



Ginger and inflammation in type 2 diabetes: clinical evidence

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1. ABSTRACT

Research has brought together five randomized clinical trials to evaluate whether ginger supplements modify certain blood markers of inflammation in people with type 2 diabetes. The results indicate small average reductions in hs-CRP, TNF-alpha, and IL-6, but the quality of the included studies limits the certainty of the conclusions. In type 2 diabetes, persistent, low-grade inflammation can accompany an impaired response to insulin. The authors' synthesis examined three blood indicators: hs-CRP, or high-sensitivity C-reactive protein, used to detect low levels of inflammation; TNF-alpha, a protein involved in communication between immune cells; and IL-6, another inflammation signaling molecule. Five randomized clinical trials were included, in which participants received either ginger or a non-ginger comparison. In the combined calculation, ginger was associated with an average reduction of 0.42 mg/L for hs-CRP, 2.13 pg/mL for TNF-alpha, and 0.61 pg/mL for IL-6. The confidence intervals did not include zero, and the P-values were less than 0.05. In simple terms, the statistical signal is consistent with a favorable average change in the analyzed markers. However, the authors themselves assessed all included studies as being at high risk of bias—that is, distortions due to how they were conducted or reported. It is therefore not possible to establish whether these laboratory changes reduce complications, symptoms, or the need for medication.

VIDEO ARTICLE



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2. WHAT THIS RESEARCH ANALYZED

The 2021 study by Mohammad and colleagues investigated whether ginger intake could affect certain inflammation signals in the blood of people with type 2 diabetes. The biological rationale is that lower inflammatory activity could make the metabolic environment less unfavorable, although it does not equate to a cure for diabetes. The authors conducted a systematic review—a search of the literature performed using pre-established criteria—followed by a meta-analysis, which is a calculation that combines the results of comparable studies. They searched for randomized trials published up to March 17, 2021, and included five studies. The outcomes were hs-CRP, TNF-alpha, and IL-6, which are markers useful for describing systemic inflammation but are not direct indicators of clinical complications.

3. WHAT RESULTS EMERGED FROM THE STUDY

In the aggregated result, ginger was associated with lower average values for the three markers examined. For hs-CRP, the weighted mean difference was -0.42 mg/L, with a 95% confidence interval from -0.78 to -0.05 and $P=0.03$. This indicates a small average reduction that is statistically compatible with an effect, but it does not establish how significant it is for an individual's health. TNF-alpha and IL-6 also decreased: -2.13 pg/mL, interval from -3.41 to -0.86 , $P=0.001$; and -0.61 pg/mL, interval from -0.92 to -0.30 , $P=0.001$, respectively. These molecules participate in signaling between immune cells. The data suggest a possible effect on circulating markers, but not proof that ginger improves insulin sensitivity or prevents cardiovascular events.

4. WHY THIS STUDY IS RELEVANT

The main value of the study is having separated biological plausibility from an evaluation in humans. Instead of relying on cells or animals, it considered trials in which participants were randomly assigned to ginger or a control group. Randomization serves to reduce, without completely eliminating, initial differences between groups. The work is also specific to type 2 diabetes. This matters because a reduction in a marker in healthy people or those with other conditions cannot be automatically transferred to

those with diabetes. However, it remains intermediate evidence: biomarkers can describe a biological change, but they are not necessarily biomarkers predictive of an individual clinical benefit.

5. STUDY LIMITATIONS AND WHAT IT DOES NOT PROVE

The most significant limitation is explicit: all five included trials were at high risk of bias. This may be due, for example, to unclear randomization or blinding procedures, small sample sizes, not fully verified adherence, or selective reporting of results. A meta-analysis does not eliminate these issues; it can only combine the data. Furthermore, the observed reductions were relatively small, and the authors could not determine whether they were clinically relevant. The study does not demonstrate an effect on heart attack, kidney disease, quality of life, optimal dosage, or long-term safety. It also does not prove that the decrease in markers is caused by the same mechanism in every person.

