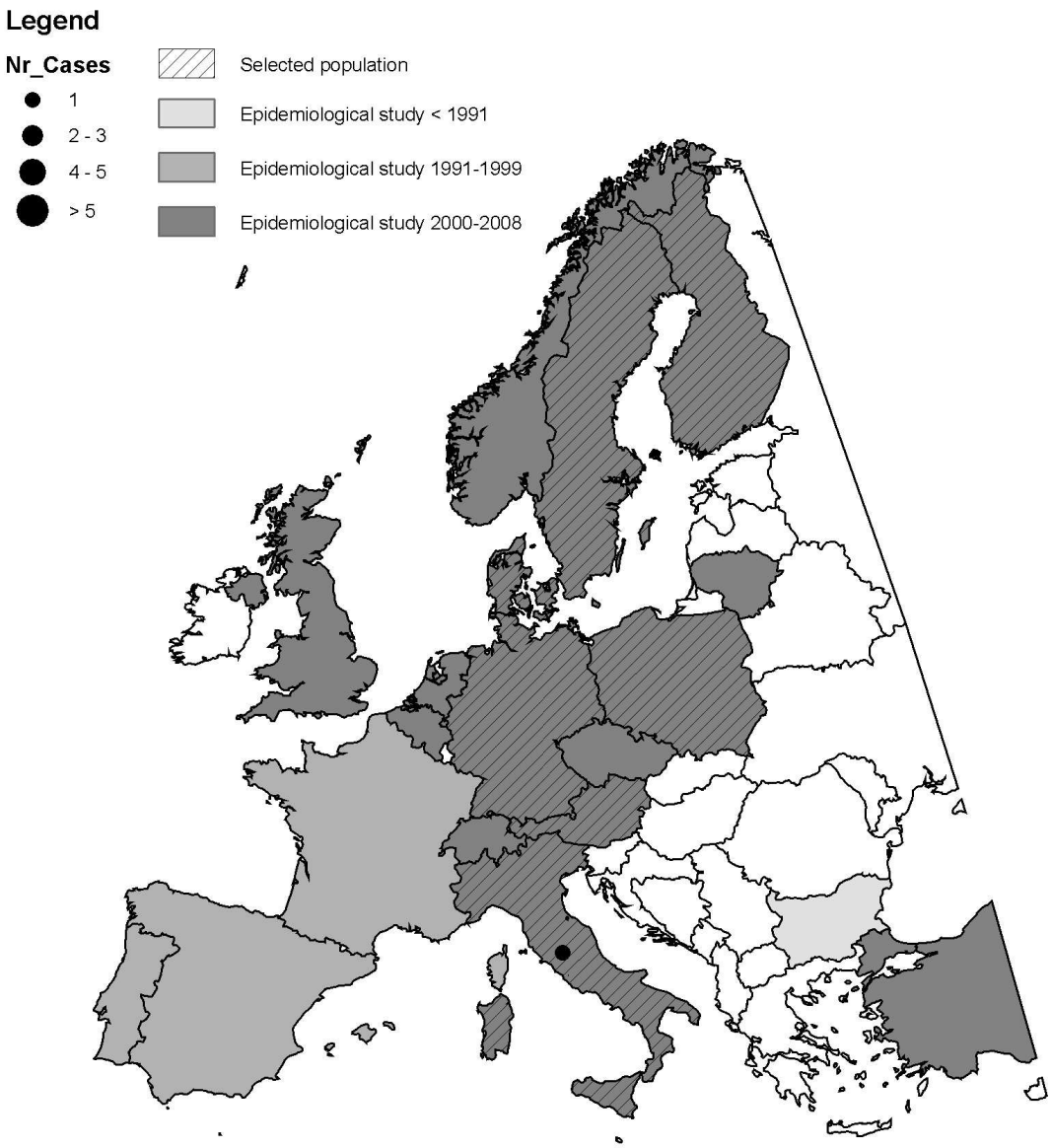
Gender
Both males and females experience allergic reactions to formaldehyde. A higher frequency was reported in women [1].

Age
Positive patch test results were found in all age groups.

Latency
Information on latency is lacking, although one case reported a reaction immediately after contact.

Regional differences
Most information is available in Germany, Italy, Denmark, Finland, and Sweden, but also other countries report allergies to formaldehyde. An overview of published data is shown on the following map.

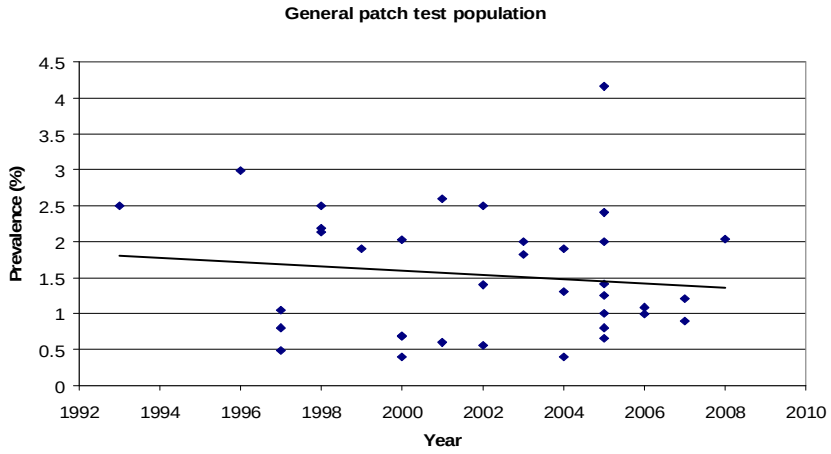
The frequency of formaldehyde is low and stable across many European countries, in a general patch test population. In Poland, the prevalence was higher in a centre with many cases of occupational dermatitis, including health care workers who were exposed to floor and instrument disinfectants [2]. However, in 2004, the percentage of positive reactions to formaldehyde dropped also in this country. This may be a first indication of decreasing role of formaldehyde in Eastern Europe as differences between Eastern and Central Europe diminish [3].


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Time trends

Since 1990, the prevalence of allergy to formaldehyde across Europe is quite stable in the general patch test population. The average value is 1.5%. One European study also showed that the frequency of formaldehyde allergy remains at a relatively low, stable level across many European countries between 1991 and 2000, at least in a general patch test population [2] [4].

An earlier study in Bulgaria reported a higher prevalence around 11% before between the years 1975 and 1987. Also in Denmark, higher prevalence rates were observed in 1985 – 1986 (3.5%) compared to 1997 – 1998 (2.5%) [5].



The prevalence is higher in occupationally exposed groups. The data for hairdressers is shown the table below. The highest prevalence numbers were reported in Poland in groups of health care workers (1998: 13.9%) and nurses (1999: 20.6%), and in Italy in a group of textile workers (2000: 12.5%).

Table Prevalence of allergy to formaldehyde in hairdressers.

Country	Total N	Positive patch test	% pos. patch test	Time period	Reference
Finland	111	6	5,4	1998	[6]
Italy	209	2	1,0	1990-1999	[7]
Germany	884	10	1,1	1995-2002	[8]
Germany	434	13	3,0	2003-2006	[9]

References

1. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.

2. Uter W, Hegewald J, Aberer W, Ayala F, Bircher AJ, Brasch J, Coenraads PJ, Schuttelaar ML, Elsner P, Fartasch M, Mahler V, Belloni Fortina A, Frosch PJ, Fuchs T, Johansen JD, Menne T, Jolanki R, Krecisz B, Kiec-Swierczynska M, Larese F, Orton D, Peserico A, Rantanen T, Schnuch A. The European standard series in 9 European countries, 2002/2003 -- first results of the European Surveillance System on Contact Allergies. *Contact dermatitis* 2005: 53(3): 136-145.

3. The European Surveillance System of Contact Allergies (ESSCA): results of patch testing the standard series, 2004. *J Eur Acad Dermatol Venereol* 2008: 22(2): 174-181.

4. Wilkinson JD, Shaw S, Andersen KE, Brandao FM, Bruynzeel DP, Bruze M, Camarasa JM, Diepgen TL, Ducombs G, Frosch PJ, Goossens A, Lachappelle JM, Lahti A, Menne T, Seidenari S, Tosti A, Wahlberg JE. Monitoring levels of preservative

sensitivity in Europe. A 10-year overview (1991-2000). *Contact dermatitis* 2002: 46(4): 207-210.
5. Johansen J, Menne T, Christophersen J, Kaaber K, Veien N. Changes in the pattern of sensitization to common contact allergens in denmark between 1985-86 and 1997-98, with a special view to the effect of preventive strategies. *The British journal of dermatology* 2000: 142(3): 490-495.
6. Leino T, Estlander T, Kanerva L. Occupational allergic dermatoses in hairdressers. *Contact dermatitis* 1998: 38(3): 166-167.
7. Iorizzo M, Parente G, Vincenzi C, Pazzaglia M, Tosti A. Allergic contact dermatitis in hairdressers: frequency and source of sensitisation. *Eur J Dermatol* 2002: 12(2): 179-182.
8. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.
9. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to hairdressing allergens in female hairdressers and clients--current data from the IVDK, 2003-2006. *J Dtsch Dermatol Ges* 2007: 5(11): 993-1001.

Fragrance mix **CAS: /**

Publications#	R phrase	LLNA *	Score of publications^	Total score
48 (1)	No records	-	2	**1**

Fragrances are a common cause of contact dermatitis. In the European standard patch test series, a mix containing various fragrances has been included. The individual compounds are discussed further in this report. Here, results from the mix are presented.

Fragrance mix I (FM I)
Cinnamic alcohol
Cinnamic aldehyde
Alpha-amyl cinnamic aldehyde
Eugenol
Isoeugenol
Hydroxycitronellal
Geraniol
Oak moss absolute

Fragrance mix II (FM II)
Alpha-hexyl cinnamaldehyde
Citral
Citronellol
Farnesol
Coumarin
Hydroxymethylpentylcyclohexenecarboxaldehyde (lyral)

This document will not include all European reports on fragrance allergies. No complete literature search was performed.

Sources of exposure
Fragrances are present in various consumer products.

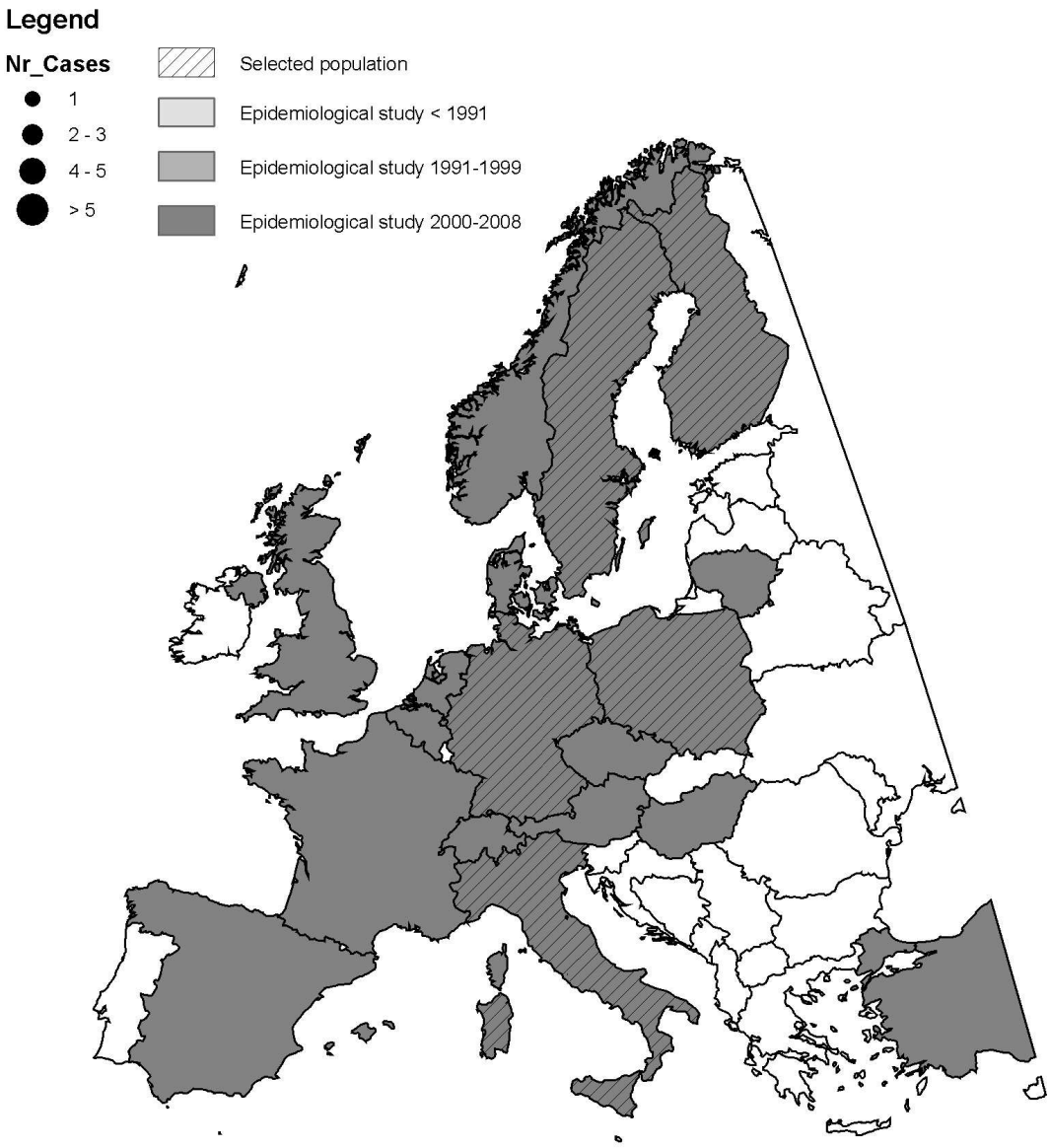
Gender
Fragrance allergy is more present in females compared to males [1].

Age
Fragrance allergy occurs in all age groups. A Belgian study showed that positive reaction occur most frequently in the age range 20 – 50 years. A peak for women was found between age 20 and 40 years, for men between 40 and 60 [1].
A German study observed a higher prevalence in the age group 60 – 66 years, compared to 13 – 18 year-olds and 6 – 12 year-olds [2].

Latency
No information on latency available.

Regional differences
In 2005, a study in 6 European centra was performed: Belgium, Germany, Sweden, UK, and two in Denmark [3]. This study shows that in Germany, the UK, and one centre in Denmark, the prevalence of fragrance allergies (both FM I and II) was lower than in Belgium, Sweden, and the second centre in Denmark during the year 2005.

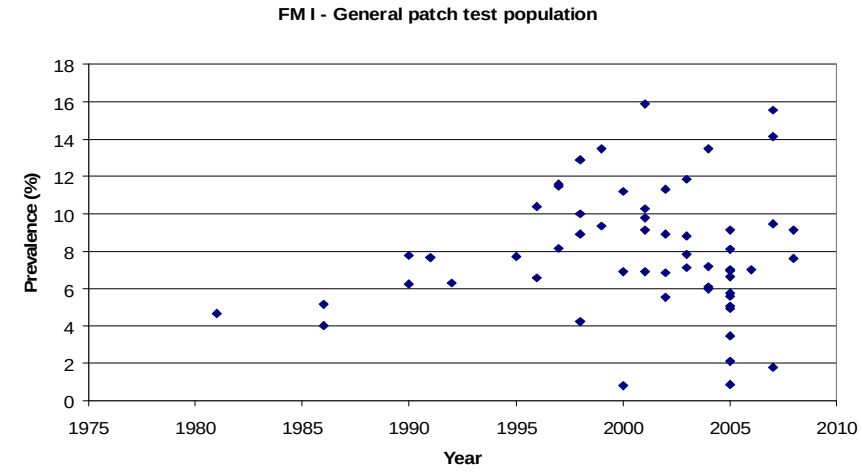
Studies were performed in various European countries, as indicated in the following map.

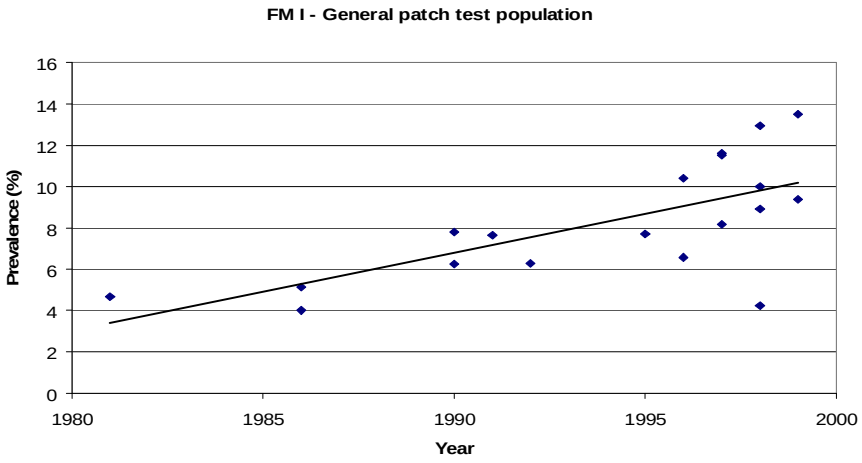


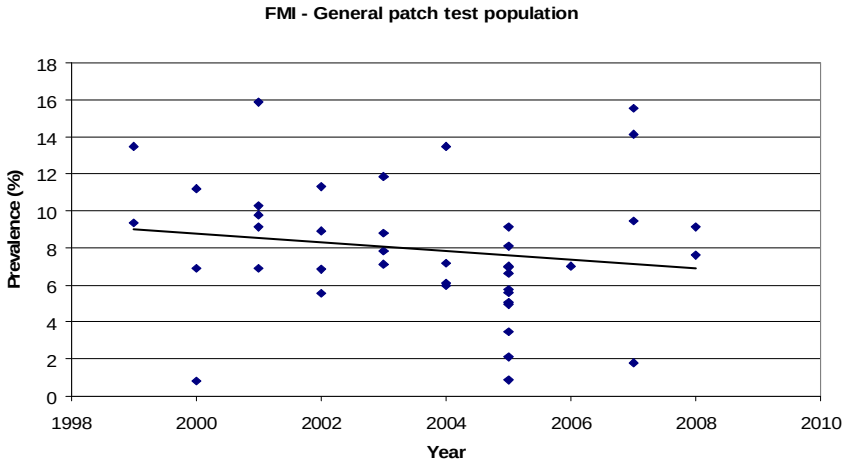
Time trends

Concerning the trends in the fragrance sensitivity rate, a fluctuating trend, either increasing or decreasing, was observed in Belgium. For FM I, the frequency was highest from 1998 to 2000 and has then decreased in recent years [1]. In Germany, prevalence increased until 1999, after which a decrease was observed [4]. This can also be concluded when all European studies are taken together (see graph).

In Denmark, an increasing trend was found between 1979 and 1992 [5], and between 1986 and 1998 [6]. In Sweden, an increase was observed between the periods 1991 – 1993 and 1999 – 2001 [7]. In Finland, a small increase was observed between 1996 and 2000 – 2002 [8].In the UK, one study reported an increasing trend between 1985 and 2005 [9], while another study reported an almost constant percentage in the period 1980 – 1996 [10].







References

1. Nardelli A, Carbonez A, Ottoy W, Drieghe J, Goossens A. Frequency of and trends in fragrance allergy over a 15-year period. *Contact dermatitis* 2008: 58(3): 134-141.
2. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.
3. Frosch PJ, Pirker C, Rastogi SC, Andersen KE, Bruze M, Svedman C, Goossens A, White IR, Uter W, Arnau EG, Lepoittevin JP, Menne T, Johansen JD. Patch testing with a new fragrance mix detects additional patients sensitive to perfumes and missed by the current fragrance mix. *Contact dermatitis* 2005: 52(4): 207-215.
4. Schnuch A, Lessmann H, Geier J, Frosch PJ, Uter W. Contact allergy to fragrances: frequencies of sensitization from 1996 to 2002. Results of the IVDK*. *Contact dermatitis* 2004: 50(2): 65-76.
5. Johansen JD, Menne T. The fragrance mix and its constituents: a 14-year material. *Contact dermatitis* 1995: 32(1): 18-23.
6. Johansen J, Menne T, Christophersen J, Kaaber K, Veien N. Changes in the pattern of sensitization to common contact allergens in denmark between 1985-86 and 1997-98, with a special view to the effect of preventive strategies. *The British journal of dermatology* 2000: 142(3): 490-495.
7. Lindberg M, Edman B, Fischer T, Stenberg B. Time trends in Swedish patch test data from 1992 to 2000. A multi-centre study based on age- and sex-adjusted results of the Swedish standard series. *Contact dermatitis* 2007: 56(4): 205-210.
8. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.
9. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.
10. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

MCI/MI
CAS: 26172-55-4/ 2682-20-4

Publications#	R phrase	LLNA*	Score of publications^	Total score
44 (30)	No records	1 (Extreme)	2	**2**

MCI: 5-chloro-2-methyl-4-isothiazolinone; methylchloroisothiazolinone
MI: 2-methyl-4-isothiazolinone; methylisothiazolinone
MCI/MI = Kathon CG

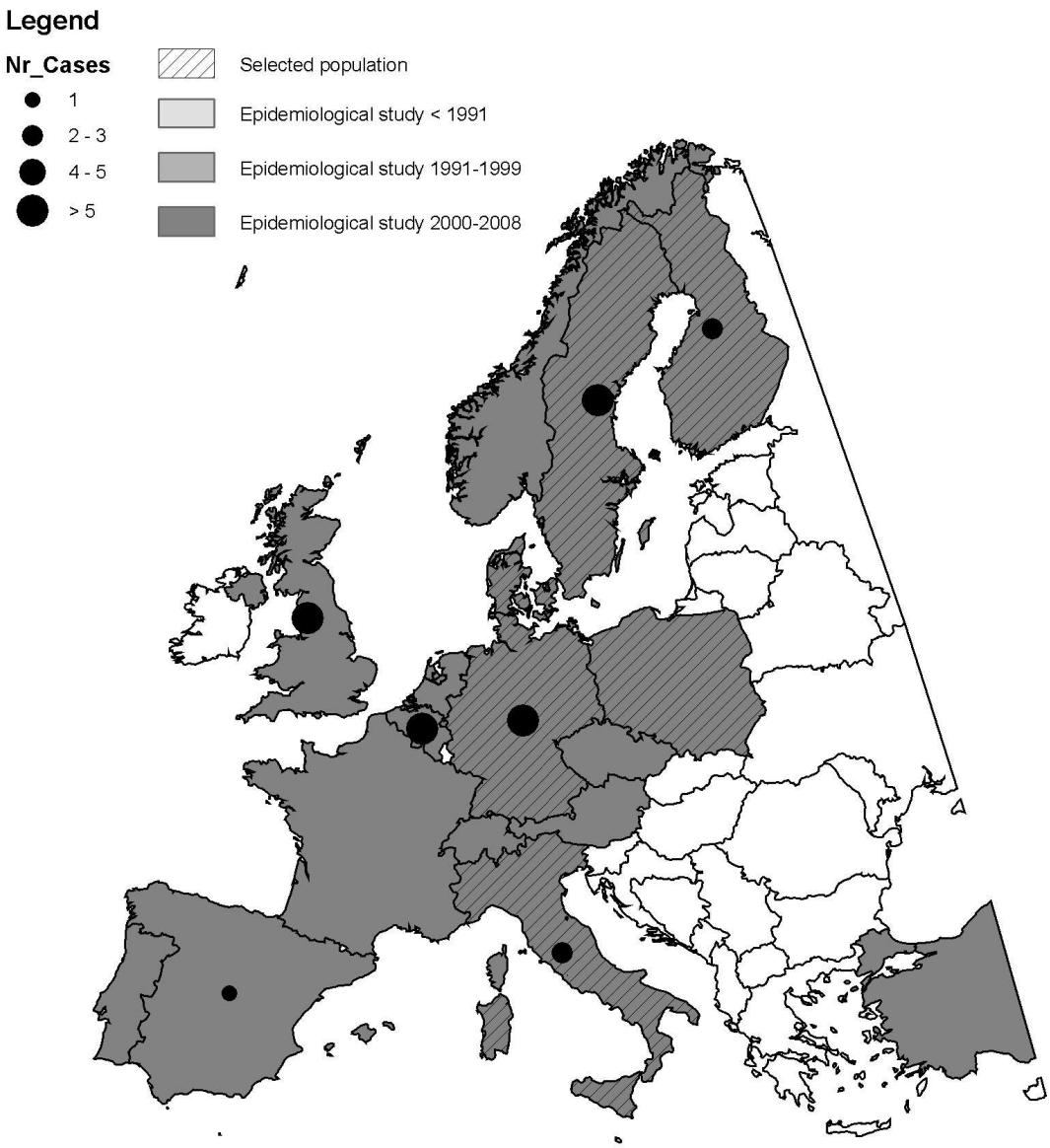
Sources of exposure
Exposure occurs often via cosmetic products or paint, both at home and during work.

Gender
Cases are described both in males and in females. Women are more often sensitized to MCI/MI [1] [2].

Age
Allergic reactions to MCI/MI have been described in all age groups, starting from 4 months old, to 77 years old. More positive patch tests were observed in children [3].

Latency
When latency is reported, symptoms are present immediately after exposure, or start maximum 2 days after the exposure.

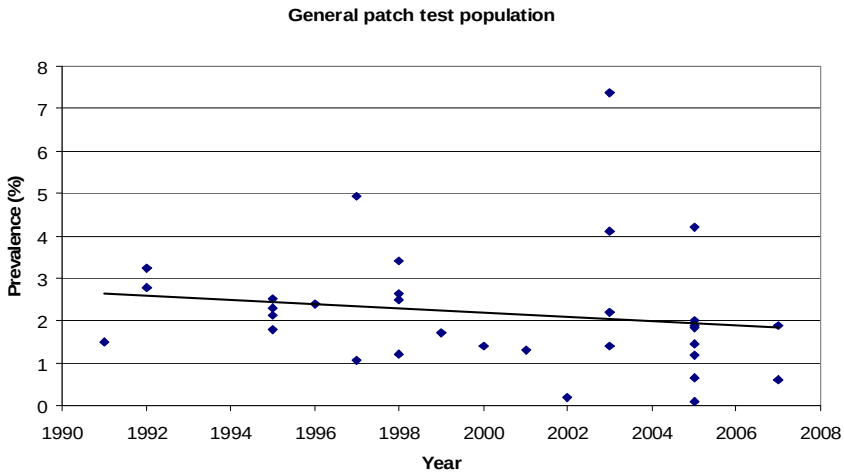
Regional differences
In Western countries, MCI/MI is not infrequently associated with occupational exposure. In Eastern Europe, this product (biocide) is rarely used in industry, and less or none sensitizations are reported there. Only in Poland, a high proportion of occupational cases is reported [4].


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Time trends

A Finnish study observed a significant decrease in prevalence levels between 1996 (2.4%) and 2002 (1.3%) [5].

Taking all European studies into account (see figure), a decrease is also observed. It can only be speculated that the restriction of MCI/MI use in cosmetics regulated by the European legislation or the introduction of the new preservative MDBGN explains this decrease [5]. Between 1991 and 2000, a stable trend was reported in Europe (prevalence of 2.0 – 2.5%) [6]. These values do not exceed the values for other preservatives [7].



Sensitization to MCI/MI in hairdressers is shown in the table below. But also in dentists, dental personnel, construction workers, and painters, positive patch tests were observed.

Table Prevalence of allergy to formaldehyde in hairdressers.

Country	Total N	Positive patch test	% pos. patch test	Time period	Reference
Finland	32	2	6,3	1998	[8]
Italy	209	5	2,4	1990-1999	[9]
Germany	884	30	3,4	1995-2002	[10]
Germany	440	18	4,1	2003-2006	[11]

References

1. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.

2. Jong CT, Statham BN, Green CM, King CM, Gawkrodger DJ, Sansom JE, English JS, Wilkinson SM, Ormerod AD, Chowdhury MM. Contact sensitivity to preservatives in the UK, 2004-2005: results of multicentre study. *Contact dermatitis* 2007: 57(3): 165-168.

3. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.

