

An update on airborne contact dermatitis: 2001–2006

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Reports on airborne dermatoses are mainly published in the context of occupational settings. Hence, in recent years, dermatologists and also occupational physicians have become increasingly aware of the airborne source of contact dermatitis, resulting mainly from exposure to irritants or allergens. However, their occurrence is still underestimated, because reports often omit the term 'airborne' in relation to dust or volatile allergens. For the present update, we screened the journals 'Contact Dermatitis' (July 2000 to December 2006); 'Dermatitis', formerly named 'American Journal of Contact Dermatitis'; 'La Lettre du Gerda' (January 2000 to December 2006); and also included relevant articles from other journals published during the same period. This resulted in an updated list of airborne dermatitis causes.

Key words: airborne; allergic contact dermatitis; contact urticaria; irritant contact dermatitis; occupational; photo-allergic contact dermatitis. © Blackwell Munksgaard, 2007.

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Contact dermatitis is defined 'airborne' on the basis of: (i) the presence in the environment of dust, droplets, or volatile causative agents; (ii) the clinical symptoms; (iii) the history of the patient and the follow-up; and (iv) the results of epicutaneous tests.

The nature of airborne reactions can be various, among which irritant, allergic, photoallergic, phototoxic, and contact urticarial, being the most common; some agents may induce more than 1 type of reaction and sometimes 1 dermatitis may mask another 1, such as for example, in the case of rosacea and airborne dermatitis in a farmer (1).

Reports on airborne dermatoses are mainly published in the context of occupational settings (2–8). Hence, in recent years, dermatologists and also occupational physicians have become increasingly aware of the airborne source of contact dermatitis, resulting mainly from exposure to irritants or allergens. Airborne contacts are still greatly underestimated although, because reports often omit this term in relation to dust or volatile allergens (9, 10). In some cases although, the responsible agents have been isolated by means of chemical analysis or direct microscopic study of the air or materials in the air (11). The different routes of exposition and relation to the clinical picture are sometimes misunderstood as well (12, 13).

The role of aeroallergens as a cause of allergic contact dermatitis or 'allergic contact dermatitis-like' atopic dermatitis is controversial. Occasionally, inhalation of pollens, dusts, and animal hair causes either flare-up of atopic dermatitis, or an apparent superimposed contact dermatitis; in some instances, the airborne allergens may produce positive patch-test reactions (i.e. with dermatophagoides, 14).

For the present update, we screened the Contact Dermatitis (July 2000 to December 2006); the Dermatitis, formerly named American Journal of Contact Dermatitis, and La Lettre du Gerda (January 2000 to December 2006); and also included relevant articles from other journals published during the same period. Table 1 gives the lists (that do not pretend to be exhaustive) with the airborne causes of dermatoses that we could retrieve. For previous reviews on this subject, we refer to Huygens and Goossens (2) and Lachapelle (10), the latter regarding irritant contact dermatitis.

Most of the allergens identified were in an occupational setting, if not the references are indicated with asterisk (Table 1). As in other recent reviews (2, 15, 16) plants represent a very important cause, particularly the Asteraceae (Compositae) family, for which recent advances in investigation of the clinical

Table 1. Causes of airborne dermatosis^a

	References
Allergic contact dermatitis	
Plants, natural resins, and wood allergens	
Ambrosia deltoidea (triangle-leaf bursage)	(22*)
Cashew nut (family Anacardiaceae)	(23*)
Chamomilla recutita (German chamomile)	(24*)
Champignon	(25)
Chrysanthemum	(26)
Colophonium	(27, 28, 29)
Compositae	(30*, 31*)
Evernia prunastri (oak moss)	(32)
Frullania	(33)
Gaillardia	(34)
Garlic	(35)
Humulus lupulus	(36)
Iris (lis)	(37)
Latex	(38)
Laurus nobilis	(39*)
Machaerium schleroxylon (Santos rosewood)	(40, 41)
Parthenium hysterophorus	(42*, 43*, 44*, 45*, 46*)
Picae abies (spruce)	(47)
Pinus sylvestris (Finish pine)	(47)
Primula obconica	(48, 49)
Propolis	(50, 51*, 52)
Pterocarpus soyauxii Taub (Padauk wood)	(53)
Rosmarinus officinalis	(54, 55)
Swartzia madagascariensis	(56)
Thymus vulgaris (Thyme)	(57)
Triplachiton scleroxylon (Obeche)	(58)
Tropical woods: Dalbergia retusa (Cocobolo wood)	(40, 59)
Verbascum densiflorum (gordolobo)	(60)
Plastics, rubbers, and glues	
Acrylates	(61–64)
Benzoyl peroxide	(65, 66)
Epoxy acrylates	(67)
Epoxy resin (and amines)	(68, 69–82)
Formaldehyde and formaldehyde resins	(83, 84)
Isocyanates	(85, 86*, 87, 88, 89)
Metals	
Cobalt	(90)
Mercury	(91, 92)
Nickel	(93, 94)
Silver	(28)
Industrial and pharmaceutical chemicals	
2-Aminothiophenol	(95)
p-Aminophenol	(96)
Azathioprine	(97*)
Azithromycin	(98, 99)
n-Alkyl dimethylbenzylammonium chloride	(100)
N,N-bis[2-bromo-ethyl] aniline	(101)
Budesonide	(102)
2-Butin-1,4-diol	(103)
Ceftiofur	(104)
Cyanamide and dibenzyl phosphite	(105)
Cinnamal (cinnamic aldehyde)	(106)
Chloroacetamide	(107*)
Diacetylmorphine	(108, 109)
Diethylene glycol monobutyl ether	(110)
Ethacridine lactate	(111)
Formaldehyde and releasers (quaternium -15)	(112)
Glutaraldehyde	(113)
HBTU (o-(benzotriazol-1-y1)-N,N,N',N',-tetramethyluronium)	(114)
3-Iodo-2-propynyl-butylcarbamate	(115)
Isothiazolinones	(116–118, 119*) (Fig. 1)
Lansoprazole	(120, 121)
Meropenem	(122)
Mesna	(123)
Methotrexate	(124)

