

Asthma and other symptoms in cinnamon workers

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ABSTRACT Cinnamon, which is the bark of the *Cinnamomum zeylanicum* tree, contains cinnamic aldehyde, which is an irritant. Workers processing cinnamon before export are exposed to much cinnamon dust. Forty such workers with an average of four years' service in the industry were examined. Thirty five workers (87.5%) had symptoms, nine having had asthma (22.5%). Other symptoms, probably related to the irritant nature of cinnamon dust, were irritation of skin (50%), loss of hair (37.5%), and smarting of eyes while at work (22.5%). Loss of weight (65%) was the commonest finding. Contact dermatitis which has previously been described was not found in any of the workers.

Cinnamon is the bark of the *Cinnamomum zeylanicum* tree. True cinnamon is a native of Sri Lanka and grows almost exclusively in this country. Sri Lanka holds the virtual monopoly of this product in the world market.¹ True cinnamon has to be differentiated from cassia, which is obtained from *Cinnamomum cassia* which grows in China.

Cinnamon has an agreeable and delicate fragrance and a sweetly pungent taste. It is therefore used as a flavouring agent for various types of products such as confectionery, pharmaceutical preparations, oriental curries, chewing gum, toothpaste, and mouth washes. It is used in cosmetics, and has carminative properties as well.

A volatile oil is distilled from the bark and leaves of the cinnamon tree but this constitutes a minor aspect of the industry in Sri Lanka. The cinnamon oil of commerce is usually obtained from *C cassia*. As much as 68% of the oil consists of cinnamic aldehyde, which is a powerful irritant that can blister the tongue. Powdered cinnamon contains only about 1% of the aldehyde and is not an irritant under ordinary circumstances.

In the past consumer countries have reported sporadic cases of contact dermatitis due to sensitivity to cinnamon.^{2,3} Two cases of cheilitis caused by cinnamon oil in bubble gum⁴ or in toothpaste⁵ have also been reported. There are, however, no published references to any other ill effects in cinnamon workers. In view of the irritant nature of cinnamic aldehyde and the reported sensitivity reactions to it, it is not unreasonable to expect cinnamon workers to exhibit other occupational ill effects. This paper reports an inquiry into this possibility.

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Manufacturing process

Cinnamon is cultivated in Sri Lanka in scattered areas along the western seaboard of the island. Plantations consist of clumps of bushes each comprising a number of fairly straight shoots. These shoots, when about the thickness of a thumb and the height of two metres, are cut off from the base and the bark is peeled off. Harvesting of shoots takes place throughout the year, though there are seasonal fluctuations largely determined by non-technical factors.

Peeling of the bark is a skilled job and is done on the plantation itself in temporary sheds put up for the purpose. After scraping off the outer skin of the bark, the peeler rubs it off with a brass block. This helps to detach the bark from the wood underneath. The peeler then splits the bark from end to end and peels it off with a special rounded knife. Several lengths of these pipe shaped barks are dovetailed into each other until a length of 105 cm is reached. The hollow of the pipe is then carefully packed with broken oddments of the bark. The quills thus formed are dried indoors on coir strands. The finished product, which is a straight rod that according to official specifications should measure from six to 38 mm in diameter is brick red, and being brittle tends to crack easily with pressure.¹

The quills are sold by the producers to local buyers who sort them into different grades and bleach them. There are 11 grades of quills, the best quality being 6 mm in diameter and devoid of any reddish brown patches on the surface. Bleaching, which is done with sulphur dioxide, imparts a golden colour to the quills and also fumigates them. Bleaching is carried out in special chambers where cinna-

mon is stacked on wooden platforms under which are placed troughs of burning sulphur. The door is closed for about 12 hours during which period the sulphur dioxide fumes percolate upwards through the quills and escape through a chimney at the top of the roof. The quills are then tied into cylindrical bundles, usually weighing 50 kg, and delivered to exporters in Colombo.

At the exporters' stores the bundles are untied, the grading checked, and the quills rebundled. This last process by which the bales are reduced to the smallest possible size in order to conserve shipping space requires very firm tying, and therefore only men handle this work. Finally, women sew a covering of jute hessian over each bundle. Both these jobs are dusty. Pieces of cinnamon variously graded as quillings, featherings, and chips according to their size break off from the quills and fall to the floor and together with the dust are swept from time to time into heaps by women who later sit around them in a circle picking up the pieces and sorting them according to their size. The residual dust together with the very small pieces is discarded.