4. Uter W, Hegewald J, Aberer W, Ayala F, Bircher AJ, Brasch J, Coenraads PJ, Schuttelaar ML, Elsner P, Fartasch M, Mahler V, Belloni Fortina A, Frosch PJ, Fuchs T,

Johansen JD, Menne T, Jolanki R, Krecisz B, Kiec-Swierczynska M, Larese F, Orton D, Peserico A, Rantanen T, Schnuch A. The European standard series in 9 European countries, 2002/2003 -- first results of the European Surveillance System on Contact Allergies. *Contact dermatitis* 2005: 53(3): 136-145.
5. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.
6. Wilkinson JD, Shaw S, Andersen KE, Brandao FM, Bruynzeel DP, Bruze M, Camarasa JM, Diepgen TL, Ducombs G, Frosch PJ, Goossens A, Lachappelle JM, Lahti A, Menne T, Seidenari S, Tosti A, Wahlberg JE. Monitoring levels of preservative sensitivity in Europe. A 10-year overview (1991-2000). *Contact dermatitis* 2002: 46(4): 207-210.
7. Schnuch A, Geier J, Uter W, Frosch PJ. Patch testing with preservatives, antimicrobials and industrial biocides. Results from a multicentre study. *The British journal of dermatology* 1998: 138(3): 467-476.
8. Leino T, Estlander T, Kanerva L. Occupational allergic dermatoses in hairdressers. *Contact dermatitis* 1998: 38(3): 166-167.
9. Iorizzo M, Parente G, Vincenzi C, Pazzaglia M, Tosti A. Allergic contact dermatitis in hairdressers: frequency and source of sensitisation. *Eur J Dermatol* 2002: 12(2): 179-182.
10. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.
11. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to hairdressing allergens in female hairdressers and clients--current data from the IVDK, 2003-2006. *J Dtsch Dermatol Ges* 2007: 5(11): 993-1001.

Methyldibromo glutaronitrile (MDBGN)
CAS: 35691-65-7

Publications#	R phrase	LLNA*	Score of publications^	Total score
49 (19)	1 (R43)	1 (Strong)	2	**3**

Euxyl K 400 is a cosmetic preservative, consisting of a mixture of MDBGN (20%) and 2-phenoxyethanol (80%; CAS 122-99-6), introduced as a replacement for MCI/MI. MDBGN and 2-phenoxyethanol are reported together in this file, although most studies only report on MDBGN. 2-phenoxyethanol is regarded as a very infrequent sensitizer [1].

Sources of exposure
MDBGN is often used as a preservative in various cosmetics and consumer products. Exposure occurs both at home, as during work (hairdressers, but also metal workers).

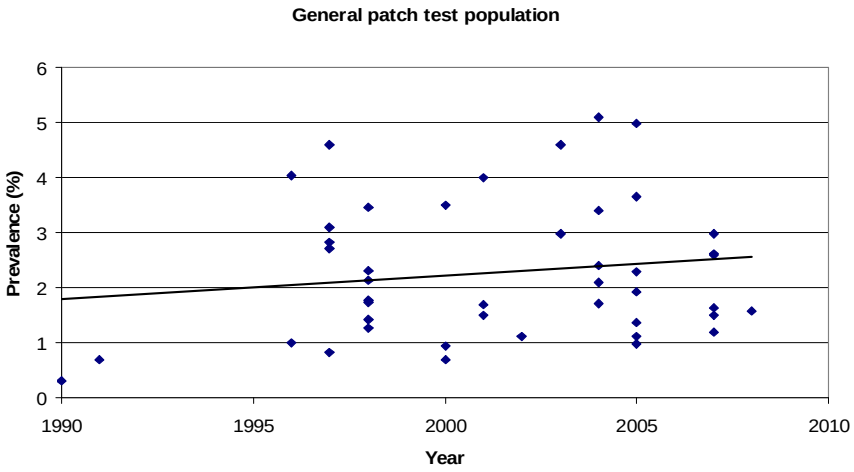
Gender
Cases are reported both in males and in females.

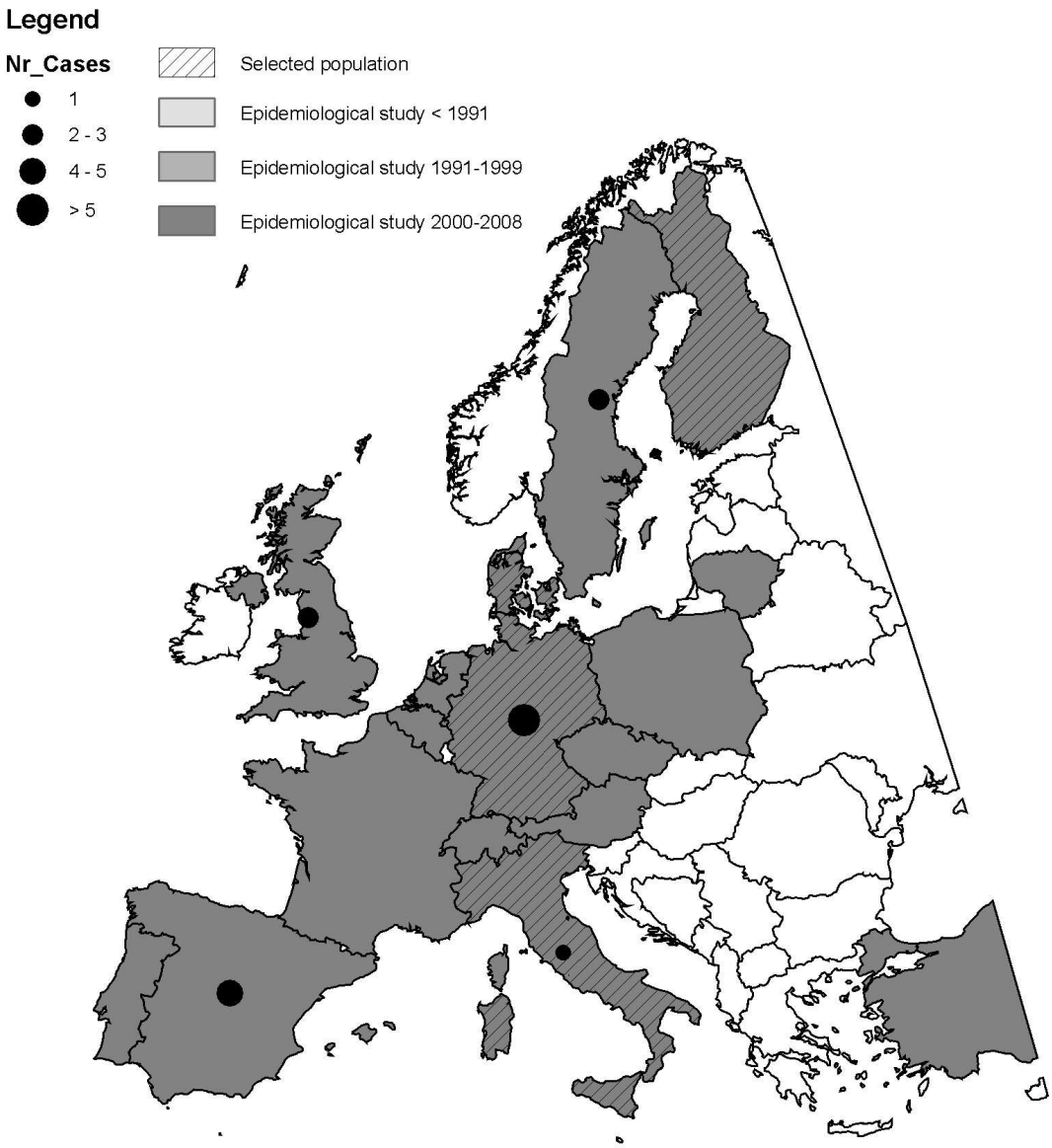
Age
Sensitization reactions are reported in all age groups (7 months – 69 years). Prevalence is higher in the older age group [2].

Latency
There is not much information about latency or duration of exposure. Latency from immediately until 1 day have been reported.

Regional differences
Data for MDBGN were found in various European countries, as indicated in the map below.

Time trends
Various reports indicate a (dramatic) increase in allergies caused by MDBGN before the year 2000 [3] [4]. All studies together are shown in the following graph, where this increasing trend is indicated. However, MDBGN has been banned from stay-on products in 2003. In 2005, its use has been limited in rinse-off products, and this was banned in 2007 [5]. The last years, a decrease can be seen in the prevalence values. This is also published recently [5].
When the test concentration is known, only those in 0.3% pet are included in the graph. However, this is not found for all studies. Both data for MDBGN and MDBGN and 2-phenoxyethanol are included in the graph, since 2-phenoxyethanol is an infrequent sensitizer. When only MDBGN data are used, the trend is the same.


General patch test population
Prevalence (%)
0
1
2
3
4
5
6
1990
1995
2000
2005
2010
Year


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

References

1. The European Surveillance System of Contact Allergies (ESSCA): results of patch testing the standard series, 2004. *J Eur Acad Dermatol Venereol* 2008: 22(2): 174-181.
2. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.
3. Wilkinson JD, Shaw S, Andersen KE, Brandao FM, Bruynzeel DP, Bruze M, Camarasa JM, Diepgen TL, Ducombs G, Frosch PJ, Goossens A, Lachappelle JM, Lahti A, Menne T, Seidenari S, Tosti A, Wahlberg JE. Monitoring levels of preservative sensitivity in Europe. A 10-year overview (1991-2000). *Contact dermatitis* 2002: 46(4): 207-210.
4. Banerjee P, McFadden JP, Ross JS, Rycroft RJ, White IR. Increased positive patch test reactivity to methyldibromo glutaronitrile. *Contact dermatitis* 2003: 49(2): 111-113.
5. Johansen JD, Veien N, Laurberg G, Avnstorp C, Kaaber K, Andersen KE, Paulsen E, Sommerlund M, Thormann J, Nielsen NH, Vissing S, Kristensen O, Kristensen B, Agner T, Menne T. Decreasing trends in methyldibromo glutaronitrile contact allergy--following regulatory intervention. *Contact dermatitis* 2008: 59(1): 48-51.

Nickel sulfate
CAS: 7786-81-4

Publications#	R phrase	LLNA*	Score of publications^	Total score
47 (13)	1 (R42/R43)	1 (Moderate)	2	**3**

Sources of exposure
Exposure to nickel sulfate is very common, and occurs both at home and during work.

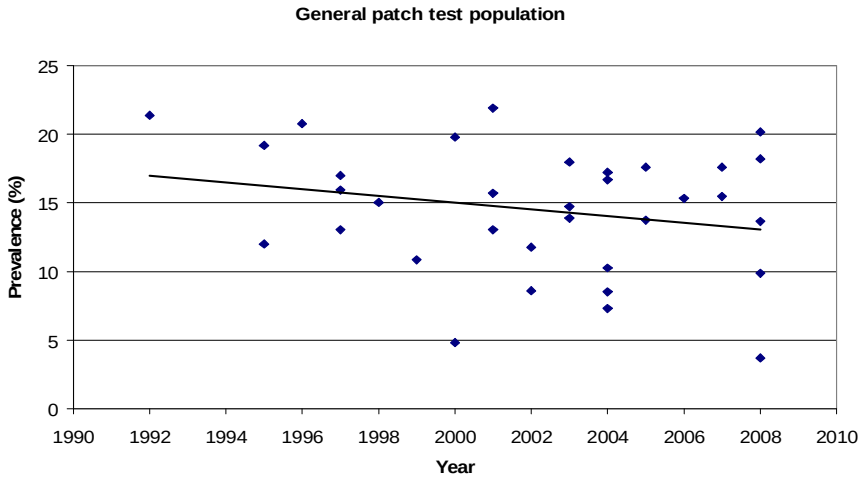
Gender
Contact dermatitis to nickel sulfate is common in both sexes. Significantly more allergies were reported in women [1] [2] [3].

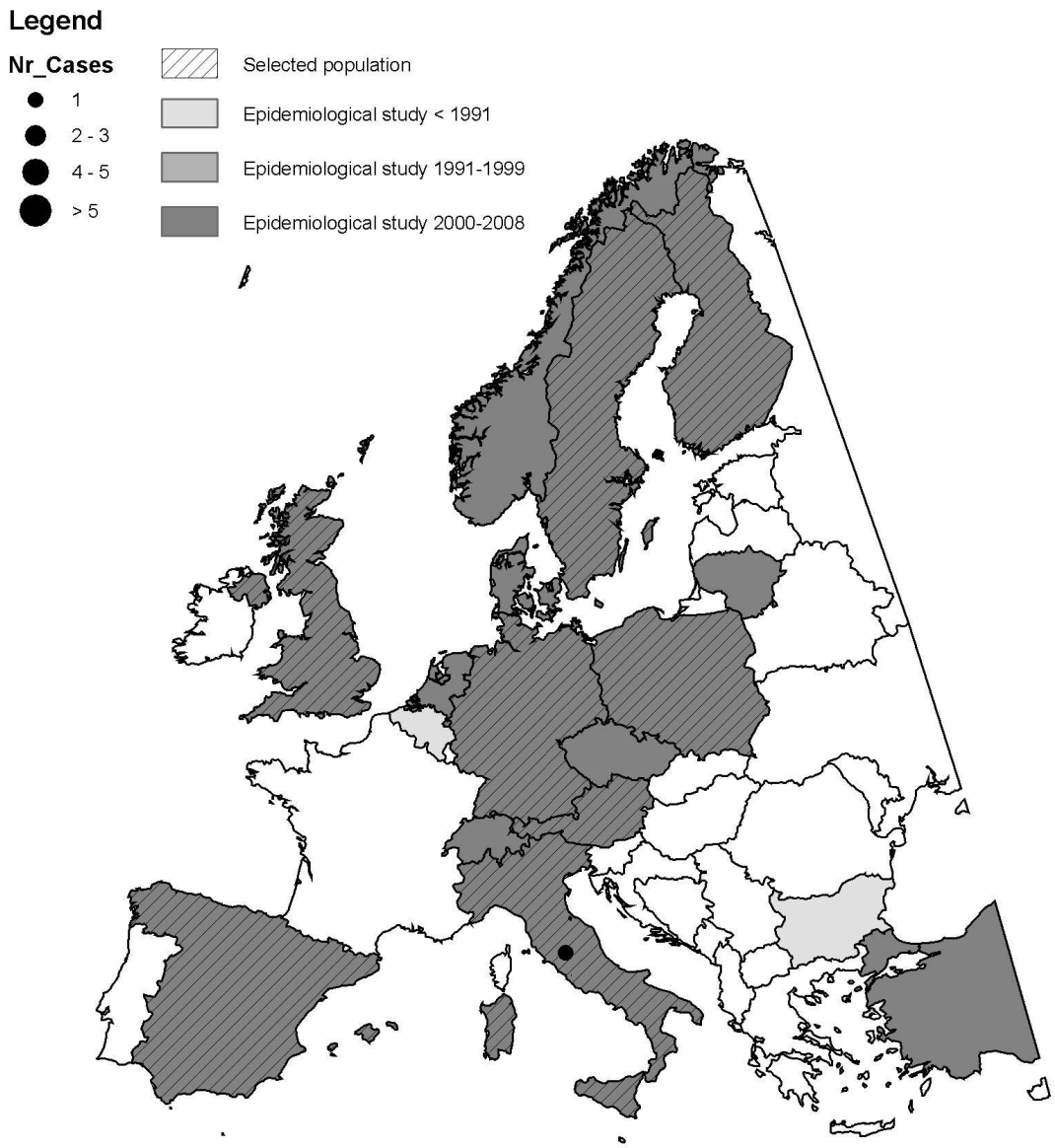
Age
Allergies to nickel sulfate are reported in the whole population: from infants age 7 months to older people age 89 years.

Latency
Only one case report described a latency period of 1 day.

Regional differences
Data are reported in large parts of Europe, as shown on the map below.

Time trends
The prevalence to nickel allergy is high. The average value since 1990 is 14.5%. Before 1990, an increasing trend in nickel allergies was reported in Bulgaria [4]. Also in Italy, significant higher concentrations were reported in 1995 – 2001 compared to 1988 – 1994 [5]. Overall, a decreasing trend in seen since 1990 (see graph). However, an increase was reported in Finland between 1995 – 1996 (20.8%) and 2000 – 2002 (21.9%) [6].




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

References

1. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.
2. Mortz CG, Lauritsen JM, Bindslev-Jensen C, Andersen KE. Nickel sensitization in adolescents and association with ear piercing, use of dental braces and hand eczema. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis (TOACS). *Acta Derm Venereol* 2002: 82(5): 359-364.
3. Fors R, Persson M, Bergström E, Stenlund H, Stymne B, Stenberg B. Nickel allergy; prevalence in a population of Swedish youths from patch test and questionnaire data. *Contact dermatitis* 2008: 58(2): 80-87.
4. Stransky L, Krasteva M. Changing patterns of contact sensitivity in Sofia. *Dermatosen in Beruf und Umwelt* 1989: 37(6): 214-216.
5. Seidenari S, Giusti F, Pepe P, Mantovani L. Contact sensitization in 1094 children undergoing patch testing over a 7-year period. *Pediatric dermatology* 2005: 22(1): 1-5.
6. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.

para-Phenylenediamine (PPD)
CAS: 106-50-3

Publications#	R phrase	LLNA*	Score of publications^	Total score
79 (16)	1 (R43)	1 (Strong)	2	**3**

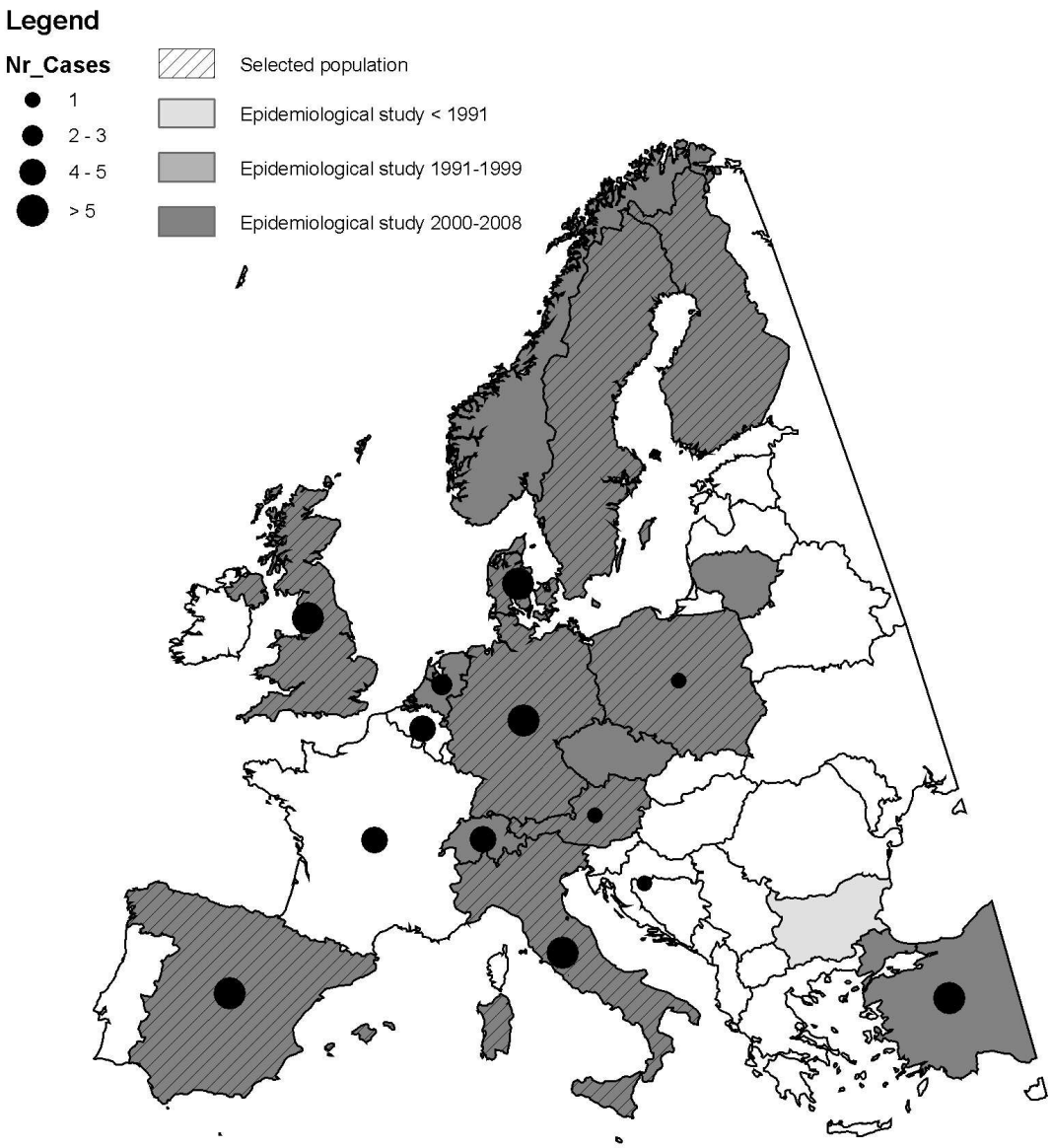
Sources of exposure
Most of the exposures occured at home, and are caused especially from contact with henna tattoos and hair dye. Occupational exposure was reported especially in hairdressers, but also in dental personnel, cleaners, and construction workers.

Gender
Both males and females were allergic to PPD after contact, although prevalence was higher in females, probably because woman more often use hair dye.

Age
Allergy for this chemical occurs in all age groups. We found cases from 3 to 96 years old. Prevalence of allergic reactions to PPD is higher in older individuals [1]. A problem here is that children are often exposed to this chemical at an early age when taking a henna tattoo on holidays. Although various cases were reported, especially after repainting the tattoo, many of them don't experience an allergic reaction at the time, but become sensitized because of the high concentrations used. When they come in contact with the chemical later, for exemple via hair dyes, in which much lower concentrations are present, they experience symptoms immediately or after some repeated contacts.

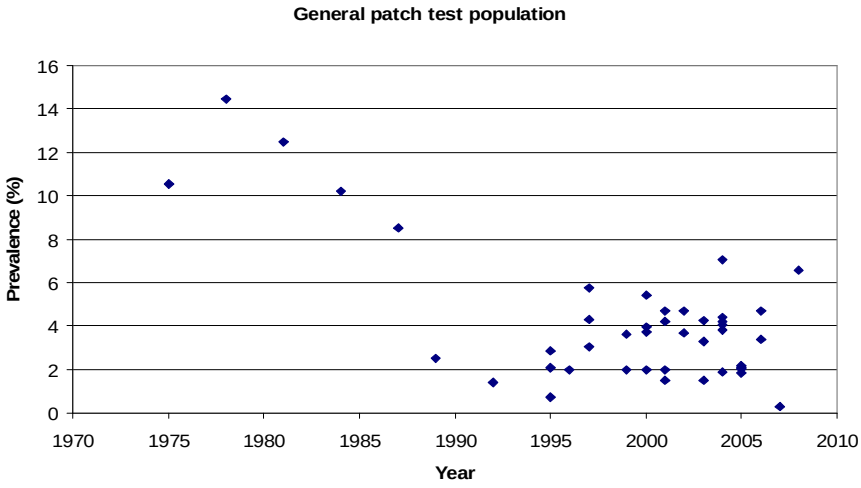
Latency
Latency varies between immediately and 10 days.

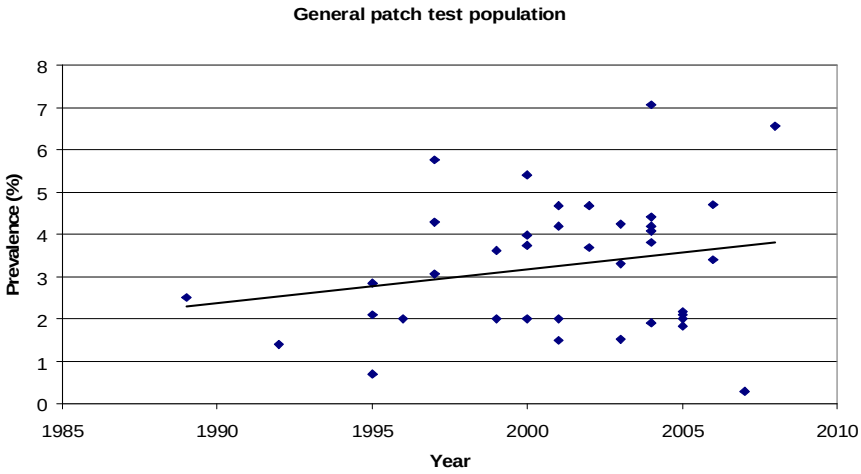
Regional differences
Data were found for a lot of European countries (see map). Additionally, some European studies were found.


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

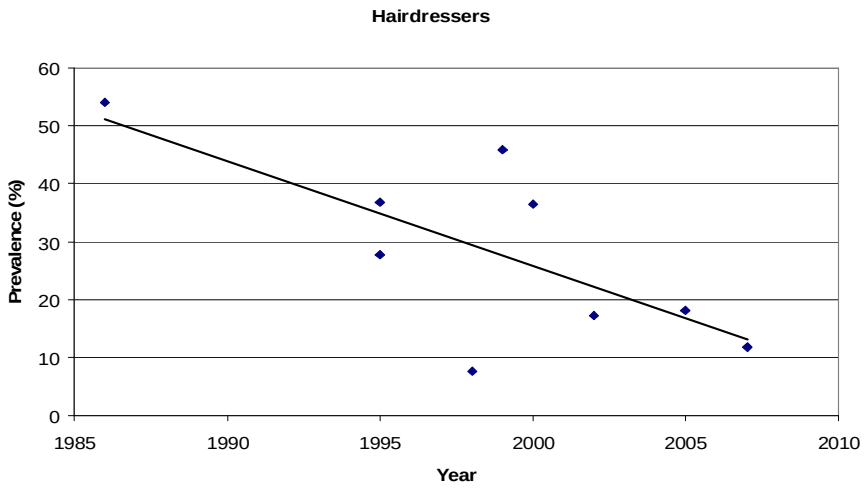
Time trends

Some of the studies performed repeated analysis and reported already time trends. Prevalence of allergic reactions in the general populations, especially caused by using hair dyes at home, is increasing. Before 1990, a decreasing trend was observed in Bulgaria [2]. However, recent studies report an increasing trend [3] [4] [5], which is also seen taking all European studies together (graph).





In hairdressers (occupational exposure), a decreasing trend is observed. This has been described in some reports, and also taking all reports together, this trend is clear. This can possibly be explained by efforts made to inform the hairdressers about the risks, to learn them preventive actions to avoid contact with the hair dyes.



References

1. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.
2. Stransky L, Krasteva M. Changing patterns of contact sensitivity in Sofia. *Dermatosen in Beruf und Umwelt* 1989: 37(6): 214-216.
3. Thyssen JP, Carlsen BC, Sosted H, Menne T, Johansen JD. Frequency of p-phenylenediamine sensitization among Danish eczema patients tested between 1985 and 2007. *Contact dermatitis* 2008: 59(3): 184-185.
4. Patel S, Basketter DA, Jefferies D, White IR, Rycroft RJ, McFadden JP, Ho SY. Patch test frequency to p-phenylenediamine: follow up over the last 6 years. *Contact dermatitis* 2007: 56(1): 35-37.
5. Lindberg M, Edman B, Fischer T, Stenberg B. Time trends in Swedish patch test data from 1992 to 2000. A multi-centre study based on age- and sex-adjusted results of the Swedish standard series. *Contact dermatitis* 2007: 56(4): 205-210.

Potassium dichromate
CAS: 7778-50-9

Publications#	R phrase	LLNA*	Score of publications^	Total score
36 (17)	1 (R42/R43)	1 (Extreme)	2	**3**

Sources of exposure
Exposure occurs via shoes. During work, exposure is possible via cement, in construction workers, and in dental personnel. In the years 1992 – 2000, the prevalence was found to be significantly higher in German construction workers (20%) compared to the general patch test population [1].

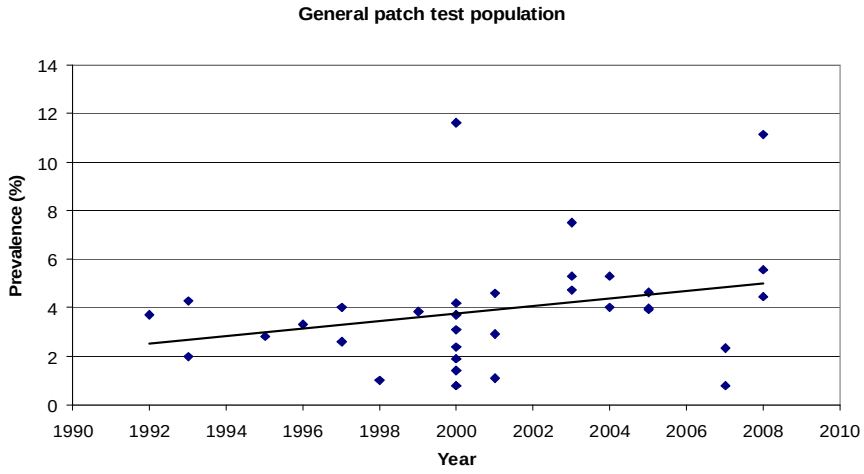
Gender
Both sexes experience contact dermatitis caused by potassium dichromate, but prevalence is higher in men [2].

