

Allergic and irritant patch test reactions to plastic and glue allergens

LASSE KANERVA, RIITTA JOLANKI AND TUULA ESTLANDER

Section of Dermatology, Finnish Institute of Occupational Health, Topeliuksenkatu 41 aA, FIN-00250 Helsinki, Finland

Key words: occupational; allergic contact dermatitis; irritant patch test reactions; plastics; glues; phenyl glycidyl ether; diaminodiphenyl methane; hexamethylene tetramine; 4-tert-butylcatechol; o-cresyl glycidyl ether. © Munksgaard, 1997.

Plastics and glues are among the most common causes of occupational dermatoses (1–3). We have compiled our 3-year statistics on patch testing with plastic and glue allergens.

Materials and Methods

Most of our patients are referred because of suspected occupational dermatoses (1, 2), and they are patch tested with a modified European standard series, and their own substances. Those with exposure to plastics and glues are usually patch tested with our plastics and glues series ("plastics and glues series 1", compounds 1–30 in Table 1, and/or "plastics and glues series 2", compounds 31–50 in Table 1). In this report, the patch test results with the 50 allergens in the plastics and glues series 1 and 2 are analysed (Table 1).

Patch testing was performed as previously described (1, 2, 4) with 2 days occlusion and 3 readings (usually on D 2, 3 and 4–6). Allergic reactions were scored according to ICDRG recommendations, +, ++ and +++ reactions being considered allergic. Irritant reactions were also recorded. Reactions scored as doubtful (?+) or irritant (IR) were classified as irritant. The patch test substances were from Chemotechnique Diagnostics AB (Malmö, Sweden), Trolab, Hermal (Reinbeck/Hamburg, Germany), Epikon Oy (Helsinki, Finland) or manufactured by ourselves (Table 1).

Results

The number of patients tested, allergic and irritant patch test reactions, and source of patch test substances are summarized in Table 1. The most common allergic patch test reactions (in rank order) were to phenyl glycidyl ether (3.4%), diaminodiphenyl methane (2.9%), hexamethylene tetramine (2.2%), 4-tert-butylcatechol (2.1%) and o-cresyl glycidyl ether (2.1%). The allergens that most often caused irritant reactions were benzoyl peroxide (6.9%), hydroquinone (6.4%), abitol (3.4%), and acid-catalyzed phenol formaldehyde resin (2.3%). 32 out of 50 chemicals caused no allergic reactions during the 3-year period (Table 1).

Discussion

Tarvainen (5), in less occupationally orientated patients, found the most frequent plastics and glues allergens to be p-tert-butylphenol-formaldehyde resin (2.6%), abietic acid (2.3%), phenyl glycidyl ether (1.2%), and diaminodiphenylmethane (0.9%). Holness & Nethercott

(6), in mainly occupational patients, reported their most common allergens to be phenyl glycidyl ether (6.1%), ethylenediamine (3.1%), melamine-formaldehyde resin (3.1%), and triethylenetetramine (2.5%).

In Finland, the most common occupational plastic and glue allergens are epoxy (1–4) and acrylic resins (1–3, 7), but we have separate patch test series for these. Thus, dental personnel, who are frequently allergic to acrylics, are not usually patch tested with the plastics and glues series. Therefore, very few allergic reactions to its acrylics were detected.

It may be useful to report irritant reactions to various patch test series. If irritant reactions to a particular patch test allergen are relatively common, weak reactions need to be even more critically evaluated. Irritant reactions caused by potent allergens may induce active sensitization (8); we have therefore suggested, for example, that the patch test concentration of 4-tert-butylcatechol should be reduced to 0.25% pet. (9).

References

1. Kanerva L, Estlander T, Jolanki R. Occupational skin disease in Finland. An analysis of 10 years of statistics from an occupational dermatology clinic. *Int Arch Occup Environ Health* 1988; 60: 89–94.
2. Estlander T. Occupational skin disease in Finland. *Acta Dermato-venereologica* 1990; suppl 155: 1–84.
3. Kanerva L, Jolanki R, Toikkanen J, Tarvainen K, Estlander T. Statistics on occupational dermatoses in Finland. In: Elsner P, Maibach H I, (eds): *Irritant dermatitis. New clinical and experimental aspects*. Basel: Karger, *Curr Probl Dermatol* 1995; 23: 28–40.
4. Jolanki R. Occupational skin disease from epoxy compounds. *Acta Dermato-venereologica* 1991; suppl 159: 1–80.
5. Tarvainen K. Analysis of patients with allergic patch test reactions to a plastics and glues series. *Contact Dermatitis* 1995; 32: 346–351.
6. Holness D L, Nethercott J R. Results of testing with a specialized collection of plastic and glue allergens. *Am J Contact Dermatitis* 1997; 8: 121–124.
7. Kanerva L, Jolanki R, Estlander T. 10 years of patch testing with the (meth)acrylate series. *Contact Dermatitis* 1997; 37: in press.
8. Kanerva L, Estlander T, Jolanki R. Sensitization to patch test acrylates. *Contact Dermatitis* 1988; 18: 10–15.
9. Estlander T, Kostianen M, Jolanki R, Kanerva L. Active sensitization and occupational allergic contact dermatitis caused by paratertiary butyl catechol. *Contact Dermatitis* submitted.

