frontiers | Frontiers in Nutrition

TYPE Editorial
PUBLISHED 29 January 2026
DOI 10.3389/fnut.2026.1782023

Check for updates

OPEN ACCESS

EDITED AND REVIEWED BY
Josep Bassaganya-Riera,
Biotherapeutics, Inc., United States

*CORRESPONDENCE
Abdelhafid Nani
nani.abdelhafid@univ-adrar.edu.dz

RECEIVED 06 January 2026
ACCEPTED 19 January 2026
PUBLISHED 29 January 2026

CITATION
Nani A and Hichami A (2026) Editorial: Polyphenols as potent modulators of inflammation-associated non-communicable diseases. *Front. Nutr.* 13:1782023. doi: 10.3389/fnut.2026.1782023

COPYRIGHT
© 2026 Nani and Hichami. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Editorial: Polyphenols as potent modulators of inflammation-associated non-communicable diseases

Abdelhafid Nani [1]* and Aziz Hichami[2]

[1]Faculty of Natural and Life Sciences, University of Ahmed Draia, Adrar, Algeria, [2]Physiologie de Nutrition & Toxicology (NUTox), UMR UB/INSERM 1231 Center for Cellular & Translational Molecular Medicine (CTM), Université Bourgogne Europe Dijon, Dijon, France

KEYWORDS

polyphenols, health, inflammation, non-communicable diseases, mechanisms

Editorial on the Research Topic
Polyphenols as potent modulators of inflammation-associated non-communicable diseases

Polyphenols constitute a diverse class of phytochemicals, with more than 8,000 characterized structures, predominantly derived from plant sources such as cereals, fruits, and vegetables. These compounds are notable for their phenolic structures and numerous hydroxyl groups, which characterize their antioxidant capacities (1). The complexities of their absorption in the small intestine, subsequent metabolism within the liver and intestines, and the transformative functions of gut microbiota in the colon underscore their intricate biological roles (2). Although advancements have been made in understanding physiological states such as pregnancy, lactation, and aging, as well as pathophysiological conditions, especially non-communicable diseases (NCDs) such as inflammatory bowel diseases (IBDs), pulmonary disorders, and cardiovascular ailments, the effects of polyphenols on these inflammation-related conditions remain only partially understood.

In this Research Topic on *Polyphenols as Potent Modulators of Inflammation-Associated Non-Communicable Diseases*, we received original research and review articles that thoroughly examined the multi-target mechanisms by which phenolic-rich healthy diets and traditional herbs influence various physiological conditions.

In their original research article, Yu et al. investigated how *Aurantii Fructus* extract (AFE), a derivative of unripe citrus fruit, serves as a therapeutic agent for ulcerative colitis by targeting specific molecular pathways and the gut microbiome. Through a murine study, the authors demonstrated that AFE treatment significantly reduces colon damage and physical symptoms by inhibiting the NF-κB inflammatory pathway and activating the Nrf2/HO-1 antioxidant pathway. Beyond chemical signaling, the extract strengthened the intestinal mucosal barrier by protecting goblet cells and restoring essential tight junction proteins. Finally, the study highlighted AFE's ability to restore microbial homeostasis, specifically by suppressing pathogenic bacteria, such as *Proteobacteria*, while fostering a diverse beneficial gut environment. Together, these findings suggested that AFE is a multi-targeted natural intervention capable of alleviating oxidative stress and dysbiosis, which are central to chronic intestinal diseases.

A pilot study by Fiecke et al. investigated how a mother's genetic secretor status influences the way her diet changes the bioactive composition of her breast milk. Researchers provided a Mediterranean-style meal plan to breastfeeding women and tracked changes in carotenoids, polyphenols, and oligosaccharides, finding that a healthy diet significantly increased specific health-promoting metabolites primarily in women with the maternal α1,2-fucosyltransferase 2 (FUT2) secretor phenotype. While dietary carotenoid levels remained stable despite higher intake, the concentrations of beneficial polyphenol metabolites and certain complex sugars were differentially modulated by underlying maternal genetics. The study suggested that non-dietary factors, such as genetics and the gut microbiome, are essential for understanding the highly variable nutritional profile of human milk. These findings underscored the personalized nature of nutrition and have significant implications for optimizing maternal diets to support infant health.