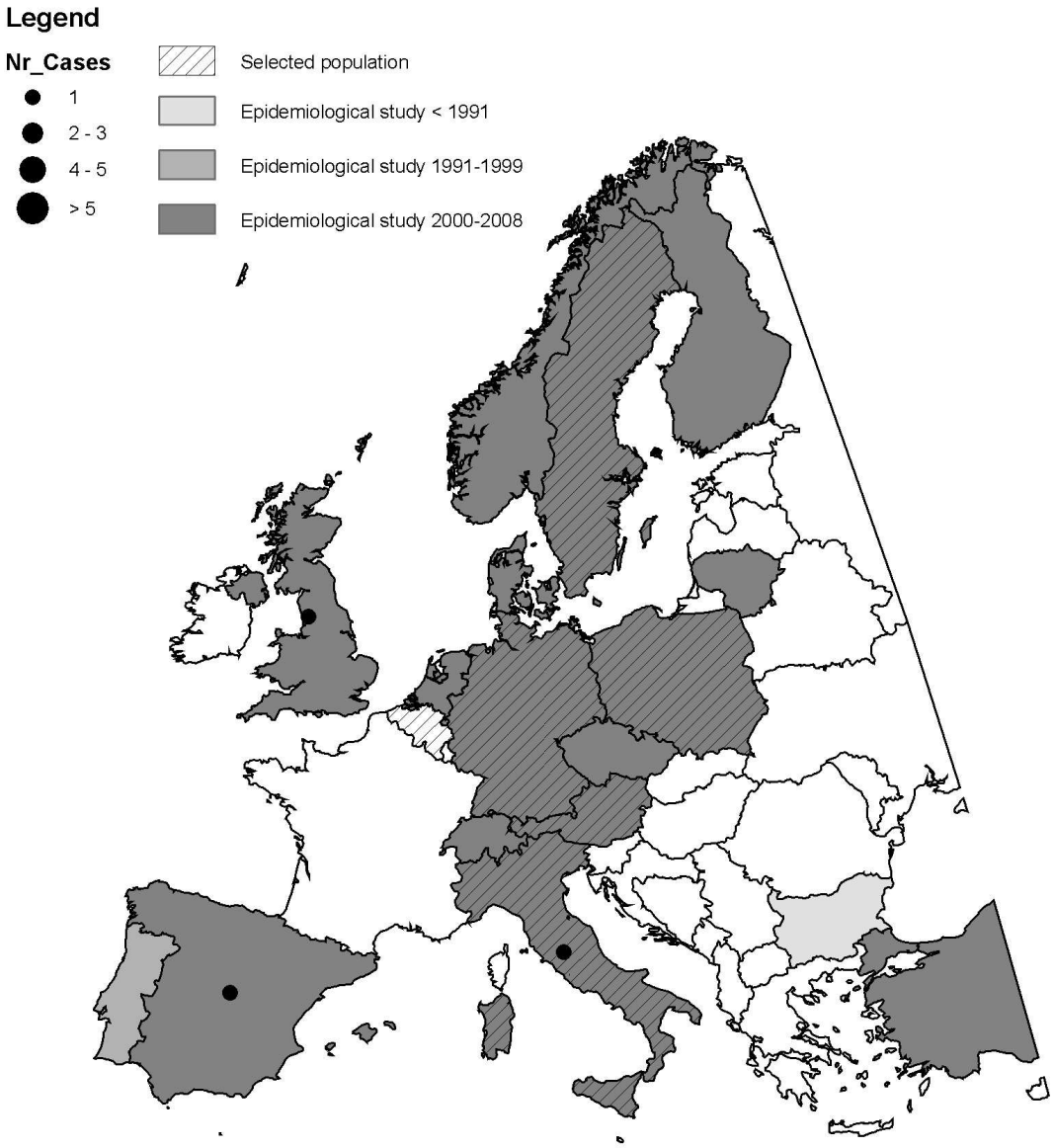
Age
Contact allergy to potassium dichromate is reported in children as young as 7 months, and in people of 86 years old.

Latency
There is no information available concerning latency or duration of the symptoms in the reports used for this report.

Regional differences
Contact dermatitis caused by potassium dichromate is evaluated in some European studies. Cases are not reported very often.

Time trends
Increasing prevalences were reported for various countries, such as Bulgaria (1975 – 1985) [3], Denmark (1986 – 1998) [4], and Italy (1994 – 2001) [5]. However, in Finland, a decrease was observed (1996 – 2002) [6]. Taken all available studies together, an increasing trend is found since 1990.




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

References

1. Uter W, Ruhl R, Pfahlberg A, Geier J, Schnuch A, Gefeller O. Contact allergy in construction workers: results of a multifactorial analysis. *The Annals of occupational hygiene* 2004: 48(1): 21-27.
2. Olsavszky R, Rycroft RJ, White IR, McFadden JP. Contact sensitivity to chromate: comparison at a London contact dermatitis clinic over a 10-year period. *Contact dermatitis* 1998: 38(6): 329-331.
3. Stransky L, Krasteva M. Changing patterns of contact sensitivity in Sofia. *Dermatosen in Beruf und Umwelt* 1989: 37(6): 214-216.
4. Johansen J, Menne T, Christophersen J, Kaaber K, Veien N. Changes in the pattern of sensitization to common contact allergens in denmark between 1985-86 and 1997-98, with a special view to the effect of preventive strategies. *The British journal of dermatology* 2000: 142(3): 490-495.
5. Seidenari S, Giusti F, Pepe P, Mantovani L. Contact sensitization in 1094 children undergoing patch testing over a 7-year period. *Pediatric dermatology* 2005: 22(1): 1-5.
6. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.

Benzoyl peroxide / Benzoic acid
CAS: 94-36-0 / 65-85-0

Publications#	R phrase	LLNA*	Score of publications^	Total score
11 (22)	1 (R43)	1 (Strong)	2	**3**

Benzoic acid is a component of Balsam of Peru in the European Patch test series. Benzoyl peroxide breaks down in contact with skin, producing benzoic acid and oxygen [1].

Sources of exposure
The source of exposure is mostly unknown. The known places were located both at home (leg ulcers) and the workplace (construction industry and healthcare workers).

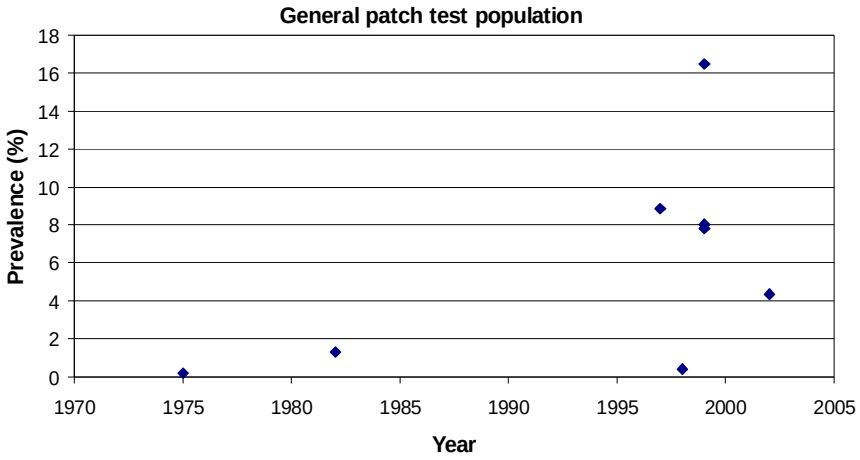
Gender
Both males and females were allergic to benzoyl peroxide.

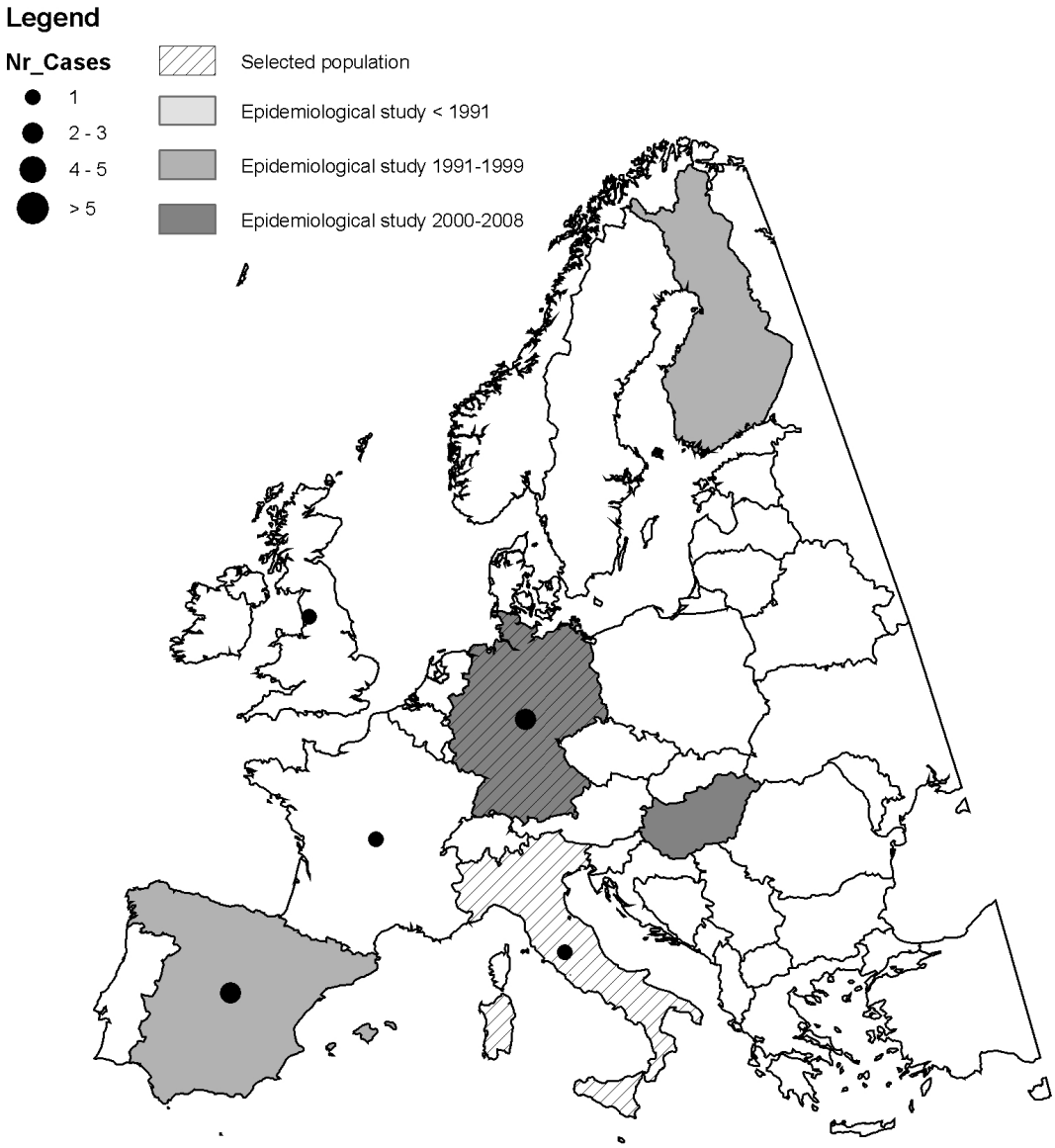
Age
Allergy for benzoyl peroxide occurs in all age groups, ranging from 6 to 66 years. In German children, more positive reactions to benzoyl peroxide were reported, compared to adolescents and adults [2].

Latency
Information on latency is lacking.

Regional differences
Most of the data were gathered in the following countries: Finland, France, Germany, Italy, Spain, and UK. On the map below, all countries are indicated were data were reported.

Time trends
There is no information on time trends. Available reports are summarized in the following graph.





References

1. Holzmann H, Morsches B, Benes P. The absorption of benzoyl peroxide from leg ulcers. *Arzneimittel-Forschung* 1979: 29(8): 1180-1183.

2. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.

Benzyl alcohol / Benzoic acid
CAS: 100-51-6 / 65-85-0

Publications#	R phrase	LLNA*	Score of publications^	Total score
7 (4)	0	1 (None/Very weak)	1	**1**

Benzoic acid is a component of Balsam of Peru in the European Patch test series.
In humans, benzyl alcohol is metabolised to benzoic acid.

Sources of exposure
Benzyl alcohol is present as a fragrance in various products such as sunscreens and hair dyes.

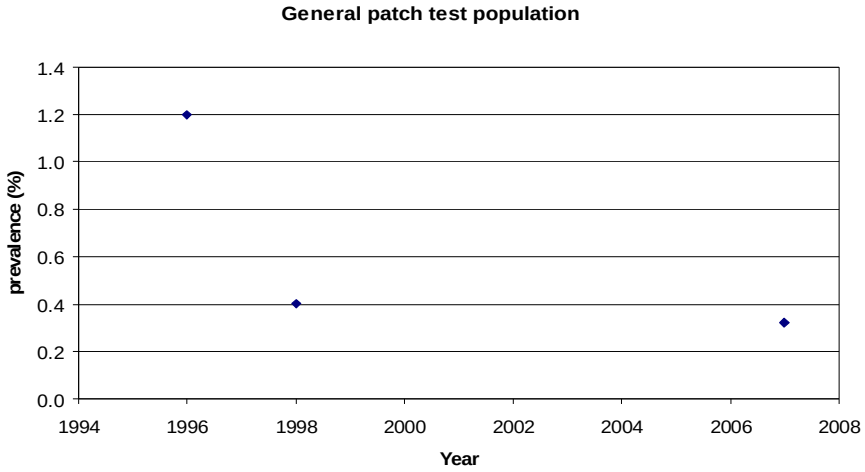
Gender
Positive patch test results have been found in both sexes.

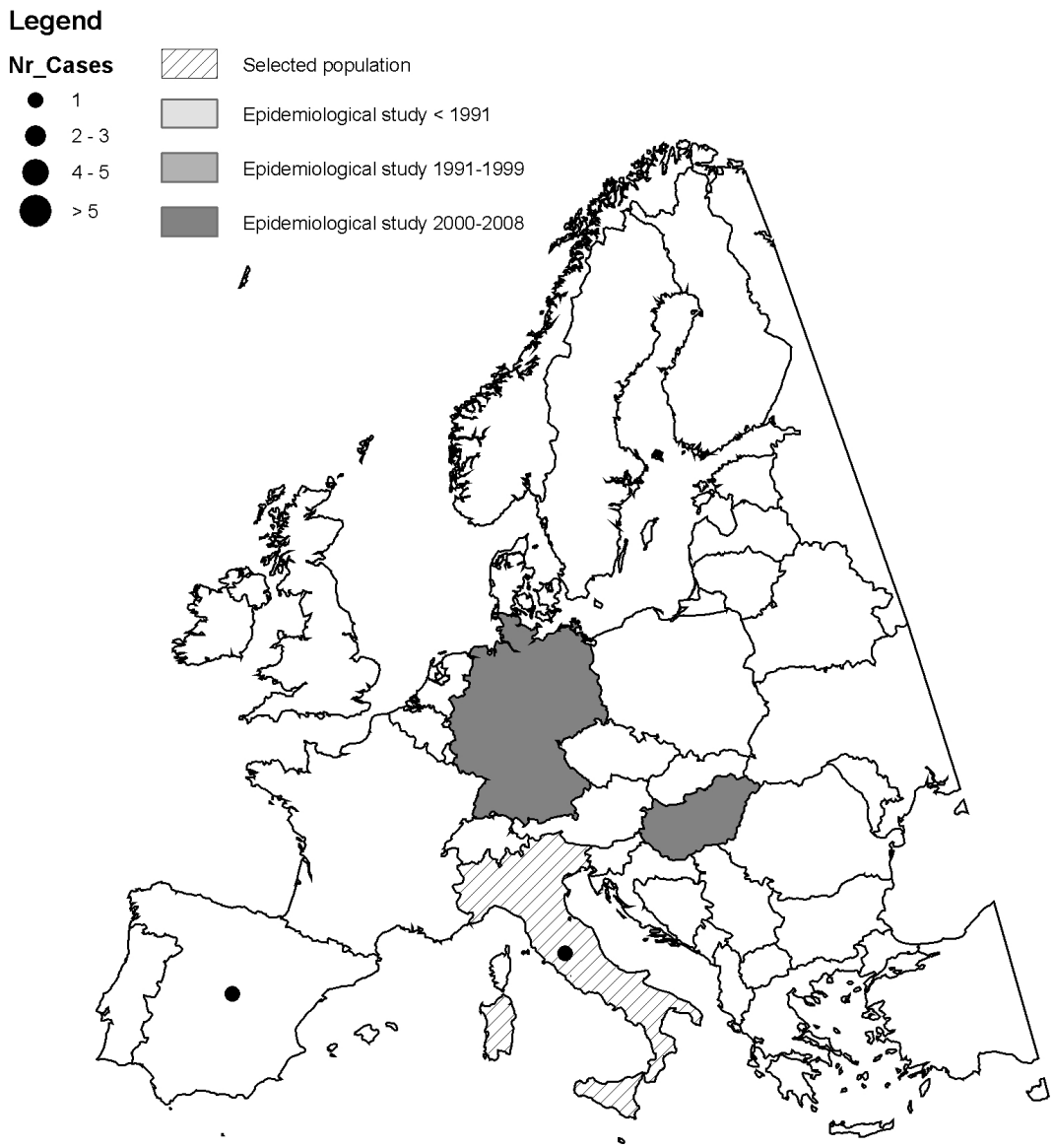
Age
All age groups have been studied.

Latency
Information on latency is lacking.

Regional differences
On the map below, all countries are indicated were data were reported.

Time trends
Prevalence values reported for Germany (0.3% in 2007 and 0.4% in 1998) were lower than worldwide values in 1996 (1.2%).




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Alpha-amyl cinnamic aldehyde / Alpha-hexyl cinnamic aldehyde
CAS: 122-40-7 / 101-86-0

Publications#	R phrase	LLNA*	Score of publications^	Total score
9 (2)	1 (R43)	1 (Weak)	2	**3**

Alpha-amyl cinnamic aldehyde is a component of the fragrance mix. Data for alpha-amyl cinnamic alcohol and alpha-hexyl cinnamic aldehyde are presented in the electronic data file together with this compound, although the results are not used in this report. Alpha-hexyl cinnamic aldehyde is also a component of the fragrance mix, but to few data are available to discuss this compound.

Sources of exposure
Exposure via fragrances in consumer products.

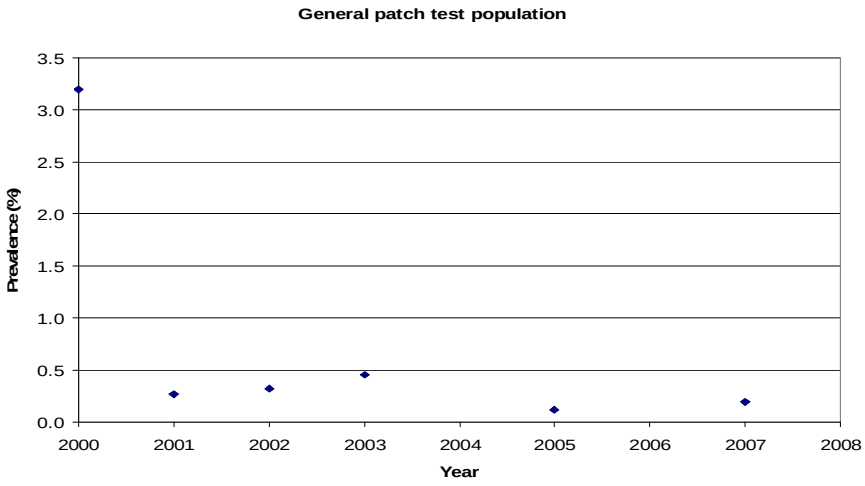
Gender
No information available.

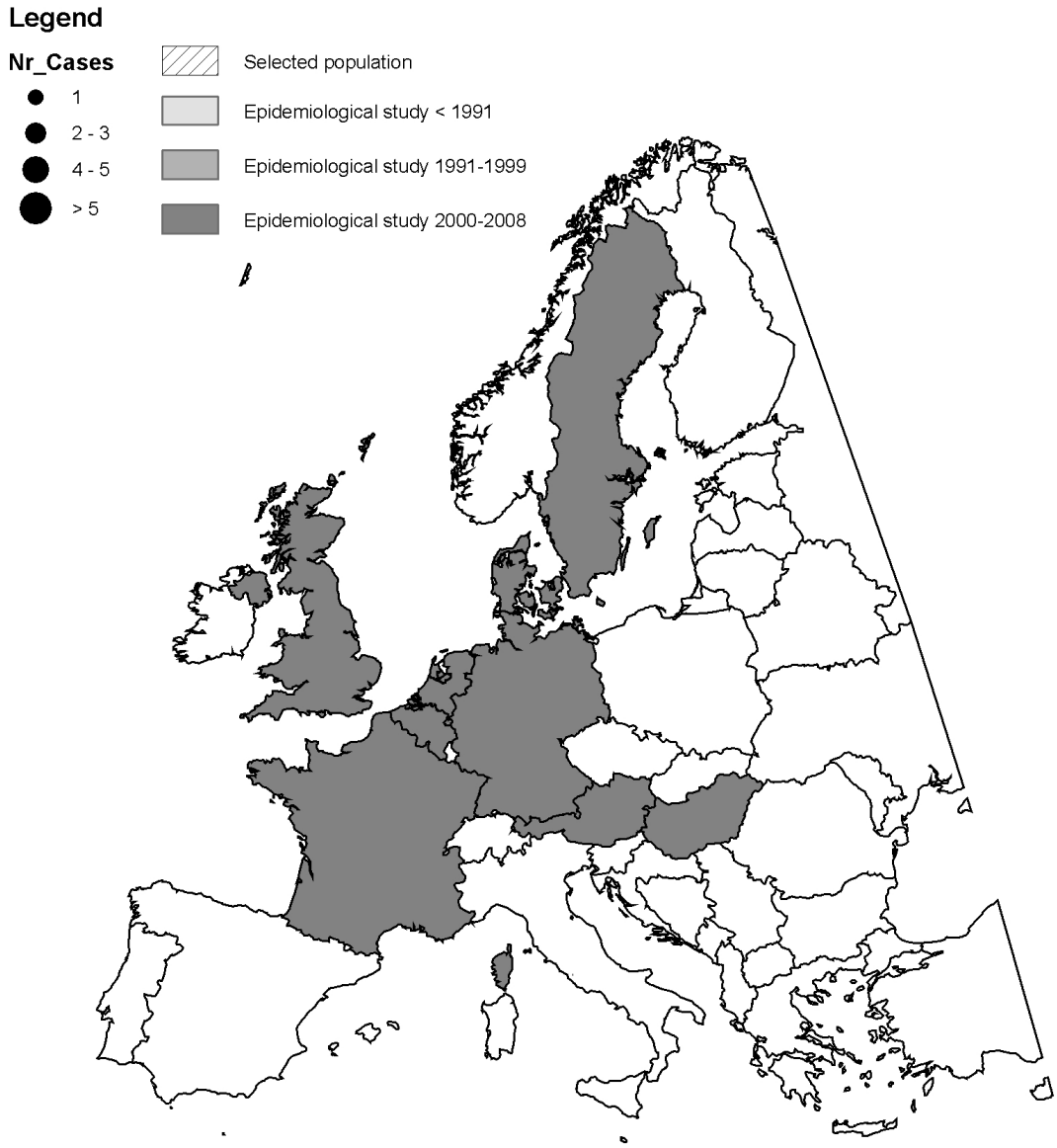
Age
No information available.

Latency
No information available.

Regional differences
Countries for which published results for this compound were found, are indicated in the map below.

Time trends
In the years 1980 – 1996, a yearly increasing incidence of 10% was reported in the UK [1]. No other information on trends is available. Comparison of results from various studies is difficult caused by various test concentrations used. In the following graph, results are shown independent on the test concentration.





References

1. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

Cinnamic aldehyde / cinnamic alcohol
CAS: 104-55-2 / 104-54-1

Publications#	R phrase	LLNA*	Score of publications^	Total score
14 (31)	1 (R43)	1 (Weak)	1	**2**

Cinnamic aldehyde is a common hapten. Cinnamic alcohol is a prohapten that requires metabolic acitivation (conversion to cinnamic aldehyde) to become sensitizing. Both chemicals are discussed together here. Both chemicals are part of the fragrance mix. Cinnamic alcohol also is a component of Balsam of Peru. Cinnamic aldehyde can be detoxified to cinnamic acid. This is a component of Balsam of Peru. This last component is not included in this report.

Sources of exposure
Cinnamic aldehyde and cinnamic alcohol are fragrance ingredients used in many fragrance compounds.

Gender
No specific information on gender is available.

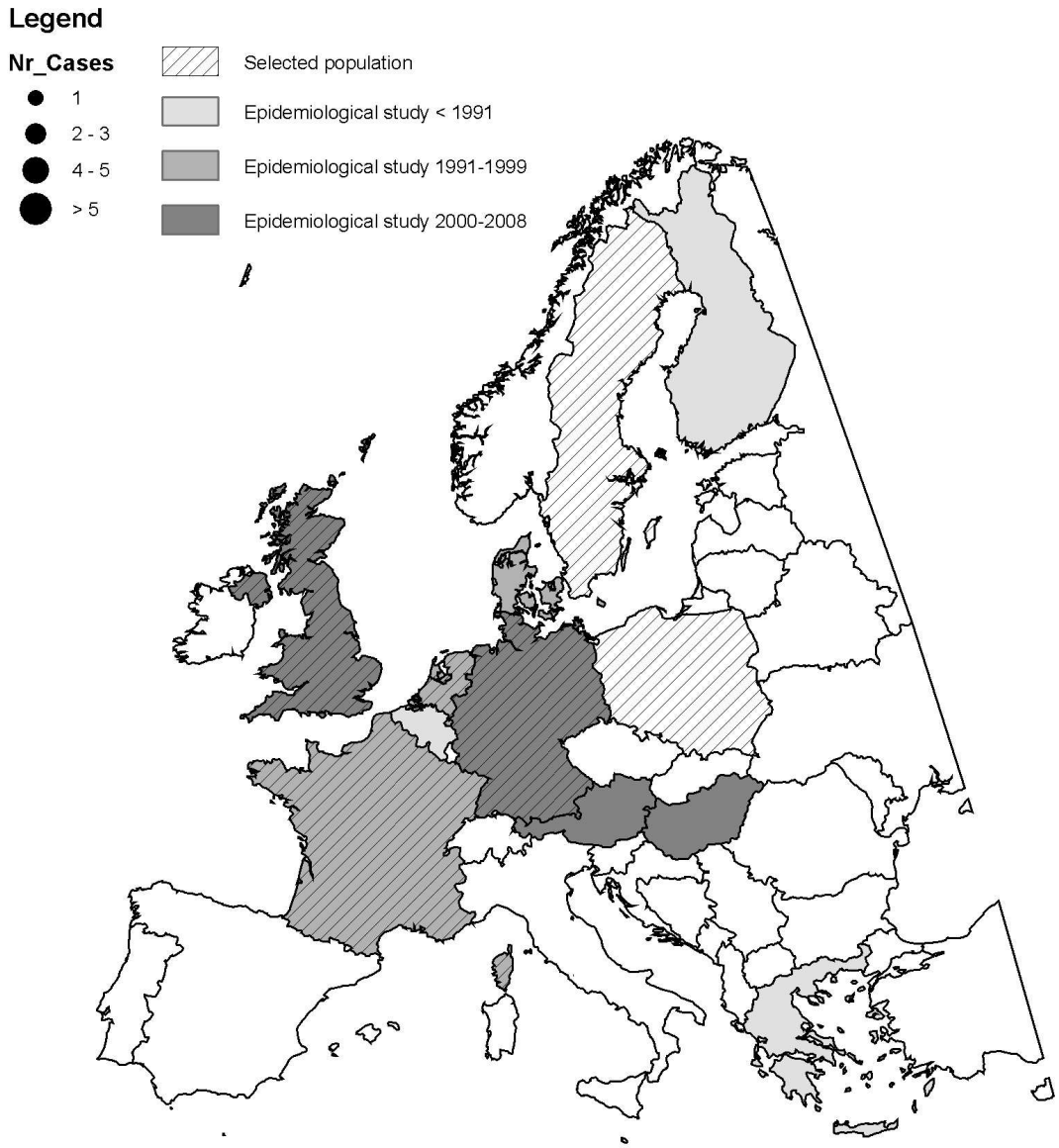
Age
No specific information on age is available.

