

# *Aloe barbadensis* Mill. as a therapeutic option for irritable bowel syndrome

## – properties, bioactivity and mode of action

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, Göteborg, torsdagen den 8e december, klockan 09.00

av **Bani Ahluwalia**

Fakultetsopponent:

**Professor Daisy Jonkers**

Maastricht University, Netherlands

### Avhandlingen baseras på följande delarbeten

- I. **Ahluwalia B**<sup>†</sup>, Iribarren C<sup>†</sup>, Magnusson MK, Sundin J, Clevers E, Savolainen O, Ross AB, Törnblom H, Simrén M, Öhman L. *A distinct faecal microbiota and metabolite profile linked to bowel habits in patients with irritable bowel syndrome*. Cells. 2021; 10(6): 1459.
- II. **Ahluwalia B**, Magnusson MK, Böhn L, Störsrud S, Larsson F, Savolainen O, Ross A, Simrén M, Öhman L. *Randomized clinical trial: Effects of Aloe barbadensis Mill. extract on symptoms, fecal microbiota and fecal metabolite profiles in patients with irritable bowel syndrome*. Neurogastroenterol Motil. 2020; 32(8): e13860.
- III. **Ahluwalia B**, Magnusson MK, Böhn L, Störsrud S, Larsson F, Öhman L and Simrén M. *Aloe barbadensis Mill. extract improves symptoms in IBS patients with diarrhoea: post hoc analysis of two randomized double-blind controlled studies*. Therap Adv Gastroenterol. 2021; 8(14): 17562848211048133.
- IV. **Ahluwalia B**, Magnusson MK, Isaksson S, Larsson F, Öhman L. *Effects of Aloe barbadensis Mill. extract (AVH200®) on human blood T cell activity in vitro*. J Ethnopharmacol. 2016; 179: 301-9.
- V. **Ahluwalia B**, Magnusson MK, Larsson F, Savolainen O, Ross AB, Öhman L. *Differences in metabolite composition of Aloe barbadensis Mill. extracts lead to differential effects on human blood T cell activity in vitro*. Molecules. 2022; 27(19): 6643.

**SAHLGRENKA AKADEMIN  
INSTITUTIONEN FÖR BIOMEDICIN**



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### **Abstract**

Irritable bowel syndrome (IBS) is a chronic and prevalent functional gastrointestinal disorder, with an incompletely understood pathophysiology. Because of the disease complexity and heterogeneity, the currently available treatment options for IBS are limited. These limitations have led to the popularity of alternative therapeutic strategies, such as the use of *Aloe barbadensis* Mill. (Aloe), despite the paucity of controlled clinical studies supporting efficacy of these treatment options. This thesis therefore aimed to determine the importance of intestinal microenvironment, as well as the therapeutic effects and potential mode of action of an Aloe gel derived extract in patients with IBS.

An integrated faecal microbiota and metabolite profile, as a joint representative of the intestinal microenvironment, distinguished IBS patients from healthy subjects, and further established the role of an altered intestinal microenvironment in the pathogenesis of IBS. The overall safety of Aloe treatment in patients with IBS was confirmed and supported the beneficial treatment effect of Aloe gel extract in subsets of IBS patients, which may depend on gut microbiota composition and function. Further, a potential mode of action for the therapeutic effect of Aloe gel extract, including dampening of immune cell activity and modulating intestinal microenvironment, was proposed. Finally, with the help of metabolomics, we expanded the knowledge of the complex and synergistic bioactive composition of Aloe gel.

In conclusion, this thesis strengthens the role of an altered intestinal microenvironment in the pathogenesis of IBS. Further, it supports the role of an Aloe gel derived extract as a therapeutic option for the symptom management of IBS.

**Keywords:** *Aloe barbadensis* Mill., Aloe, irritable bowel syndrome, metabolites, microbiota, prebiotic, immunosuppressive.