

### Is there cross-reactivity between Shea Butter and Natural Rubber Latex?

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**Answer:** The relationship between these materials remains unclear. There are currently no published studies that confirm the presence or absence of cross-reactive allergens in shea butter and natural rubber latex (NRL), but personal accounts posted online in latex allergy forums are suggestive of a possible link. Some background information is provided below for NRL-sensitive individuals concerned about using shea butter products.



Shea butter is made from the high-fat nuts or seeds of the shea tree (*Vitellaria paradoxa*). Although shea trees are not related genetically to the rubber trees (*Hevea brasiliensis*) whose sap is used to prepare many NRL-based products, a latex-type substance has been identified in some shea butters, prompting obvious concerns among NRL allergy sufferers.

It is important to recognize that not all latex preparations are allergenic or problematic for persons allergic to NRL. Latex sap is present in thousands of plant species to help ward off attacks from predatory animals and microorganisms. Several important allergens in NRL are plant defense proteins. Some of these proteins may also be present in other latex,

but at least one source (guayule) does not contain any allergens that cross-react with those in NRL, and others with different protein structures or compositions may be much better tolerated compared to NRL.

Commercial shea butter products can contain a variety of constituents at different concentrations, and refined products may also include chemical additives to improve their appearance or aroma. This variability may help to explain why some NRL-sensitive persons have problems tolerating certain shea butters but not others, based on patch testing or application of small quantities on their skin. Content information for specific products can also be difficult to obtain, complicating or preventing the identification of possible irritants or allergens.



Shea nuts are related to Brazil nuts, which in some cases can cross-react with other common tree or plant nuts. In addition to their high fat content, shea nuts and shea butters also contain proteins that may be capable of causing allergic reactions. In a recent study (the only published report to date examining possible allergic reactions to shea butter),

proteins extracted from shea nuts and shea butters did not cross-react with prominent allergens in Brazil nut, pistachio, cashew and peanut (1).

Unfortunately, as noted earlier, a similar study of shea product cross-reactivity in NRL-sensitive patients has not yet been performed. These studies should include pure and blended shea butter products, NRL samples from several sources, and multiple NRL-allergic subjects to cover the widest possible range of commercial products and patient sensitivities. A single clinical or laboratory study may not provide definitive answers to the question of shea butter-NRL cross-reactivity. Until conclusive scientific data are published, continued patch testing or avoidance of shea butter products is recommended.

(1) Chawla KK, Bencharitiwong R, Ayuso R, Grishina G, Nowak-Wegrzyn A. Shea butter contains no IgE-binding soluble proteins. *J Allergy Clin Immunol.* 2011; 127: 680-682.

#### Inside

- Page 1** Is there cross-reactivity between Shea Butter & Natural Rubber Latex?
- Page 2** ALAA 20th Anniversary Letter to the Editor
- Page 3** Letter to the Editor
- Page 4** Ask The Expert
- Page 5** Donation Form
- Page 6** Mylan

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## Shea butter contains no IgE-binding soluble proteins

Letters to the Editor • J ALLERGY CLIN IMMUNOL MARCH 2011

### To the Editor:

The Food Allergen Labeling and Consumer Protection Act of 2004 requires major allergens to be listed in all packaged goods. The 2006 US Food and Drug Administration guidelines include shea nut among other tree nuts. Shea nut is distantly related to Brazil nut,<sup>1</sup> which cross-reacts with almond, hazelnut, walnut, and peanut.<sup>2</sup> Because of its high content of nonsaponifiable lipids, shea butter is widely used in cosmetic, baby care, food, and confectionary products.<sup>3</sup>

Shea butter is derived from the kernel of the shea nut (Sapotaceae family), which is the seed of the fruit of the karit tree, indigenous to the Savannah region of Africa. Local women manually produce shea butter by shelling the fruit and using the inner nut. The nut is boiled, sun-dried, crushed, and roasted to form a paste. The paste is purified, heated, and mixed with water so that fat rises to the surface, which later hardens to form the butter.<sup>4</sup> It can take 8 hours to produce 1 L butter because of the difficulty in refining the fat and latex within the nuts, which limits solvent extraction.<sup>4</sup> The fatty content of the shea nut kernel varies by region from 29.7% to 53.7%.<sup>3</sup> The protein content is poorly characterized; in one study, 42 mg protein was extracted from 100 g shea nut (0.042%).<sup>5</sup> For comparison, Brazil nut contains 14% protein, cashew and pistachio 21%, and peanut 25%.