Latency
No information on latency or duration of symptoms is available.

Regional differences
Most studies on these compounds were reported in Germany, although also various other countries published data for these chemicals, as shown on the map below.

Time trends
Cinnamic aldehyde was found to be a more frequent sensitizer than cinnamic alcohol, consistent with the theory that cinnamic alcohol may be a prohapten. However, cinnamic alcohol may act as an allergen on its own right or via conversion to an allergen other than cinnamic aldehyde [1].

In Denmark, a significant decrease in the frequency of reaction to these chemicals was registered between 1979 and 1992, although a reduction in the test concentration from 2% to 1% was applied at the same time [2]. Also in the UK, a significant reduction of 18% yearly for cinnamic aldehyde, and 9% yearly for cinnamic alcohol was observed in the period 1980 – 1996 [3]. A German study reported stable prevalence values during the years 1996 – 2002, although they observed a small peak in 1999 [4].



References

1. Buckley DA, Basketter DA, Smith Pease CK, Rycroft RJ, White IR, McFadden JP. Simultaneous sensitivity to fragrances. *The British journal of dermatology* 2006: 154(5): 885-888.

2. Johansen JD, Menne T. The fragrance mix and its constituents: a 14-year material. *Contact dermatitis* 1995: 32(1): 18-23.

3. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

4. Schnuch A, Uter W, Geier J, Lessmann H, Frosch PJ. Sensitization to 26 fragrances to be labelled according to current European regulation. Results of the IVDK and review of the literature. *Contact dermatitis* 2007: 57(1): 1-10.

Citral / Geraniol
CAS: 5392-40-5 / 106-24-1

Publications#	R phrase	LLNA*	Score of publications^	Total score
14 (6)	1 (R38/R43)	1 (Weak/Moderate)	2	**3**

Component of fragrance mix. Citral has 2 isomers: geranial and neral. Another compound, geraniol, is not expected to be a contact sensitizer. Geraniol is readily autoxidized upon air exposure, forming several compounds with allergenic activity. The major allergenic autoxidation products identified were geranial and neral. Also metabolic activation of geraniol is possible. Nerol and geraniol are isomers.
Prevalences for geraniol where however higher than for citral. This might be due to the metabolization of geraniol to some other compounds, 6,7-epoxygeraniol or 6,7-epoxygeranial, which are more potent contact allergens than citral [1]. Information of both geraniol and citral are discussed here together, although two separate graphs for timetrends are shown.

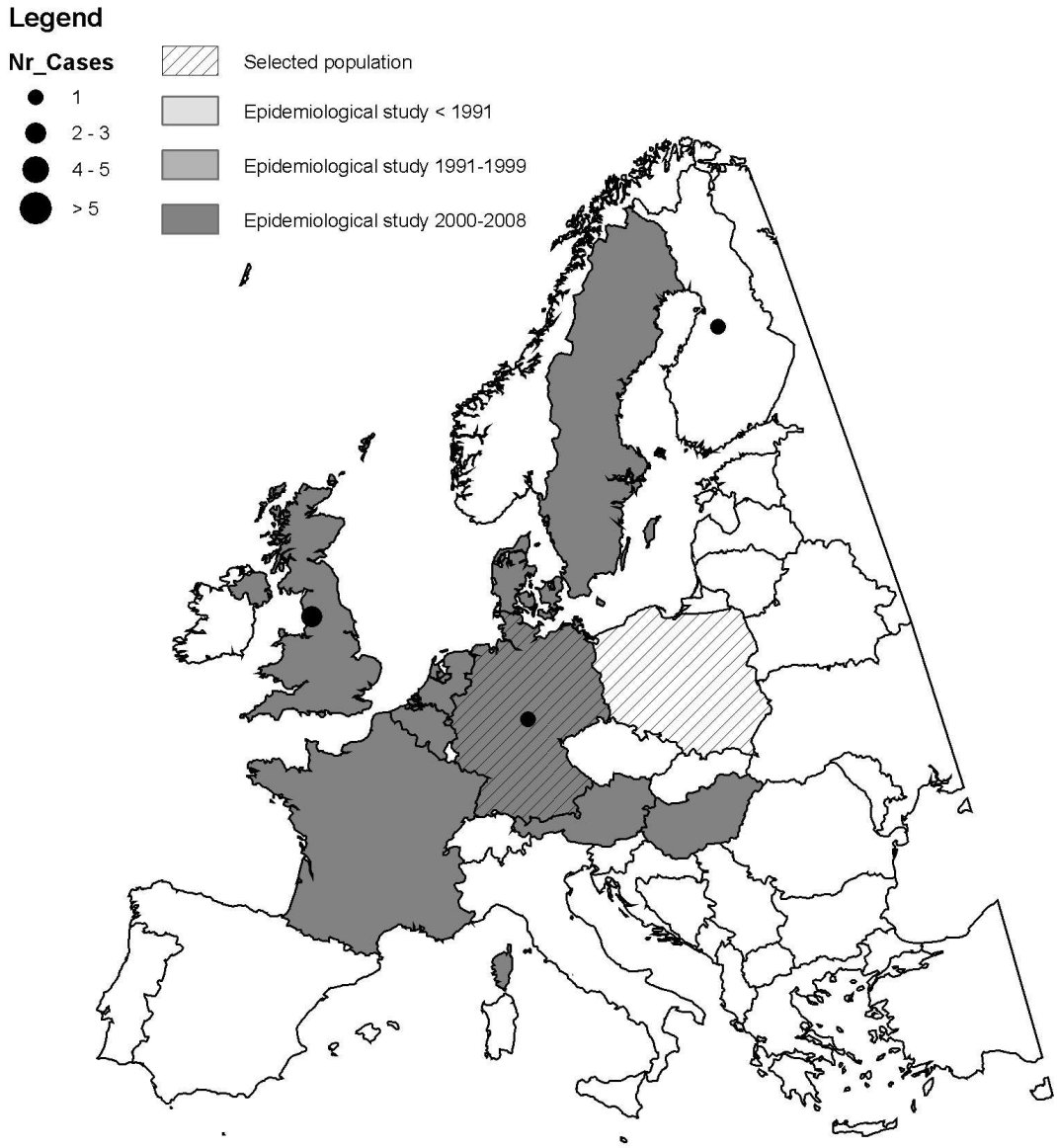
Sources of exposure
Exposure by fragrances. Occupational exposure in perfume factories, bakeries (citrus peel, and baking ingredient), and bartenders (citrus fruits).

Gender
No specific information about gender.

Age
No specific information about age.

Latency
No information about latency.

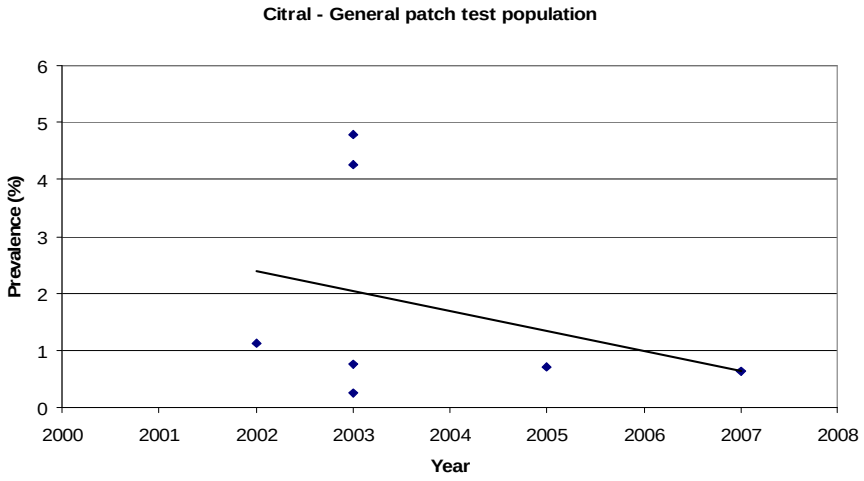
Regional differences
Results are published in various European countries, as shown on the map.

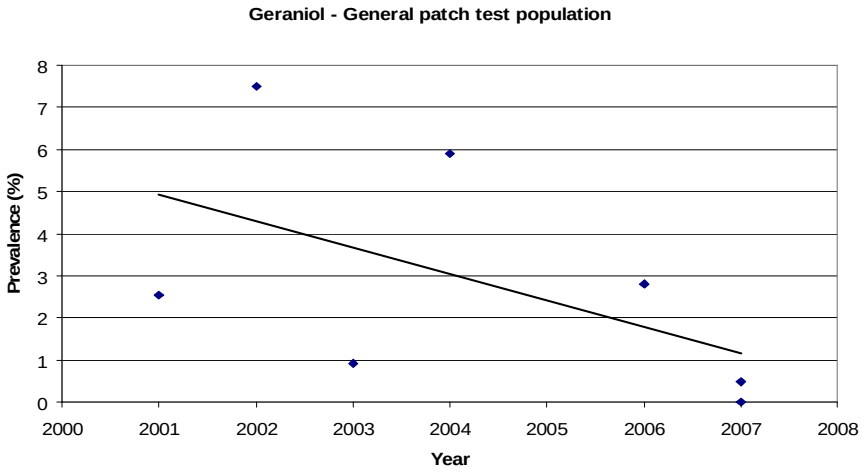

Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Time trends

The amount of positive patch tests for geraniol was relatively constant during the period 1990 – 1996 in the UK [2].

Data reported in various Eurpean studies are shown in the following graphs. However, since the test concentration used in these studies is not always known, these results are difficult to compare.





References

1. Hagvall L. Cytochrome P450-mediated activation of the fragrance compound geraniol forms potent contact allergens. *Toxicology and applied pharmacology* 2008.

2. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

Coumarin
CAS: 91-64-5

Publications#	R phrase	LLNA*	Score of publications^	Total score
6 (3)	1 (R43)	0 (None)	1	**1**

Component of fragrance mix.

Sources of exposure
Exposure via fragrances

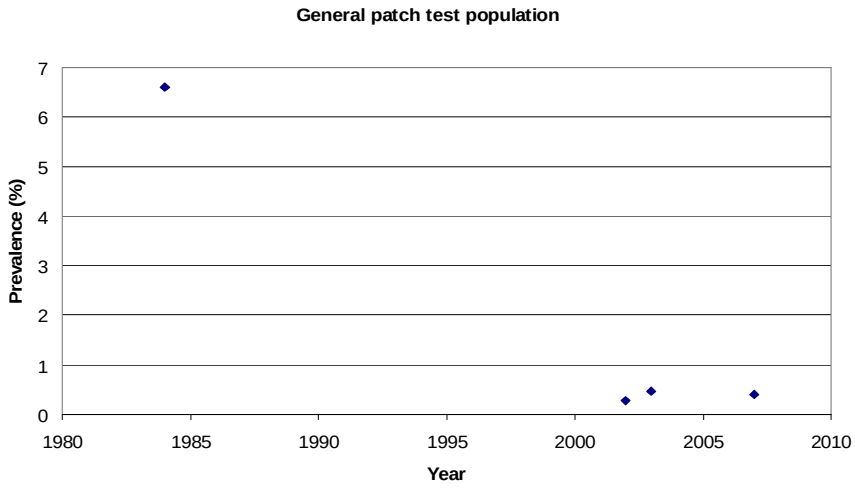
Gender
No specific information.

Age
No specific information.

Latency
No information available.

Regional differences
There are not enough data to compare between various countries.

Time trends
Only few data are available. However, since 2000, the prevalence seems to be stable.



Eugenol
CAS: 97-53-0

Publications#	R phrase	LLNA*	Score of publications^	Total score
16 (9)	1 (R38/R43)	1 (Weak)	1	**2**

Component of Balsam of Peru and fragrance mix.

Sources of exposure
Dentists are often exposed to eugenol.

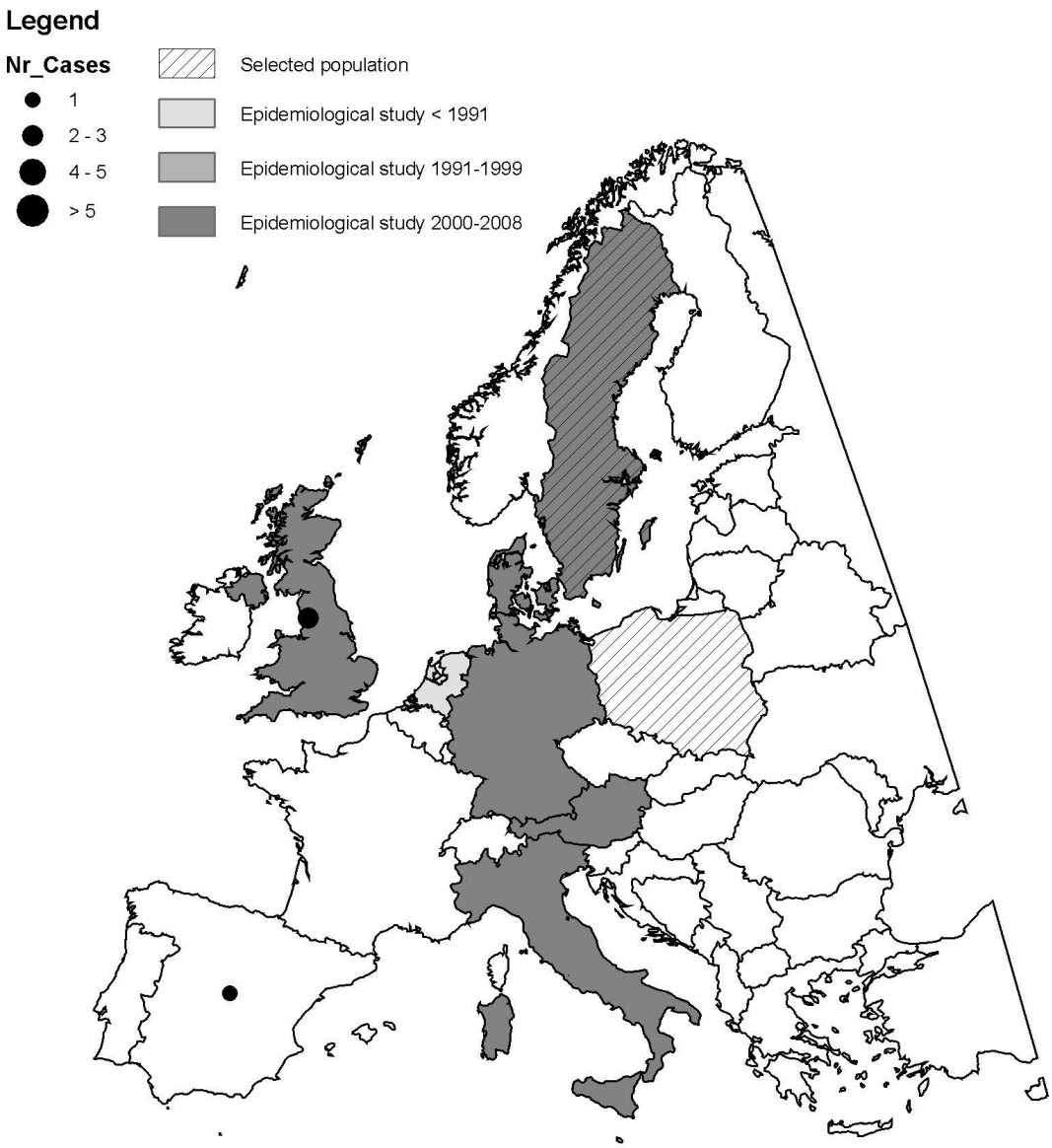
Gender
No specific information available.

Age
No specific information available.

Latency
No data on latency available.

Regional differences
Sensitization to eugenol was studied in some European countries.

Time trends
One study performed in the UK reported a stable prevalence in the period 1980 – 1996 [1]. There are not enough data to report on trends in Europe. In a selection of individuals with positive reactions to the fragrance mix, the prevalence is around 10%. In the general population, this is around 1.5%.



References

1. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

Hydroxycitronellal
CAS: 107-75-5

Publications#	R phrase	LLNA*	Score of publications^	Total score
14 (4)	1 (R38/R43)	1 (Weak)	1	**2**

Component of fragrance mix.

Sources of exposure
Exposure via fragrances in consumer products.

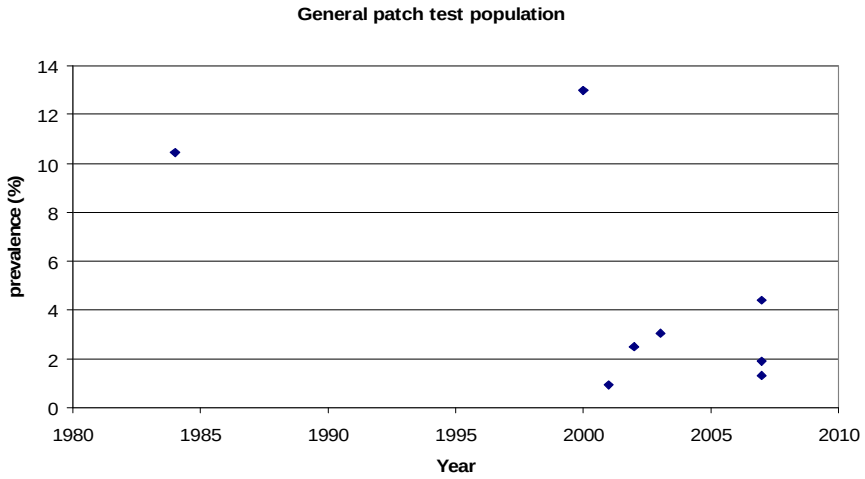
Gender
No specific information.

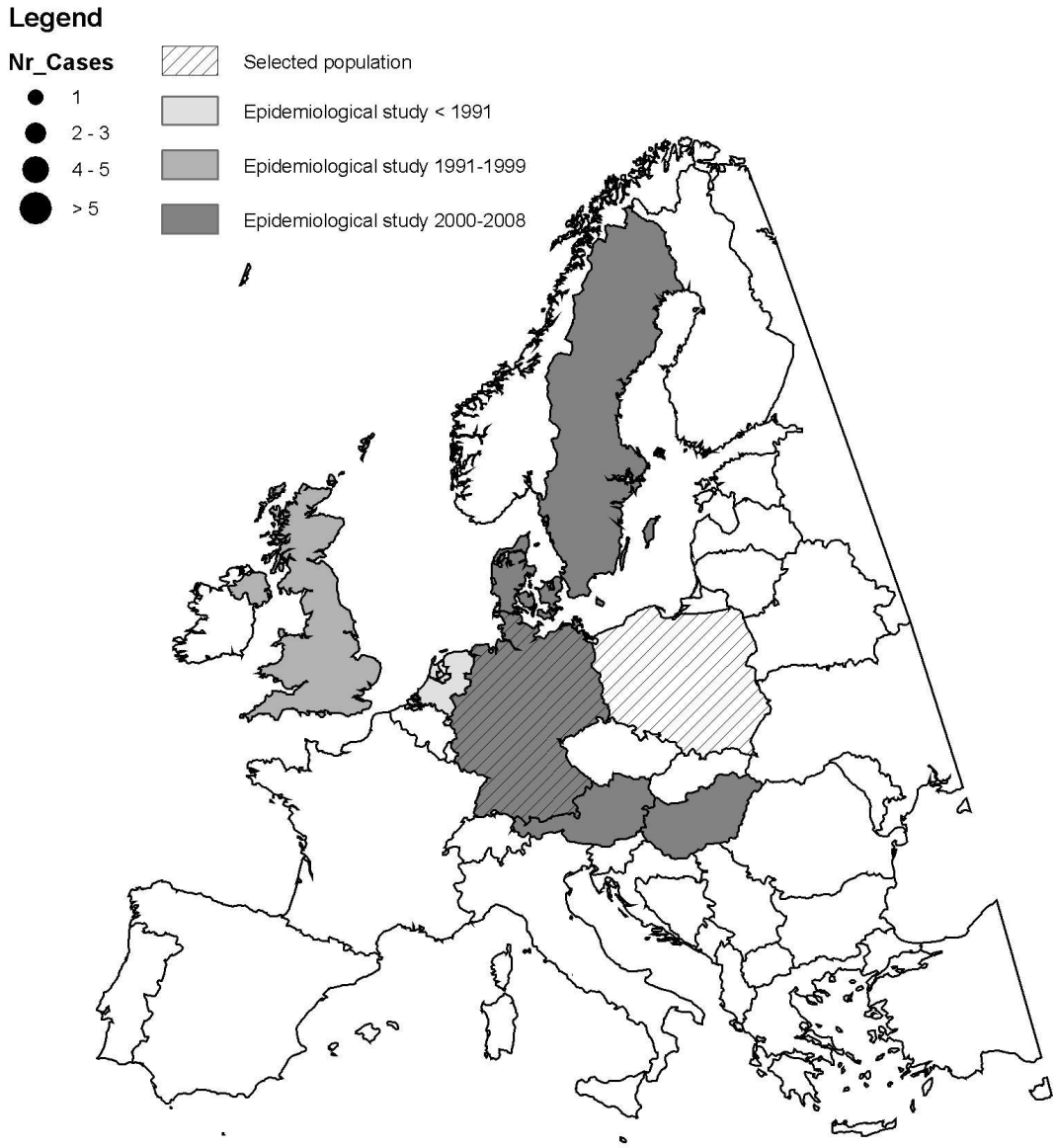
Age
No specific information.

Latency
No information available.

Regional differences
Some results from European countries were published for this compound. An overview is shown on the map below.

Time trends
In the UK, a slow decline was shown in incidence by 5% yearly during the period 1980 – 1996 [1]. When all available European data are taken together, prevalence values seem to increase in recent years.





References

1. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

Isoeugenol
CAS: 97-54-1

Publications#	R phrase	LLNA*	Score of publications^	Total score
16 (10)	1 (R38/R43)	1 (Moderate)	2	**3**

Component of Balsam of Peru and fragrance mix.

Sources of exposure
Exposure by fragrances.

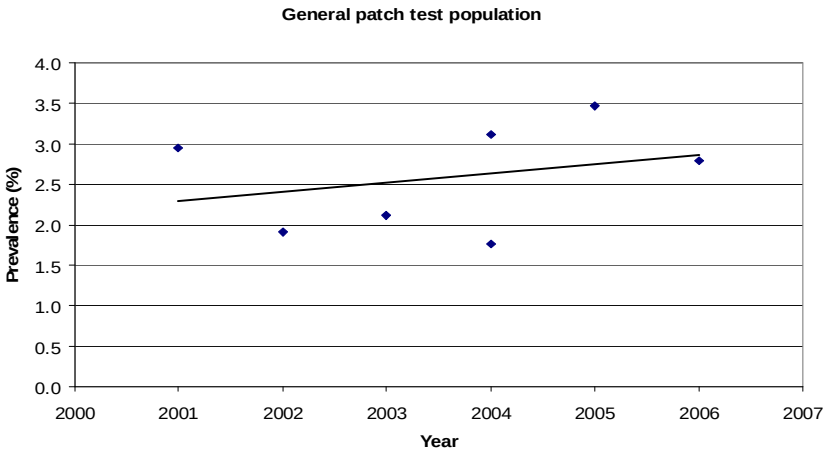
Gender
No specific information available.

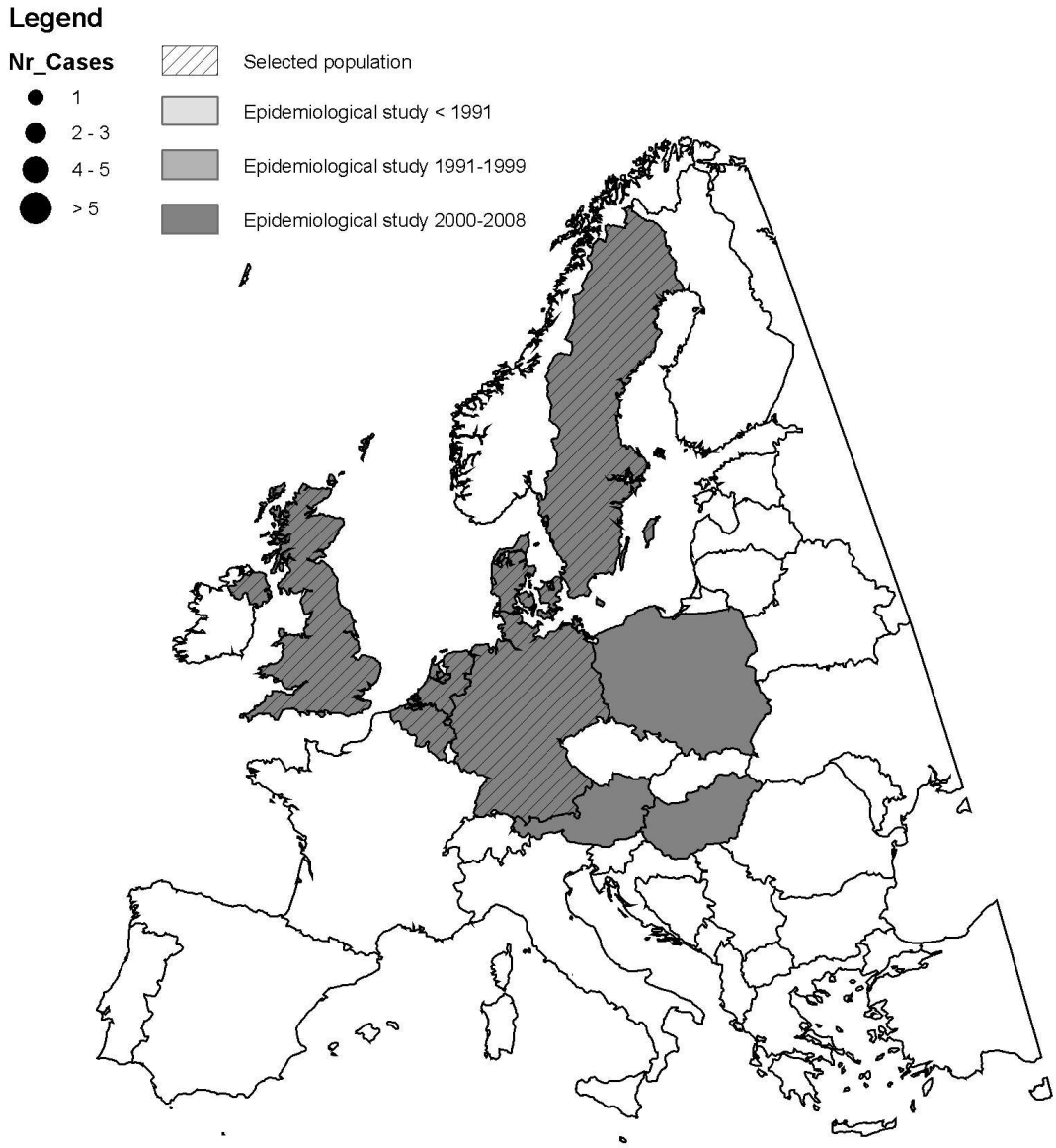
Age
No specific information available.

Latency
No data on latency available.

Regional differences
Epidemiological studies were only reported in some countries. Data from The Netherlands and the UK are comparable. See map below.

Time trends
In the UK, the incidence increased annually with 5% for this chemical in the years 1980 – 1996 [1]. Also in the UK, an increasing prevalence was reported between 2001 and 2005 [2]. These data, together with a study from the Netherlands, are shown in the following graph. In Germany and Austria, studies reported prevalence values for patients with positive reactions to fragrance mix. In this subgroup, on average 12% of the individuals reacted positive to isoeugenol.





References

1. Buckley DA, Wakelin SH, Seed PT, Holloway D, Rycroft RJ, White IR, McFadden JP. The frequency of fragrance allergy in a patch-test population over a 17-year period. *The British journal of dermatology* 2000: 142(2): 279-283.

2. White JM, White IR, Glendinning A, Fleming J, Jefferies D, Basketter DA, McFadden JP, Buckley DA. Frequency of allergic contact dermatitis to isoeugenol is increasing: a review of 3636 patients tested from 2001 to 2005. *The British journal of dermatology* 2007: 157(3): 580-582.

Lyral
CAS: 31906-04-4

Publications#	R phrase	LLNA*	Score of publications^	Total score
13 (4)	1 (R43)	1 (Weak)	1	**2**

Component of fragrance mix.

