

Sensitivity to 35 essential oils

EDWARD RUDZKI¹, ZDZISŁAWA GRZYWA² AND WLADYSŁAW S. BRUO³

¹Department of Dermatology, Warsaw, Poland, ²School of Medicine, Warsaw, Poland

³Pollena Aroma, Warsaw, Poland

Two hundred consecutive patients and 50 subjects positive to balsams were tested with the 35 essential oils most frequently used in Polish cosmetics. The frequency of sensitivity to the particular oils is noted and the index of sensitization calculated as the amount of oil/kg used annually for the production of Polish cosmetics per one patient positive to this oil. The correlation of positive tests to essential oils with positive tests to four balsams of the standard series is shown.

Key words: Abies alba oil – balsams – bergamot oil – cassia oil – citronella oil – clove oil – cosmetics – essential oils – eucalyptus oil – geranium oil – German camomile oil – Himalayan cedarwood oil – lavender oil – litsea cubeba oil – pine needle oil – sassafras oil – ylang-ylang oil.

Received for publication December 24, 1975

Only a few communications can be found on the frequency of sensitivity to essential oils (Fregert & Rorsman 1963, Calnan 1970 a b c, Meneghini 1970, Rudzki & Kielak 1972, Nakayama et al. 1974). The present investigations were undertaken to

1. test 200 consecutive dermatitis patients with 35 essential oils which are most frequently used in Poland
2. determine an index of sensitization for these oils
3. check how often sensitization to these oils is revealed by four balsams (balsam of Peru, turpentine, the wood tars ol. Betulae and ol. Fagi, and colophony) of the standard series
4. study the correlation between sensitization to the above mentioned 35 essential oils and sensitization to each of these four balsams.

Material and Methods

The investigations were performed with two groups of patients:

1. 200 consecutive patients with dermatitis
2. 50 other subjects positive to one or more of four balsams (which comprised balsam of Peru, wood tars, colophony and turpentine). All these patients were tested with the 35 essential oils which were used at a concentration of 2% in yellow soft paraffin.

Results

The results of the present investigations concerning essential oils are shown in Tables 2 to 7. Table 1 shows the amounts in kilograms of each of the essential oils used annually in Polish cosmetics.

From among 35 essential oils tested on

Table 1. Annual use in kilograms of 35 essential oils in Polish cosmetics

Sandalwood	620
Lavender	10,000
Cassia	2,000
Thyme	100
Oak moss abs.	220
Juniper berries	20
Calamus	1,500
Zdrawetz concrete	150
Coriander	800
Sweet orange	10,000
Petitgrain bigarade	1,100
Peppermint	16,000
Clary sage	650
Petitgrain Paraguay	1,600
Abies alba	2,000
Cananga	1,400
Sassafras	30,000
Himalayan cedarwood	10,000
Lavandin	3,000
Pine needle	5,000
Guaiaac wood	400
Vetiver	1,600
Spike	1,700
Clove	1,600
Angelica root	100
Rosemary	3,000
Bitter orange	400
Bergamot	2,000
German camomile	8
Lemon	1,500
Ylang-ylang	1,400
Eucalyptus	5,000
Geranium	800
Citronella	15,000
Litsea cubeba	45,000

200 consecutive patients, 28 (14%) gave positive results. The largest number of patients was sensitive to citronella oil (5) and in diminishing order to ylang ylang (4), bitter orange, bergamot, Himalayan cedarwood, eucalyptus, geranium and litsea cubeba oil (3). One or two patients reacted to the remaining oils. In addition, frequent reactions were observed to star anis oil; but on account of some of its properties this oil will be the subject of a separate communication. Of the remaining seven oils to which the patients did not react, four (sandalwood,

Table 2. Positive reactions to essential oil in 200 patients related to the 187 negative reactors to balsams

	Number of positive reactions in 200 patients	Number of positive reactions in 187 patients with negative reactions to balsam
Cassia	2	1
Oak moss	1	1
Juniper	1	0
Zdrawetz	1	1
Coriander	2	0
Sweet orange	1	0
Petitgrain bigarade	1	0
Peppermint	1	1
Clary sage	1	0
Petitgrain Paraguay	1	0
Abies alba	2	0
Cananga	1	1
Lavandin	1	0
Pine needle	4	0
Vetiver	1	0
Spike	1	0
Clove	2	1
Angelica	2	1
Bitter orange	3	1
Bergamot	3	2
Camomile	1	0
Lemon	1	0
Cedarwood	3	1
Eucalyptus	3	1
Geranium	3	2
Citronella	5	4
Litsea cubeba	3	1
Ylang-ylang	4	3

lavender, thyme and guaiac wood oil) gave positive results in the additional group of subjects sensitive to balsams. No patient reacted to calamus, sassafras or rosemary oil. It should be stressed that sandalwood, thyme and guaiac wood oils are used in Polish cosmetics in relatively small amounts, whereas lavender and sassafras oils are used in large quantities.

