

Airborne contact dermatitis in gaitas (flageolets) constructors after exposure to sawdust of caviuna

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Exotic wood species are used in the manufacture of furniture, musical instruments, tool handles, and other wooden items. Exposure to sawdust of the wood can produce dermatitis on exposed areas in woodworkers. We studied 7 patients, gaitas constructors who used caviuna wood to make their instruments. They developed dermatitis on exposed areas hours after they had begun to work with caviuna. We performed patch tests using the European standard series, caviuna sawdust sample, and a series of dalbergiones. 15 controls were performed. Two caviuna samples provided by a patient were analysed by thin-layer chromatography (TLC). Patch test with caviuna sawdust yielded positive reactions in all patients. 5 of the 7 sufferers reacted strongly to obtusaquinine and (R)-4-methoxydalbergione deriving from *Dalbergia retusa*, but also to sensitizers present in other rosewoods. Patch tests with R-3,4-dimethoxydalbergione deriving from *Machaerium scleroxylum* remained negative in the patients, as well as in control subjects. The TLC analysis of the samples showed that the woods could have been *M. scleroxylum*, *D. cearensis* or *D. frutescens*, but not *D. retusa*. In our patients, airborne contact dermatitis was caused by exposure to caviuna sawdust. The patients must have been in contact with different *Dalbergia* species and especially with *D. retusa*.

Key words: airborne contact dermatitis; caviuna; cocobolo; cross-reactions; *Machaerium scleroxylum*; patch test. © Blackwell Munksgaard 2007.

Accepted for publication 24 December 2006

Exotic woods from Central and South America, Africa and Asia possess valuable characteristics of hardness, resistant to moisture and fungi, as well as a certain beauty. They are used for the manufacture of furniture, musical instruments, tool handles and other ornamental objects such as necklaces and bracelets.

A great number of tropical woods belong to the subfamily Papilionaceae of the Leguminosae like the genera *Dalbergia*, *Machaerium*, *Pterocarpus* and *Brya* (1).

Rosewood, also called palisander, is a general term for timbers mainly of the genus *Dalbergia*. Species from the related genus *Machaerium*, e.g. *Machaerium scleroxylum* are often used as a substitute due to their similar appearance and physical properties (2). The colloquial and trade names of the tropical species often are misleading and confusing. On the one hand, a single name may be used for a large number of different timbers, while on the other, one species may have 10 or more different trade names (3, 4) (Table 1). For example, caviuna vermelha wood is a common

name for *M. scleroxylum*, while cocobolo is a common name for *Dalbergia retusa* (syn. *D. obtusa*). Botanical identification of finished wood is often a difficult task.

The heartwood of genus *Dalbergia* and *Machaerium* species contains sensitizing quinones, a class of neoflavanoids, named dalbergiones (1,5). Each member of these genera shows a slightly different profile of dalbergiones (6) (Table 1). Exclusively *M. scleroxylum* contains one important dalbergione, the very strong sensitizer (R)-3,4-dimethoxydalbergione. Obtusaquinone and (R)-4-methoxydalbergione are the main but moderate sensitizers in *D. retusa*.

Exposure to sawdust and scrapings of the wood can produce dermatitis on exposed areas of woodworkers.

Case Reports

In the Municipal School of Music in Zaragoza (Spain), caviuna wood was used over a period of 5 years to construct gaitas (flageolets) (Fig. 1).

Table 1. Types of dalbergiones present in the main members of the genera *Dalbergia* and *Machaerium**

Dalbergiones	<i>Dalbergia nigra</i> All. (Brazilian rosewood) (Jacaranda) (caviuna)	<i>Dalbergia latifolia</i> Roxb. (East Indian rosewood) (Bombay blackwood)	<i>Dalbergia retusa</i> Memsley (Cocobolo) (Granadillo)	<i>Dalbergia melanoxylon</i> Guill. And Perr. (African blackwood) (African Granadillo)	<i>Machaerium scleroxylon</i> Tul. (Pao ferro) (Caviuna vermelha) (Santos rosewood)	<i>Machaerium kuhlmanii</i> Hoehne and <i>M. nictitans</i> Benth.
(R)-4-methoxydalbergione	+	+	+			
(S)-4-methoxydalbergione	+	+		+		
(R)-3,4-dimethoxydalbergione					+	
(R)-3,4-dimethoxy-4'-hydroxydalbergione						+
(S)-4,4'-dimethoxydalbergione	+	+				
(S)-4'-hydroxy-4-methoxydalbergione	+	Traces	+	+		
(S)-3'-hydroxy-4,4'-dimethoxydalbergione				+		
Dihydro-2',4'-dimethoxydalbergione		+				
Obtusaquinone			+			

*Adapted from Southon I W. Plants and their constituents. In: Phytochemical Dictionary of the Leguminosae, Vol. 1, Bisby F A, Buckingham J, Harbone J B (eds): London, Chapman & Hall, 1994: 246.