Some importers request quills of a shorter length than the standard ones. These are supplied by cutting the long quills into the specified lengths with an electric circular saw. The rotation of the blade carries a considerable amount of dust towards the operator who normally wears a mask. Each firm has one or two men trained in this work because it is important that a clean cut should be effected without damage to the quill.

The peelers are usually not much exposed to cinnamon dust. On the other hand, workers in local buyers' stores are exposed to a considerable amount of the dust as well as sulphur dioxide. By the time that cinnamon is brought to the exporter in Colombo there is no evidence of residual sulphur dioxide. Most exporters of cinnamon in Sri Lanka also handle other varieties of spices, such as cardamon, cloves, and nutmeg, and the workers are therefore exposed to a mixed dust. To assess the influence of cinnamon dust alone on the workers without interference from other dusts or sulphur dioxide, an exporter's store which handled only cinnamon was selected for the present study.

Methods and materials

All 40 workers employed in a large cinnamon store in Colombo were examined at the Central Chest Clinic, Colombo, between January and March, 1982. Each worker was interviewed according to a questionnaire that included a full occupational history. The questions on respiratory symptoms were based on the Medical Research Council question-

naire on respiratory symptoms.⁶ Questions relevant to non-respiratory aspects of their health were incorporated into the questionnaire after preliminary discussions with the management and some of the workers. Each worker was submitted to a physical examination. A chest radiograph was done on standard sized film. Peak expiratory flow was measured with a mini-Wright's peak flow meter. Other investigations were carried out where indicated. Twenty two workers were examined more than once.

The store selected for the present study was located in a large hall with a high roof. On entering the store one was struck with the overpowering aroma of cinnamon.

The manager and the storekeeper were included in the study as they worked in a small enclosure off part of the common hall and frequently moved among the workers. The working hours in the store were 8 am to 5 pm on week days, and 8 am to 3 pm on Saturdays.

Results

The ages of the 40 workers (21 women, 19 men) (table 1) ranged from 18 to 53 (mean 31.8). Their average period of service in the cinnamon industry was four years (range 2 months to 11 years): 45% of the workers had worked for six years or more and 42.5% for one year or less (table 2).

None of the women in the study smoked. Nine of the men smoked an average of 5.8 cigarettes a day.

All but five of the workers had symptoms. Fifteen workers (37.5%), of whom eight were women, had a cough (table 3). Their average age was 32.2 years. Five men with symptoms were smokers, and they smoked about seven cigarettes a day.

Table 1 Age and sex distribution of cinnamon workers

Age group (years)	Men	Women	Total
10-19	4	0	4
20-29	12	7	19
30-39	2	6	8
40-49	1	4	5
50-59	0	4	4
Total	19	21	40

Table 2 Period of service in the cinnamon industry

Years of service	No of workers	Percentage of total
0- 1	17	42.5
2- 3	1	2.5
4- 5	4	10.0
6- 7	15	37.5
8- 9	2	5.0
10-11	1	2.5
Total	40	100.0

Table 3 *Prevalence of abnormalities in the 40 cinnamon workers*

	No	Percentage of total
Loss of weight	26	65.0
Irritation of skin	20	50.0
Loss of head hair	15	37.5
Cough	15	37.5
Asthma	9	22.5
Smarting of eyes	9	22.5
Rash	5	12.5

ASTHMA

Asthma, defined as a disease characterised by narrowing of intrathoracic airways indicated by dyspnoea or wheezing varying in severity over short periods,⁷ was present in four men and five women. In seven this condition had developed since starting to work with cinnamon and four attributed their asthma to their work.

Case 1—A 52 year old woman who had worked in the cinnamon store for seven years developed asthma four months after starting work. She had had no previous employment before joining the industry. She developed asthma only when heavily exposed to cinnamon dust, such as when sorting out quillings, sweeping the floor, or working near the cinnamon cutting machine. The symptoms then came on within a few minutes. Because of this her job was changed to sewing the jute hessian covers for cinnamon bundles. She did not get asthma while at home, and other types of dust did not induce an attack. Salbutamol relieved the attacks, but when severe she had to seek outpatient treatment at the hospital. At the chest clinic she was given a provocative inhalation of cinnamon dust obtained from sweepings at her place of work. Just before the test she had an occasional rhonchus on auscultation, but within 10 minutes of inhalation she developed numerous rhonchi and breathing became laboured. The peak expiratory flow which was 300 l/min just before inhalation dropped to 220. Thirty minutes after inhalation the peak expiratory flow increased to 270 l/min and the attack gradually passed off.

