

Allergic Contact Dermatitis from Exotic Woods: Importance of Patch-Testing with Patient-Provided Samples

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Exotic woods from tropical and subtropical regions (eg, from South America, south Asia, and Africa) frequently are used occupationally and recreationally by woodworkers and hobbyists. These exotic woods more commonly provoke irritant contact dermatitis reactions, but they also can provoke allergic contact dermatitis reactions. We report three patients seen at Mayo Clinic (Rochester, MN) with allergic contact dermatitis reactions to exotic woods. Patch testing was performed and included patient-provided wood samples. Avoidance of identified allergens was recommended. For all patients, the dermatitis cleared or improved after avoidance of the identified allergens. Clinicians must be aware of the potential for allergic contact dermatitis reactions to compounds in exotic woods. Patch testing should be performed with suspected woods for diagnostic confirmation and allowance of subsequent avoidance of the allergens.

EXOTIC WOODS are used in the assembly of many objects, including decorative items, furniture, tool handles, musical instruments, and ornamental jewelry such as bracelets and necklaces. Much of the wood used for these purposes comes from tropical and subtropical regions, including South America (Amazon basin), south Asia, and west and central Africa.¹ Exotic woods are valued for their beauty, strength, stability, and resistance to moisture and fungi.² Dermatitis associated with wood is more commonly due to irritant or phototoxic reactions, often after contact with tree sap. Nonetheless, exotic woods can cause a multitude of other cutaneous reactions, including allergic contact dermatitis,¹ contact urticaria,³ and photoallergic reactions.⁴ Less common contact reactions include erythema multiforme-like reactions,^{5–7} pigmented contact dermatitis,⁸ and lymphomatoid contact dermatitis.⁹ In this report, we discuss three patients with allergic contact dermatitis from exotic woods. This study was performed with the approval of the Mayo Clinic Institutional Review Board.

Case Reports

Patient 1

A 66-year-old man presented with a 3-week history of dermatitis involving his face, head, neck, and left hand. Despite treatment with topical corticosteroids and oral antihistamines, the dermatitis persisted. Physical examination showed edematous, erythematous papules coalescing into plaques in an aerosolized distribution on the exposed areas of his face and anterior neck (Fig 1) and on the dorsal left hand and interdigital web spaces (Fig 2). The skin beneath his hairline and the skin of the submental region were free of involvement. Further questioning revealed that he had been carving a bowl from wood of the Brazilian tree *Machaerium scleroxylon* (commonly termed “pao ferro” or “pau ferro”) approximately 1 week before the onset of the rash and had been exposed to a large amount of sawdust while sanding the wood. He was prescribed a 5-day course of prednisone (40 mg daily), along with topical hydrocortisone 2.5% cream, triamcinolone 0.1% cream, and fluocinonide 0.01% cream to be applied twice daily to the affected areas.

Patch testing was performed approximately 1 month after completion of the oral prednisone course. The patient was patch-tested with our standard allergen series; we also tested with pao ferro wood dust provided by the patient. The wood dust was placed on paper tape, applied to his back, and removed after 2 days. Pao ferro provoked a grade 3+ reaction (erythematous, edematous plaque with scattered vesicles) on days 3 and 5 (Fig 3). By his follow-up

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Figure 1. Edematous, erythematous papules coalescing into plaques on face and anterior neck.

visit 4 months after patch testing, his dermatitis had completely resolved with topical corticosteroids and avoidance of pao ferro.



Figure 2. Edematous, erythematous papules coalescing into plaques on the dorsal left hand and interdigital web spaces.



Figure 3. Edematous, erythematous plaques with scattered vesicles. This grade 3+ reaction was observed 2 days after placement of a patch test with pao ferro wood.

Patient 2

A 43-year-old man presented with an 8-year history of dermatitis that involved both hands (most notably on the fingertips) and that had not responded to treatment with moisturizers or topical corticosteroids. Physical examination showed dermatitis with fissuring of the first, second, and third fingers of the right hand and the second finger of the left hand. His hobbies included woodworking with numerous exotic woods (such as east Indian rosewood, koa, ebony, mahogany, and cocobolo) to assemble cribbage boards.

Patch testing was performed with our standard allergen series, plastic and glue series, rubber series, and patient-provided sawdust samples of each of the woods he had used. To avoid cross-contamination between samples, he was instructed to thoroughly clean the tools used to create the sawdust before he made up each sample, and the samples were packaged and labeled separately. Each wood sample was placed on paper tape, applied to the patient's back, and removed after 2 days. Patch testing showed grade 1+ reactions (macular erythema) to cocobolo (*Dalbergia retusa*) on days 3 and 5. After 1 month of treatment with topical clobetasol 0.05% ointment (applied twice daily) and with avoidance of cocobolo wood, his hand dermatitis resolved almost completely.

