

A BOTANICAL CONSIDERATION OF THE WEED OLEORESIN PROBLEM

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THE problem of weed dermatitis in the State of Minnesota is by no means new. As early as 1894 MacDougal⁶ published a case of dermatitis due to the showy lady's-slipper (*Cypripedium reginae*, *C. spectabile*) and the moccasin flower (*C. calceolus* var. *pubescens*). He noted in addition that there were a number of native Minnesota plants which had been definitely ascertained to be more or less "poisonous" by means of skin contact. Among these he listed the following:

Cocklebur (*Xanthium canadense*)
Smartweed (*Polygonum hydropiper*)
Wood Nettle (*Laportea canadensis*)
Beggar's-Ticks (*Bidens frondosa*)
Skunk Cabbage (*Symplocarpus foetidus*)

It is interesting to note some of the author's further observations in the light of information since uncovered: "No doubt the larger percentage of the common plants known to be poisonous is due to the fact that they offer much more opportunity for observation than do the rarer forms. . . . It is by no means to be understood that there are many plants which are always and invariably poisonous, for many of the plants in this category are injurious to only a very small percentage of the persons touching them, so that their irritating qualities might remain undiscovered altogether unless tested by a large number." MacDougal reasoned that these noxious plants poisoned one by piercing glandular hairs or by means of volatile agents (e.g., toxicodendric acid of *Rhus*).

These early acute observations, together with those of Blackley, Walker, Hannah⁵ and others have since been much extended and clarified by: (1) the immunologic concepts of Bloch and Jadassohn, (2) the chemical and immuno-biologic studies of Coca, Brown, Milford¹ and others, (3) the clinical studies of Shelmire,⁸ Brunsting,² Sulzberger,⁹ Anderson² and others; so that as a consequence of this substrate of information, it is pretty well established that in a gross qualitative manner, at least, plants and their pollens may be

separated into two fractions of clinical importance:

1. The water-soluble protein fraction relating to atopic manifestation such as hayfever, asthma, et cetera.
2. The organic solvent fraction relating to contact dermatitis.

During the past several years we have had the opportunity of studying twenty-five cases of eczema in which positive patch tests were obtained to the oleoresinous fractions of a number of weeds. In all of these cases there was present reasonable evidence that the positive skin test reactions were related to the patients' clinical condition.

Having obtained such information, one is confronted immediately with several problems: which weeds most frequently cause dermatitis, and which weeds giving positive skin reaction are present in a given patient's locality? Furthermore, inasmuch as positive patch test reactions in a given individual often occur within a group of weeds closely related to one another botanically, the question of their allergenic interrelationships appears. It would be extremely helpful, for example, to know the major and minor allergenic relationships of these weeds because such information could be employed in determining the constituency, proportion-wise, of the various weed oleoresins, which would be included in hyposensitization material to be administered to a given patient.

In regard to the geographic distribution of weeds of "allergic" importance in the state of Minnesota we have had the good fortune of having at our disposal previous studies of Ellis and Rosendahl³ and of Rosendahl, Ellis and Dahl.⁷ Having determined the weeds which appeared "significant" on the basis of our cases, such weeds were then plotted in terms of their geographical location in the state of Minnesota, as determined by the previously noted studies, in Figures 1 and 2. The utility of such data is quite evident. We are indebted to Dr. J. W. Moore for the collection sites of various species.

It is with considerable temerity that one ap-

¹*Rhus* oleoresins were omitted in this study.

