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Patch tests with antioxidants

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● To our knowledge, there is little information on the prevalence of sensitization to aromatic amines used as antioxidants in the rubber industry; they are added to the manufacturing process to retard deterioration due to oxygen and ozone. To offer up-to-date data for this

industry, we report the results of patch testing with *p*-phenylenediamine compounds in French rubber workers with suspected contact dermatitis (CD).

From January 1994 to December 1999, 171 rubber workers from different factories with suspected dermatitis were seen in our dermatologic consultancy. During this period, 171 of them were patch-tested with *N*-isopropyl-*N'*-phenyl-*p*-phenylenediamine (IPPD) 0.1% pet., 26 with *N*-phenyl-*N'*-cyclohexyl-*p*-phenylenediamine (CPPD) 1% pet., 111 with *N*-hexyl-*N'*-phenyl-*p*-phenylenediamine (6PPD) 0.5% pet., 137 with *N,N*-diphenyl-*p*-phenylenediamine (DPPD) 0.25% pet., and 14 with *N,N*-di- β -naphthyl-4-*p*-phenylenediamine (DBNPD) 1% pet., in accordance with the IDCRG guidelines. The allergens used for patch testing were supplied by Trolab Hermal (Reinbek, Germany) (IPPD) and Chemotechnique Diagnostics (Malmö, Sweden) (DPPD, CPPD, and DBNPD), and were prepared in our laboratory (6PPD). Reactions of $\geq +$ were considered positive.

Test results are given in Table 1. Of the 171 patch-tested patients, eight had a positive reaction to IPPD. Five of the 111 patients patch-tested with 6PPD showed a positive reaction, as did two of 137 patients patch tested with DPPD. No positive reaction was observed in the 26

patients patch-tested with CPPD or in the 14 patients patch tested with DBNPD. In eight cases of sensitization to IPPD, two patients were also sensitive to 6PPD and two to DPPD.

IPPD and its derivatives are known to be very potent sensitizers. A large number of case reports have shown that rubber antioxidants play an important role as causative chemicals in rubber CD (1–3). In a 5-year Finnish study of rubber workers, 71.4% (15/21) of all occupationally related allergic CD was due to a component of black rubber mix (4).

Our results are higher than those reported in the general population with suspected CD. In 3851 patients, von Hintzenstern et al. observed 0.16% positive reaction to IPPD, 0.18% to CPPD, and 0.05% to DPPD (5). In 4680 patients, Conde-Salazar et al. observed 2.07% positive reaction to IPPD, 2.09% to CPPD, 0.9% to DPPD, and 0.06% to DBNPD (6). However, a much higher frequency of response than in our results was observed by Kilpikari among 50 rubber workers with occupational diseases in 1982: 24% reacted to IPPD and 11% to CPPD (4).

Currently, the rubber industry probably does not form the main occupational high-risk group for sensitization to IPPD derivatives. In 1994, Kiec-Swierczynska found only three workers in the rubber industry among 51 patients allergic to rubber, out of 339 persons suffering from occupational dermatitis (7). It affects not

Table 1. Patch test reactions at *N*-isopropyl-*N'*-phenyl-*p*-phenylenediamine 1% pet. (IPPD), *N*-phenyl-*N'*-cyclohexyl-*p*-phenylenediamine 1% pet. (CPPD), *N*-hexyl-*N'*-phenyl-*p*-phenylenediamine 0.5% pet. (6PPD), *N,N*-diphenyl-*p*-phenylenediamine 0.25% pet. (DPPD), and *N,N*-di- β -naphthyl-4-*p*-phenylenediamine 1% pet. (DBNPD) in rubber workers

Allergens	<i>n</i> (test)	+	++	+++	Positive reaction frequencies (%)
IPPD	171	4	4	0	4.6
6PPD	111	2	3	1	5.4
CPPD	26	0	0	0	0
DPPD	137	0	2	0	1.5
DBNPD	14	0	0	0	0

only the rubber workers but also other occupations involving the use of or close contact with rubber products, as in construction, painting, and cleaning (6).

Finally, cross-sensitivity between rubber antioxidants seems to occur quite frequently (1). We observed such cross-reactions among some patients.

In conclusion, we think that the increasing automation and better working practices within the rubber industry minimize direct physical contact with the antioxidants and could explain our results regarding the previous data.

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