Patient 3

A 75-year-old retired carpenter presented with a 9-month history of intensely pruritic dermatitis involving his torso, extremities, and posterior neck. His dermatitis had not responded to topical corticosteroids or oral antihistamines, although he noted improvement with short courses of oral corticosteroids. Physical examination showed

scattered erythematous papules, patches, and plaques, often with overlying scale, on the patient's trunk and extremities, along with numerous excoriations and urticarial lesions. His main hobby was woodworking, and he had begun turning wooden pens and pencils from exotic woods (Fig 4) approximately 1 year before his presentation at our clinic. He identified at least 30 different woods, both domestic and exotic, to which he was exposed through his hobbies.

Patch testing was performed with our standard allergen series, plant series, rubber series, textile series, and patient-provided wood samples. Each sample was packaged and labeled separately. Shavings were created from each sample. To avoid cross-contamination between samples, the tools used to create the shavings were cleaned thoroughly before making each sample. Each sample was placed on paper tape, applied to the patient's back, and removed after 2 days. On day 5, he displayed grade 1+ reactions (macular erythema) to numerous exotic woods (including purpleheart, ebony, cocobolo, bocote, padauk, and Honduran rosewood) and to one domestic wood (tulipwood) (Fig 5). Strict allergen avoidance, including the cessation of woodworking, was recommended. His dermatitis and pruritus resolved after approximately 3 months of allergen avoidance and the use of topical triamcinolone 0.1% three times daily beneath wet dressings.

Discussion

We present three patients with allergic contact dermatitis from various exotic woods. After patch testing successfully identified the exotic-wood contact allergens, all three patients experienced a marked improvement or resolution of dermatitis following topical treatments and avoidance of the identified allergens.



Figure 4. Pens made of exotic woods.



Figure 5. Macular erythema 4 days after placement of patch tests; positive reactions to numerous exotic woods (including purpleheart, ebony, cocobolo, bocote, padauk, and Honduran rosewood) and to domestic tulipwood were observed.

While uncommon, the development of allergic contact dermatitis is a well-known potential complication of working with wood from tropical and subtropical regions. Most often, contact sensitization to exotic woods is attributable to benzoquinones and naphthoquinones.¹ For example, all *Dalbergia* (rosewood) species contain sensitizing benzoquinones (ie, dalbergiones) that protect the trees from termites and mosquito larvae.¹⁰ Occasionally, a precursor to the sensitizing agent is present in the wood and is subsequently oxidized to the quinone in the air or within the skin.

Allergic contact dermatitis reactions typically occur after contact with fine dust particles and shavings created during woodworking, and patients most commonly present with airborne contact dermatitis¹ (as did patients 1 and 3 in this report). Dermatitis first appears on areas of exposed skin such as the face, neck, eyelids, hands, and forearms. Unexposed areas may be affected as dust is carried manually to other areas and gets trapped underneath clothing, especially around collars and sleeves. The clinical presentation may resemble that of photodermatitis, except airborne allergic contact dermatitis often involves sun-protected sites (eg, upper eyelids, postauricular triangles, and submental areas).¹¹ Because of the airborne nature of the allergens, patients may also experience irritation of oral, ocular, and respiratory mucosa.^{12–15} In fact, the development of

occupation-related asthma after exposure to exotic-wood dust has been previously documented.¹⁶

Contact allergy may also occur after contact with finished wood products although this is somewhat rare. More common causes include exposure to woodwind instruments, jewelry, and footwear. A comprehensive list of previously reported contact allergies to exotic woods is presented in Table 1.^{1,10,12,13,17–42}

In our cases, airborne contact dermatitis developed in patient 1 after exposure to pao ferro (*Machaerium scleroxylon*). This wood, also known as caviuna, is a Brazilian timber associated with numerous reported cases of allergic contact dermatitis.^{34,43,44} Native to South America, it is often imported because it is less expensive than wood from other tropical leguminous trees (eg, *Dalbergia* spp).⁴⁴ The quinone (R)-3,4-dimethoxydalbergione