Sources of exposure
Lyral is present as a fragrance in various consumer products such as hair dye and deodorant.

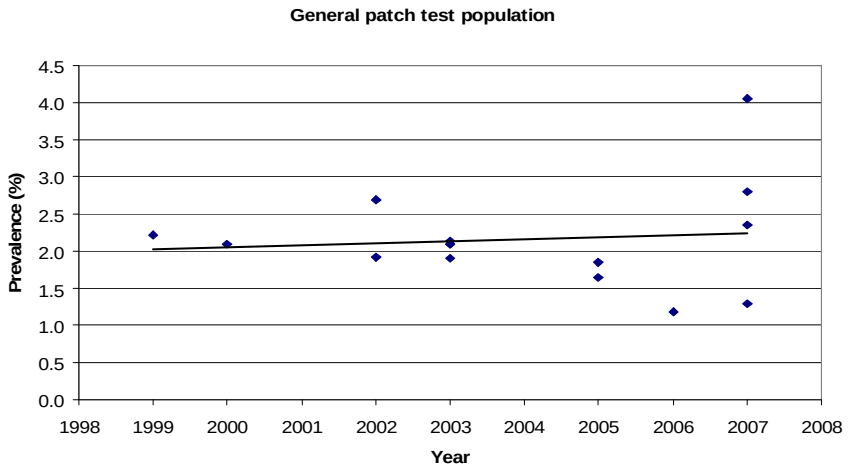
Gender
In Denmark, a higher prevalence was reported in women compared to men [1].

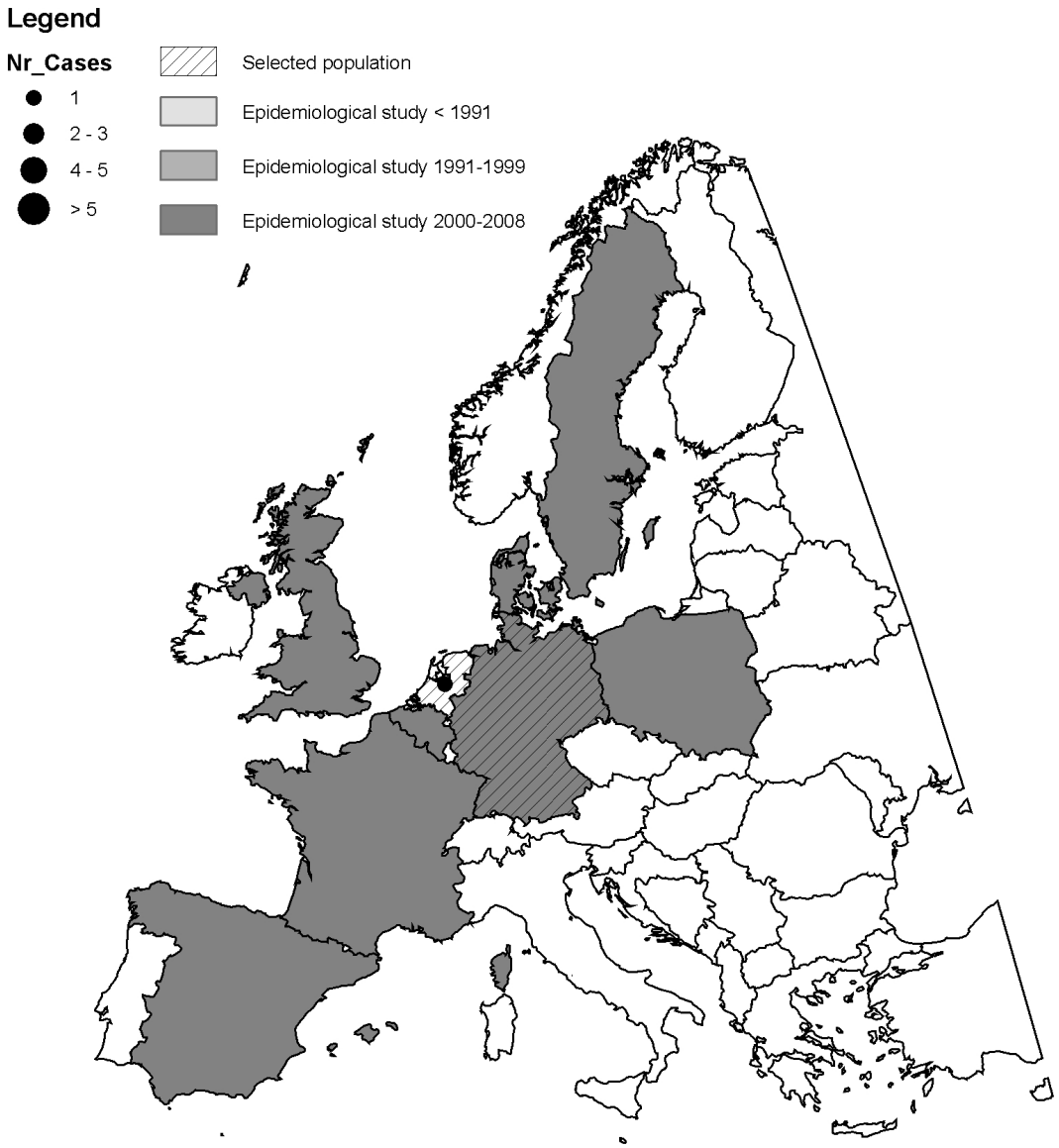
Age
No information available.

Latency
No information available about latency.

Regional differences
Frequency of positive patch tests for lyral was studied in some European countries, as shown on the map below.

Time trends
In Denmark, an increase was observed in prevalence values for lyral in the period 2003 – 2007, especially in women [1]. Also taking all European studies together, this increase is observed.





References

1. Braendstrup P, Johansen JD. Hydroxyisohexyl 3-cyclohexene carboxaldehyde (Lyral) is still a frequent allergen. *Contact dermatitis* 2008: 59(3): 187-188.

1,2-Benzisothiazolin-3-one
CAS: 2634-33-5

Publications#	R phrase	LLNA*	Score of publications^	Total score
5 (5)	1 (R38/R43)	1 (Moderate)	2	**3**

Sources of exposure
All exposures occured at the workplace, which include the paint industry (4 cases), pottery industry, an assembling factory for water-softeners and air fresheners. 1,2-benzisothiazolin-3-one is also used as a biocide and the sodium salt of this chemical is used in the metal industry. Of all sources of exposure, except for the paint industry, one case was noted.

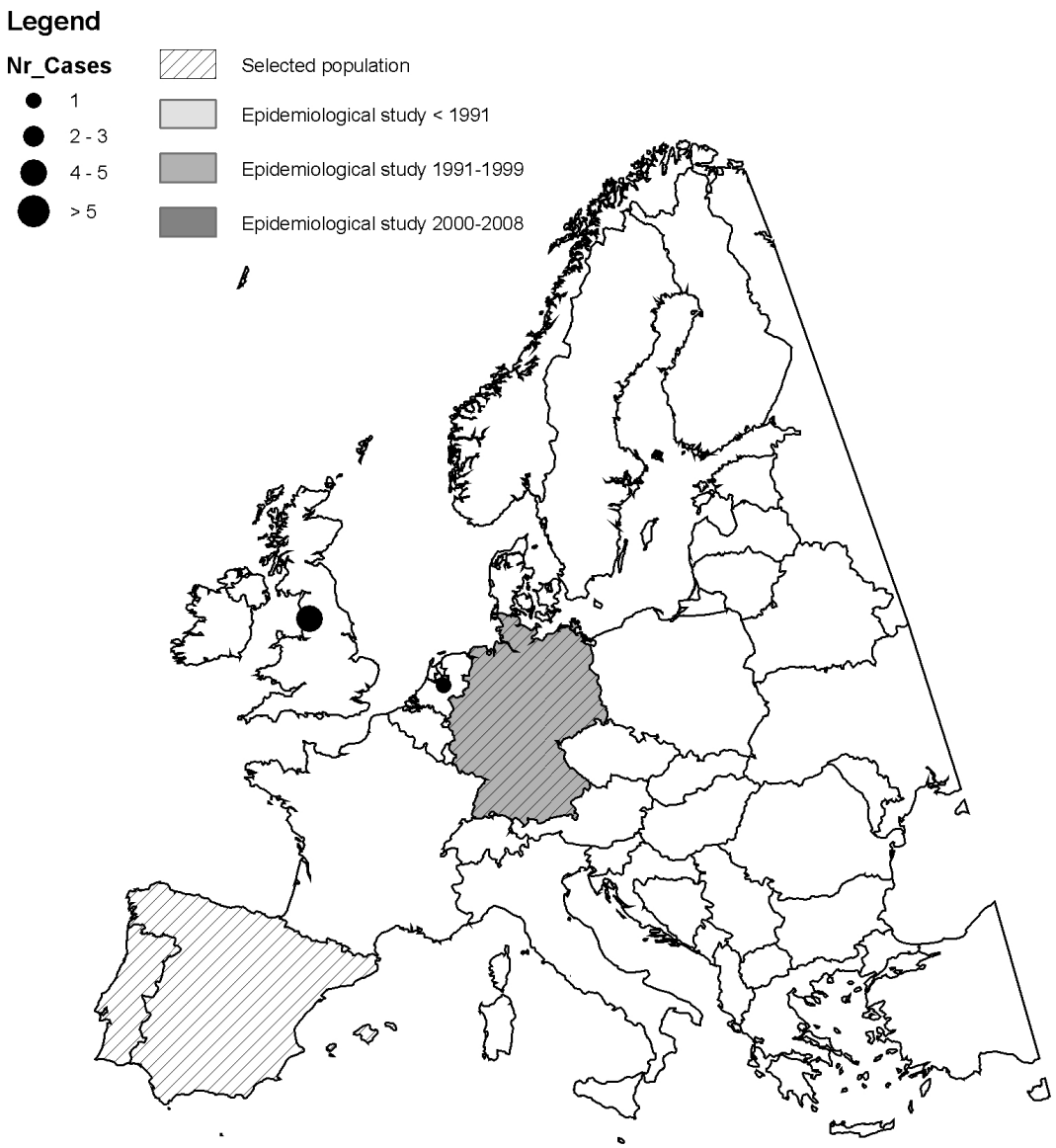
Gender
Both men and women are allergic to this chemical. Mainly males were allergic to 1,2-benzisothiazolin-3-one after contact. Only for the use of this chemical as a biocide, cases of allergic females were reported.

Age
There is not much information on the age of allergic individuals. Two male cases were noted at the age of 47 and 63.

Latency
Information of latency is mostly absent. Only one case reported a latency period of several months.

Regional differences
Data were found for the following countries: Germany, Portugal, Spain, The Netherlands, and UK. See map below.

Time trends
No information on time trends.


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

2,5-Diaminotoluene
CAS: 95-70-5

Publications[#]	R phrase	LLNA*	Score of publications^	Total score
10 (1)	1 (R43)	1 (Strong)	2	**3**

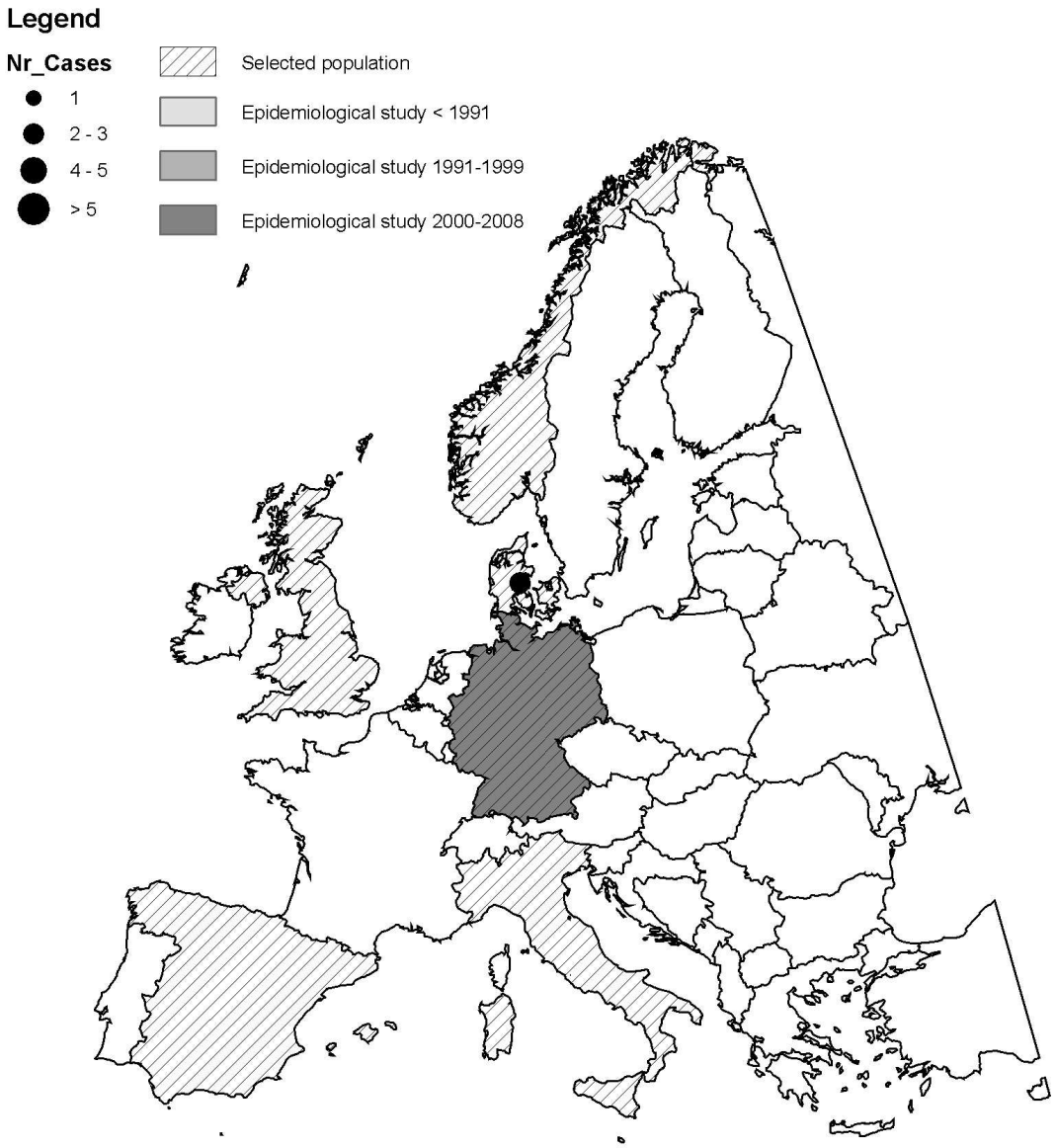
Sources of exposure
Most of the exposures at home or at the workplace (hairdressers and clients) are caused especially from contact with hair dye. One study reported exposure after using eyebrow and eye-lashes-tinting product.

Gender
Both males and females were allergic to 2,5-diaminotoluene, although prevalence is probably higher in females because they use more often hair dyes.

Age
Allergy for this chemical occurs in all age groups. There were cases from 14 to 72 years old reported.

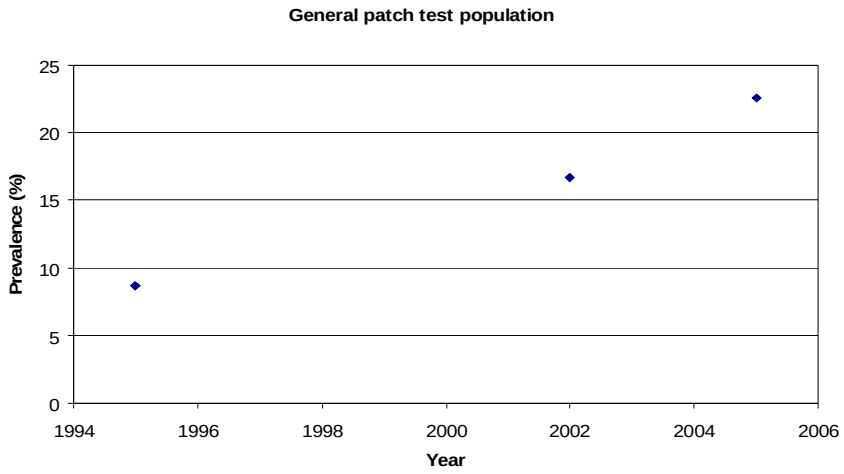
Latency
Latency varied between 1 or 2 hours with maximul one week.

Regional differences
Data were found for the following countries: Denmark, Germany, Italy, Norway, and Spain. See map below.

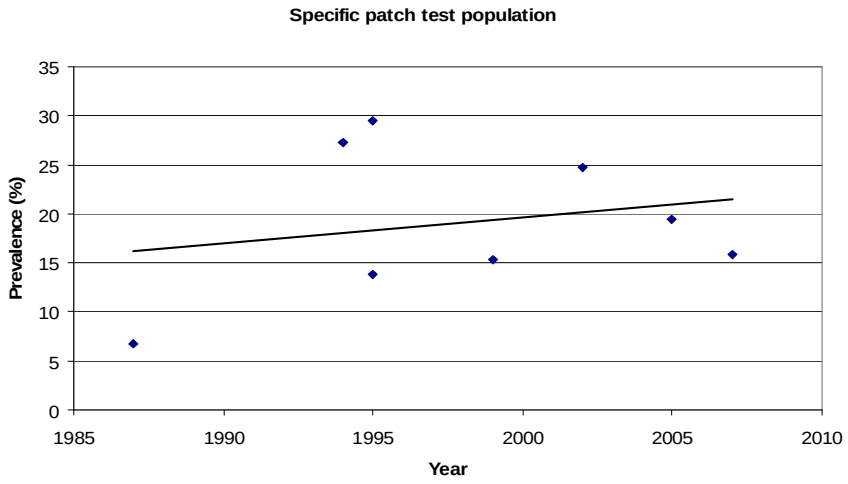


Time trends

Two German studies reported on the general patch test population, exposured to hair dyes. Here, an increasing trend is observed, as also mentioned in one of these studies [1].



In a specific population (occupational exposure to hair dyes), there is a slight increase observed as shown in the graph below. This was confirmed by a study conducted in Spain (from 1980 – 1993 until 1994 – 2003) were an increase from 6.8% to 15.3% was observed after occupational exposure [2]. In contrast, Uter *et al.* (2003) described a slight decline from 29.5% tot 24.8% after occupational exposure to hair dye in a study conducted from 1995 – 2002 [1].



References

1. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.
2. Valks R, Conde-Salazar L, Malfeito J, Ledo S. Contact dermatitis in hairdressers, 10 years later: patch-test results in 300 hairdressers (1994 to 2003) and comparison with previous study. *Dermatitis* 2005: 16(1): 28-31.

2-Hydroxyethyl acrylate
CAS: 818-61-1

Publications[#]	R phrase	LLNA*	Score of publications^	Total score
4 (4)	1 (R43)	1 (Moderate)	2	**3**

Sources of exposure
Allergic contact dermatitis to 2-hydroxyethyl acrylate has been reported after contact with artificial finger nails, contact lenses, cosmetic cream, and ocuupationally after contact with media for electron microscopy.

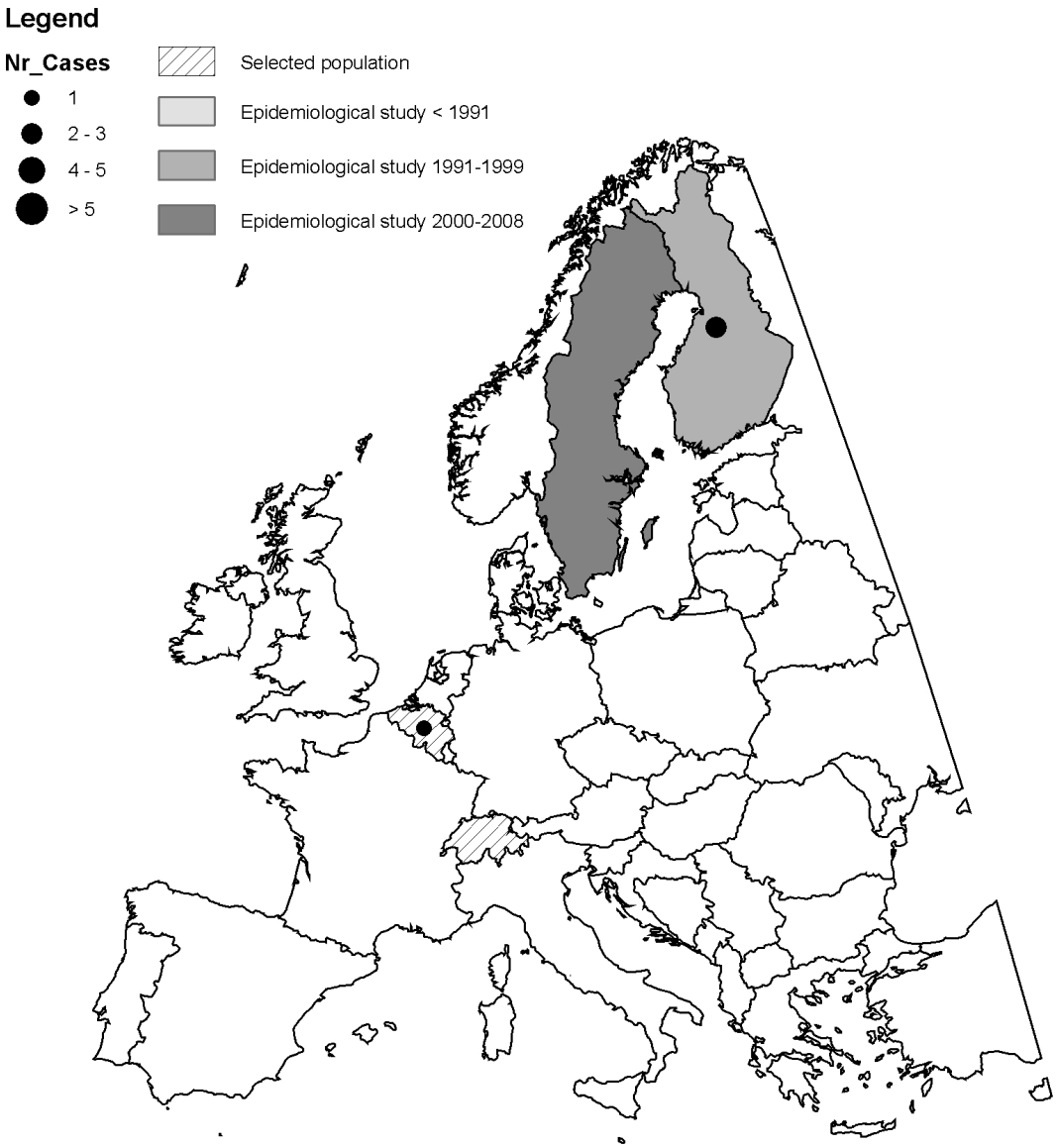
Gender
Both male and female cases were reported.

Age
Cases were reported in the age range 19-64 years.

Latency
One study reported immediate reaction.

Regional differences
Only a few countries reported cases of contact dermatitis caused by this chemical compound, as shown on the map below.

Time trends
There is not enough information to report on time trends.


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

2-Mercaptobenzothiazole
CAS: 149-30-4

Publications#	R phrase	LLNA*	Score of publications^	Total score
19 (16)	1 (R43)	1 (Moderate)	2	**3**

Sources of exposure
Occupational exposure was observed in health care workers (rubber gloves), hairdressers (hair dye), metal workers, and construction workers. Also exposure at home was noted after contact hair dye.

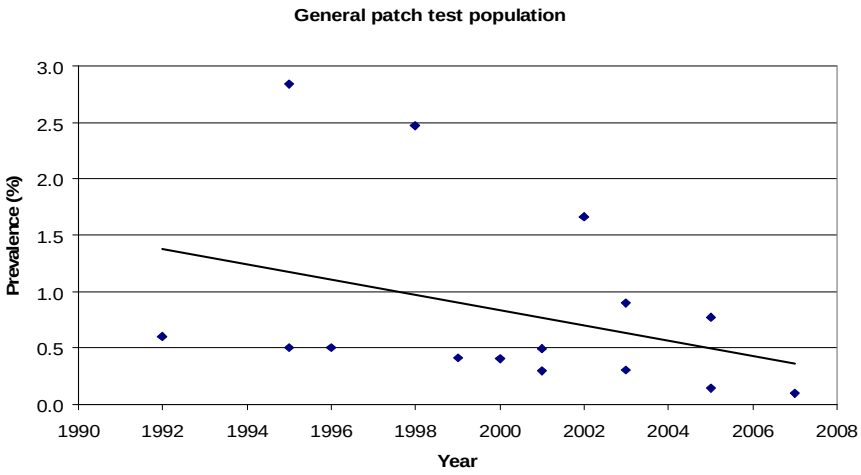
Gender
Both males and females were allergic to 2-mercaptobenzothiazole.

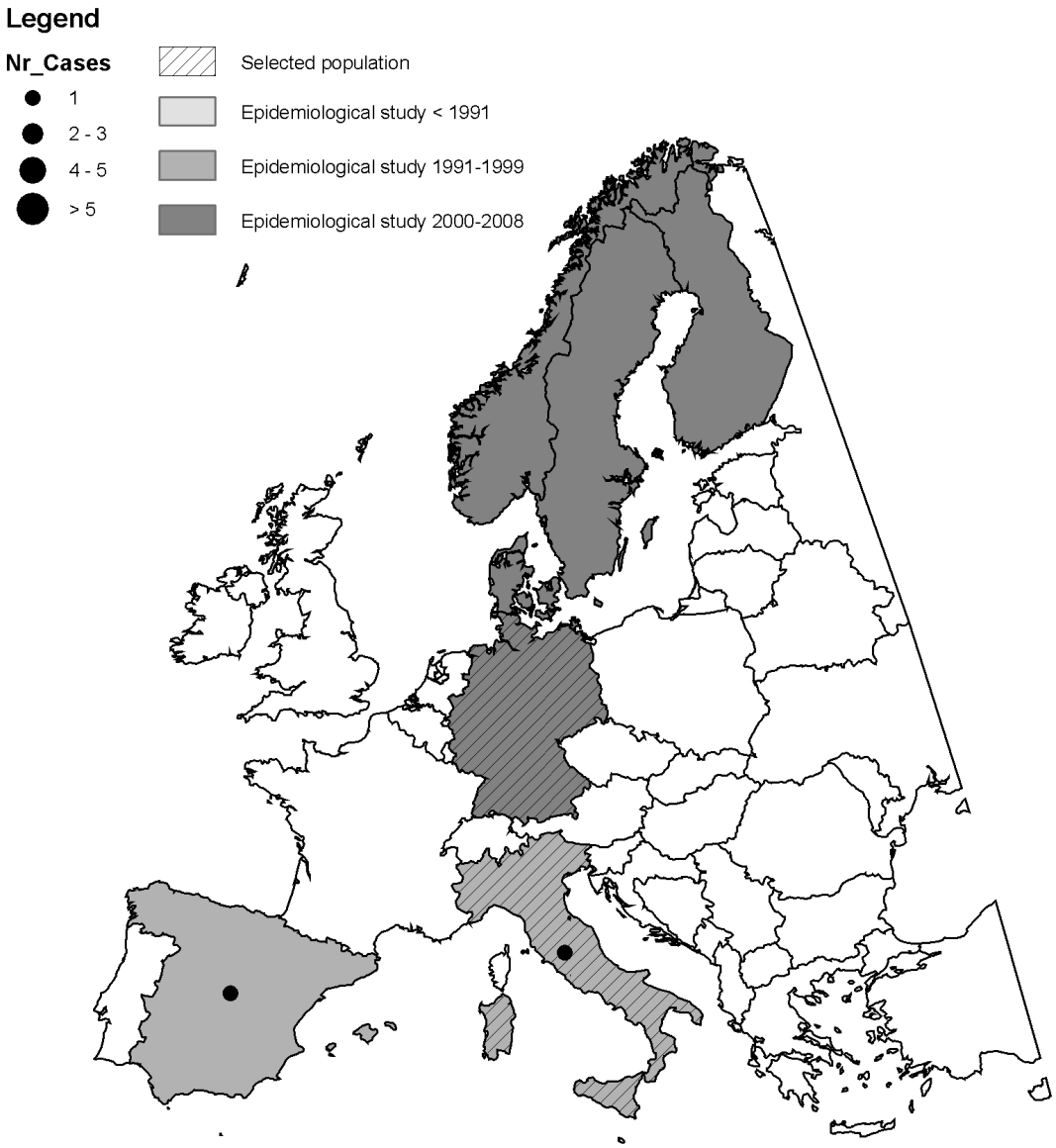
Age
The age of exposure ranged from 7 months to 77 year.