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proaches the question of the allergenic relationship of the various weeds. True, the chemistry of some plant material has been studied in considerable detail, e.g., rhus, primula, et cetera. But to

producing dermatitis of the contact allergic type. Despite the previously noted information differentiating the water-soluble protein fraction from the oleoresinous fraction of weeds, both on

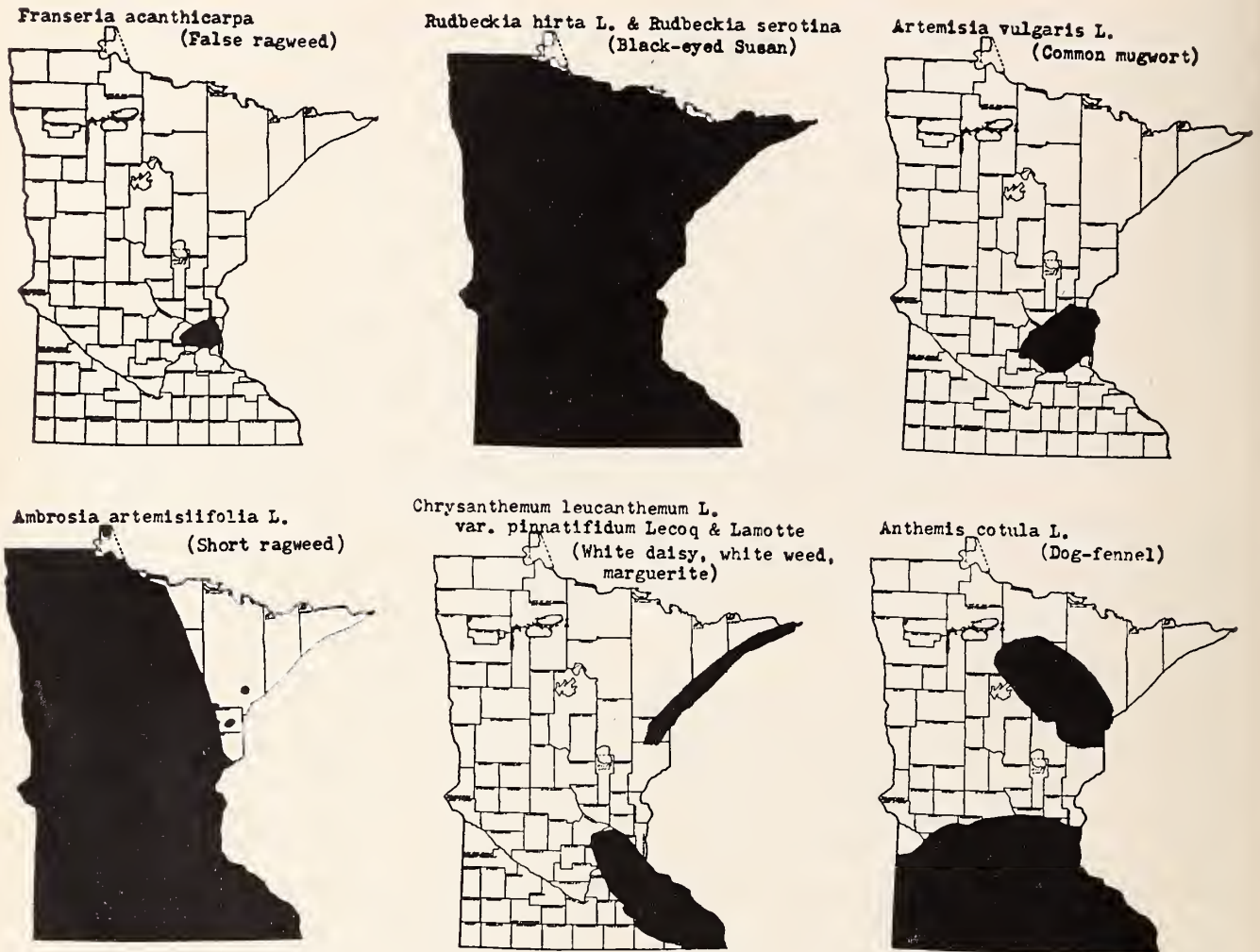


Fig. 1.

our knowledge information is rather sparse regarding the composition of the materials under consideration here either in a chemical or an immuno-biological sense.

