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Curcumin: different formulations, non-overlapping clinical results

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1. ABSTRACT

This umbrella review gathered existing research on plants from the ginger family and curcumin. It shows that while the number of available results is vast, interventions, dosages, formulations, and clinical conditions differ significantly. For this reason, a general conclusion cannot replace the evaluation of the specific product studied.The authors' synthesis examined 161 meta-analyses of randomized trials, published in 76 articles, covering 67 distinct health outcomes. An umbrella review is a study that evaluates many systematic reviews and meta-analyses—that is, analyses that combine the results of multiple studies. Simply put, it does not directly measure the effect of a capsule on a single group of people: it observes how consistent the already published conclusions are. Zhang and colleagues considered signs of heterogeneity, i.e., differences between studies that make summarizing their results less straightforward, as well as potential publication bias. The authors described favorable associations for various areas, including metabolic parameters, chronic inflammatory disorders, and osteoarthritis pain. However, the work includes both curcumin and other plants of the Zingiberaceae family, such as ginger. Therefore, it does not allow for attributing every result solely to curcumin or culinary turmeric. The authors themselves conclude that more robust clinical trials are needed to confirm the observed associations. The main value of the publication is methodological: it serves as a reminder that many results do not automatically make preparations with different compositions and absorption rates equivalent.

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MISSION

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Through articles, reviews, in-depth analyses and expert contributions, the Journal champions evidence-based medicine and science, fostering a correct interpretation of scientific data and countering misinformation. Every piece of content is developed with the aim of translating the complexity of research into understandable, useful and applicable information, while keeping intact the principles of accuracy, transparency and scientific independence.

Free from political, industrial and commercial influence, the journal stands as an authoritative and independent editorial space, dedicated to promoting scientific culture, professional development and the growth of health awareness among the public.

2. WHAT THIS RESEARCH ANALYZED

To understand the practical significance of this work, it should be clarified that Zhang and colleagues did not test a new turmeric formula on participants. They analyzed systematic reviews with meta-analysis of randomized human trials. A randomized trial assigns participants to different interventions based on a random criterion; a meta-analysis numerically combines results that are already available.The publication collected research on Zingiberaceae plants and curcumin, evaluating very different outcomes: metabolic parameters, joint pain, inflammatory conditions, and gastrointestinal, neurological, and oral cavity disorders. This means that the material examined was very broad, but also composed of products, populations, durations, and outcome measures that were not identical. Comparing studies therefore requires caution from the outset.

3. WHAT RESULTS EMERGE FROM THE STUDY

The general message is that numerous summaries of clinical trials have reported potentially favorable outcomes, without identifying a single formula valid for all uses. The authors highlight results primarily for metabolic syndrome, non-alcoholic fatty liver disease, certain cardiovascular and inflammatory conditions, osteoarthritis pain, and specific gastrointestinal disorders.The most significant quantitative data concerns the scope of the collection: 161 meta-analysis, 76 articles, and 67 outcomes. However, the verified publication does not provide a single dosage, a unique extract, or a measure of effect applicable to all these outcomes. The authors also examined heterogeneity and publication bias. In practice, while the direction of some results may appear favorable, their robustness varies depending on the clinical question and the preparation used.

4. WHY THIS STUDY IS RELEVANT

For the reader, the core point is simple: the word “curcumin” does not necessarily identify equivalent interventions. In studies, the type of extract, the percentage of curcuminoids, the dosage, the presence of added substances, and the formulation—which influences bioavailability, i.e., the amount of the compound that reaches the circulation after intake—can all vary.The study by Zhang and colleagues is relevant because it highlights the gap between a vast body of literature and a precise clinical conclusion. A result obtained with a specific formula does not demonstrate the same effect as the spice used in cooking, nor does it apply to every supplement that lists turmeric on the label. Standardization helps in knowing the declared content, but this review does not prove that different standardized products produce the same effects.

5. STUDY LIMITATIONS AND WHAT IT DOES NOT DEMONSTRATE

The main limitation is the broad scope of the topic. The publication brings together curcumin and various plants from the same botanical family, as well as clinical conditions that are very different from one another. Consequently, it does not allow for determining which specific formulation is preferable, which dose is appropriate, or which effect is reproducible in a given person.Furthermore, an umbrella review depends on the quality of the reviews and studies already published. Even when a meta-analysis shows a mean difference, this does not automatically demonstrate a clinically relevant benefit for everyone. The work does not prove that dietary turmeric treats a disease, it does not replace medical therapies, and it does not allow for the transfer of results from one condition to another. This is where the usefulness of independent verification lies.