Table 1. Allergic and irritant patch test reactions caused by a series of of a plastic and glue allergens over a 3-year period

Compound	%(w/w) ^{a)}	Source	No. patients	Allergic reactions (number/%)	Rank order of allergic reactions	Irritant reactions (number/%)	Rank order of irritant reactions
1. hydroquinone	1.0	C	173	0		11=6.4%	2
2. dibutyl phthalate	5.0	C	173	0		2=1.2%	
3. phenyl salicylate	1.0	C	173	0		0	
4. dioctyl phthalate	2.0	C	173	0		2=1.2%	
5. 2,6-di-tert-butyl-4-cresol (BHT)	2.0	C	173	0		2=1.2%	
6. 2(2-hydroxy-5-methyl-phenyl) benzotriazol	1.0	C	173	0		2=1.2%	
7. benzoyl peroxide	1.0	C	173	3=1.7%	6	13=6.9%	1
8. 1,4-butanediol dimethacrylate (BUDMA)	2.0	C	171	1=0.6%		0	
9. azodiisobutyrodinitrile	1.0	C	173	0		1=0.6%	
10. bisphenol A	1.0	C	174	0		0	
11. tricresyl phosphate	5.0	C	173	0		3=1.7%	8
12. phenol-formaldehyde resin	1.0	C	173	3=1.7%	6	1=0.6%	
13. triphenyl phosphate	5.0	C	174	0		1=0.6%	
14. toluenesulfonamide-formaldehyde resin	10.0	C	174	1=0.6%		0	
15. resorcinol monobenzoate	1.0	C	173	2=1.2%		0	
16. 2-phenylindole	2.0	C	172	0		1=0.6%	
17. 2-tert-butyl-4-methoxy-phenol (BHA)	2.0	C	173	0		1=0.6%	
18. triethylenetetramine (TETA)	0.5 aq./pet. ^{a)}	C	174	0		3=1.7%	8
19. diethylenetriamine (DETA)	1.0	C	174	0		1=0.6%	
20. diaminodiphenylmethane (MDA)	0.5	C	174	5=2.9%	2	0	
21. abitol	10.0	C	174	0		6=3.4%	3
22. hexamethylenetetramine	2.0	C	174	4=2.2%	3	1=0.6%	
23. 4-tert-butylphenol	1.0	C	174	0		2=1.2%	
24. toluenediisocyanate (TDI)	1.5/2.0	F/C	18/156	2=1.1%		0/3=1.9% ^{b)}	7
25. diphenylmethane-4, 4-diisocyanate (MDI)	1.5/2.0	F/C	18/156	3=1.7%	6	0/1=0.6% ^{b)}	
26. 2-monomethylol phenol	1.0	C	173	0		1=0.6%	
27. methyl methacrylate (MMA)	2.0	C	173	2=1.2%		2=1.2%	
28. phenol-formaldehyde resin, acid-catalyzed	5.0	T	174	3=1.7%	6	4=2.3%	4
29. diphenyl thiourea	1.0	T/C	174	0		1=0.7%	
30. phenol-formaldehyde resin, alkali-catalyzed	5.0	T	174	0		2=1.2%	
31. urea formaldehyde resin	10.0	T	143	1=0.7%		2=1.4%	
32. melamine formaldehyde resin	10.0	T	143	0		1=0.7%	
33. alpha-pinene	15.0	T	144	0		1=0.7%	
34. 4-tert-butylcatechol	1.0	T	143	3=2.1%	4	2=1.4%	
35. diethyl phthalate	5.0	T	143	0		2=1.4%	
36. diisodecyl phthalate	5.0	T	144	0		2=1.4%	
37. dimethyl phthalate	5.0	T	144	0		3=2.1%	5
38. di-2-ethylhexyl phthalate	5.0	T	144	0		2=1.4%	
39. isophoronediamine (IDPA)	0.5	T	146	0		0	
40. o-cresyl glycidyl ether	0.25	T	146	3=2.1%	4	2=1.4%	
41. n-butyl glycidyl ether	0.25	T	145	1=0.7%		1=0.7%	
42. phenyl glycidyl ether	0.25	T	145	5=3.4%	1	0	
43. phenyl isocyanate	0.1	T	144	0		1=0.7%	
44. triphenylmethane triisocyanate	0.1	T	144	0		1=0.7%	
45. N, N-dimethyl-4-toluidine	5.0	C	143	0		0	
46. epichlorohydrin	0.1	T	145	0		1=0.7%	
47. abietic acid	10.0	C	142	2=1.4%	10	2=1.4%	
48. acrylonitrile	0.1	E	142	0		0	
49. cyanoacrylate	2.0	E	142	0		2=1.4%	
50. phenol-formaldehyde resin	5.0	F	142	1=0.7%		3=2.1%	5

^{a)} Patch test concentration. All test substances were in pet., except triethylenetetramine which was in aq. in 18 patients.

^{b)} Irritant reactions with higher test concentration (2.0%).

Source of allergens: C=Chemotechnique Diagnostics Ab;T=Trolab, Hermal Chemie; F=Finnish Institute of Occupational Health; E=Epikon Oy.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.