The sensitization index was calculated as the amount of oil used annually in the pro-

Table 3. Positive tests to essential oils related to positive reactions to balsam of Peru

	Positive reactions of patients positive to balsam of Peru only (20)	Positive reactions of all patients positive to balsam of Peru (31)
Cassia	7	9
Thyme	1	1
Oak moss	1	1
Juniper	1	1
Zdrawetz	0	1
Coriander	1	1
Peppermint	0	1
Clary sage	1	2
Abies alba	1	2
Pine needle	1	4
Vetiver	0	1
Spike	0	1
Clove	3	5
Camomile	0	1
Lemon	0	1
Geranium	1	1
Citronella	0	3
Litsea cubeba	0	1
Ylang-ylang	1	1

duction of cosmetics per one patient positive to the given oil. Per one positive patch test the following amounts (in kilograms) of each essential oil were used: German camomile 8, juniper berries 20, angelica root 50, bitter orange 133, zdrawetz concrete 150, geranium 50, ylang ylang 350, coriander 400, clary sage 650, bergamot 666, clove 800, cassia and abies alba 1000, petitgrain bigarade 1100, pine needle 1250, cananga 1400, lemon 1500, petitgrain Paraguay and vetiver 1600, eucalyptus 1666, spike 1700, oak moss absolute 2200, lavandin and citronella 3000, Himalaya cedarwood and sweet orange 10,000 and litsea cubeba 15,000. The value of the index calculated in this way is, however, diminished by two facts. First of all, contact with essential oils from other sources (such as foreign cosmetics) is not

Table 4. Positive tests to essential oils related to turpentine reactions

	Positive reactions in patients positive to turpentine only (23)	Positive reactions in all patients positive to turpentine (31)
Lavender	1	1
Cassia	3	5
Oak moss	1	1
Juniper	1	1
Coriander	1	1
Sweet orange	1	1
Petitgrain bigarade	2	2
Abies alba	8	9
Cananga	1	1
Pine needle	13	14
Guaiaac wood	1	1
Vetiver	1	1
Spike	1	1
Clove	0	1
Angelica	1	1
Bitter orange	3	3
Bergamot	1	1
Camomile	1	2
Lemon	1	2
Cedarwood	3	3
Eucalyptus	2	2
Geranium	1	1
Citronella	1	2
Litsea cubeba	1	1
Ylang-ylang	1	1

taken into account, and secondly positive tests may be multiple reactions to compounds containing an identical allergen (false cross-sensitivity) or cross-reactions to chemically related substances.

The fact that the amount of oils per one positive test is smallest in the case of German camomile oil may be the result of frequent application in Poland of camomile compresses. An example of 'false cross-reaction' is probably responsible for simultaneous sensitivity to turpentine and pine needle oil.

Of the 200 consecutive patients, 187 were negative to all four balsams. Among the

Table 5. Positive tests to essential oils related to colophony reactions

	Positive reactions to essential oils in patients positive to colophony only (4)	Positive reactions to essential oils in all patients positive to colophony (7)
Sandalwood	1	1
Cassia	0	2
Zdrawetz	0	1
Sweet orange	1	1
Peppermint	0	1
Clary sage	1	2
Pine needle	1	2
Guaiaac wood	1	1
Vetiver	1	2
Spike	0	1
German camomile	1	1
Citronella	0	1
Litsea cubeba	1	2

latter, 11 were positive to 1, 2, or 3 oils. This could not be suspected on the basis of tests with the standard series. Nevertheless, all subjects who were positive to more than three oils (5, 7 and 15) were also positive to balsams.

Balsam of Peru is usually considered to be a useful screening agent for perfume

Table 6. Positive tests to essential oils related to wood tars sensitivity

	Number of positive reactions to essential oils in patients positive to wood tars only (4)	Number of positive reactions to essential oils in all patients positive to wood tars (11)
Cassia	0	1
Coriander	2	2
Clary sage	2	2
Petitgrain Paraguay	1	1
Lavandin	1	1
Pine needle	0	1
Clove	0	1
Citronella	1	2
Ylang-ylang	1	1
Other oils	0	0

sensitivity (Mitchell 1975). But in Denmark, simultaneous sensitivity to perfumes and wood tars is more frequent than that to the same perfumes and balsam of Peru (Rothenborg & Hjorth 1968). Our data indicate that about half of the patients who are positive to each of the four balsams are also positive to one or several essential oils (Tables 3 to 6), the positive results with these oils showing a somewhat better agree-