Table 1. Exotic Woods Previously Associated with Allergic Contact Dermatitis

Genus and Species Name	Common Name	Reference
<i>Afzelia africana</i>	Afzelia, African mahogany	1
<i>Apuleia leiocarpa</i>	Garapa, Brazilian ash	17
<i>Aspidosperma</i> spp	Brazilian box tree wood, Araracanga, Volador	18
<i>Bowdichia nitida</i>	Sucupira, sapupira	19
<i>Chlorophora excelsa</i>	Iroko	20
<i>Cordia gerascanthus</i>	Bocote, canalete	12; this report
<i>Cordia dodecandra</i>	Ziricote	12
<i>Dalbergia latifolia</i>	Indian rosewood, shisham	13
<i>Dalbergia melanoxylon</i>	African blackwood, Mpingo	21
<i>Dalbergia nigra</i>	Jacaranda, Brazilian rosewood, Cabiuna, Caviuna	21
<i>Dalbergia retusa</i>	Cocobolo, granadillo	22; this report
<i>Dalbergia stevensonii</i>	Honduran rosewood	This report
<i>Diospyros celebica</i>	Ebony	12
<i>Diospyros crassiflora</i>	Ebony	23; this report
<i>Diospyros ebenum</i>	Ebony	24
<i>Distemonanthus benthamianus</i>	Ayan	21
<i>Dyera costulata</i>	Jelutong	25
<i>Entandrophragma cylindricum</i>	Sapele	26
<i>Erythrophleum guyanense</i>	Tali, missanda	27
<i>Erythrophleum ivorense</i>	Tali	28
<i>Gluta renghas</i>	Rengas	29
<i>Grevillea robusta</i>	Grevillea	30
<i>Khaya anthotheca</i>	African mahogany	31
<i>Lophopetalum dubium</i>	Perupok	32
<i>Machaerium acutifolium</i>	Bolivian rosewood	33
<i>Machaerium scleroxylon</i>	Pao ferro, pau ferro	34; this report
<i>Mansonia altissima</i>	Mansonia	10
<i>Olea europaea</i>	Olive wood	35
<i>Peltogyne paniculata</i>	Purpleheart	36; this report
<i>Pericopsis elata</i>	Afromosia	21
<i>Pterocarpus dalbergioides</i>	Andaman padauk	36
<i>Pterocarpus soyauxii</i>	African padauk	37; this report
<i>Swietenia macrophylla</i>	Honduran mahogany	38
<i>Tabebuia</i> spp	Bethabara	39
<i>Tectona grandis</i>	Teak	21
<i>Thespesia populnea</i>	Portia tree	40
<i>Triplochiton scleroxylon</i>	Obeche	38
<i>Turraeanthus africanus</i>	Avodiré	41

Data from US Department of Agriculture Forest Products Laboratory.⁴²

is a very strongly sensitizing dalbergione present exclusively in pao ferro.^{5,45,46}

Patient 2 had hand dermatitis attributable to contact with cocobolo (*Dalbergia retusa*). This wood, also known as granadillo, is native to Central America and is commonly used in knife handles, jewelry, musical instruments, and brush backs.¹⁰ Several cases of allergic contact dermatitis reactions to this wood have been described previously.^{47,48} Its main contact allergens are moderate sensitizers, namely, (R)-4-methoxydalbergione, (S)-4'-hydroxy-4-methoxydalbergione, and obtusaquinone, an isomeric form of (R)-4-methoxydalbergione that is converted after contact with the skin.^{45,49}

Patient 3 had contact allergies to numerous exotic woods, including purpleheart, ebony, cocobolo, bocote, padauk, and Honduran rosewood. With the exception of Honduran rosewood, each of these exotic woods has been previously associated with allergic contact dermatitis (see Table 1).

Several patients with contact allergies to numerous exotic woods (similar to patient 3) have been described previously.^{12,26} Although the many positive patch-test reactions may have been caused by sensitization to individual exotic wood species, we speculate that the positive reactions also may be due to cross-reactions between numerous exotic woods. Cross-reactivity between exotic woods occurs commonly because they contain allergens with similar structures. For example, (R)-4-methoxydalbergione, the sensitizing agent in cocobolo, is also present in Brazilian rosewood and east Indian rosewood.⁵⁰ Similarly, wood allergens from *Dalbergia* spp may cross-react with primin from primrose (*Primula obconica*), deoxylapachol from teak (*Tectona grandis*), lapachenole from peroba (*Paratecoma peroba*), and mansonone A from mansonina (*Mansonina altissima*).¹⁰ Clinicians should be aware of the potential for cross-reactivity between woods with similarly structured allergens, and patients should be counseled regarding these cross-reactions.

It is notoriously difficult to distinguish between irritant and allergic contact dermatitis reactions attributable to exotic woods, and it is possible that the observed reactions were in fact irritant and not allergic. Previously described methods may help differentiate between irritant and allergic reactions.⁵¹ However, because the described patients were referred, it was not possible to do further tests to distinguish these reactions. Nevertheless, we believe that the positive reactions in patient 3 were more likely to be allergic reactions, although it is difficult to say with certainty. The positive reactions were not present initially upon removal of the patch-test samples; they were first observed 4 days after patch-test placement. Additionally,

the patient's condition improved markedly after he began avoiding the sensitizing woods, which further supports the likelihood that his reactions were allergic reactions.

As with other contact allergies, avoidance of the allergen is an essential component of treatment. All three of our patients were able to avoid their respective exotic woods and sensitizing allergens, and their skin conditions improved shortly thereafter. Yet, avoidance can often be exceedingly difficult. Barrier creams typically are not very effective in preventing reactions.¹² Efficient exhaust ventilation in the workplace is required by law, but numerous woods can create a diaphanous dust that is not removed by most ventilators. Therefore, protective clothing and excellent personal hygiene are required. Moreover, adding moisture to the air with water or oil near the site where the dust is created may be beneficial.¹

As the popularity of woodworking hobbies increases and the global market economy continues to expand, clinicians may see increasing numbers of patients with allergic contact dermatitis from exotic woods. Therefore, clinicians must ask about patients' occupations and hobbies, and contact allergy to exotic woods should be suspected in patients who work with hardwoods and present with dermatitis on exposed sites. For select patients, patch testing with sawdust or wood-shaving samples from the suspected woods can be performed for diagnostic confirmation and to facilitate subsequent avoidance of the contact allergen.

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