The narrative review by Shao et al. examined salvianolic acid B (SalB), the primary bioactive component of the traditional Chinese herb *Salvia miltiorrhiza*, and evaluated its potential as a modern cardioprotective agent. SalB's primary biological activities include potent antioxidant, anti-inflammatory, anti-fibrotic, anti-thrombotic, and anti-apoptotic properties. SalB was identified as a multi-target natural compound that exerts its wide-ranging biological effects by modulating an intricate network of signaling pathways. Its pharmacological actions are not isolated but interact synergistically, enhancing its therapeutic potential for complex diseases. The regulatory network of SalB demonstrated significant cross-talk. For example, it regulated the AKT/mTOR pathway for antioxidant, anti-inflammatory, and anti-cancer effects while also attenuating the CD36/PI3K/AKT pathway for anti-fibrotic actions. It also synergistically inhibited oxidative stress and inflammation through regulating the Nrf2/NLRP3 and NF-κB/NLRP3 pathways.

Preclinical research has demonstrated SalB's efficacy across a broad spectrum of cardiovascular conditions, including atherosclerosis, myocardial infarction (MI), myocardial ischemia-reperfusion injury (MI/RI), cardiac hypertrophy, and various forms of cardiomyopathy. However, the clinical translation of SalB is hindered by significant challenges, primarily its structural instability and extremely low oral bioavailability.

A meta-analysis by Wu et al., encompassing 15 randomized controlled trials (RCTs) with 894 participants, explored the clinical efficacy and safety of dietary polyphenols as adjunctive treatments for chronic obstructive pulmonary disease (COPD). The study demonstrated that phenolic compounds had varying effects. Indeed, curcumin and salidroside (from Salvia) significantly reduced systemic inflammation and improved respiratory function. Globally, dietary supplementation with eight polyphenols led to a significant overall reduction in pro-inflammatory cytokines (IL-6, TNF-α) and a significant increase in IL-10 anti-inflammatory cytokine. Salidroside and curcumin demonstrated the most significant and consistent benefits. Salidroside was effective in improving coagulation markers, lung function, TNF-α, and symptom scores. Curcumin significantly reduced systolic blood pressure. The study provided evidence that these bioactive supplements can modulate metabolic-inflammatory networks, lowering blood pressure and improving lung parameters, such as Forced Expiratory Volume in 1 second (FEV1) and the FEV1/Forced Vital Capacity (FVC) ratio. Hence, the authors advocated for personalized nutritional interventions to transform polyphenol preparations into precise, cost-effective therapies for lung disease management.

Overall, the themes in this Research Topic highlighted the therapeutic potential of plant-derived compounds for the management of inflammation-associated NCDs. Dietary polyphenols modulated multiple interconnected pathways through:

- Inhibition of the NF-κB, a central regulator of inflammation.
- Activation of the Nrf2/HO-1 pathway, which is crucial for cellular defense against oxidative stress.
- Modulation of gut microbiota by strengthening the intestinal mucosal barrier and restoring microbial homeostasis.
- Activation of the AMPK pathway, which is increasingly recognized for its diverse effects on inflammatory signaling beyond its established role in metabolic regulation of food intake.

Author contributions

AN: Writing – review & editing, Writing – original draft. AH: Validation, Writing – review & editing.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was used in the creation of this manuscript. Generative AI was used to summarize accepted manuscripts. The text was subsequently revised by the author(s).

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

1. Nani A, Murtaza B, Sayed Khan A, Khan NA, Hichami A. Antioxidant and anti-inflammatory potential of polyphenols contained in Mediterranean diet in obesity: molecular mechanisms. *Molecules.* (2021) 26:985. doi: 10.3390/molecules26040985

2. Zhang W, Qi S, Xue X, Al Naggar Y, Wu L, Wang K. Understanding the gastrointestinal protective effects of polyphenols using foodomics-based approaches. *Front Immunol.* (2021) 12:671150. doi: 10.3389/fimmu.2021.671150