The original confusion as to whether it was the pollen or other plant parts that were capable of producing the dermatitis has now been settled in favor of both. Simpson's early impression¹⁰ that the weed dermatitis active principle was extractable in a number of organic solvents has since received support from Coca, Milford and Brown. These later investigators, by means of simple lucid experiments, demonstrated the gross chemical and immuno-biological differentiation between the water-soluble protein fraction capable of producing hay fever and asthma and the oleoresin, non-volatile organic extract fraction capable of

a chemical and a biological (immunological) basis, it is a fairly common practice to attempt to transfer the concept of major and minor allergens as elucidated with respect to atopic states (hay fever, asthma), to the contact allergic state induced by oleoresins as well. For example, short ragweed water-soluble protein fraction, for all practical purposes, protects anaphylactically against bur-weed-marsh-elder, ragweed, cocklebur, et cetera. Therefore, it has been reasoned erroneously that a parallel situation exists with respect to the dermatitis producing oleoresin fraction of these same weeds. However, such a conclusion is not justified. We do not mean to deny the possibility that the concept of major and minor allergen may not pertain to oleoresinous extracts, but this is as yet unproven. As a starting point in the general

study of this problem, we decided to subject our data, and that of others, to a botanical analysis to determine what possible inter-relationships and trends might be determined by this device. Our

inssofar as tested, are more likely complexes of offending species, as illustrated in Figure 3.

Within the very real limits of the small population examined, it would appear from Figure 3

