Identification of a Contact Allergen in Guayule Latex and Formulated Guayule Latex Products

Sir:

Guayule (*Parthenium argentatum* Gray) is well on the road to full commercialization as the demand for a source of nonallergenic latex rubber continues to grow. It is estimated that 6.5% of the general population and 40% of medical workers have allergenic reactions to products formulated from *Hevea brasiliensis* (*Hevea*) latex (1). Thus the driving force for the current commercialization effort of guayule is as a latex-producing crop with the proven absence of the proteins that cause Type I systemic allergic reactions with individuals sensitized to *Hevea* latex. Guayule latex has been shown to contain low levels of proteins, none of which elicits an allergenic response in subjects who are sensitized to *Hevea* latex proteins (2).

One potential problem in the commercialization process must be addressed: the process must exclude from guayule latex a family of potent contact allergens, the guayulins. Guayulins A and B are the *trans*-cinnamic and *p*-anisic acid esters, respectively, of the sesquiterpene alcohol partheniol. Guayulin A has been identified as a potent contact allergen, causing Type IV contact dermatitis in sensitized test subjects (3). Guayulin content has been shown to vary approximately 150-fold during the growing season (4). Therefore, possible guayulin contamination of isolated latex and any allergenic potential will be dependent on time of harvest.

Recent investigations in our laboratory using high-performance liquid chromatography (HPLC), and confirmed with gas chromatography–mass spectrometry and guayulin standards, have shown that guayulins A and B can be carried through the latex product formulation process. Furthermore, these compounds survive the vulcanization process used in the manufacture of dipped rubber goods. A 3.2-g sample of dipped film prepared from vulcanized guayule latex was subjected to a 6-h Soxhlet extraction with acetone (4). A 2.0-g dry weight equivalent of fresh guayule latex was coagulated using acetic acid, rinsed with water to a pH of 7.0, rolled into a thin film, and subjected to the same extraction as the film. The acetone-soluble materials, i.e., the resin fraction, were concentrated by rotary evaporation and analyzed using HPLC (5).

Table 1 summarizes our results. The fresh latex has a 26.2% resin fraction based on dry rubber content (DRC) of which 3.9% is guayulin A, resulting in a 1.03% DRC concentration. The dipped film contained 10.1% resin of which 2.7% was guayulin A, resulting in a 0.26% DRC concentration. The lower levels of guayulins in the dipped film may be due to the vulcanization process. However, the lower levels may also be due to seasonal fluctuation, since the fresh latex and film were produced from samples harvested 2 yr apart. Table 2 is a comparison of the resin and guayulin levels in guayule shrub over the course of a single growing season (adapted from Table 1, Ref. 5). The guayulin A content of the resin in latex is not significantly different from that of whole-shrub resin. More importantly, the guayulin content of the dipped film, while lower than that of the latex itself, is not significantly different from that of the whole shrub tissue. Indeed, depending on the harvest date, the guayulin content may be more concentrated than that found in whole shrub tissue.

TABLE 1
Guayulin A and B Content in Fresh Guayule Latex and a Dipped Film Product

		Guayulin A		Guayulin B	
	Resin (%DRC)	DRC (%)	Resin (%)	DRC (%)	Resin (%)
Latex	26.2	1.03	3.92	0.26	0.98
Film	10.1	0.27	2.67	0.13	1.27

[a]DRC, dry rubber content.

Individuals sensitized to guayule plant material face the real possibility of having an allergic response to a cured film product prepared from guayule latex. The mere presence of a demonstrated contact allergen in a cured film detracts from its commercial viability as an alternative to a similar product from *Hevea* latex. The threshold response in cinnamaldehyde-sensitive subjects is 0.02% cinnamaldehyde in ethanol using patch testing and sensitized human subjects (6). The

TABLE 2
Seasonal Variation in Whole-Shrub Guayulin A and B Content[a]

	Guayulin A		Guayulin B	
Month	Shrub (ppm)	Resin (%)	Shrub (ppm)	Resin (%)
Jan	1967	4.19	275	0.59
Feb	242	0.48	39	0.08
Mar	3629	7.26	526	1.05
Apr	27	0.05	9	0.02
May	29	0.06	5	0.01
Jun	841	1.96	126	0.29
Jul	2939	5.76	385	0.75

[a]Adapted from Reference 5.

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threshold sensitivity to guayulin A may not be as low as that of cinnamaldehyde. Our results provide sufficient evidence to support the need for further research into the persistent nature of guayulins throughout the dipped film process.

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