Latency
No information.

Regional differences
Most of the data were gathered in Germany and Italy. See map below.

Time trends
There is a decreasing trend in prevalence of allergy to 2-mercaptobenzothiazole. A Swedish and a German publication also reported this decreasing trend: from 0.6% in 1991 – 1993 to 0.4% in 1999 – 2001 [1], and from 0.4% in 1995 – 2002 to 0.1% in 2003 – 2006 [2], respectively. In Finland, a stable prevalence of 0.5% was reported between 1995 – 1996 and 2000 – 2002 [3]. However, a Danish report described an increasing trend from 1985 to 2005 in European patch test series in an eczema population with focus on patients with multiple contact allergies [4].





References

1. Lindberg M, Edman B, Fischer T, Stenberg B. Time trends in Swedish patch test data from 1992 to 2000. A multi-centre study based on age- and sex-adjusted results of the Swedish standard series. *Contact dermatitis* 2007: 56(4): 205-210.
2. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.
3. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.
4. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact dermatitis* 2007: 57(2): 76-83.

3-Aminophenol
CAS: 591-27-5

Publications#	R phrase	LLNA*	Score of publications^	Total score
4 (0)	0	1 (Moderate)	1	**1**

Sources of exposure
All reports concerned exposure to hair dyes. Both occupational exposure, exposure at home, or client from hairdressers were reported.

Gender
No information available.

Age
No information available.

Latency
No information available.

Regional differences
No information available.

Time trends
In German hairdressers, a slight increase was reported between 1995 – 2002 (3.6%) and 2003 – 2006 (3.9%). In their customers, a clear increase was reported between those periods (4.2% - 9.2%, respectively) [1] [2].

References
1. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to hairdressing allergens in female hairdressers and clients--current data from the IVDK, 2003-2006. *J Dtsch Dermatol Ges* 2007: 5(11): 993-1001.
2. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.

3-Dimethylaminopropylamine
CAS: 109-55-7

Publications#	R phrase	LLNA*	Score of publications^	Total score
8 (6)	1 (R43)	1 (Moderate)	2	**3**

3-dimethylaminopropylamine has been suggested as a key substance in contact allergy to cocamidopropylbetain. In this report, both chemicals are reported separately.

Sources of exposure
Hair dye and shampoo are the most mentioned source of exposure.

Gender
Allergies were reported in both sexes.

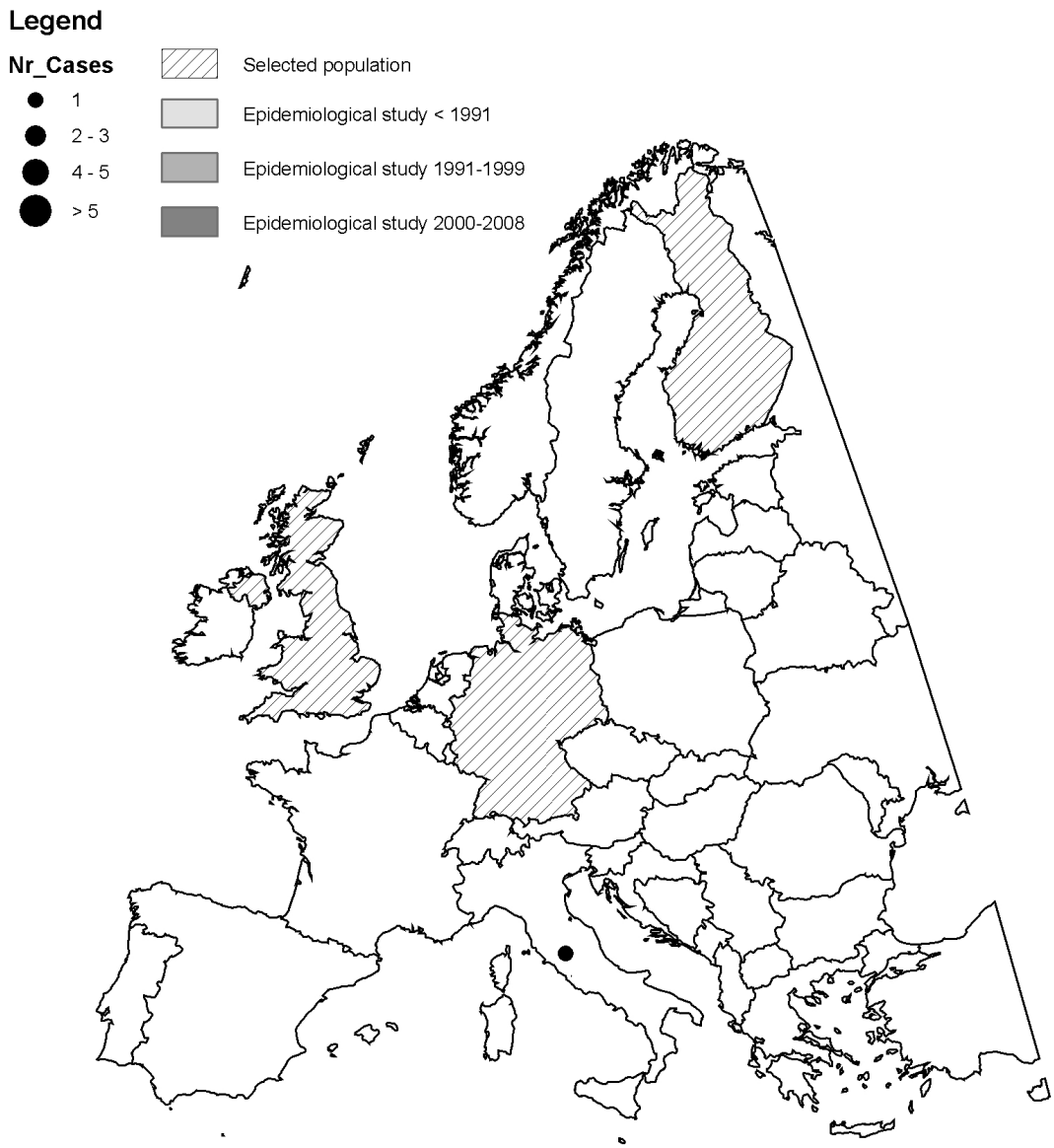
Age
Allergic reactions to 3-dimethylaminopropylamine and cocamidopropylbetain both have been reported in the age range 26 – 69 years.

Latency
No information available.

Regional differences
No information available.
In the map below, only reports for 3-dimethylaminopropylamine are shown.
For cocamidopropylbetain, 3 epidemiological studies were performed in Germany.

Time trends
No information available for 3-dimethylaminopropylamine.

For cocamidoproplbetain, an increasing trend has been reported between 1995 – 2002 (2.0%) and 2003 – 2006 (2.9%) in a general patch test population in Germany. This increase was also seen in hairdressers in the same period (3.1% - 3.5%) [1] [2]. A larger German study in the period 1995-1999 reported a prevalence value of 2.5% in the general patch test population.



References

1. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to hairdressing allergens in female hairdressers and clients--current data from the IVDK, 2003-2006. *J Dtsch Dermatol Ges* 2007: 5(11): 993-1001.

2. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.

Diphenylthiourea
CAS: 102-08-9

Publications#	R phrase	LLNA*	Score of publications^	Total score
6 (2)	0	1 (Weak)	1	**1**

Sources of exposure
Exposure via a swimming or wet suit, PVC adhesive tape, personnal computer mouse mat, and rubber gloves.

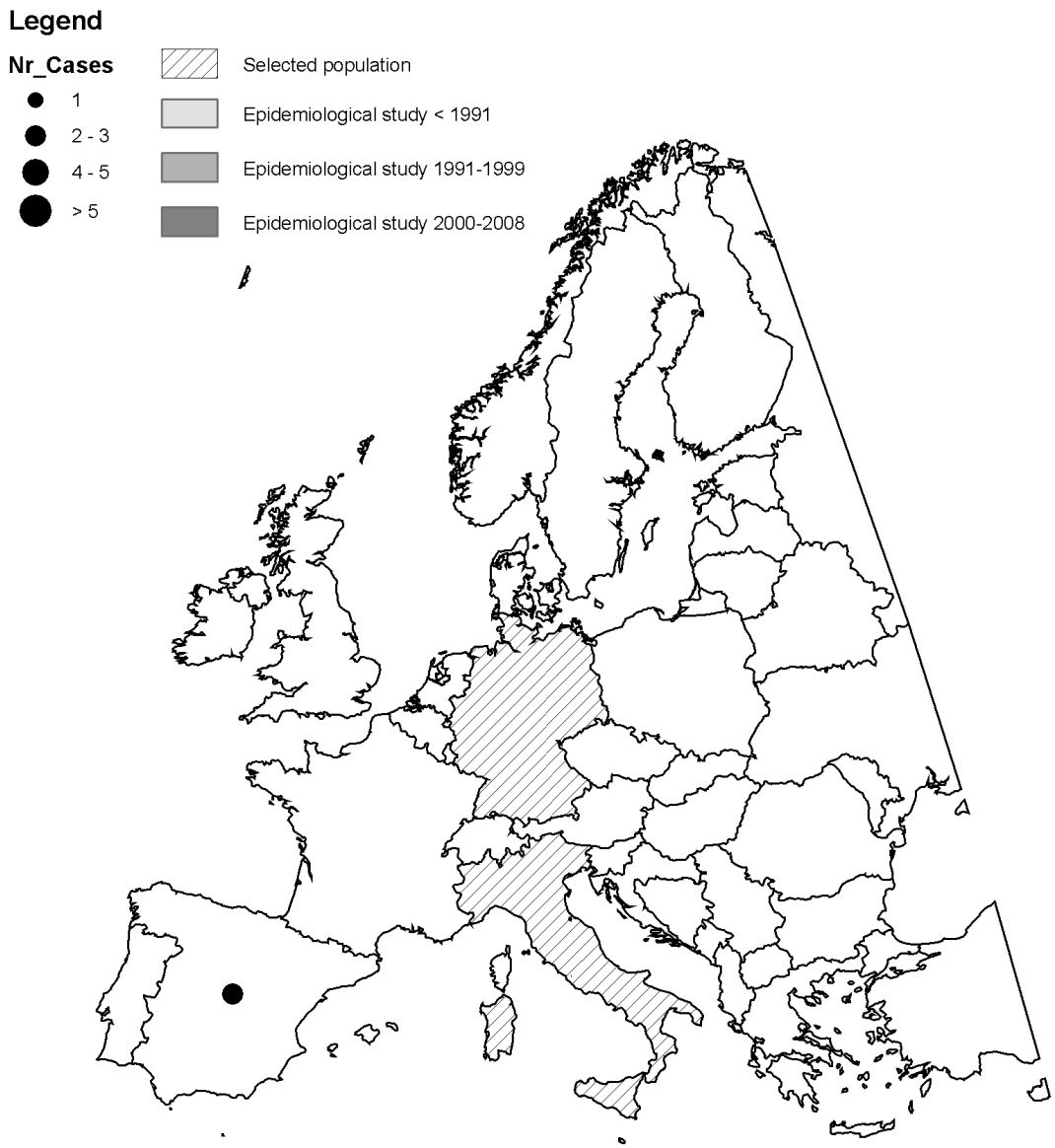
Gender
Both males and females were allergic to diphenylthiourea.

Age
One study reported that allergy for diphenylthiourea starts at adolescence age, ranging from 22 years to 74 years. There are a lot of reports with no information on age of allergic individuals.

Latency
Information on latency is lacking.

Regional differences
Most of the data were gathered in Spain (3 reports), followed by Italy (2 reports), and Germany (1 report). See map below.

Time trends
There are not enough data to report on trends in Europe. One report focused on occupational rubber glove allergy in the period 1995 – 2001, but no time trend for diphenythiourea was reported [1].



References

1. Geier, J., et al., *Occupational rubber glove allergy: results of the Information Network of Departments of Dermatology (IVDK), 1995-2001.* Contact Dermatitis, 2003. **48**(1): p. 39-44.

Ethylene glycol dimethylacrylate
CAS: 97-90-5

Publications[#]	R phrase	LLNA*	Score of publications^	Total score
10 (10)	1 (R37/R43)	1 (Weak)	2	**3**

Sources of exposure
Allergic contact dermatitis for ethylene glycol dimethylacrylate is reported especially in dentists. Additionally, exposure to nail cosmetics and glues was reported.

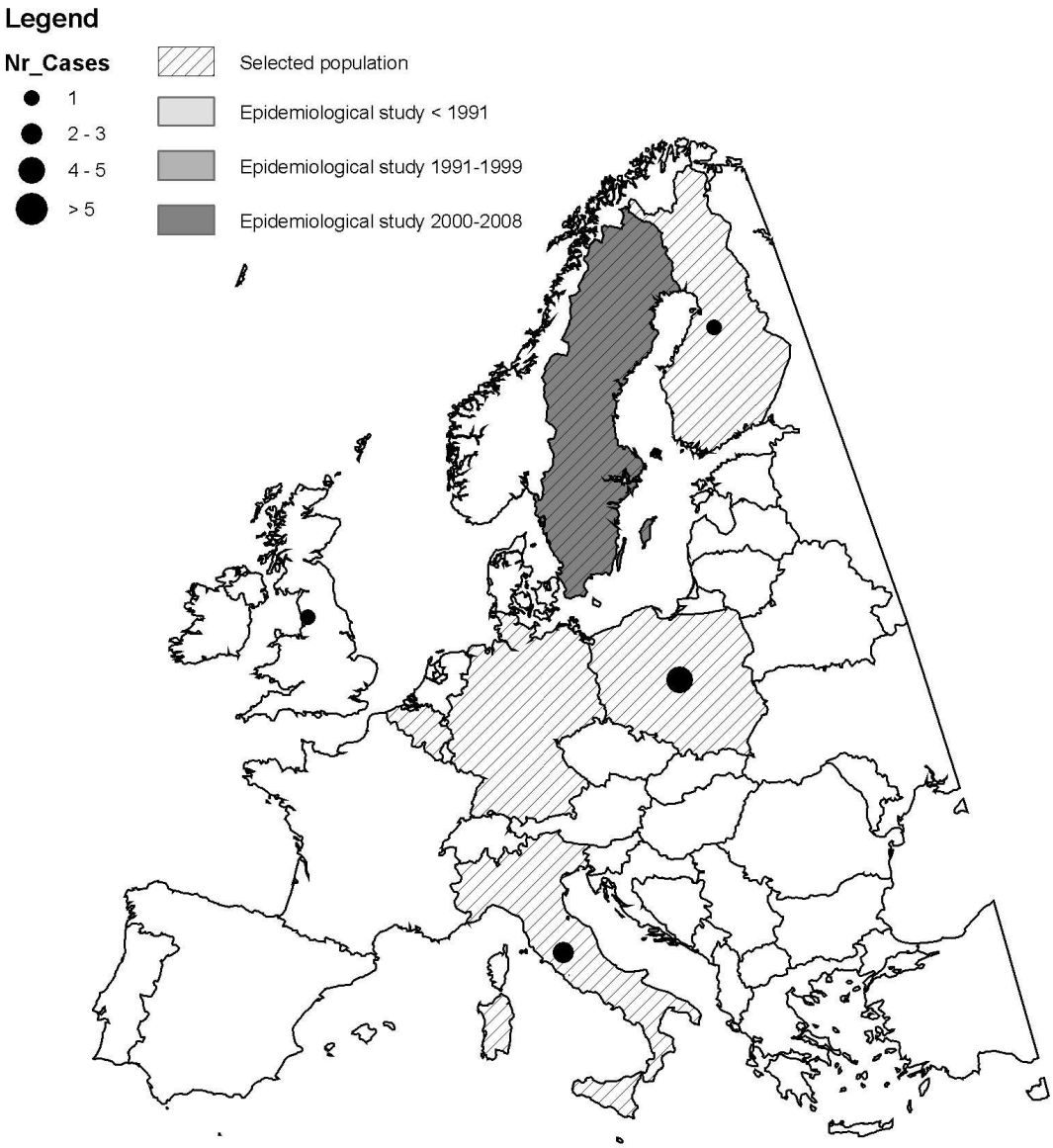
Gender
Allergic dermatitis was reported in both men and women.

Age
Allergy was reported in the age range 12-94 years.

Latency
No information available.

Regional differences
A Swedish epidemiological study reported a prevalence of 0.6% in 2008. See map below.

Time trends
A Belgian study showed an increasing trend in the period 1979 – 1999 [1].



References

1. Geukens S, Goossens A. Occupational contact allergy to (meth)acrylates. *Contact dermatitis* 2001: 44(3): 153-159.

Ethylenediamine
CAS: 107-15-3

Publications#	R phrase	LLNA*	Score of publications^	Total score
4 (14)	1 (R42/R43)	1 (Moderate)	1	**2**

Sources of exposure
Reported cases include exposure to detergents, adhesive plaster and floor polish remover. Also a nurse and workers in a wire-drawing factory were studied for allergic contact dermatitis to ethylenediamine.

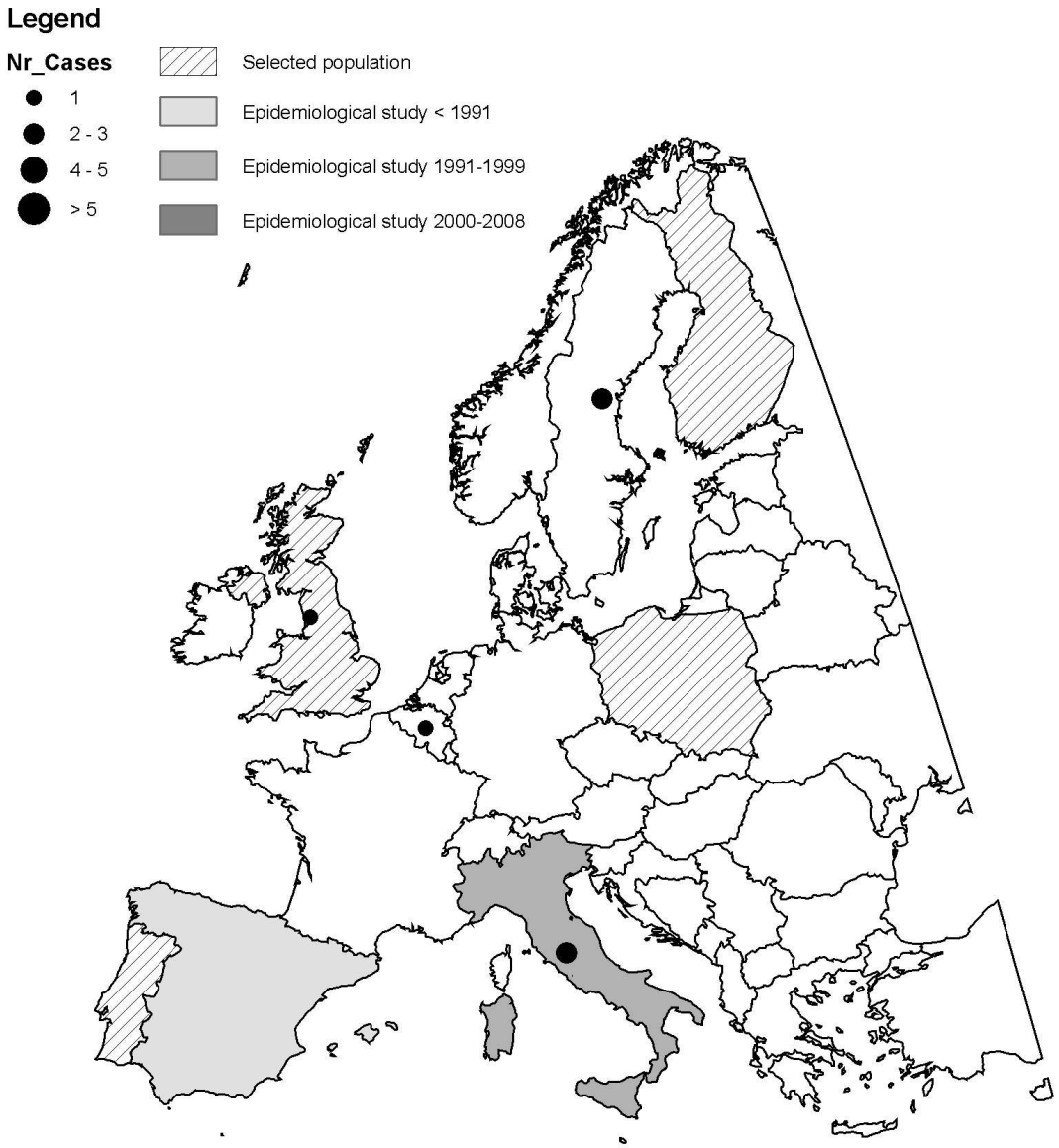
Gender
Allergic dermatitis was reported in both men and women.

Age
Cases were reported in the age range 10 – 49 years.

Latency
No information available.

Regional differences
One epidemiological study was reported in Italy, concerning the years 1984 – 1993. In Spain, a prevalence of 2.5% was reported in 1980. Occupational exposure and cases are more reported.
See map below.

Time trends
No information available.


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Glutaraldehyde
CAS: 111-30-8

Publications#	R phrase	LLNA*	Score of publications^	Total score
6 (15)	1 (R42/R43)	1 (Strong)	2	**3**

Sources of exposure
No information available for the general patch test population. At the workplace, contact dermatitis is especially reported in healthcare workers, nurses and dental personnel.

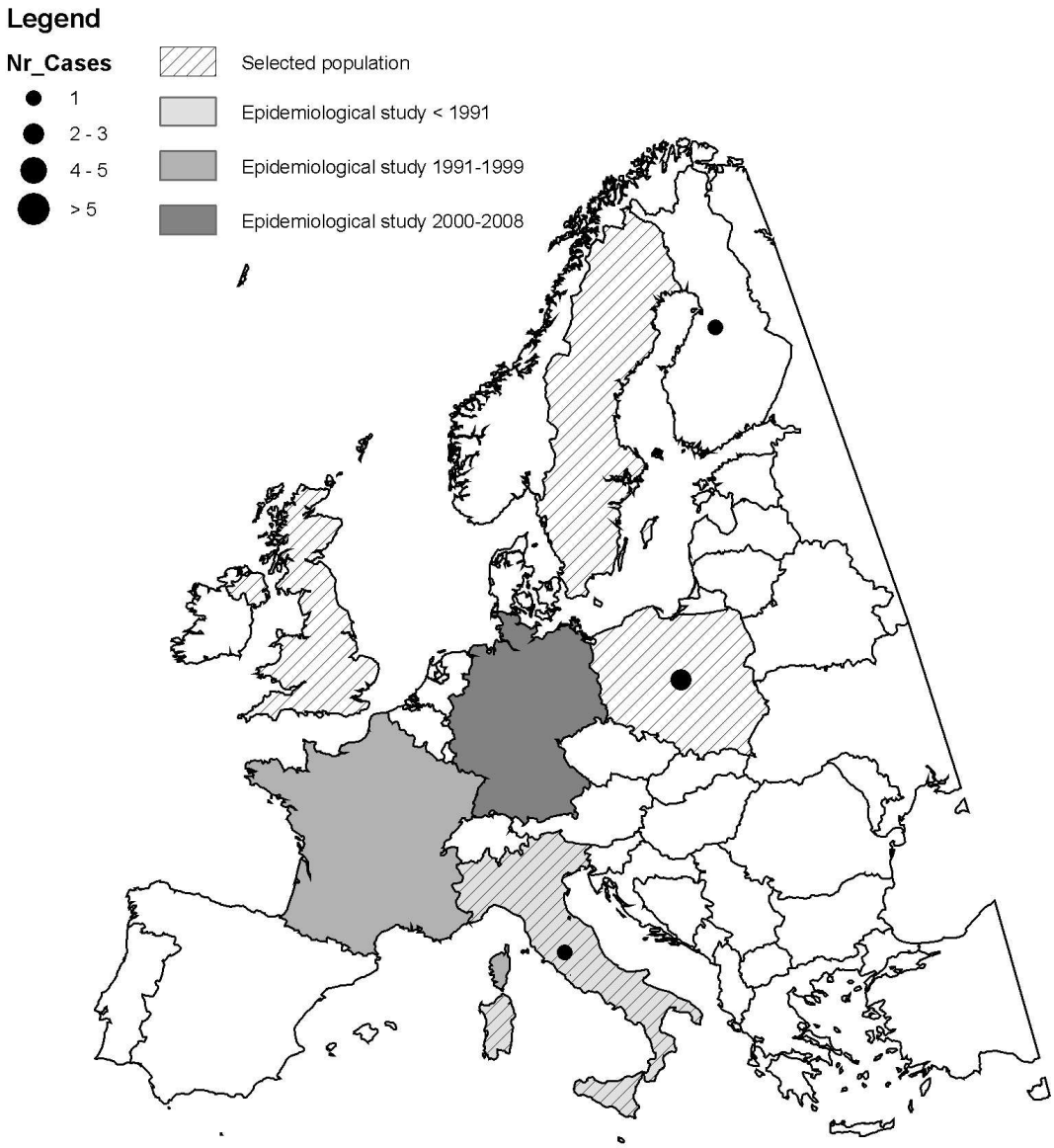
Gender
Positive reactions were reported both in men and women.

Age
Occupational dermatitis was reported in the age range 21 – 74 years.

Latency
No information available.

Regional differences
In the general patch test population, data were found for Germany. Italy and France reported earlier also on this compound. See map below.

Time trends
No information available.
In Germany, an average prevalence of 0.5% was reported in 2003 in the general patch test population. In occupational exposed groups, prevalence was higher (on average 7.6% over the years).


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Glyoxal
CAS: 107-22-2

Publications#	R phrase	LLNA*	Score of publications^	Total score
4 (3)	1 (R38/R43)	1 (Moderate)	2	**3**

Sources of exposure
Only occupational exposure with resulting allergic contact dermatitis was reported, especially in health care workers.

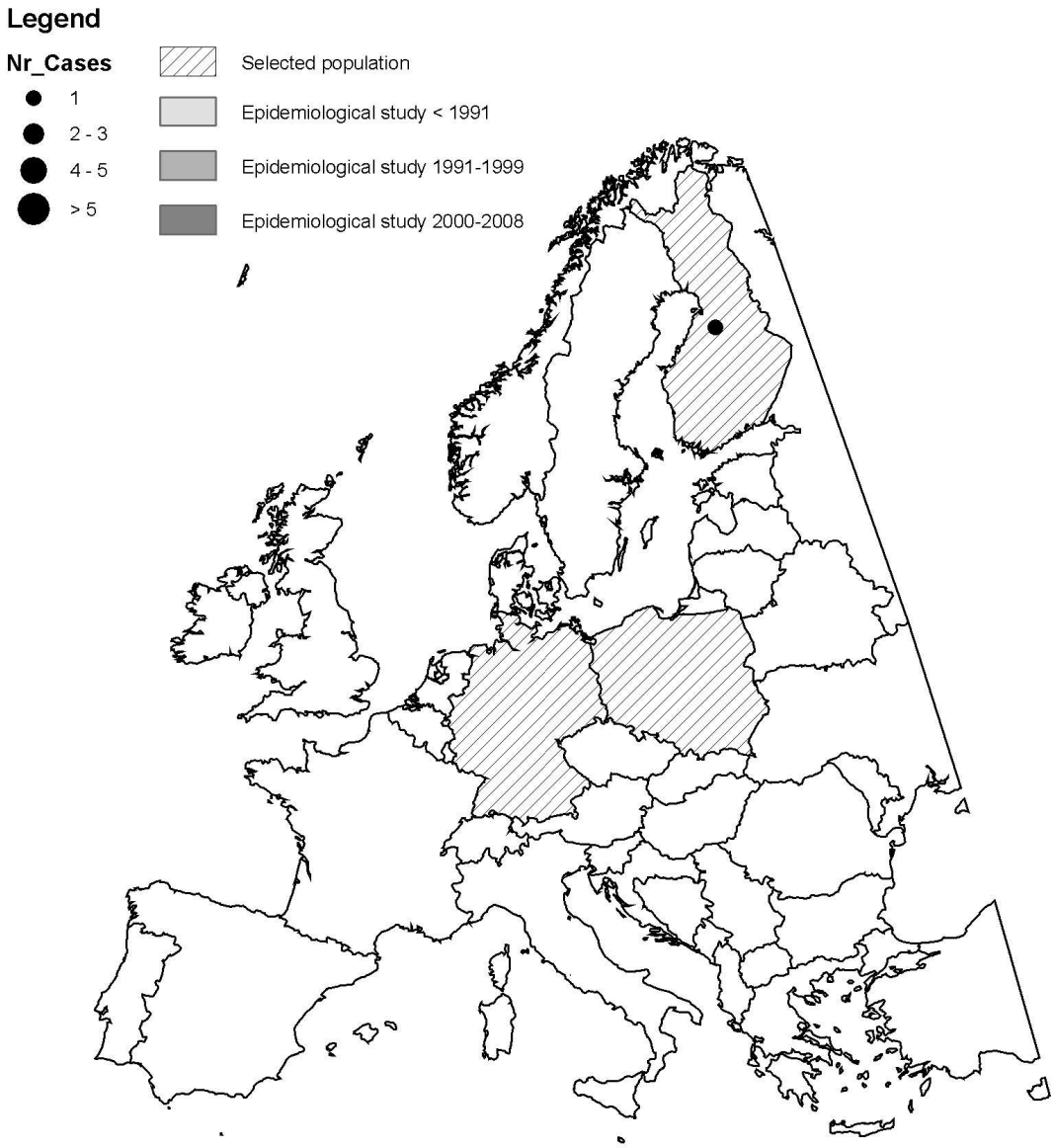
Gender
Both women and men.