Table 1. Continued

	References
Methyl chloroform	(125)
(<i>N</i> -methyl- <i>N</i> -nitroso- <i>p</i> -toluenesulfonamide) Diazald	(126)
Oxycodone	(127)
Paraphenylenediamine	(128)
Pristinamycin	(129)
Quinazoline oxide	(130)
Ranitidine	(131)
Simvastatin	(132)
Tetrazepam	(133, 134, 135)
Succinimidyl carbonates	(136)
Pesticides and animal feed additives	
Acephate	(137*)
1,3-Dichloropropene	(138)
Olaquinox	(139)
Organophosphorus pesticides	(140*)
Phoxim	(141*)
Pigs' feed	(142)
Propineb	(143)
Miscellaneous	
Agricultural dusts (storage mites, flax allergens, <i>Pantoea agglomerans</i> , and moulds)	(5)
Cigarettes	(144*)
Disperse dyes	(145)
FAZ-exhaust Kodak (polyethylene terephthalate, polyvinyl butyral, and silver)	(146)
Irritant contact dermatitis	
Dermatitis in a particleboard manufacturing facility	(147)
Phosphates in a fertilizer factory	(148)
Synthetic fibres from an air-conditioning filter	(149)
Chlorothalonil	(150)
Photoallergic reactions	
Carprofen	(151)
Chlorpromazine	(152)
Contact urticaria	
Amoxicillin	(153)
Curcumin	(154)
Epoxy resin	(155)
HATU and HBTU	(156, 157)
Hyacinth	(158)
Pine processionary caterpillar (<i>Thaumetopoea pityocampa</i>)	(159–164)
Spathiphyllum wallisii flower	(165, 166)
Weeping fig (<i>Ficus benjamina</i>)	
Yucca (<i>Yucca aloifolia</i>)	
Contact urticaria syndrome	
Anisakis simplex	(167, 168)
Compositae	(169)
Diphenylmethane-4,4'-diisocyanatae	(170)
Fern	(171)
Goat dander	(172)
Protease	(173)
Lupine flour	(174)
Triphenyl phosphite	(175)
Protein contact dermatitis	
Flour	(176)
Sapele wood	(177)
Erythema-multiforme-like eruption	
1,2-Ethanedithiol	(178)
Japanese lacquer tree (<i>Rhus verniciflua</i>)	(179)
Weeds	(180)

^aReferences with asterisk (*) represent non-occupational setting. HATU, *N*-[(dimethylamine)-1*H*-1,2,3-triazolo[4,5-*b*]pyridine-1-yl-methylene]-*N*-methyl-methanaminium hexafluorophosphate *N*-oxide; HBTU, *N*-[(1*H*-benzotriazol-1-yl)(dimethylamino)methylene]-*N*-methylmethanaminium hexafluorophosphate *N*-oxide) and 9-f.

signs, diagnosis, and therapy have been published (17, 18*, 19*, 20, 21). Although mono- and sesquiterpene-lactones, contained in Asteraceae, are by far the most frequently described airborne allergens in weed dermatitis, many other plant and wood aller-

gens remain unidentified. The principal sensitizers although include phenols (*Anacardiaceae*), quinones (*Tectona*, rosewood), and terpenes (*Frullania*, *Pinus*).

Although airborne irritants are more difficult to demonstrate, they are certainly more common



Fig. 1. Severe allergic contact dermatitis from airborne exposure to methyl- and methylchloro-isothiazolinone in freshly-painted walls.

than allergic reactions (10). They include fibrous materials (such as glass fibres, rock wool, and grain dust), which give rise to mechanical dermatitis by friction, inducing both hyperkeratosis and acute dermatitis; wood and cement dust, which cause irritant reaction with lichenified dermatitis at the contact sites.

Conclusion

This survey provides an updated list of airborne causes of dermatoses, most often occupation-induced. Irritant and allergic dermatitis are the most common, but some causes of photoallergic reactions, the contact urticaria (syndrome), protein contact dermatitis, and erythema-multiforme-like eruptions have also been retrieved. The causes are multiple: plants, natural resins, and wood allergens; plastics, rubbers, and glues; metals; industrial and pharmaceutical chemicals; pesticides and animal feed additives, enzymes, and animal dander.

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