Case 2—A 37 year old woman who had had no previous employment developed asthma after working for six years in the industry. The symptoms usually appeared after about one and a half hours' exposure to dust while sorting out quillings or working near the cinnamon cutting machine. So far as possible she avoided this type of work. Whenever she stayed at home for a few days she was without the wheeze. Occasionally the wheeze developed while at home, but only on days when she had been heavily exposed to cinnamon dust.

Case 3—A 24 year old man who had worked for a total of four years in the cinnamon store had oper-

ated the cinnamon cutting machine for the past one and a half years. After using the machine for about an hour he developed a cough, wheeze, and tightness in the chest. He usually worked the machine for two hours at a stretch. The symptoms subsided half an hour after switching off the machine. He then resumed work.

LOSS OF WEIGHT

Of the 26 workers who lost weight after starting work in the store, 20 of them who could state their original weight had lost an average of 3.8 kg during their period of service (range 1-12 kg). The latter figure, which was the maximum weight loss noted in the study, was in a recent recruit after nine months' service. The manager lost 9 kg and the storekeeper 4.5 kg. Neither of them did any manual work. The storekeeper, who had started losing weight after six months' work, was the only person to pick up subsequently.

SKIN LESIONS

None of the five workers with skin lesions had occupational contact dermatitis. Three had ringworm, one had pityriasis versicolor, and the fifth had a traumatic lesion of both knees, the result of habitually kneeling on the floor at work.

HAIR LOSS

Twelve women and four men complained of excessive breakage or loss of hair when combing. It was mild and did not alter their appearance. Only one of the workers with less than a year's service had this symptom, and he had noticed it only a month before the interview.

IRRITATION OF SKIN

A common symptom in 20 workers was the irritation or burning sensation they experienced on a warm day when sweating. They noticed this symptom when cinnamon dust settled on to the body and it disappeared on washing the skin with water.

SMARTING OF EYES

Nine workers complained of smarting eyes when doing dusty work.

Discussion

The ill effects noticed among workers in the present study seem to fall into three broad categories—namely, respiratory symptoms (cough and wheeze), effects on the skin and mucous membranes (irritation of skin, hair loss, and smarting of eyes), and loss of weight. A large proportion (87.5%) of the workers had at least one symptom, but most were mild

and did not unduly worry the workers. They were aware of a relation between these symptoms and their work but considered them mostly as disabilities that had to be tolerated as long as they worked in the industry.

A prevalence of nine cases of asthma among 40 cinnamon workers (22.5%) is high when compared with other industries in Sri Lanka with comparable working conditions, where dusts of vegetable origin are liberated. For example, asthma was present in 6.4% of tea workers⁸ and 2.5% of kapok workers.⁹

Chronic bronchitis—that is, a history of cough and phlegm during most days for at least three months of at least one year—is uncommon in the general population in Sri Lanka.⁸ No cinnamon workers had this condition. The cough in cinnamon workers was unlikely to be related to smoking as it was present in eight of the women, who were all non-smokers. Cinnamon dust is as likely to act as an irritant to the respiratory mucosa as it does to the skin and eyes. In this respect it may be compared with another irritant, chilli dust, which also causes a high incidence of cough, burning sensation of skin, and loss of weight.¹⁰

Sweating while doing manual work is common in tropical countries such as Sri Lanka, and men often work stripped to the waist. Many workers experienced itching or a burning sensation when cinnamon dust settled on the sweat. Cinnamic aldehyde may dissolve in sweat and cause this irritation. The smarting of the eyes in some of the workers was probably due to the same effect. There were no cases of contact dermatitis due to sensitivity to cinnamon in the present study.

Diffuse loss of hair occurs from many causes and the action of toxic substances is one of these. Loss of hair was common in cinnamon workers, developing after about a year's service and then lasting at least as long as they worked. It is not known whether it was due to suppression of hair growth or breakage of hair.

The commonest finding in the present study was loss of weight, sometimes quite appreciable. It is unlikely to have been due to increased manual work for the manager and the storekeeper were also affected. Loss of weight has been reported in extrinsic allergic alveolitis due to vegetable dusts,¹¹ but in these workers there was no clinical or radiographic evidence of such a condition.

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