Age
Cases were in the age range 21 – 69 years.

Latency
No information available.

Regional differences
Reports originate from Germany, Poland and Finland. See map below.

Time trends
An average prevalence of 3.2% was reported in occupational exposed groups. All these reports are from the period 1998 – 2005.


Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Hydroquinone
CAS: 123-31-9

Publications#	R phrase	LLNA*	Score of publications^	Total score
6 (9)	1 (R43)	1 (Strong)	1	**2**

Sources of exposure
Reported exposure to this compound occurs via hair dyes, bleaching creams, and in a film laboratory.

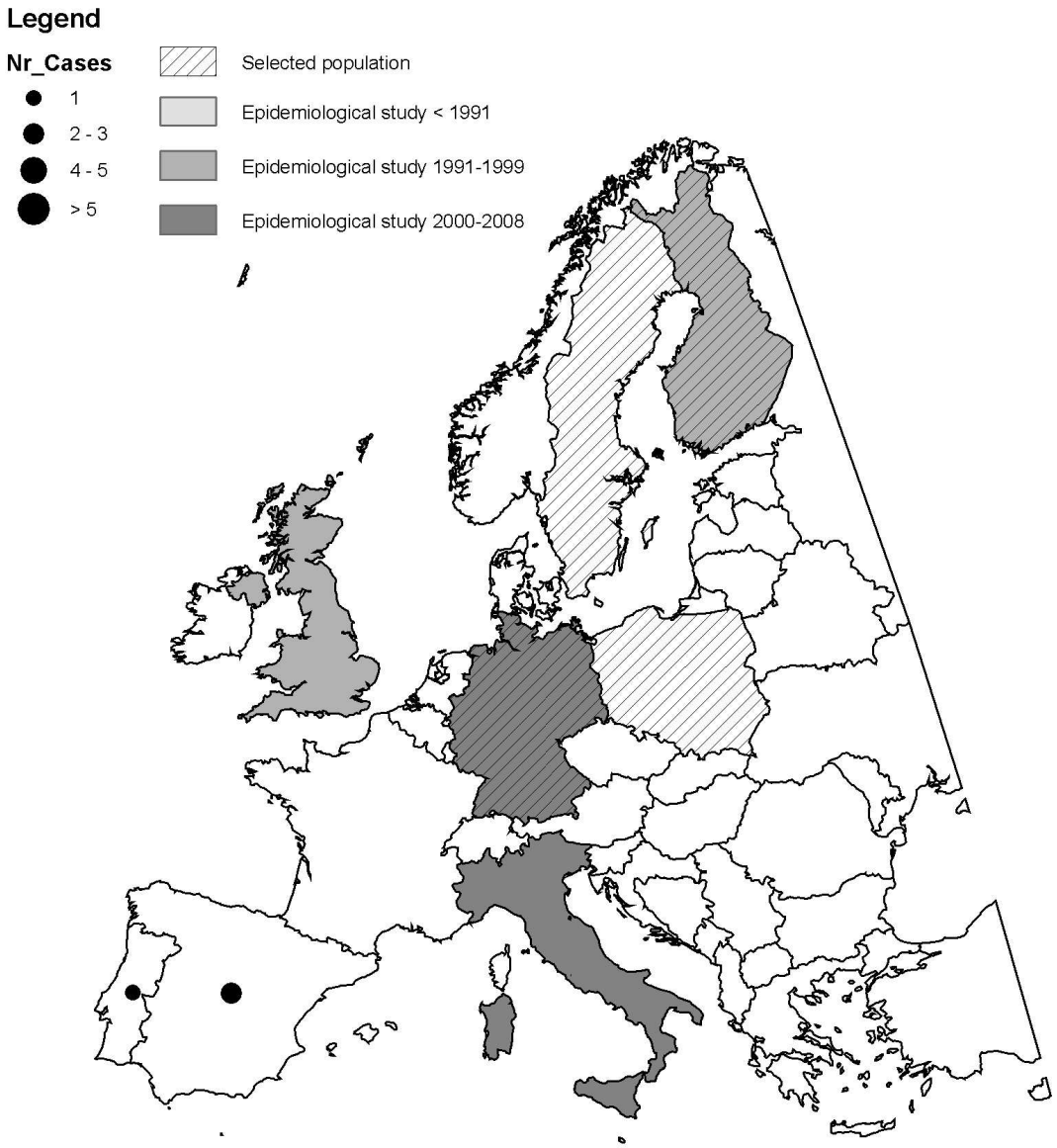
Gender
Allergies were observed both in males and females.

Age
Reports of allergic reactions were reported in the age range 7 months – 46 years.

Latency
A latency of 7 days was reported after contact with a bleaching cream.

Regional differences
Sensitization of this compound was evaluated in epidemiological studies especially in Germany. See map below.

Time trends
In Germany, an increase in prevalence was reported between 1995-2002 (1.5%) and 2003 – 2006 (5.4%) in a general patch test population. Interestingly, a lower prevalence was observed in German hairdressers in the period 1995 – 2002 (0.7%) and 2003 – 2006 (0.9%) [1] [2].



References

1. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to hairdressing allergens in female hairdressers and clients--current data from the IVDK, 2003-2006. *J Dtsch Dermatol Ges* 2007: 5(11): 993-1001.

2. Uter W, Lessmann H, Geier J, Schnuch A. Contact allergy to ingredients of hair cosmetics in female hairdressers and clients--an 8-year analysis of IVDK data. *Contact dermatitis* 2003: 49(5): 236-240.

Imidazolidinylurea
CAS: 39236-46-9

Publications#	R phrase	LLNA*	Score of publications^	Total score
11 (9)	No records	1 (Weak)	2	**2**

Sources of exposure
The source is mostly not reported, however, imidazolinidylurea is used as a preservative. One case reported the source as a ultrasonic gel. Another study included hairdressers.

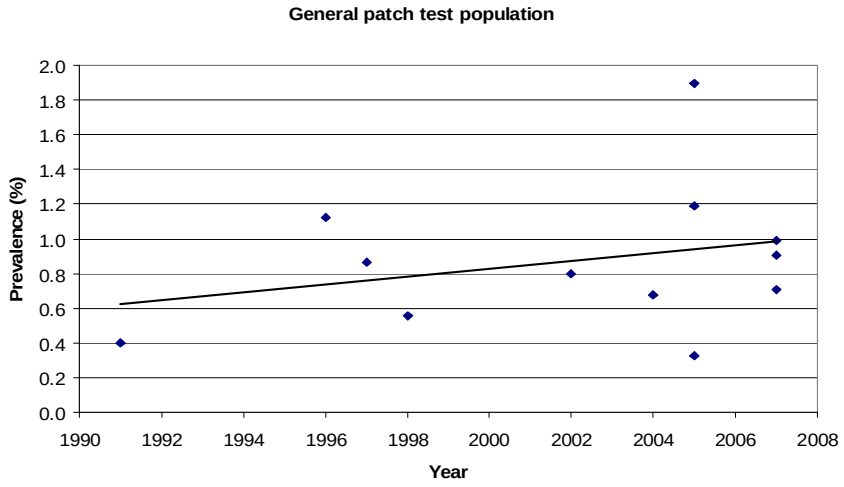
Gender
A higher prevalence was reported in females (1.0%) compared to males (0.7%) [1].

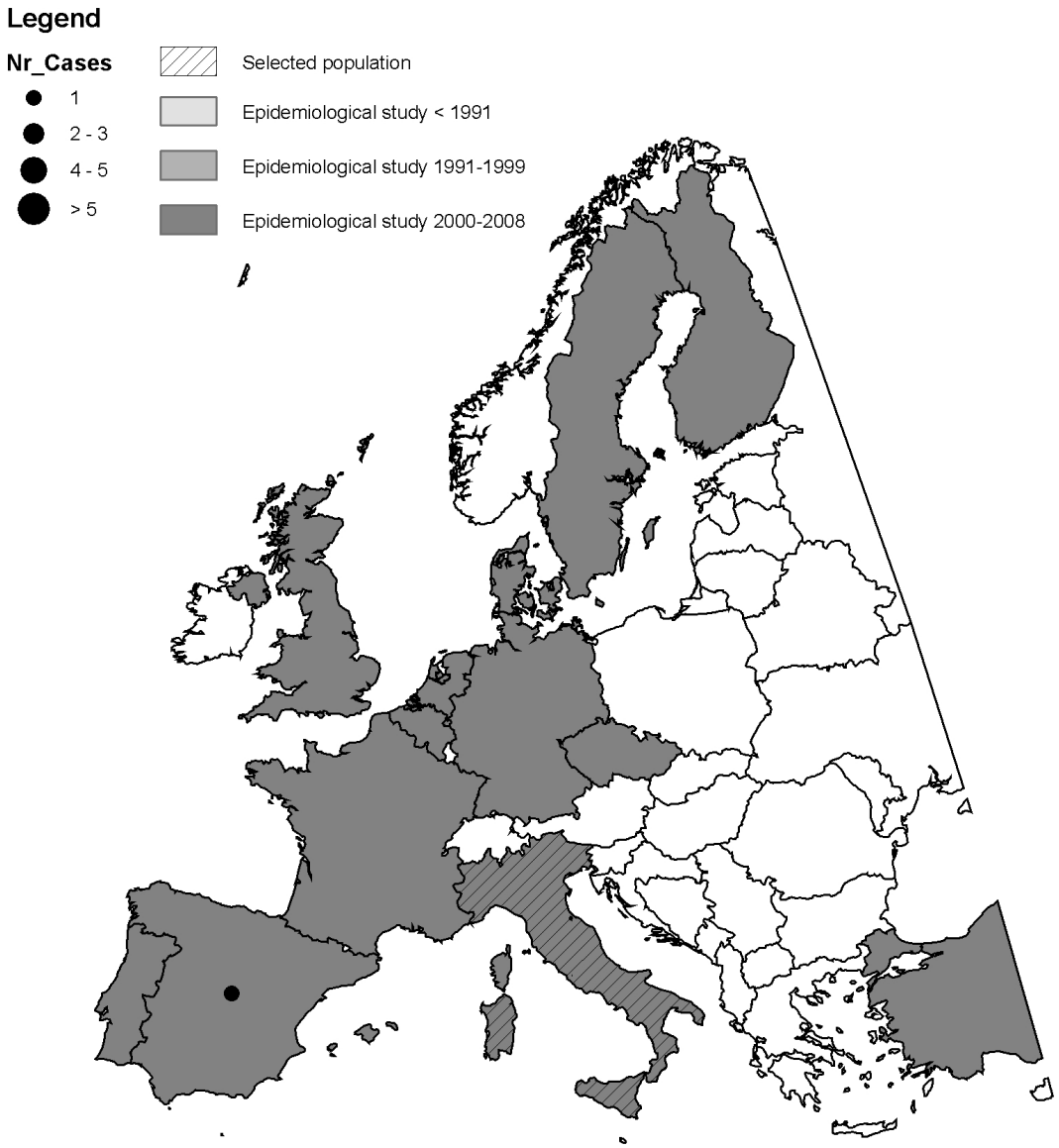
Age
Information is available in the age range 6 months – 47 years.

Latency
No information available.

Regional differences
On the map is shown for which countries information is available.

Time trends
Taken all European reports together, an increasing trend is observed (see graph). An increasing trend in prevalence was also seen in the UK between 2000 and 2007 [1]. In contrast, a decreasing trend was reported between 1995 – 1996 (1.1%) and 2000 – 2002 (0.8%) in Finland [2].





References

1. Jong CT, Statham BN, Green CM, King CM, Gawkrodger DJ, Sansom JE, English JS, Wilkinson SM, Ormerod AD, Chowdhury MM. Contact sensitivity to preservatives in the UK, 2004-2005: results of multicentre study. *Contact dermatitis* 2007: 57(3): 165-168.

2. Hasan T, Rantanen T, Alanko K, Harvima RJ, Jolanki R, Kalimo K, Lahti A, Lammintausta K, Lauerma AI, Laukkanen A, Luukkaala T, Riekki R, Turjanmaa K, Varjonen E, Vuorela AM. Patch test reactions to cosmetic allergens in 1995-1997 and 2000-2002 in Finland--a multicentre study. *Contact dermatitis* 2005: 53(1): 40-45.

Lauryl gallate
CAS: 1166-52-5

Publications#	R phrase	LLNA*	Score of publications^	Total score
3 (0)	1 (R43)	1 (Strong)	2	**3**

Sources of exposure
Exposures occurred by contact with lipstick at home and bakery products at the workplace. There was also exposure by preservatives.

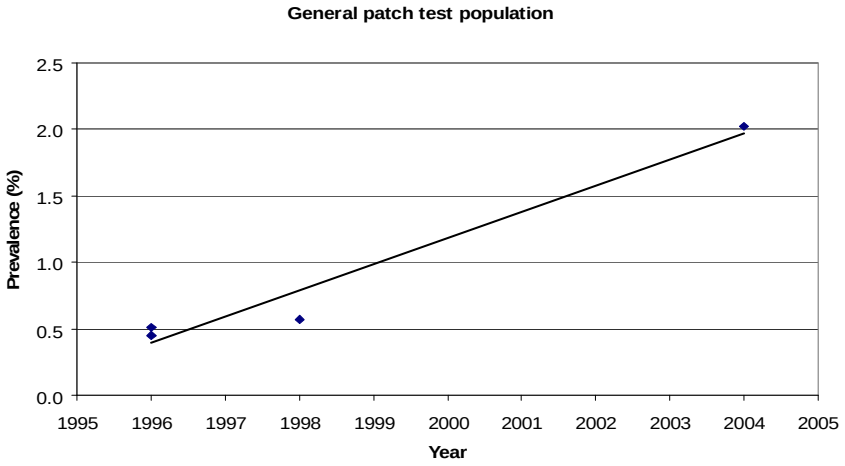
Gender
Both males and females were allergic to lauryl gallate.

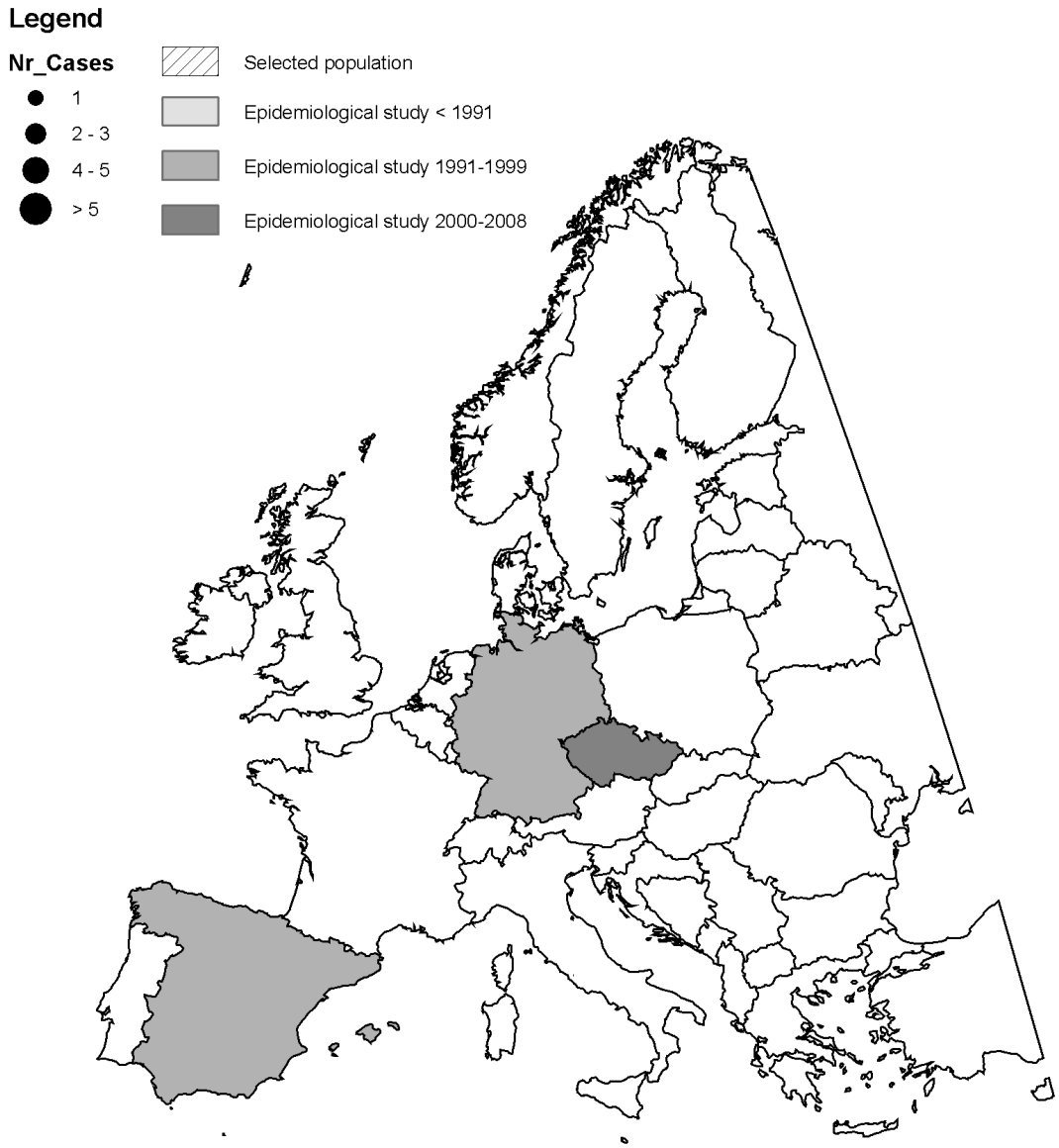
Age
One study noted exposure on average at 44.3 year.

Latency
No information available.

Regional differences
Most of the data were gathered in Spain, but also in Germany and Czech Republik. See map below.

Time trends
There is an increase in prevalence for lauryl gallate allergy in recent years.




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Lilial
CAS: 80-54-6

Publications#	R phrase	LLNA*	Score of publications^	Total score
4 (3)	1 (R43)	1 (Weak)	2	**3**

Sources of exposure
Lilial is a fragrance.

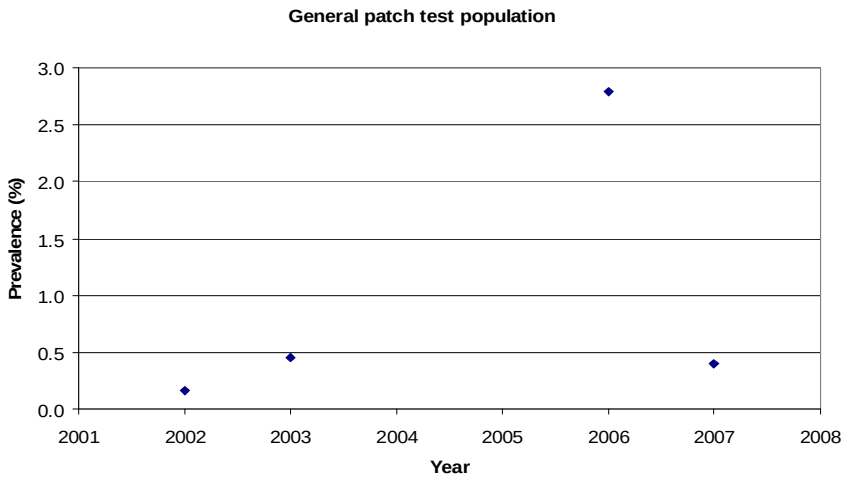
Gender
No information available.

Age
One study reported a mean age of 44.9 +/- 17.5 years.

Latency
No information available.

Regional differences
No information available.

Time trends
Not enough information is available to report on time trends.



Limonene / R-(+)-Limonene / S-(-)-Limonene
CAS: 138-86-3 / 5989-27-5 / 5989-54-8

Publications#	R phrase	LLNA*	Score of publications^	Total score
15 (4)	1 (R38/R43)	1 (None/Very weak)	1	**2**

Different isoforms (R-(+) and S-(-)) of limonene exist and were discussed together in this file. Data are especially derived from R-(+)-limonene.

Sources of exposure
In a lot of reports there was no information of sources of exposure. Some exposures occurred in lab and metal workers or via contact with citrus fruits, degreaser, fragrance, and a hand cleaning product.

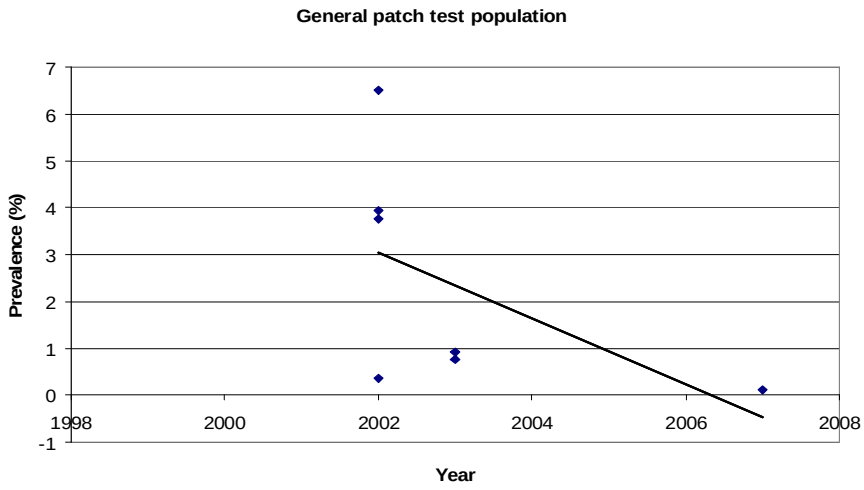
Gender
Both males and females were allergic to limonene.

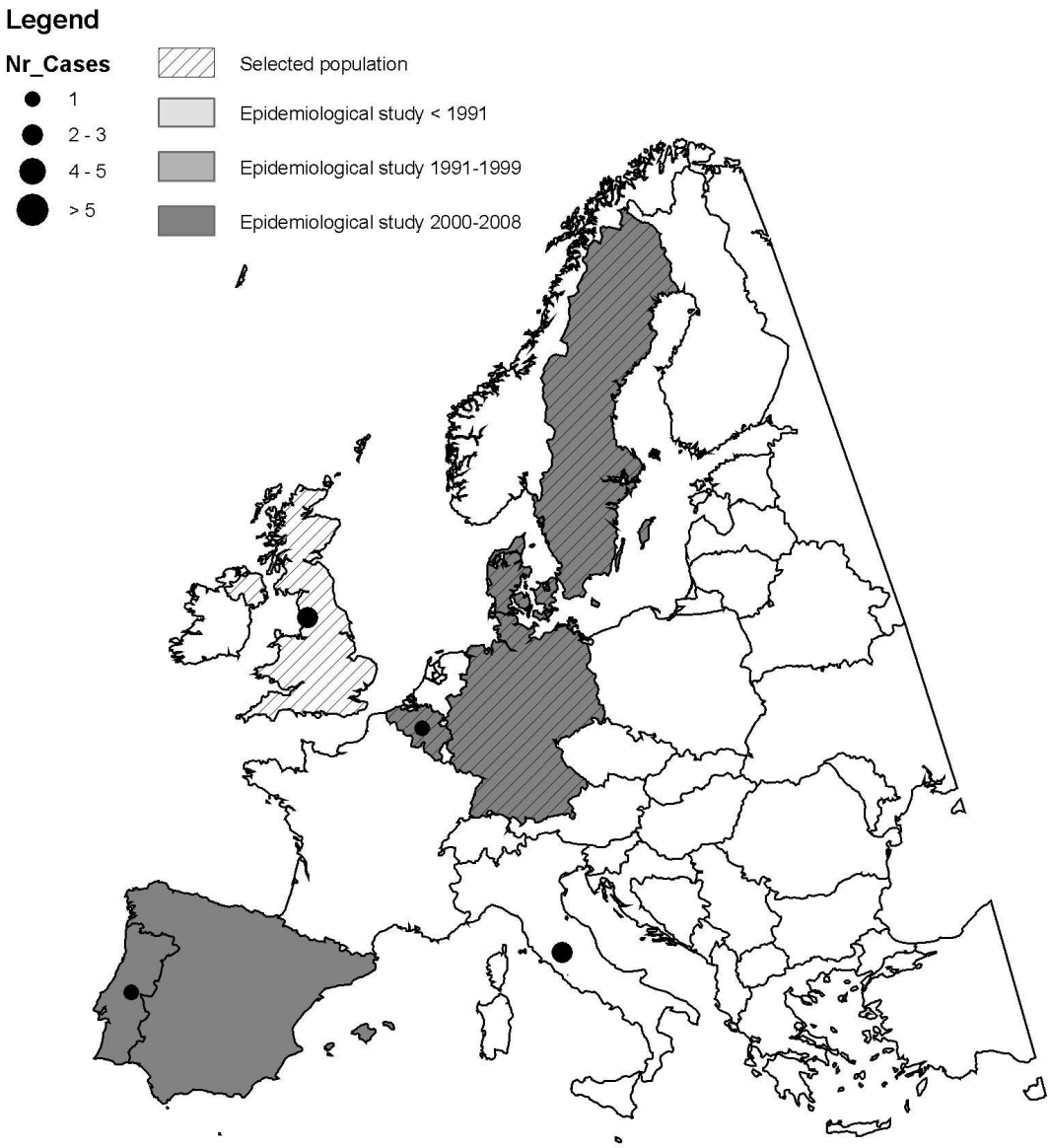
Age
Most reports gave no information on age of exposure, but 4 reports noted exposures in people from 39 to 61 years.

Latency
Information on latency is lacking. One study concluded that the allergic response was immediate, with only improvement during weekends.

Regional differences
Most of the data were gathered in Sweden, followed by Belgium, Germany, Denmark, Portugal, UK, Spain, and Italy. Matura *et al.*, (2002) studied allergy to R(+)-limonene in 4 European countries. It was remarkable that the prevalence was high in Spain (6.5%), followed by Sweden (3.9%) and Belgium (3.8%). A lower prevalence was observed in Portugal (0.4%) [1]. Heydorn *et al.* (2003) published data on S-(-)-limonene allergy with a prevalence of 0.8% and 0.9% in Sweden en Denmark [2], which is much lower than the prevalence in the previous study of Matura. See map below.

Time trends
There are only data starting from 2002 untill 2007. By using these few reports a decreasing trend of allergy to limonene can be observed.





References

1. Matura M, Goossens A, Bordalo O, Garcia-Bravo B, Magnusson K, Wrangsjo K, Karlberg AT. Oxidized citrus oil (R-limonene): a frequent skin sensitizer in Europe. *Journal of the American Academy of Dermatology* 2002: 47(5): 709-714.

2. Heydorn S, Johansen JD, Andersen KE, Bruze M, Svedman C, White IR, Basketter DA, Menne T. Fragrance allergy in patients with hand eczema - a clinical study. *Contact dermatitis* 2003: 48(6): 317-323.

Linalool
CAS: 78-70-6

Publications#	R phrase	LLNA*	Score of publications^	Total score
6 (5)	1 (R43)	1 (None/Very weak/ Weak)	2	**3**

Sources of exposure
One publication reported on occupational exposure in a perfume factory. Also exposure at home was noted after contact with fragrance.