Out of 70 pupils, 7 chose caviuna wood to make their instruments. Three of these 7 pupils developed dermatitis on exposed areas of the body, 2 of them also suffered from associate rhinitis. To find out the source of their symptoms we included 3 students with dermatitis from the School of Music, and 4 patients who were gaitas constructors too, but not pupils of the school. These 4 patients had obtained their caviuna wood samples from the school. 3 of them suffered from dermatitis on exposed areas, 2 of them had associate rhinitis. 1 presented with erythema multiforme-like eruption.

Case 1

A 58-year-old gaitas constructor observed rhinitis a few minutes after beginning to use caviuna for the first time. The following day he developed itching erythema and edema on his face and neck.

Case 2

A 37-year-old gaitas constructor developed rhinitis and itching erythema on his face a few hours after beginning to work with caviuna. This occurred 3 months after he had started working with caviuna.

Case 3

A 48-year-old gaitas constructor presented with rhinitis a few minutes after working with caviuna. He also showed itching erythema of his face, neck and genitals. Edema of his eyelids developed hours later. The symptoms began 6 months after he had started using caviuna.

Case 4

A 46-year-old gaitas constructor showed an eczematous eruption on her face and neck with associate rhinitis hours after she had been using

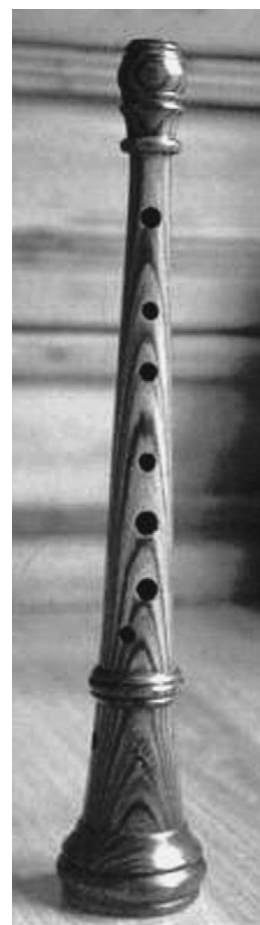


Fig. 1. Gaita (flageolet)

caviuna. Only 1 month before she had the first contact with the wood.

Case 5

A 27-year-old gaitas constructor developed itching erythema on his face, neck and hands as well as edema on his lips 4 months after he had started using caviuna.

Case 6

A 22-year-old gaitas constructor recognized red, mildly itching papules and disseminated plaques with target shaped areas. These lesions involved his face, neck, arms, hands and dorsal side of the feet. He had started to work with caviuna 3 months ago.

Case 7

A 35-year-old gaitas constructor presented with rhinoconjunctivitis a few minutes after using caviuna. He also presented itching erythema, vesicles on his face and hands hours later. He too had started working with caviuna 3 months before.

All clinical manifestations completely cleared as soon as the patients stopped using caviuna. After switching to *D. melanoxylon*, *D. cearensis*, *D. frutescens* and *D. retusa* they had no problems with the woods anymore.

Material and Methods

We got into contact with the company that supplied the Municipal School of Music with caviuna in order to find out its botanical name.

One of the patients provided a sample of caviuna from the school. It was sent to one of the authors (BMH) for chemical analysis by thin-layer chromatography (TLC). Comparison of

the supplied species with authentic material of *M. scleroxylon* was done by careful grinding of the solid wood sample by a rasp and extracting the scrapings with chloroform at 39°C over night. These extracts were analysed on TLC plates in the system chloroform + methanol (100 + 1). For comparison, we used different dalbergiones deriving from previous analytical investigations (7). Patients 3 and 7 suffering from rhinitis were prick tested with caviuna sawdust mixed with water in a 10% concentration.

In a first step, all patients were tested with the European Standard series, caviuna sawdust sample and the contact sensitizer of the mostly suspected wood (*M. scleroxylon*): (R)-3,4-dimethoxydalbergione (Table 2).

As (R)-3,4-dimethoxydalbergione remained negative, we performed further patch tests with a series of dalbergiones supplied by one of the authors (BMH), as described in Table 2. Patients 1 and 7 refused to continue with patch testing. Therefore no further tests could be done on them.

