

## Is Soybean Lectin an Issue?

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Lectins have been in the spotlight, and for some, have become a cause for concern. At least when it comes to soyfoods, that concern is mostly much ado about nothing.

Given all the attention they're receiving, you might think these proteins are newly discovered, perhaps because of a sudden advance in technology. Given all the concerns being raised about them, you might be thinking of avoiding foods that contain them. If you do, you can pretty much say goodbye to a long list of healthy foods such as legumes (including soy and peanuts), eggplant, peppers, potatoes, tomatoes and avocados. Despite the hoopla, studies show there is little reason for concern.

Lectins are anything but new to the scientific community. They are a class of protein that occurs widely in nature and have been known to exist in plants for more than a century. Much of the lectin research has focused on legume lectins but these carbohydrate-binding proteins are widely distributed throughout the plant kingdom.<sup>1</sup> The lectin in soybeans was discovered in the 1950s.<sup>2</sup>

In plants, lectins appear to function as nitrogen storage compounds, but also have a defensive role, protecting the plant against pests and predators.<sup>3,4</sup> They are capable of specific recognition of and binding to carbohydrate ligands. The term lectin (*legere* = Latin verb for to select) was coined by Boyd circa 1950 to emphasize the ability of some hemagglutinins (lectins) to discriminate blood cells within the ABO blood group system.<sup>5-8</sup> The term lectin is preferred over that of hemagglutinin and is broadly employed to denote "all plant proteins possessing at least one non-catalytic domain, which binds reversibly to a specific mono- or oligosaccharide."<sup>4</sup>

Orally ingested plant lectins remaining at least partially undigested in the gut may bind to a wide variety of cell membranes and glycoconjugates of the intestinal and colonic mucosa leading to various deleterious effects on the mucosa itself as well as on the intestinal bacterial flora and other inner organs.<sup>9,10</sup> The severity of these adverse effects may depend upon the gut region to which the lectin binds.<sup>11</sup> Several cases of lectin poisoning due to the consumption of raw or improperly processed kidney beans have been reported.<sup>12-14</sup>

The lectin content of soybeans varies considerably among varieties, as much as fivefold.<sup>15</sup> However, from a nutritional perspective, it is the amount in properly processed soyfoods that is most relevant. Although there has been a lot of debate about whether even active soybean lectin is harmful, a true pioneer in this field, Irvin E. Liener, concluded that soybean lectin isn't a concern because it is readily inactivated by pepsin and the hydrolases of the brush border membrane of the intestine.<sup>16,17</sup> But, others think soybean lectin does survive passage through the small intestine.<sup>18,19</sup>

Not surprisingly, autoclaving legumes including soybeans completely inactivates lectins. However, foods aren't typically autoclaved. The most practical, effective, and commonly used method to abolish lectin activity is aqueous heat treatment. Under conditions where the seeds are first fully soaked in water and then heated in water at or close to 100°C, the lectin activity in fully hydrated soybeans, kidney beans, faba beans, and lupin seeds is completely eliminated.<sup>20,21</sup> Thompson et al.<sup>22</sup> noted that cooking beans to the point where they might be considered edible is more than sufficient to destroy virtually all of the hemagglutinating activity of lectins. More recently, Shi and colleagues<sup>23</sup> found that soaking and cooking soybeans destroyed more than 99.6% of the lectin content, which agrees with earlier work by Paredes-Lopez and Harry.<sup>24</sup>

Finally, evidence from clinical trials in no way suggests that the possible residual lectin content of soyfoods is a cause for concern. Adverse effects typically associated with lectin toxicity don't show up in the hundreds of clinical trials involving a range of soy products that have been published. Not surprisingly, the U.S. Food and Drug Administration recently concluded that soy protein is safe.<sup>25</sup>

## References

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