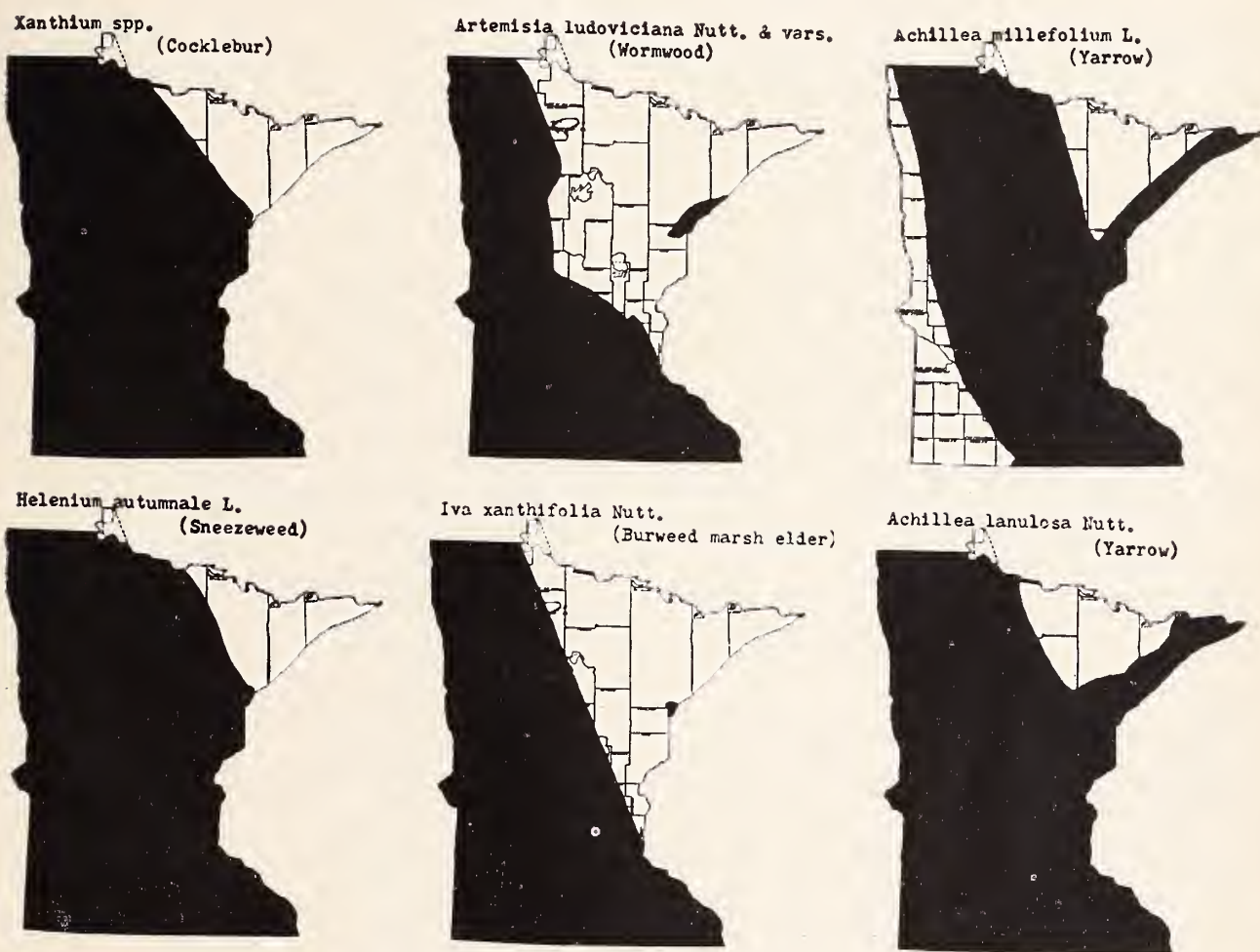


Fig. 2.

data include only those patients which showed positive patch test reactions to one or more weeds. The patients were tested with twenty-four commercial oleoresin weed extracts* in acetone. The material was applied to the upper back or abdomen in the usual manner. The positive cutaneous test reactions so obtained were plotted into a table arranged according to botanical relationships⁴ (Table I). Technical names follow the treatment presented in Gray's *Manual*.⁴

These statistics corroborate our earlier clinical impression that the Family *Compositae* is an outstanding etiological agent in the production of weed contact eczemas. Further analysis reveals that certain tribes within the Family *Compositae*,

that certain tribes within the *Compositae*, e.g., sunflower (*Helianthiae*), dog fennel (*Anthemideae*) and sneezeweed (*Heleniceae*) are the important sources of the sensitizing components.

It becomes apparent that just as there are differences in sensitizing potencies between tribes, so there are differences in sensitizing potencies within a given tribe (Fig. 4).

Considering the above data, it appears possible that short ragweed contains the major antigenic agent and shares major antigenic components with false ragweed, burweed-marsh elder and cocklebur. The antigenic relationship of these weeds to black-eyed Susan and sunflower, if there be any at all, must be a remote one. It is of some interest to note that also from a botanical point of view black-eyed Susan and sunflower are differentiated

*Graham Laboratories, Dallas, Texas.

TABLE I—Botanical Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Burweed Marsh Elder---	+	+		+	+			+	+		+	+	+	+		+	+						+	+		+	Sunflower Tribe
Short Ragweed-----	+	+	+	+	+	+		+		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+		
False Ragweed-----				?	+			+	+		+	+	+	+	+	+	+							+	+	+	
Cocklebur-----	+	+	+	+		+					+	+				+		+	+				+	+		+	
Black Eyed Susan---																									+		
Sunflower-----																									+		Sneezeweed Tribe
Sneezeweed-----		+		+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Yarrow-----													+		+		+							+			Dog Fennel Tribe
Dog Fennel-----				?				+						+	+									+	+		
Wild Feverfew-----	+		+	+	+			+	+	+		+	+	+	+	+	+							+		+	
Common Wormwood--	+	+		+				+	+	+		+	+	+	+	+	+							+	+	+	Thistle Tribe
Smaller Burdock---																									+		
American Thistle---				+								+															
Dandelion-----																+		+									Chicory Tribe
Red Root Pigweed---																		+									
Lamb's Quarters---																											
Russian Thistle---																											
Western Water Hemp--																											
St. John's Wort-----																+		+									
Evening Primrose---									+																		
Common Milkweed---				?		+							+					+						+			
Horse Nettle-----				?																							
Golden Rod-----																											
Aster (MANY-FLOWERED)-																											

from the four species just mentioned. For example, both black-eyed Susan (*Rudbeckia*) and sunflower (*Helianthus*) are insect-pollinated whereas the other species are solely wind-pollinated.

In Figure 5 we again note the disparity in reaction incidence within a botanical tribe. It would seem likely that common wormwood and wild feverfew are, on the basis of biological evidence (patch tests), probably linked closely together

antigenically, with the relationship to dog fennel and yarrow at best held by an antigen of a minor character.