6. INDEPENDENT SUPPORTING EVIDENCE

A randomized trial in 64 people with type 2 diabetes has reinforced the point closest to the original question: after eight weeks of 2 g per day of ginger, TNF-alpha and hs-CRP were lower compared to the control group; however, IL-6 did not differ between groups. This supports a possible effect on certain inflammatory signals, but the small sample size and short duration make the confirmation moderate [1]. In another trial in 42 people with type 2 diabetes and chronic periodontitis, 2 g per day of ginger for eight weeks, along with the periodontal therapy received by all participants, were associated with decreases in IL-6, hs-CRP, and TNF-alpha compared to the placebo. The result converges with the direction observed by Mohammad, but the oral condition and concomitant treatment limit its extension to type 2 diabetes in general [2]. An independent synthesis of 25 clinical studies, not limited to diabetes, found statistically significant effects on CRP, TNF-alpha, and IL-6. This evidence supports the consistency of the biomarker-response chain, but it is indirect because it includes different populations and conditions [3].

7. CONFLICTING EVIDENCE

A trial of 70 people with type 2 diabetes found a reduction in CRP and prostaglandin E₂, but no significant difference in TNF-alpha between ginger and placebo after 12 weeks. The result indicates that markers do not necessarily move together and reduces the certainty of a uniform effect on cytokines [4]. In another randomized study, 204 people with type 2 diabetes received ginger, cinnamon, cardamom, saffron, or just tea for eight weeks. In the ginger group,

no significant effects on measures of inflammation or oxidative stress emerged compared to the control. The study is relevant and larger, but the comparison between spices, the use of tea as a vehicle, and the short duration complicate the interpretation [5]. These differences suggest dependence on dose, formulation, duration, initial conditions, and the chosen marker. No directly conflicting evidence sufficiently relevant beyond those described has been identified; this does not prove the absence of contrary results.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

Independent research shows a trend that is often favorable regarding inflammatory markers, but results are not uniform across biomarkers and clinical contexts.

Quadro comparativo

Publication	Model and duration	Main result	Relationship to the study
Mahluji et al. [1]	RCT, 64 people with type 2 diabetes, 8 weeks	Reduced TNF-alpha and hs-CRP; IL-6 did not differ from control	Partial and direct confirmation
Zare Javid et al. [2]	RCT, 42 people with type 2 diabetes and periodontitis, 8 weeks	Reduced IL-6, hs-CRP, and TNF-alpha with concomitant oral therapy	Direct but contextual confirmation
Jalali et al. [3]	Meta-analysis of 25 clinical studies	Statistically significant effects on CRP, TNF-alpha, and IL-6	Indirect confirmation in mixed populations
Arablou et al. [4]	RCT, 70 people with type 2 diabetes, 12 weeks	Reduced CRP, but no significant difference in TNF-alpha	Discordance on a specific marker
Azimi et al. [5]	RCT, 204 people with type 2 diabetes, 8 weeks	No significant effect on inflammation and oxidative stress	Direct discordance

9. SINTESI EDITORIALE E CONCLUSIONI

EDITORIAL CONCLUSION

The synthesis by Mohammad and colleagues suggests that ginger supplements may be associated with small reductions in hs-CRP, TNF-alpha, and IL-6 in people with type 2 diabetes. These values describe biological signals linked to inflammation, not direct measures of well-being, complications, or therapeutic control of the disease. The result is biologically consistent with some independent trials, but it is not uniform: other studies do not detect variations for all markers or do not observe effects on the inflammatory profile. The main reason for caution is methodological. The five

studies included in the original synthesis were all at high risk of bias, and the available trials are generally short. Therefore, the body of evidence does not allow ginger to be considered a treatment for inflammation associated with type 2 diabetes. It may remain a topic of nutritional research, to be evaluated without replacing structured nutrition, physical activity, clinical monitoring, and prescribed therapies.

Aggiornato al 27/10/2026. Questo contenuto riflette una sintesi divulgativa delle evidenze scientifiche al momento della pubblicazione e non sostituisce il parere medico.



10. TRANSPARENCY AND SCIENTIFIC RESPONSIBILITY

Artificial Intelligence was used solely as a tool for editorial and documentary support. All content, interpretations, bibliographic citations and conclusions have been verified, reviewed and approved by the author, who assumes full scientific responsibility for them.

The manuscript was also subjected to independent peer review prior to publication.

To ensure the greatest transparency, the complete history of the article, including the dates of submission, revision, acceptance and publication, as well as information on the peer review process, is available on the dedicated Article History page.

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