



# Halitosis: an underestimated but important extraintestinal manifestation in inflammatory bowel disease

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We read with interest the articles on the prevalence and treatment of primary sclerosing cholangitis, which is an important extraintestinal manifestation (EIM) in inflammatory bowel disease (IBD), published in this journal in October 2023.<sup>1,2</sup>

EIM is a field of growing interest to IBD practitioners. The association between EIM and IBD has been established since 2016 with the publication of the first European evidence-based consensus on EIM in IBD.<sup>3</sup> Joint manifestations, skin manifestations, ocular manifestations, liver manifestations (including primary sclerosing cholangitis) and oral manifestations are the main types of EIM, and improvement of these EIM has been observed after advanced therapies.<sup>4</sup> However, halitosis, an important oral manifestation of IBD, has been underestimated, with few reports so far.<sup>5,6</sup> Halitosis is a worldwide public health problem that has a severely negative impact on a patient's self-confidence and quality of life.<sup>5</sup> Therefore, halitosis in IBD should be taken seriously by IBD practitioners.

Halitosis is generally categorized as intraoral halitosis and extraoral halitosis. All existing researches suggest that halitosis in IBD is intraoral and is mainly caused by various oral conditions such as tongue coating, oral ulceration, diffuse erythematous gingival hyperplasia, acute periodontitis, and xerostomia.<sup>5</sup> These conditions lead to overgrowth of oral pathogenic bacteria and consequent over-production of malodorous vol-

atile sulfur compounds including hydrogen sulfide, methanethiol, and dimethyl sulfide. A case report showed that oral ulcerations improved after the administration of infliximab in Crohn's disease,<sup>7</sup> which might contribute to the improvement of intraoral halitosis.

However, we hold a different perspective. In a pilot study conducted by the author in East China on 53 patients with active ulcerative colitis, we found over two-fifths of the ulcerative colitis patients also had extraoral halitosis. Moreover, their organoleptic score of extraoral halitosis significantly decreased after 1 week of mesalazine-based therapy.<sup>8</sup> These results imply that extraoral halitosis in IBD has a distinct pathogenesis. One possible explanation is that the overgrown gut bacteria in IBD can produce over amount of volatile sulfur compounds.<sup>6</sup> These compounds are absorbed by the gut. Although hydrogen sulfide and methanethiol are highly reactive and quickly metabolized by the intestinal mucosa, the inactive dimethyl sulfide can pass through the colon epithelium, enter the bloodstream, be transported through the circulatory system to the lung and exhaled into the air, resulting in elevated levels of dimethyl sulfide in the breath.<sup>5</sup> Therefore, extraoral halitosis in IBD should be referred to as "blood-borne extraoral halitosis."<sup>5</sup> The mesalazine-based therapy inhibits the overgrowth of gut bacteria and subsequently reduces the production of dimethyl sulfide in the gut, showing a beneficial effect on improving extraoral halitosis in IBD.

In conclusion, extraoral halitosis in IBD is underestimated and deserves more attention from IBD practitioners.

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No potential conflict of interest relevant to this article was reported.

### Data Availability Statement

The data underlying this article will be shared on reasonable request to the corresponding author.

### Author Contributions

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