6. INDEPENDENT CONFIRMATORY EVIDENCE

Initial confirmation of the need to distinguish between formulas comes from a randomized crossover clinical trial involving 12 healthy adults. With an equivalent dose of 207 mg of curcumin, the micellar formulation produced blood exposure—measured as the area under the concentration-time curve—57 times greater than unformulated curcumin; the complex with γ-cyclodextrin achieved a 30-fold increase. The area under the curve indicates how much of the substance circulates over time. This supports the “formula absorption” transition, but it does not demonstrate a clinical advantage, as the sample was small, healthy, and the study lasted only 24 hours [1].A meta-analysis of 32 randomized trials, involving 2,038 participants, found average reductions in certain markers of

inflammation, including C-reactive protein, interleukin-6, and TNF-alpha. C-reactive protein is a protein that can increase in the presence of inflammation; it does not, by itself, identify a disease or a clinical response. The authors also noted uncertainties regarding dose, duration, and formulation. This evidence supports the existence of biological signals in humans, but it does not make all products interchangeable [2].A methodological analysis of 171 systematic reviews, however, confirms the interpretive challenge: only 3.5% described subgroup or sensitivity analyses based on bioavailability in their methods, and only 6.4% reported them in their results. The work does not measure a therapeutic effect; however, it documents that syntheses often aggregate non-homogeneous formulas. This is an indirect but strong confirmation of the caution required by the study by Zhang and colleagues [3].

7. CONFLICTING EVIDENCE

Results are not uniform across all clinical settings. In a randomized study of 50 people with non-alcoholic fatty liver disease, 1,500 mg of curcumin per day for 12 weeks, added to lifestyle advice, was not superior to a placebo in improving inflammation and liver characteristics. Some values changed within the groups, but the difference between groups was not significant. This limits the idea that a signal observed in broad syntheses always translates into an additional benefit [4].A second randomized study, conducted on 62 people after surgery for Crohn's disease and terminated early for futility, found no efficacy of oral curcumin in preventing postoperative recurrence compared to a placebo. At six months, endoscopic recurrence was present in 58% of the curcumin group and 68% of the placebo group, with no significant difference. This is a specific clinical context and does not invalidate other results, but it shows that effects depend on the disease, concomitant treatment, and preparation [5].

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

Independent publications show why the breadth of evidence and the comparability of products must be evaluated separately.

Quadro comparativo

Publication	Model and sample size	Main result	Relationship with the Zhang study
Flory et al., 2021 [1]	Crossover RCT; 12 healthy adults	Micelles and γ-cyclodextrin increased plasma exposure compared to unformulated curcumin.	Direct confirmation that different formulations are not interchangeable in terms of absorption.
Ferguson et al., 2021 [2]	Meta-analysis; 32 trials, 2,038 participants	Average reductions in various inflammatory markers, with uncertainties regarding dose, duration, and formulation.	Partial confirmation of the existence of clinical signals, without defining a universal product.
Bučević Popović et al., 2024 [3]	Methodological study; 171 systematic reviews	Bioavailability was rarely considered in quantitative analyses.	Indirect confirmation of the methodological limitation linked to the aggregation of different formulations.
Saadati et al., 2019 [4]	RCT; 50 people with non-alcoholic fatty liver disease	Curcumin and lifestyle advice were not superior to placebo plus advice.	Discordant evidence: a favorable result does not necessarily emerge in every context.
Bommelaer et al., 2020 [5]	Multicenter RCT; 62 people after surgery for Crohn's disease	No efficacy in preventing postoperative recurrence.	Discordant evidence: clinical outcomes may differ according to the disease and associated treatment.

9. SINTESI EDITORIALE E CONCLUSIONI

EDITORIAL CONCLUSION

The work by Zhang and colleagues provides a broad map, not a single answer regarding the efficacy of curcumin. By bringing together 161 meta-analyses, it shows that there is a great deal of research on various outcomes, but also that quantities, products, populations, and clinical measures do not coincide. This makes it inappropriate to treat dietary turmeric, unformulated curcumin, and supplements using different technologies as if they were the same intervention. Independent verifications reinforce this caution: some formulas significantly modify absorption, some syntheses detect variations in biological markers, while specific clinical studies show no advantages over a placebo. Standardization remains useful for knowing the declared content of an extract, but it does not, by itself, establish efficacy, dosage, or appropriateness of use. To correctly interpret a result, one must ask which product was studied, in which people, for how long, and compared to what. Only this information allows for a scientifically proportionate assessment of the evidence available today.

Aggiornato al 17/11/2026. 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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