

Abstract

The Anti-Inflammatory Action of Artichoke, Fenugreek and Caigua (AFC) Original Blend in an Inflammatory Bowel Disease In Vitro Model [†]

Paola Palestini ^{1,2,*} , Elena Lonati ^{1,2} , Paolo Corbetta ¹, Stefania Pagliari ^{2,3} , Emanuela Cazzaniga ^{1,2} , Luca Campone ^{2,3}  and Alessandra Bulbarelli ^{1,2} 

¹ School of Medicine and Surgery, University of Milano-Bicocca, Via Cadore 48, 20900 Monza, Italy; elena.lonati1@unimib.it (E.L.); paolo.corbetta@unimib.it (P.C.); emanuela.cazzaniga@unimib.it (E.C.); alessandra.bulbarelli@unimib.it (A.B.)

² Bicocca Center of Science and Technology for FOOD (BEST4FOOD), University of Milano-Bicocca, Piazza della Scienza 2, 20126 Milan, Italy; stefania.pagliari@unimib.it (S.P.); luca.campone@unimib.it (L.C.)

³ Department of Biotechnology and Biosciences, University of Milano-Bicocca, Piazza della Scienza 2, 20126 Milan, Italy

* Correspondence: paola.palestini@unimib.it

[†] Presented at the 14th European Nutrition Conference FENS 2023, Belgrade, Serbia, 14–17 November 2023.

Abstract: Background and objectives: The incidence of chronic inflammatory pathologies has incrementally increased in recent years, as in the case of inflammatory bowel disease (IBD), which is characterized by intestinal epithelial barrier disruption, increased inflammatory mediator production and excessive tissue injury. Changes in eating habits might have played a key role in this scenario. Therefore, the interest in specific diet development and in functional food formulation has been growing. Phytoextracts from several origins, from plants to waste, enriched in bioactive molecules, alone or combined, might be a resource for the obtainment of an efficient synergistic beneficial. Thus, the aim of this study consists of evaluating the protective effects of artichoke, fenugreek and caigua (AFC) phytoextract original blend. Methods: In order to mimic the intestinal barrier's inflammatory environment, Caco-2 cells were cultured and polarized on a transwell system and then exposed to a pro-inflammatory cytokine cocktail (TNF α and IL-1 β). Before being exposed to an inflammatory stimulus, cells were pre-treated with an AFC digested blend, according to the INFOGEST in vitro static digestion protocol. After digestion, the content of active substances within the blended extract (ACFB) was revealed by UHPLC–ESI–HRMS analysis. The AFC digested extract's protective effect was evaluated by measuring the transepithelial resistance (TEER) as a marker of barrier integrity and analysing the nuclear factor kappa B (NF- κ B) pathway. Results: The TEER values improved in cells which were pre-treated with the AFC blend, relative to inflamed cells, suggesting a regulation in tight junction protein expression and/or localization. The transcription factor p65NF- κ B is activated by phosphorylation under cytokine exposure, with a 160% increase in its target COX-2. Moreover, a 40-fold increase in IL-8 release was observed. Interestingly, in cells pre-treated with the AFC blend, the activated p65NF- κ B was halved, compared to inflamed cells only. Furthermore, a consequent reduction by about 50% for COX-2 and by 30% for IL-8 was observed. Discussion: Taken together, these results highlight the anti-inflammatory potential of the AFC blend, probably due to the presence of flavonoids such as luteolin, apigenin and chrysin. This experimental evidence suggests that an AFC blend could be a good ingredient for food functionalization if further used in nutritional strategies.



Citation: Palestini, P.; Lonati, E.; Corbetta, P.; Pagliari, S.; Cazzaniga, E.; Campone, L.; Bulbarelli, A. The Anti-Inflammatory Action of Artichoke, Fenugreek and Caigua (AFC) Original Blend in an Inflammatory Bowel Disease In Vitro Model. *Proceedings* **2023**, *91*, 291. <https://doi.org/10.3390/proceedings2023091291>

Academic Editors: Sladjana Sobajic and Philip Calder

Published: 7 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: inflammatory bowel disease; phytochemical; inflammatory pathologies

Author Contributions: Conceptualization, A.B., E.L. and P.P.; methodology, E.L., P.C., E.C., L.C., S.P. and A.B.; validation, E.L. and A.B.; resources, P.P.; data curation, E.L., L.C., S.P. and A.B.;

writing—original draft preparation, E.L., P.P. and A.B.; supervision, A.B.; funding acquisition, P.P. All authors have read and agreed to the published version of the manuscript.

Funding: PNRR PE10, ON Foods; Research and innovation network on food and nutrition Sustainability, Safety and Security—Working ON Foods.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data are preliminary.

Conflicts of Interest: The authors declare no conflicts of interest.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.