Our number of cases is small and subject to

particular botanical groups discussed. Yet this was done with the intention of setting up hypotheses against which laboratory and clinical experiments may be pitted in the near future.

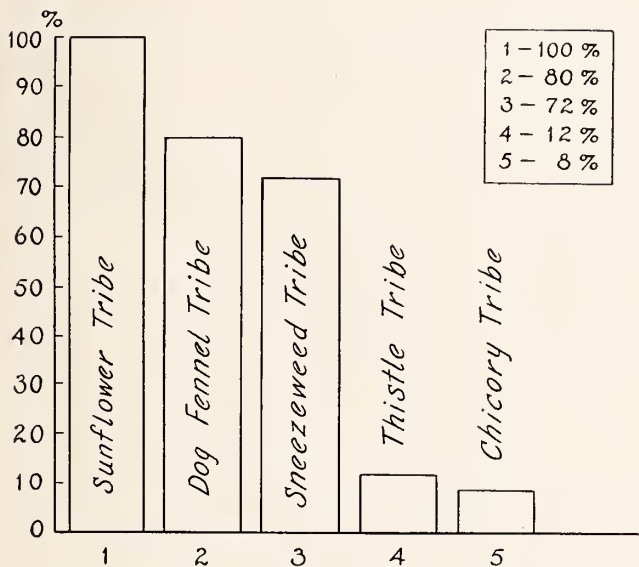


Fig. 3. Reactions within the Family Compositae (per cent).

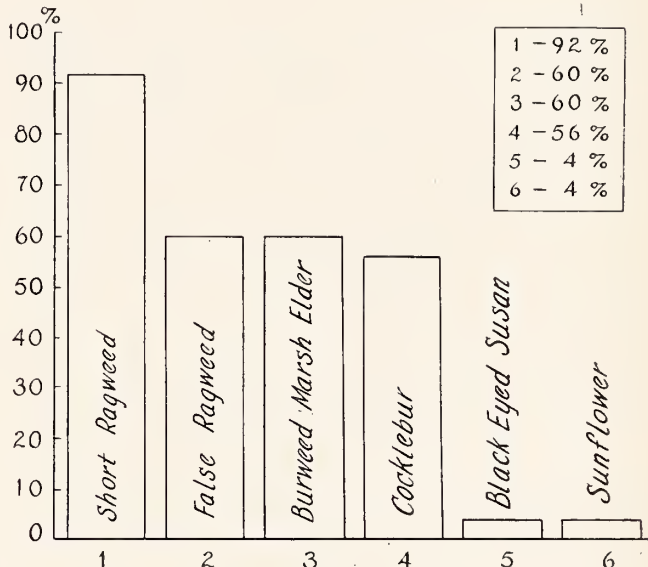


Fig. 4. Reactions within the sunflower tribe (*Heliantheae*) (per cent).

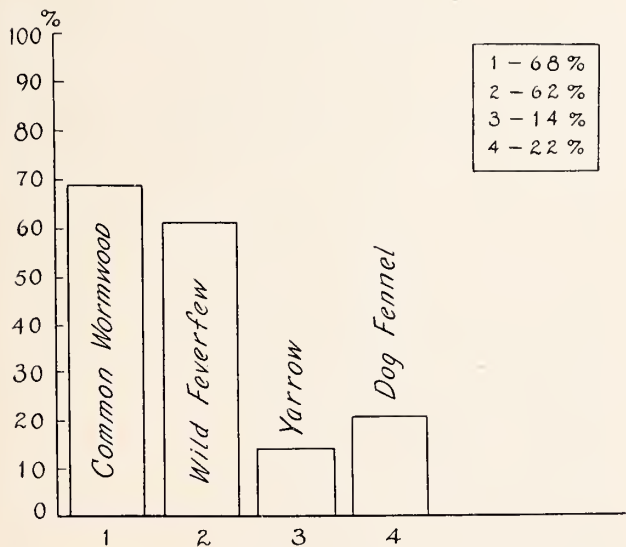


Fig. 5. Reactions within the dog fennel tribe (*Anthemideae*) (per cent).