Controls with caviuna sawdust samples were performed on 15 volunteers. As 5 of the above-mentioned 7 patients reacted to obtusaquinone deriving from *D. retusa/obtusa* (cocobolo), a new analysis was carried out to compare cocobolo with the supplied caviuna samples on TLC.

Results

The company supplying caviuna to the Municipal School of Music claimed the botanical name of caviuna to be *M. scleroxylon*.

However the TLC analysis of the samples showed that the woods were either *M. scleroxylon* or *D. cearensis* and *D. frutescens*, but not *D. retusa* (cocobolo).

The prick tests performed on patients 3 and 7 with caviuna sawdust remained negative. The results of the patch tests are shown in Table 2. All patients reacted strongly to caviuna sawdust.

Table 2. Patch tests results

Material	% conc.	Veh.	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6		Case 7	
			48	96	48	96	48	96	48	96	48	96	48	96	48	96
Cav. sawdust	1	pet.	–	++	+	++	+	++	++	++	+	++	++	+++	–	+
	10	pet.	++	+++	++	+++	++	+++	++	+++	++	+++	+++	+++	++	+++
	1	wat.	–	+	+	+	+	+	++	++	–	+	+	++	–	–
	10	wat.	++	++	++	++	+	++	++	+++	+	++	+++	+++	++	++
R-3,4-dimethoxydalbergione	0,01	pet.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Obtusaquinone	1	pet.			++	++	++	++	+++	+++	+	++	+	+++		
(S)-4,4-dimethoxydalbergione	1	pet.			++	++	++	++	+	+++	–	–	–	–		
(R)-4-methoxydalbergione	1	pet.			++	++	++	++	++	+++	–	++	–	+		
(S)-4-methoxydalbergione	1	pet.			+	+	++	++	+	+++	+	+	+	++		
(S)-4-mydroxy-4-methoxydalbergione	1	pet.			–	–	–	–	–	–	–	–	–	–		

cav., caviuna; conc., concentration; veh., vehicle; pet., petrolatum; wat., water.

5 of them reacted strongly to obtusaquinone and (R)-4-methoxydalbergione found in cocobolo while (S)-4-methoxydalbergione showed moderate to weak reactions. 3 of them reacted to (S)-4,4'-dimethoxydalbergione. Patch test with (R)-3,4-dimethoxydalbergione remained negative in all patients as well as in the controls.

The latency period observed between the first contact and the development of cutaneous symptoms showed to be of 1 month in 1 individual and 3 months in 5 of the 7 individuals. Only 1 of them recognized cutaneous symptoms as soon as he began to work with caviuna.

Discussion

Fine wood dust being produced during wood processing initially provokes a typical airborne contact dermatitis (2, 8, 9). Later, the ankles, dorsa of the feet, genitals, and armpit can become involved because the wood dust is trapped between clothing and the skin, and simultaneously is transferred to other parts of the body by hand (1).

In our patients, airborne contact dermatitis with eczematous lesions and erythema multiforme-like eruption was connected to rhinitis or conjunctivitis in 2 cases. In all cases, exposure to caviuna sawdust was responsible for the symptoms observed. As prick-test results with caviuna sawdust remained negative, their rhinitis must be interpreted as a primary irritation of the nasal mucosa, as previously described (10). To demonstrate a probable occupational rhinitis, it would have been necessary to perform a nasal challenge test, but all the patients refused this test.

With certainty the statement of the company that caviuna is *M. scleroxylon* cannot be supported. On the contrary, the results of the patch tests with the dalbergiones confirm that the patients must have been in contact with different *Dalbergia* species such as *D. melanoxyton*, *D. cearensis*, *D. frutescens* and especially with *D. retusa/obtus*, named cocobolo. It is unlikely that Brazilian and East Indian rosewood may have played a role, as these species usually are used for string and reed instruments such as violins, violas, guitars, recorders and flutes (11). 5 of the 7 sufferers

reacted strongly to obtusaquinone found in cocobolo, but no patient showed the slightest reaction to (R)-3-4-dimethoxydalbergione, the strongest of all sensitizers among the dalbergiones. (R)-3,4-dimethoxydalbergione occurs solely in *M. scleroxylon*, but not in any *Dalbergia* species. Cross-reactions have not been observed. It remains obscure why “caviuna”, which is a common name for *M. scleroxylon*, has been used in that company for a wood belonging to the genus *Dalbergia*. We are sure that the main part of the timbers used by our patients to manufacture flageolets must have been cocobolo wood.

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