In 2003, Lack et al<sup>6</sup> proposed that sensitization to peanut protein may occur through application of skin preparations containing cold-pressed peanut oil to

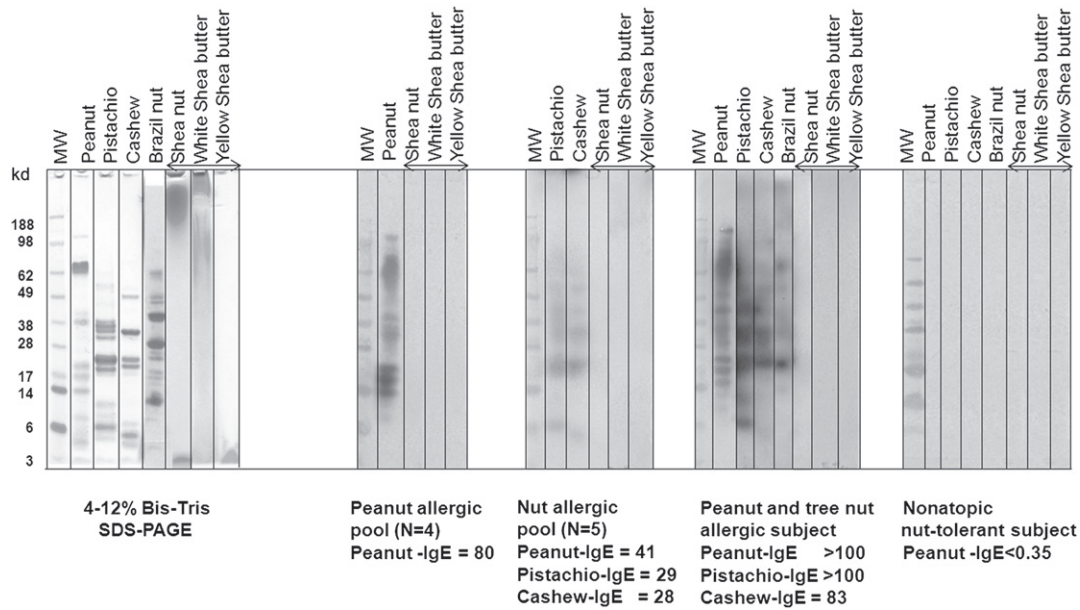
inflamed skin, highlighting the cutaneous route of peanut exposure. There are no reports of ingestion or contact-related reactions to shea butter in individuals without allergy. Considering the wide use of skin products containing shea butter, we sought to determine whether there are detectable proteins in shea nut or shea butter extracts and whether such proteins are recognized by subjects with peanut or tree nut allergy.

Extracts were prepared from raw shea nut kernels (Africa Imports, Hackensack, NJ) and white and yellow shea butters from Ghana. Shea nuts were ground and homogenized into a paste. The paste was defatted and extracted by 2 different methods: (1) cold acetone in filter papers and extracted by PBS with protease inhibitor cocktail without EDTA (Roche, Indianapolis, Ind) with or without mercaptoethanol for 4 hours, or (2) petroleum ether in Soxhlet (Barnstead Electrothermal, Essex, United Kingdom) extracted by the buffered sodium borate method (0.1 mol/L H<sub>3</sub>BO<sub>3</sub>, 0.025 mol/L Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>, 0.075 mol/L NaCl, pH 8.45 with protease inhibitor) at room temperature for 1 hour.<sup>7</sup> Shea butters were defatted with acetone and extracted by PBS alone or with 0.1 mol/L β-mercaptoethanol with protease inhibitors. Other nut extracts were processed as published.<sup>8</sup> Protein concentration was determined by Coomassie protein assay (Thermo Scientific, Rockford, Ill). Soluble proteins (4 mg/lane) were separated by NuPAGE Novex 4% to 12% Bis-Tris and 3% to 8% Tris-Acetate SDS-PAGE gels

(Invitrogen, Carlsbad, Calif) and stained with SimplyBlue SafeStain (Invitrogen). The resolved proteins were transferred to Immobilon-P membranes (Millipore, Bedford, Mass). Sera for immunolabeling were obtained from subjects with peanut and peanut/tree nut allergy with a history of convincing IgE-mediated allergic reactions and no known history of allergic reactions to shea nut or shea butter. A nonatopic nut-tolerant individual was used as negative control. Individual and pooled sera were diluted in PBS containing 0.05% Tween 20, 1% BSA, and 10% normal goat serum. Membranes were incubated with Iodine-125-goat antihuman IgE (DiaMed, Windham, Me) and exposed to Kodak bio-Max imaging film (Kodak, Rochester, NY) for 1 to 17 days.