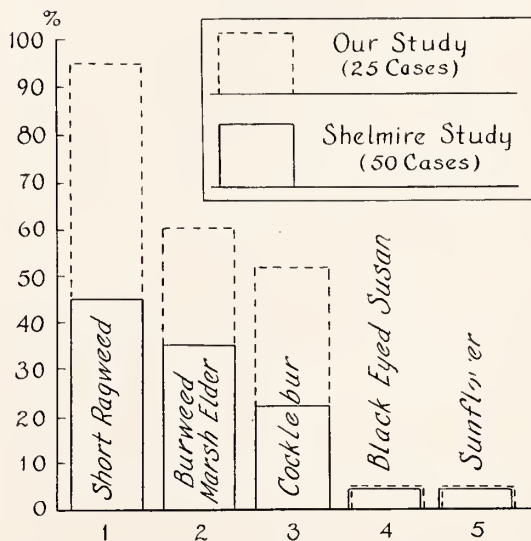


Fig. 6. Comparative studies: sunflower tribe (*Heliantheae*) (per cent).

criticism on that account. However, it is of interest and obviously supports our findings that Shelmire's study on weed dermatitis produces a profile very similar to our own (Fig. 6).

We have admittedly indulged in speculation beyond the bounds afforded by our information regarding what might represent major and minor allergenic relationships between and within the

Summary

1. The geographic distribution of weeds of dermatitic significance in the State of Minnesota has been illustrated graphically.

2. Analysis reveals that the large botanical Family Compositae contains the majority of offending weeds of those tested.

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Confusion was further enhanced when those who subscribed to *The Journal AMA* in 1950 continued to receive it in 1951, even if they did not pay their AMA dues for 1951. On the other hand, those who paid their AMA dues for 1951 but had failed to pay their 1950 dues did not receive *The Journal AMA*.

Further confusion has been caused by the existence of a special membership known as a "fellow." In 1951 this cost an extra \$5.00. Beginning with the year 1952 there will be just one membership and no more "fellows."

The simple solution for each member in arrears would be to pay up in full, shoulder his share of the AMA expenses and take his place with the nearly 150,000 other physicians in the country who are banded together for the advancement of the science and art of medicine and the betterment of public health.

For \$15.00 of his \$25.00 AMA dues, the member receives \$15.00 worth of *The Journal AMA*—one large number a week—or he may substitute a subscription to any one of the specialty journals. The balance of the \$25.00—or \$10.00—helps support the multitude of activities of the AMA. The only other income the AMA has is from advertisements in *The Journal AMA* and the nine specialty journals published by our national organization. Some of these journals are not self-supporting.

When we consider what we receive in return for our various medical society dues, it becomes evident that we receive more than our money's worth.

THE CHANGING MOLE

(Continued from Page 1158)

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Not all of the Fund goes to scientific research. Each year at least forty freshmen are awarded \$250.00 in Minnesota Alumni Scholarships. Three outstanding graduate students this year will receive Fellowships, each amounting to \$1,200, plus tuition.

The Greater University Fund is sponsored by the Minnesota Alumni Association and is now conducting its fourth annual drive with \$125,000 the goal.

Here is an opportunity to assist in a worthwhile project. Contributions which are income-tax deductible may be sent to the Greater University Fund, Coffman Memorial Union, University of Minnesota, Minneapolis 14, Minnesota.

A BOTANICAL CONSIDERATION OF THE WEED OLEORESIN PROBLEM

(Continued from Page 1173)

3. Not only are there differences in sensitizing capacity between botanical tribes but also there are differences in sensitizing capacity within a given tribe.

4. The probably antigenic relationships are indicated with respect to tribes *Anthemideae* (dog fennel) and *Heliantheae* (sunflower).

5. The profile of our cases dealing with the sunflower tribe (*Heliantheae*) resembles that of Shelmire's study of this same group of weeds.

6. Biologic studies will be carried out to determine further allergenic relationships between the various oleoresinous materials.

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