

## Oil of turpentine – a disappearing allergen

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Oil of turpentine has become an infrequent allergen because of its replacement by the petroleum product white spirit, its deliberate exclusion from industrial products, and because the balsam oils used nowadays do not contain the sensitiser  $\Delta^3$ -carene. On the basis of the generally low incidence of sensitisation being currently recorded, the International Contact Dermatitis Group recommend that oil of turpentine be removed from standard patch test series.

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Turpentine is an oleoresin (oil and rosin) obtained as a yellow sticky gum from pine trees. Oil of turpentine, often loosely called turpentine, is the volatile oily fraction derived from the distillation of turpentine and there is one part of this fraction to five parts of the non-volatile residue known as rosin or colophony. In warm climates tree gum is harvested during the summer months by wounding the pine trees and collecting the exudate which is then separated into its component parts by steam or vacuum distillation. Such oil of turpentine is known as gum turpentine or balsam oil. In cold climates, oil of turpentine is a by-product of the sulphate extraction process in which pine wood is converted into paper pulp. This oil of turpentine is known as sulphate oil or sulphate turpentine.

Oil of turpentine is a mixture of  $\alpha$ -pinene,  $\beta$ -pinene,  $\Delta^3$ -carene and d- and l-limonene (dipentene). The concentration of each fraction varies with the botanical spe-

cies and the geographical source; all turpentines contain high proportions of  $\alpha$ -pinene but the amount of  $\Delta^3$ -carene differs. In the sulphate oils of Sweden, Finland and Russia, the proportion of  $\Delta^3$ -carene is high (30–40%) whereas the amount is low or negligible in the balsam oils of southern Europe, the south of France and the U.S.A. A high content of  $\Delta^3$ -carene is undesirable not only because of its allergenic properties but also commercially because it has no industrial use. Nowadays the major sources of supply of oil of turpentine are Portugal, Spain, Mexico, China and India; for industrial reasons the amounts produced by France and the U.S.A. have greatly diminished.

Hellerström (1939) was the first to show, in painters, that the greater dermatitic effect of Swedish turpentine, as compared with that from France, was due to the presence of  $\Delta^3$ -carene in the oil of turpentine made in Sweden and its absence from the

French product. The allergen is an oxidation product, identified as a hydroperoxide of  $\Delta^3$ -carene by Helleström et al. (1955) and confirmed by Piriälä & Siltanen (1958). This hydroperoxide of  $\Delta^3$ -carene is the principal allergen in Finnish, Swedish and Chinese oils of turpentine. In his monograph Rokstad (1946) described patch testing at the Finsen Institute with the various fractions of oil of turpentine, including  $\Delta^3$ -carene.

#### Incidence of Sensitisation

In the 1950s, oil of turpentine was a frequent cause of allergic occupational dermatitis but the gradual withdrawal of allergenic oil of turpentine from general use has led to a sharp decline in the incidence of sensitisation. Three factors have led to this decrease. Firstly, countries differ in the amount of oil of turpentine they produce and in many where it is an indigenous product the allergenic properties of the turpentine are low. Secondly, oil of turpentine is expensive, especially if imported,

therefore it has been widely replaced by the petroleum product white spirit, which is cheap and effective. Thirdly, as in East Germany, oil of turpentine has been severely restricted in paints, solvents and polishes with the specific purpose of reducing occupational dermatitis (Behrbohm 1966). In Belgium by the 1970s, the number of cases of turpentine allergy had decreased considerably and sensitisation was no longer a problem (Oleffe 1973). Sensitisation in France was reviewed by Carbillet (1973).

Oil of turpentine is irritant and too strong a patch test concentration will give an erroneously high incidence of sensitisation. In the European series (Fregert et al. 1969) 4,825 patients were patch tested with 5% turpentine in olive oil and 5.2% of the men and 6.4% of the women reacted. However, these results were considered relevant in less than half (41%), suggesting that a proportion of these positive responses may have been toxic effects.

To avoid irritant reactions, in 1972 the members of the International Contact Der-

Table 1. Incidence of positive patch test reactions to oil of turpentine (0.3% in olive oil) in eight centres, 1973-1976

		Copen- hagen	Lund	Malmö	Hel- sinki	Bari	Wy- combe	London	San Fran- cisco	Total
1973	Tested	469	885	1167	600	369	285	1546	142	5463
	+	9	9	8	34	0	5	12	3	80
	%	1.9	1.0	0.7	5.7	0	1.8	0.8	2.1	1.5
1974	Tested	537	861	1264	540	474	322	1433	164	5594
	+	7	10	7	18	4	3	10	11	70
	%	1.3	1.2	0.6	3.3	0.8	0.9	0.7	6.7	1.3
1975	Tested	558	900	1459	560	628	268	1858	195	6426
	+	5	15	5	4	1	4	11	2	47
	%	0.9	1.7	0.3	0.7	0.2	1.5	0.6	1.0	0.7
1976	Tested	427	-	1350	624	542	338	1982	109	5372
	+	5	-	9	2	3	3	16	0	38
	%	1.2	-	0.6	0.3	0.6	0.9	0.8	0	0.7

Table 2. Relevance of patch test reactions to oil of turpentine in eight centres, 1973-1976

	Copen- hagen	Lund	Malmö	Hel- sinki	Bari	Wy- combe	London	San Fran- cisco	Total
Positive	26	34	29	58	8	15	49	16	235
Relevant	5	14	24	11	4	10	23	7	117
%	19	41	82	19	50	66	46	44	50

matitis Research Group agreed to use 0.3% turpentine peroxides in olive oil for patch testing and the number of positive reactors in eight centres were recorded. (The following members of the ICDG took part in this study: Calnan, C. D., Cronin, E., Fregert, S., Hjorth, N., Magnusson, B., Maibach, H., Meneghini, C., Pirilä, V. and Wilkinson, D.) From 1973-1976 the incidence fell steadily: in 1973 it was 1.5% (80 of 5463), in 1974 it was 1.3% (70 of 5594), in 1975 it was 0.7% (47 of 6426) and in 1976 it was 0.7% (38 of 5372) (Table 1).

The tracing of an exposure to oil of turpentine, either past or present, varied in the different centres. In Malmö the reaction was considered relevant in most cases (80%), whereas in Copenhagen and Helsinki it was of much less significance (19%). The overall relevance for the eight centres was 50% (Table 2).

### Discussion

This study of the incidence of reactions to oil of turpentine confirms that it is no longer a significant allergen in the general environment. The International Contact Dermatitis Group has decided therefore to remove it from the standard series of allergens recommended for the routine investigation of patients and suggests that it be used only for selected patients.

Oil of turpentine is still used in artists'

paints, in colours for the pottery industry and in liniments. It is occasionally present in furniture and black shoe polishes. Household paints, thinners, solvents, varnishes and lacquers are generally based on white spirit but a few specialised products may contain oil of turpentine or  $\alpha$ -pinene. In countries where oil of turpentine is produced and is cheap its industrial use is likely to be much more widespread, but these balsam oils contain little or no  $\Delta^3$ -carene, their sensitising potential is low and they are not a hazard.

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