ELISA was used to detect small protein fractions, which might not be detected by Western blot. Ninety-six-well plates were coated overnight at 48°C with peanut and shea nut extracts (100 mL/well; protein range, 6.25–200 mg/mL) in carbonate-bicarbonate coating buffer (0.05 mol/L, pH 9.4). Unspecific binding was blocked by 2% BSA, 0.05% Tween 20 in PBS. Peanut/tree nut-allergic pooled sera and a nonatopic control, diluted 1:10 and 1:20 in the blocking buffer, were added and incubated for 2 hours. Allergen-specific IgE was detected with peroxidase-labeled goat antihuman IgE antibody 1:2500 (KPL, Gaithersburg, Md), developed with tetramethylbenzidine (eBiosciences, San Diego, Calif), terminated with stop

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**FIG 1.** SDS-PAGE and immune recognition of proteins from shea nut, shea butter, peanut, and tree nut extracts (UniCAP median of specific IgE unit, kilounits of antibody per liter (kU<sub>A</sub>/L). We did not detect any defined protein bands in shea nut and shea butter. Nuts were extracted with method 1 (acetone and PBS). MW, Molecular weight.

solution, and read on a microplate reader at 450 nm.

We did not detect any defined soluble protein bands in shea nut or shea butter extracts with SDS-PAGE, even when using gel suitable to detect proteins with molecular weights up to 260 kd (Novex Sharp Protein Standard; Invitrogen). In contrast, multiple well defined protein bands were detected in the peanut, cashew, pistachio, and Brazil nut extracts that corresponded to the known allergens of those nuts. Shea nut and white and yellow shea butter extracts contained 730, 12, and 6 mg/mL water/salt soluble protein by Coomassie assay, respectively. However, this is substantially less compared with cashew extract (25 mg/mL).<sup>8</sup> By Western blot, no IgE binding to shea nut and shea butter was detected, regardless of the method of protein extraction and using sera that strongly bound to the proteins in peanut, cashew, pistachio, and Brazil nut extracts (Fig 1). In ELISA, no IgE binding was detected to shea nut or shea butter, whereas strong binding to peanut proteins was detected (data not shown).

This is the first study examining the potential allergenicity of shea butter. Shea nut and shea butter contain extremely low levels of water/salt soluble protein with undetectable IgE binding by Western blot and ELISA. Protein extraction may be limited by the high fat content of shea nut compared with other tree nuts and peanut and by the presence of latex within the shea nut.<sup>4</sup> These findings

are reassuring for individuals with nut allergy who are using shea butter-based products topically. This may explain why no allergic reactions have been reported, despite the popularity of these products. It is unknown whether nipple creams with shea butter used by mothers could predispose to sensitization toward other tree nuts or peanuts in breast-fed infants. In summary, we did not detect any IgE binding to water/salt soluble proteins in shea nut and shea butter extracts with Western blot and ELISA, suggesting minimal availability of protein in commercial shea butter products.

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# Ask The Expert ???

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## Natural Rubber Latex Allergy and the Poinsettia

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**At this time of the year** we receive many phone calls regarding the potential for patients who have natural rubber latex allergy to develop allergic reactions to poinsettia plants. Fortunately, I do not recall seeing or hearing of any severe allergic reactions to poinsettia contact in our patients who have latex allergy. There are multiple lactifer or latex secreting plants in the world. Poinsettia is one of the most common flowering tropical plants. It comes from the family Euphorbiaceae of which *Hevea brasiliensis* (the rubber tree) is a member.

A small table is included at the end of the text of some plants related to the *Hevea brasiliensis*. Little is published on this cross reactivity of latex in this family in the medical literature. However, early in the 1990's our research group spent some time and effort on characterizing some cross reactivity between the latex derived from poinsettia and from *Hevea brasiliensis*. There appears to be cross reactivity in the laboratory setting of the latex proteins from these plants. Most important though, one would have to have significant contact with the poinsettia plant's latex directly to have an allergic reaction. Otherwise, a high number of



reactions would be reported in the population of patients who have latex allergy. The latex is found in a circulation system within the plant and is not secreted until the system is accessed by breaking a leaf or injuring the plant in some manner. Even in this case, only a small drop of latex that can be immediately wiped off of the skin is unlikely to cause an allergic reaction. Despite this minimal risk, we are discouraging direct contact with poinsettia latex because of the remote possibility of an allergic reaction.

It would be prudent not to overreact to the mere presence of poinsettia in the environment, as this is likely to be safe.

For those who wish to avoid all forms of latex as recommended by their doctors, their personal contact with poinsettias should be limited.

<b>Genus/Species</b>	<b>Common Name</b>
<i>Hevea brasiliensis</i>	Rubber Tree
<i>Euphorbia pulcherrima</i>	Poinsettia
<i>Euphorbia splendens</i>	Crown of Thorns
<i>Manikot esculenta</i>	Tapioca
<i>Acalypha wilkesiana</i>	Jacobs Coat
<i>Ricinus communis</i>	Castor Bean
<i>Acalypha hispida</i>	Chenille plant

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