



# A Viewpoint on the Leaky Gut Syndrome to Treat Allergic Asthma: A Novel Opinion

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## Abstract

Asthma is a common respiratory disease characterized by airway inflammation, airway hyperreactivity, and reversible airflow obstruction. Despite current treatments, the prevalence of asthma has increased markedly over decades. According to the theories proposed to explain the pathophysiology of autoimmune diseases in integrative medicine, leaky gut syndrome is a phenomenon of increased intestinal permeability due to the disruption of tight junctions and is thought to be related to many chronic diseases, such as food intolerance, inflammatory bowel disease, rheumatoid arthritis, asthma, and other autoimmune disease. One of the classical approaches used by integrative physicians to treat leaky gut syndrome is to repair intestinal permeability to prevent allergic cascade. Due to several mechanisms that have been mentioned in the protective effects of plant gums and plantain family seeds on the intestinal epithelium, we can propose an effective management for leaky gut syndrome to treat asthma.

## Keywords

asthma, leaky gut syndrome, plant gum

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Asthma is a common respiratory disease characterized by airway inflammation, airway hyperreactivity, and reversible airflow obstruction.<sup>1,2</sup> Despite current treatments, the prevalence of asthma has been increased markedly over decades due to activation of the immune system typified by a helper T-cells subtype 2 (TH<sup>2</sup>)-predominant.<sup>1</sup> The exact cause of asthma is unknown but it is likely to be a polygenic disease influenced by environmental factors and generally is associated with an allergic-type activation of the immune system typified by a helper T-cells subtype 2 (TH<sup>2</sup>)-predominant.<sup>1</sup> These T-cells produce IgE in response to inhaled antigens and cause allergic airway inflammation.<sup>1</sup> It has been suggested that the whole mucosal immune system might be involved in asthma, with activated T lymphocytes migrating from one mucosal site to another, so a possible relation between asthma and the gastro-intestinal tract is an area of increasing interest.<sup>3</sup>

According to the theories proposed to explain the pathophysiology of asthma and other autoimmune diseases in integrative medicine, “leaky gut syndrome,” also called “increased intestinal permeability,” has been mentioned as one of the significant causes, whereas in general practice, contrary to integrative practice, “leaky gut syndrome” is not a well-established diagnosis.<sup>3-6</sup> Leaky gut syndrome is a phenomenon of increased intestinal permeability due to disruption of tight junctions and

is thought to be related to many chronic diseases, such as food intolerance, inflammatory bowel disease, rheumatoid arthritis, asthma, and other autoimmune diseases.<sup>7,8</sup>

Autoimmunity happens because of the intestinal permeability due to the existence of enlarged spaces among the cells of gut wall.<sup>9</sup> These spaces create a leaky environment, and large undigested protein molecules enter the blood stream stimulating the immune response and T cells start making antibodies against these larger molecules, while in the healthy intestinal

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tract, the tight junctions limit the transport of large molecules (0.500 Da) across the epithelium.<sup>4,9</sup>

Managing diseases using drugs without considering the possible underlying dysfunction that could be regarded as incomplete and even poor medical practice may lead to many other medical challenges.<sup>4</sup> For this reason, the integrative approach is to assess the underlying dysfunctional integrity of the gastrointestinal system and then treat the diagnosed disease accordingly.<sup>4</sup> For example, one of the classical approaches, used by integrative physicians in leaky gut syndrome, is to repair intestinal permeability to prevent allergic cascade.<sup>4</sup> In this article, we reviewed literature on dietary fibers including plant gums and plantain family seeds playing an essential role in the treatment of respiratory diseases via the perspective of integrative medicine on leaky gut syndrome.

## Viewpoint

Asthma, according to the leaky gut theory, has been described as one of the allergic diseases caused by the activation of immune system because of intestinal permeability.<sup>3</sup> It has been hypothesized that asthma can be treated well, considering the underlying gut dysfunction stimulating allergic pathways. For example, based on integrative medicine, asthma can be managed by improving intestinal permeability via repairing the gastrointestinal mucosa and thus preventing immunological cascades.<sup>4</sup> In fact, intestinal epithelial cell turnover including proliferation, migration, differentiation, and apoptosis and also gut barrier functions are dynamic processes that are affected by nutritional status, the route of feeding, and the adequacy of specific nutrients in the diet. Emerging studies are defining potential therapeutic roles for specific nutrients and diet-derived compounds in gut mucosal turnover, repair, and barrier function. The role and regulation of endogenous bowel flora in generating short-chain fatty acids from diet-derived fiber and other diet-derived compounds and the effects of these agents on gut function are being increasingly elucidated.<sup>10</sup> It has been concluded that the gut microbiota metabolizes the fiber, consequently increasing the concentration of circulating short-chain fatty acids, and mice fed a high-fiber diet had increased circulating levels of short-chain fatty acids and were protected against allergic inflammation in the lung.<sup>11</sup>

Subsequently, the demulcent effect of gum and plantain seeds produces a coating of slime that acts to soothe and protect exposed or irritated surfaces of the gastrointestinal tract.<sup>12</sup> It is believed that the soothing effects of gums and mucilages also benefit irritable states of the urinary and respiratory tracts via reflex associations with the digestive tract via nervous coordination.<sup>12</sup> In addition, several studies have indicated that dietary fibers such as plant gums may have a protective effect on gastrointestinal mucosa.<sup>13</sup> For instance, a considerable protective effect of acacia gum extract on the histology of intestine of albino rats treated with nonsteroidal anti-inflammatory drugs was recorded. In the group given nonsteroidal anti-inflammatory drugs followed by gum, histological specimens of intestines showed villar fusion, epithelial cell proliferation,

and crypt proliferation.<sup>14</sup> It was also observed that the submucosal hyalinization with serosa and mucosal layers were thickened in the same group.<sup>14</sup>

In other studies, several mechanisms have been mentioned about the protective effects of dietary fibers on the intestinal epithelium. Due to the ability of these fibers to fix organic and inorganic substances, their absorption by the intestinal epithelium is delayed, reduced, or even avoided, protecting this epithelium from potential damage. On the other hand, they are highly hydro-soluble fibers and make markedly viscous solutions, increasing the thickness of the intestinal diffusion barrier. This effect would help maintain the morphofunctional integrity of intestinal epithelium.<sup>13</sup> Dietary fibers may also protect duodenal mucosa by decreasing gastric acid secretion, diminishing the load of harmful acid that could have access to duodenal mucosa. Additional mechanisms may include an anti-inflammatory action, reducing pro-inflammatory biomarkers such as C-reactive protein, interleukin-6, interleukin-12, or tumor necrosis factor- $\alpha$ .<sup>13</sup>

## Conclusion

Taking into account the various properties of plant gum exudates and other dietary fibers with equivalent properties in the intestinal mucosal layer, we can assume them as an effective herbal compound in performing new clinical trials for patients suffering from leaky gut syndrome and asthma to investigate the results on asthma management.

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## Author Contributions

MA conceptualized the article. MKF collected the data and made the first draft of the article. The other authors worked on the revision. All authors approved the final version of article.

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## Ethical Approval

This study did not require ethical approval as human subjects were not involved.

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