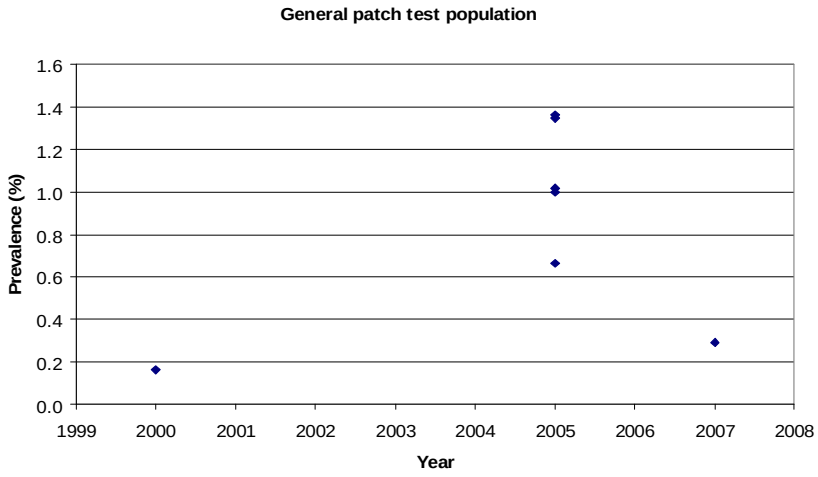
Gender
Both males and females were allergic to linalool.

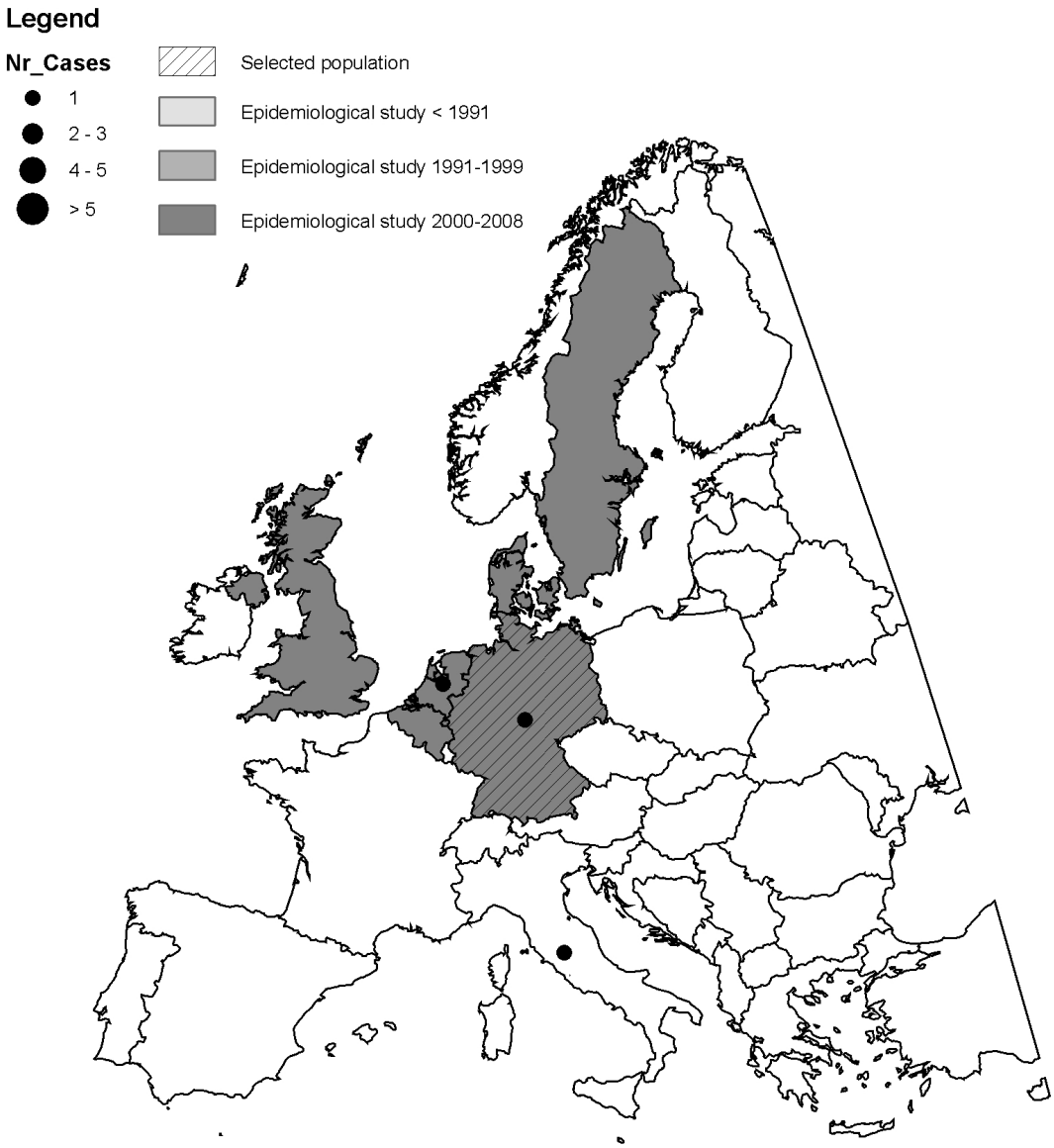
Age
Worldwide the mean age group is 46.3 year [1].

Latency
No information available.

Regional differences
Matura *et al.,* (2005) studied allergy to selected oxidized fragrance terpenes, including linalool in 0.5% and 2% concentration, in the following countries: Germany, Denmark, Belgium, UK, and Sweden. In Germany, prevalence was highest [2]. See map below.

Time trends
There is not enough data to report on a trend in prevalence in Europe.





References

1. Larsen W, Nakayama H, Fischer T, Elsner P, Frosch P, Burrows D, Jordan W, Shaw S, Wilkinson J, Marks J, Sugawara M, Nethercott M, Nethercott J. Fragrance contact dermatitis - a worldwide multicenter investigation (Part III). *Contact dermatitis* 2002: 46(3): 141-144.

2. Matura M, Skold M, Borje A, Andersen KE, Bruze M, Frosch P, Goossens A, Johansen JD, Svedman C, White IR, Karlberg AT. Selected oxidized fragrance terpenes are common contact allergens. *Contact dermatitis* 2005: 52(6): 320-328.

Propyl gallate
CAS: 121-79-9

Publications#	R phrase	LLNA*	Score of publications^	Total score
5 (7)	1 (R43)	1 (Strong)	2	**3**

Sources of exposure
Most of the exposures occurred by contact with cosmetics and bakery products. There was also a report where the source of exposure was a stabilizing agent.

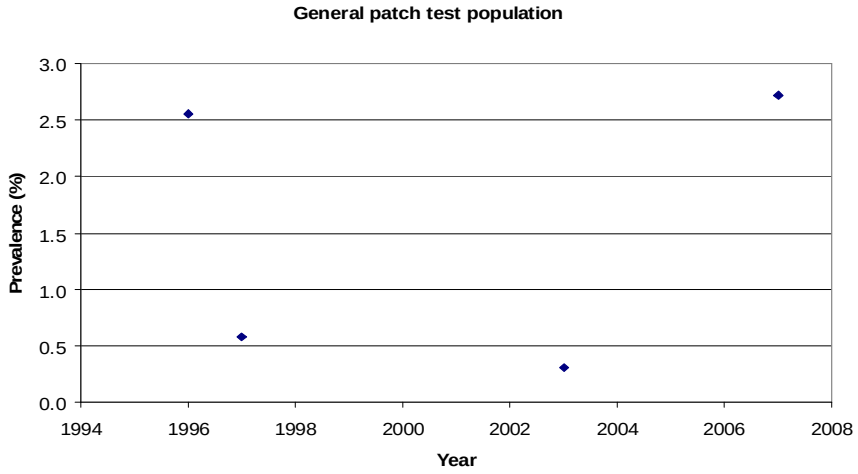
Gender
Both males and females were allergic to propyl gallate.

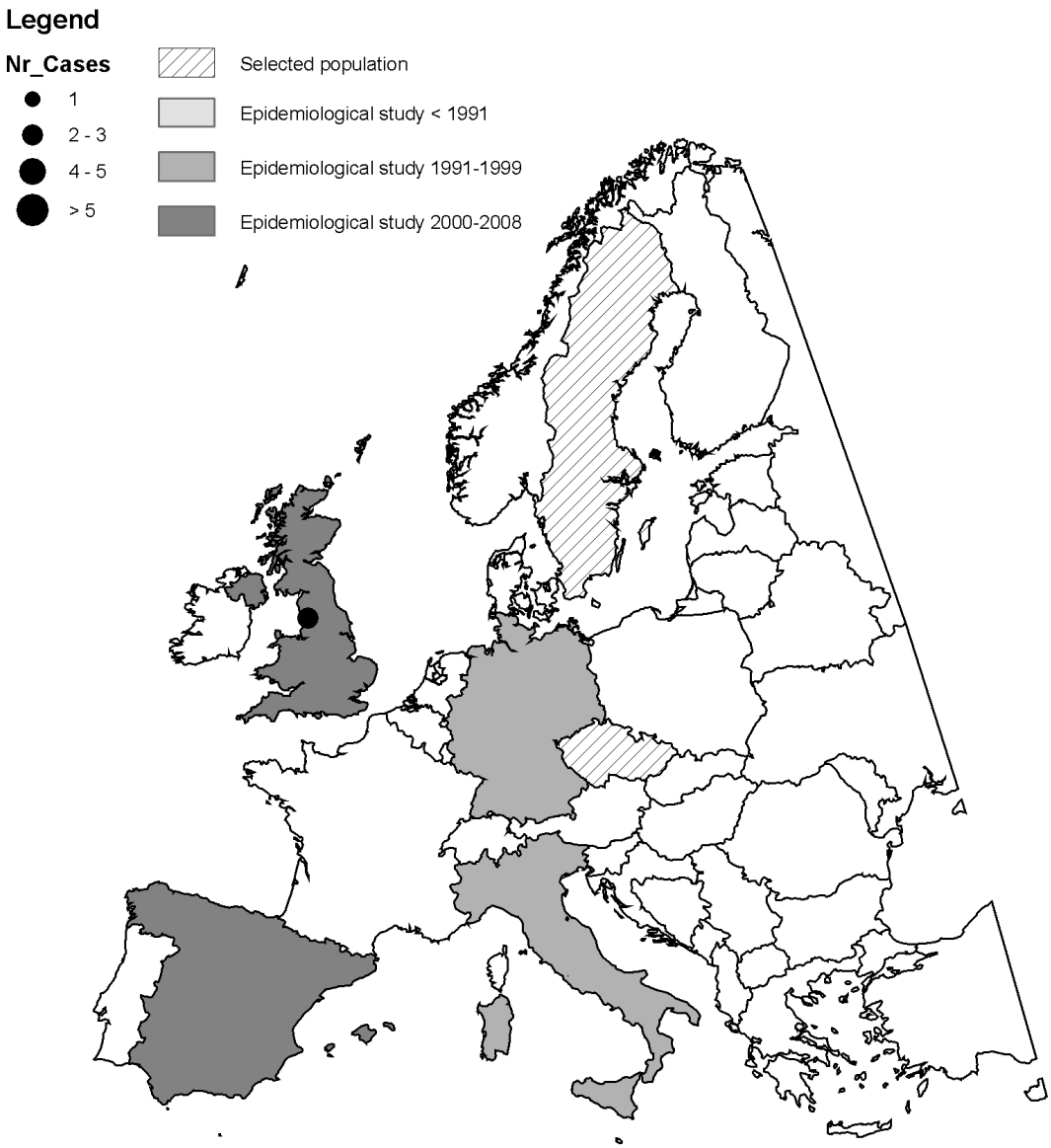
Age
Three reports noted exposures in the range of age 40 – 45 year.

Latency
Information on latency is lacking. One study concluded that the allergic response was immediate, with only improvement during weekends (occupational exposure).

Regional differences
Most of the data were gathered in Spain, followed by Italy, Germany, UK, Sweden, and Czech Republic. See map below.

Time trends
There is not enough data to report a time trend. Reported data are shown in the graph.




Legend
Nr_Cases
1
2 - 3
4 - 5
> 5
Selected population
Epidemiological study < 1991
Epidemiological study 1991-1999
Epidemiological study 2000-2008

Propylene glycol
CAS: 57-55-6

Publications#	R phrase	LLNA*	Score of publications^	Total score
9 (2)	0	1 (None/Very weak)	2	**2**

Sources of exposure
One study described exposure in metal workers. Other exposures are via contact with ultrasonic gel, ibuprofen gel, and a cosmetic cream.

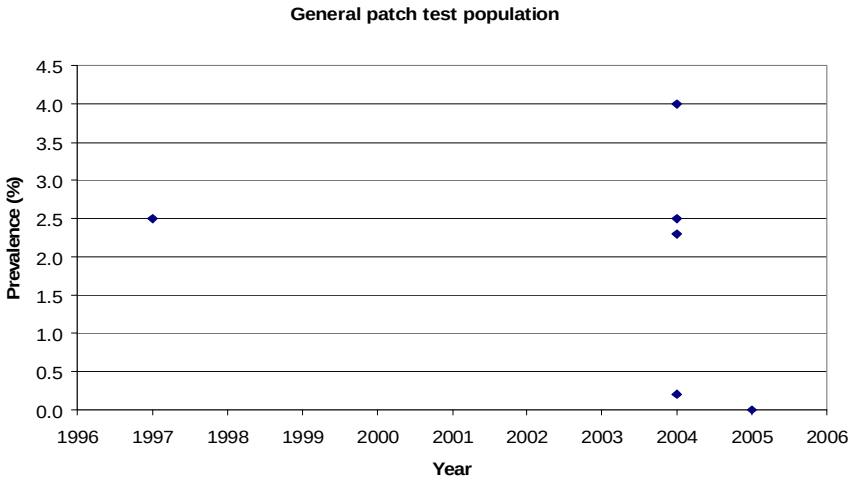
Gender
Both males and females were allergic to propylene glycol.

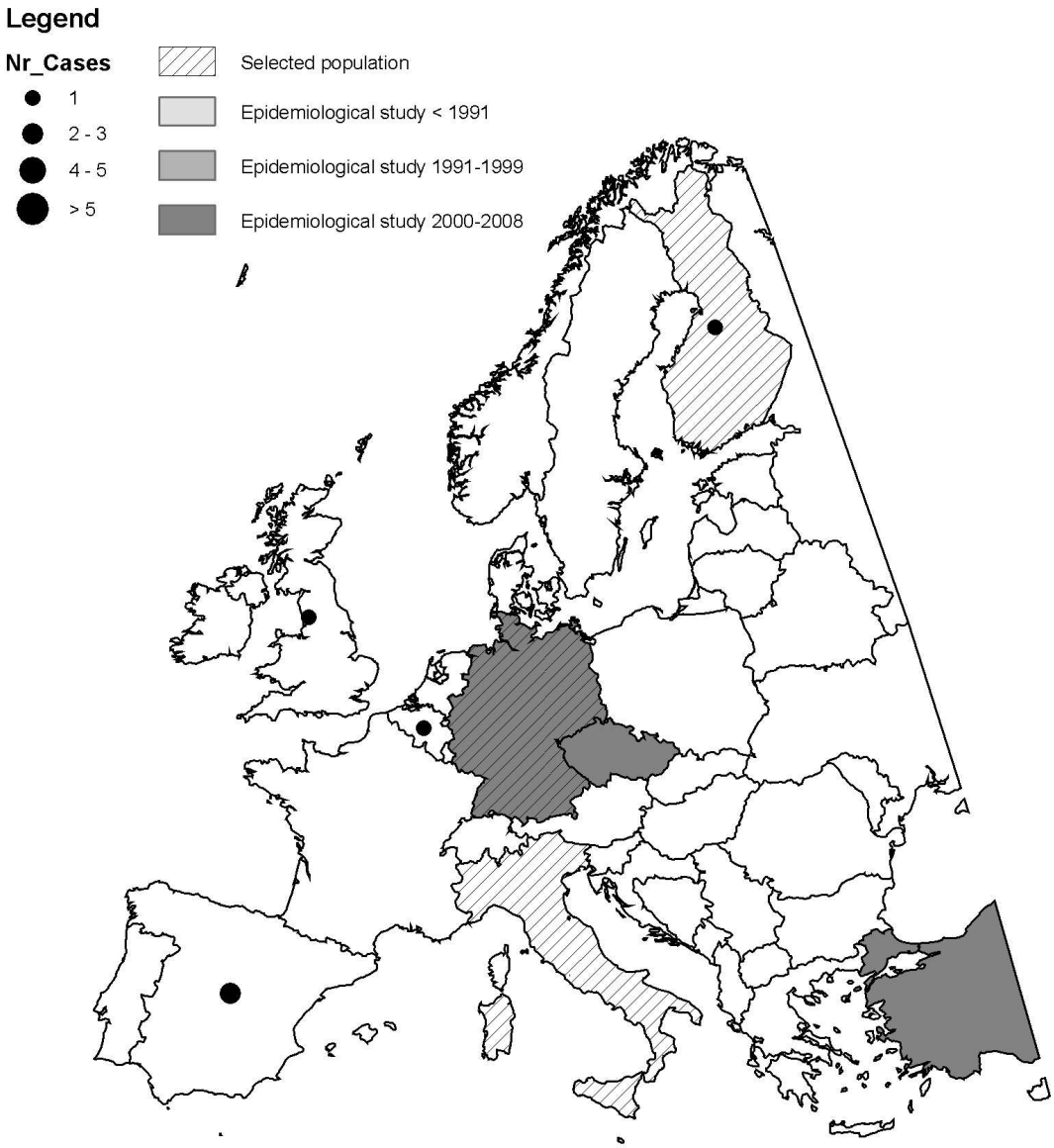
Age
Exposure occurred in all age groups ranging from 6 to 66 year. Heine *et al.*, (2004) studied allergy to propylene glycol in 3 age groups: 6 – 12 year, 13 – 18 year, and 60-66 year. The highest prevalence was observed in the youngest age group (4%). The prevalence in the other two age categories was almost the same, 2.3% for 13 – 18 year and 2.5% for 60 – 66 year [1].

Latency
There were 2 reports with information on latency, with a period of 3 – 4 hours and 24 hours.

Regional differences
Most of the data were gathered in Germany, followed by Spain, Belgium, UK, Czech Republik, Finland, and Turkey. See map below.

Time trends
There is not enough data to report on time trends in Europe.





References

1. Heine G, Schnuch A, Uter W, Worm M. Frequency of contact allergy in German children and adolescents patch tested between 1995 and 2002: results from the Information Network of Departments of Dermatology and the German Contact Dermatitis Research Group. *Contact dermatitis* 2004: 51(3): 111-117.

Tetramethylthiuram disulfde
CAS: 137-26-8

Publications#	R phrase	LLNA*	Score of publications^	Total score
18 (38)	1 (R38/R43)	1 (Moderate)	2	**3**

Sources of exposure
Occupational exposure was observed in health care workers after contact with rubber gloves. Also exposure at home was noted after contact with bandages, latex gloves, and after applying a henna tattoo. There was also one case of exposure after contact with a cornet/trumpet.

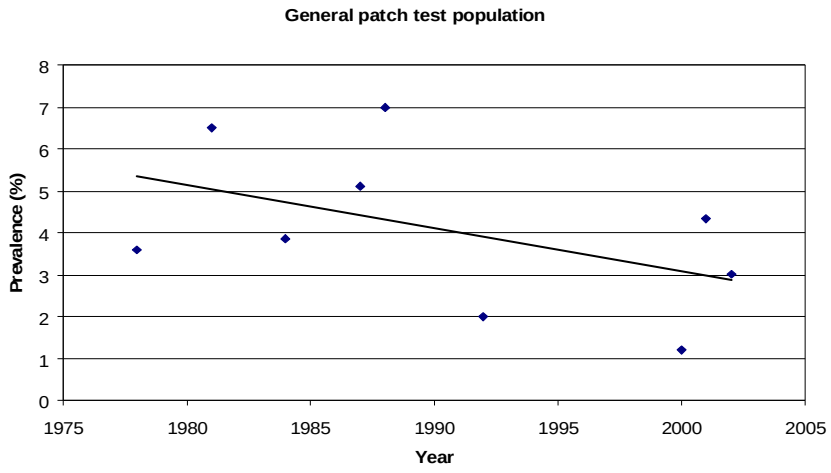
Gender
Both males and females were allergic to tetramethylthiuram disulfide.

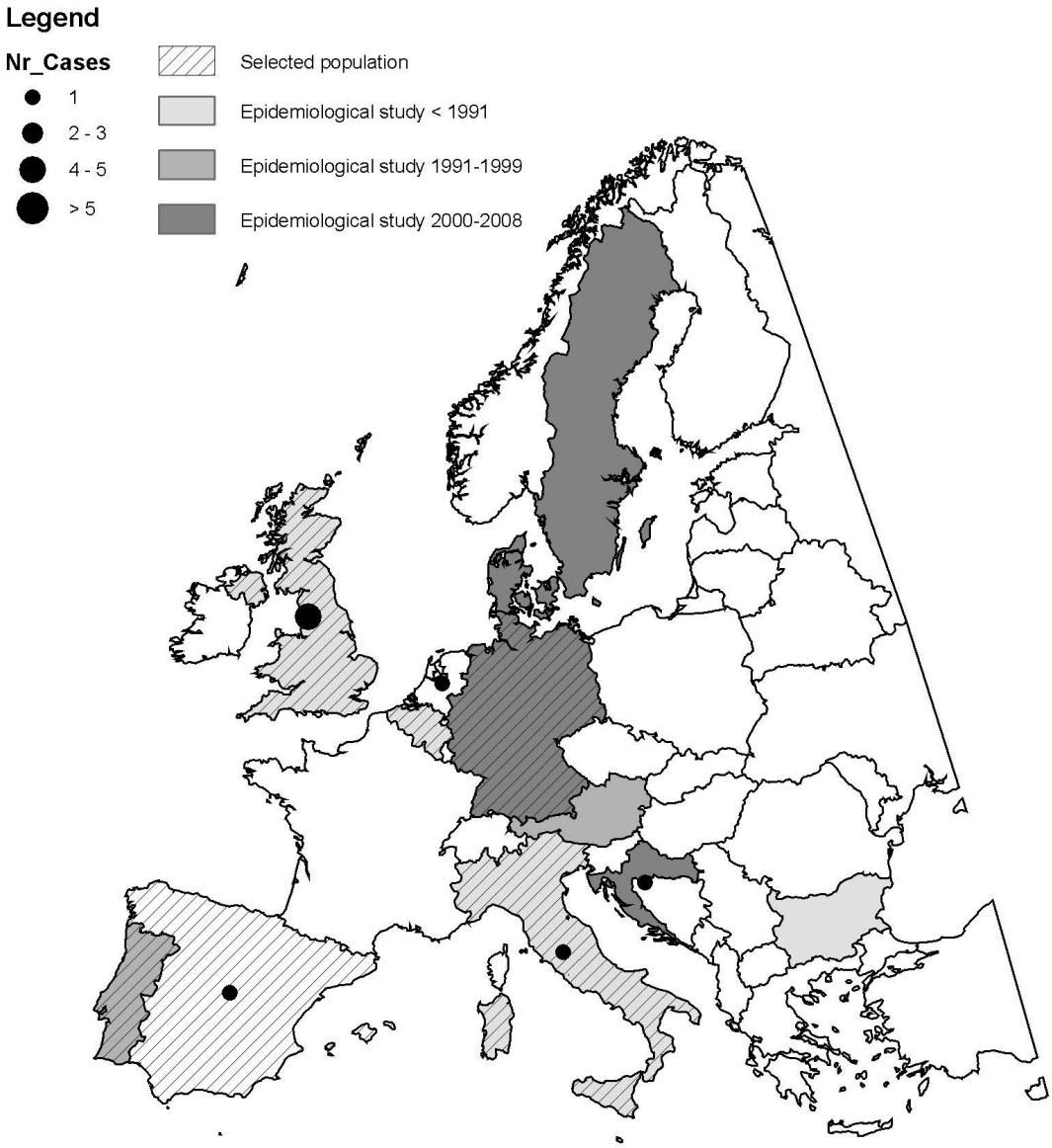
Age
The age of exposure ranged from 3 – 80 years.

Latency
Two reports describe a latency period of 1 – 2 days.

Regional differences
Most of the data were gathered in UK, Italy, and Germany. See map below.

Time trends
There is a decreasing trend in prevalence of allergy to tetramethylthiuram disulfide. In a Swedish study, a decrease was observed between the periods 1991-1993 (2% prevalence) and 1999 – 2001 (1.2% prevalence). The high prevalence before 1990 was observed in a study in Bulgaria [1].





References

1. Stransky L, Krasteva M. Changing patterns of contact sensitivity in Sofia. *Dermatosen in Beruf und Umwelt* 1989: 37(6): 214-216.

Compound	CAS	Sources of exposure	Gender/Age	Additional information
1-Butanol	71-36-3	Sunscreen	-	1 case
3-Phenylenediamine	108-45-2	Occupational	-	1 report (1977)
6-Methylcoumarin	92-48-8	-	-	5 studies
Aniline	62-53-3	-	-	1 report in Germany: prevalence of 2.2% (2007)
Benzaldehyde	100-52-7	Perfume factory	Females	1 report in Germany
Bisphenol A diclycidyl ether	1675-54-3	Occupational: immersion oil, glue, and epoxy resins; plastic industry	-	-
Butyl glycidyl ether	2426-08-6	Occupational (at least 1 report)	-	3 reports (1979, 1991, and 2007)
Camphorquinone	465-29-2	-	-	1 report: active sensitization to camphorquinone during the patch test.
CD-3	25646-71-3	Color film development	-	Some cases (nineties)
Chloramine T	127-65-1	Nurse	-	1 report in Italy
Diethylenetriamine	111-40-0	Occupational	-	-
Sodium lauryl sulfate	151-21-3	-	-	1 epidemiologic study in Germany
Resorcinol	108-46-3	Hairdressers	Females (1 report)	2 reports with information of The Netherlands, Finland, Norway, and Italy
Phthalic anhydride	85-44-9	-	-	8 cases in France and UK were reported with ACD caused by positive reaction to phthalic anhydride/trimellitic anhydride/glycols copolymer.
Metol	55-55-0	Dental personnel and film laboratory	Females and males	Reports from Sweden
Methyl salicylate	119-36-8	Reflex spray	-	1 case
Methyl 2-nonynoate	111-80-8	-	-	1 report in UK (1988)
Maleic anhydride	108-31-6	-	-	2 reports in Sweden and Italy
Lactic acid	50-21-5	Wart remover solution	-	1 report in Spain
Isopropanol	67-63-0	Occupational and at home (medi-swab)	-	1 study in UK
Glycerol	56-81-5	Moisturizing cream	Female (29 year)	1 case in UK

Ethyl vanillin	121-32-4	-	-	1 report (1976)
Ethyl acrylate	140-88-5	Artificial finger nails and glues, and in dentists	Females and males	-
1-Chloro-2,4-dinitrobenzene	97-00-7	Algicides, rubber tyre factory, and in an analytical team	-	Some older European reports (before 1990)
Dimethylsulfoxide	67-68-5	-	-	1 case
2-Hydroxypropyl methacrylate	923-26-2	Occupational: dentist, ink, sealant	Female and male	Reports from Denmark and Finland
4-Nitrobenzylbromide	100-11-8	Pharmaceutical lab researcher	-	3 cases in Italy, UK, and Germany
Diethyl maleate	141-05-9	Occupational	Male (30 year)	1 case in Sweden; Symptoms were only present directly after contact with the compound.
Dihydrocoumarin	119-84-6	Fragrance	-	1 study The Netherlands in selected patients (1984): 3.8% reacted positive
Phenylacetaldehyde	122-78-1	Perfume factory	Male (26 year)	1 case in Switzerland; Latency of 1 day
Isopropyl myristate	110-27-0	Sunscreen and hygiene sprays at home and metal workers	Females and males (1 case 64 year)	Data from UK and Germany; Latency of 3 days (1 study)
Iodopropynyl butylcarbamate	55406-53-6	Wood preservatives, cleansing wipes, cosmetics, cutting oils and metal workers	Females and males (20 – 58 years)	Data from Denmark, UK, Italy, Germany, and The Netherlands
Benzyl cinnamate	103-41-3	-	-	Component of Balsam of Peru; 2 reports in Germany, 1 study tested 2042 individuals, of which 0.3% reacted positive
Benzyl salicylate	118-58-1	-	18 – 88 years	Component of Balsam of Peru; Germany: prevalence of 0.1% (2007) Denmark and Sweden: prevalence of 0.3% (2003)
Vanillin	121-33-5	-	-	Component of Balsam of Peru