Table 7. Number of patients reacting to none or more than one of the 35 essential oils tested related to the various groups of balsam reactors

200 : 50 patients	Patients positive to none or more than one oil										
	0	1	2	3	4	5	6	7	8	9	15 oils
200 patients	183	6	2	6	0	1	0	1	0	0	1
Negative to balsams (187)	176	5	1	5	0	0	0	0	0	0	0
All balsam of Peru reactors (31)	13	12	3	0	0	1	1	0	0	1	0
Positive to balsam of Peru only (20)	8	9	2	0	0	0	1	0	0	0	0
All turpentine reactors (31)	12	8	4	2	0	3	0	1	0	0	1
Positive to turpentine only (23)	8	5	4	2	0	2	0	1	0	0	1
All wood tars reactors (11)	6	2	1	1	0	1	0	0	0	0	0
Positive to wood tars only (4)	2	0	0	1	0	1	0	0	0	0	0
All colophony reactors (7)	3	1	0	1	0	1	0	0	0	1	0
Positive to colophony only (4)	2	0	0	1	0	1	0	0	0	0	0

ment with the reaction to turpentine (Table 4) than with balsam of Peru (Table 3).

Of the 20 patients positive to balsam of Peru and negative to other balsams, 12 reacted to one or more essential oils; seven were positive to cassia oil (Table 3). This may have been because 80–90 % of this oil consists of cinammic aldehyde; Hjorth (1961) noted that 68 % of persons positive to balsam of Peru reacted to 5 % cinammic aldehyde and 21 % of such subjects to a 2 % concentration. Thus, cinammic aldehyde could be the cause of simultaneous reactions to these substances. Subjects sensitive to balsam of Peru react less frequently to the remaining essential oils, with the exception of clove oil to which three patients were positive (Table 3).

Of the 23 patients positive to turpentine and negative to other balsams, 15 reacted to some oils (Table 4). Twelve of these 15 reacted to pine needle oil and eight to abies alba oil. Both these oils contain alpha-pinene, but only pine needle oil contains delta-3-carene which is interesting in the light of views on turpentine allergens (Pirilä & Siltanen 1955, Hellerström et al. 1963, Pirilä et al. 1965, Grimm & Gries 1968).

References

- Calnan, C. D. (1970a) Oil of cloves, laurel, lavender, peppermint. *Contact Dermatitis Newsletter* 7, 148.
- Calnan, C. D. (1970b) Oil of Patchouli. *Contact Dermatitis Newsletter* 8, 180.
- Calnan, C. D. (1970c) Oil of Cinnamon. *Contact Dermatitis Newsletter* 8, 181.
- Fregert, S. & Rorsman, H. (1963) Hypersensitivity to balsam of pine and spruce. *Archives of Dermatology* 87, 693–695.
- Grimm, W. & Gries, H. (1968) Untersuchungen über die Terpentinöl – Allergie. *Berufsdermatosen* 16, 190–203.
- Hellerström, S., Lodin, A., Rajka, G., Swedin, B. & Widmark, G. (1963) Sensitization of pigs with 3-carene. *Acta Dermatovenereologica (Stockholm)* 43, 311–323.
- Hjorth, N. (1961) Eczematous allergy to balsam. *Acta Dermatovenereologica (Stockholm)* 41, suppl. 46.
- Meneghini, C. L. (1970) Cosmetic constituents. *Contact Dermatitis Newsletter* 8, 182.
- Mitchell, J. C. (1975) Contact hypersensitivity to some perfume materials. *Contact Dermatitis* 1, 196–199.
- Nakayama, H., Hanaoka, H. & Ohsiro, A. (1974) *Allergen controlled system /ACS/*, p. 18. Tokyo: Kanehara Shuppan.
- Pirilä, V., Pirilä, L. & Siltanen, E. (1965) Sensitization to oil of turpentine. Pemphigus and Occupational Dermatoses due to chemical sensitization. Budapest. Ed. Liebnert E. and Florian E., p. 132.
- Pirilä, V. & Siltanen, E. (1955) On the chemical nature of the eczematogenic agent in oil of turpentine. *Dermatologica* 110, 144–155.
- Rudzki, E. & Kielak, D. (1972) Sensitivity to some compounds related to balsam of Peru. *Contact Dermatitis Newsletter* 12, 335–356.
- Rothenberg, H. W. & Hjorth, N. (1968) Allergy to perfumes from toilet soaps and detergents in patients with dermatitis. *Archives of Dermatology* 97, 417–421.

Address:

Edward Rudzki
Department of Dermatology
Koszykowa 82a
Warsaw
Poland

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.