



# The impact of egg consumption on indices of gastrointestinal health: a systematic literature review

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Eggs are highly digestible, nutrient-rich and are a valuable source of protein and choline, thereby promoting a range of health benefits. Several studies have found an association between protein intake and gastrointestinal microbial diversity<sup>(1)</sup>, while bacterial fermentation of undigested protein in the large bowel can produce short-chain fatty acids, such as butyrate, positively influencing host metabolic health, gut integrity and immune function<sup>(2)</sup>. On the other hand, dietary choline stimulates gastrointestinal bacterial production of trimethylamine and the prothrombotic compound trimethylamine-N-oxide (TMAO)<sup>(3)</sup>. Despite these established links, limited studies have explored the effects of whole egg intake on indices of gastrointestinal health. This systematic literature review aimed to synthesise research that has investigated the impact of egg-supplemented diets or egg consumption on markers of gastrointestinal health including microbiome, function and symptoms. This review was conducted in accordance with PRISMA guidelines. Five databases (Ovid Medline, Embase, CINAHL Plus, SCOPUS, and PsychInfo), and reference lists of relevant papers, were searched from inception until April 2023. Studies were included if they examined the link between whole chicken egg consumption and gastrointestinal health in healthy adults (aged >16). Indices of gastrointestinal health were defined as any outcomes related to gastrointestinal factors, including symptoms, microbiome, inflammation, colonic fermentation and TMAO. Reviews and case studies were excluded. All studies underwent risk of bias assessment. Overall, 548 studies were identified and 19 studies were included after screening. Eight of these were randomised controlled trials (RCTs), 8 cross-sectional and 3 prospective cohort studies. Participants ranged in number between 20–32,166 and in age between 18–84 years. Study periods varied between 3–14 weeks for RCTs and 6 months–12.5 years for prospective cohort studies. RCTs examined intakes between 1–4 eggs/day, with the majority examining 3 eggs/day (n = 6). The primary outcome across 15 articles was TMAO levels, with most reporting no significant associations (n = 13). Five studies examined inflammation with inconsistent findings ranging from no alterations (in TNF- $\alpha$ , IL-8, CRP), increases (in anti-inflammatory marker LTB5, TNF- $\alpha$ ), and decreases (in IL-6, CRP). Lastly, 7 studies explored alterations in microbiome. Two RCTs and 2 cross-sectional trials reported no alterations in microbial diversity in response to eggs. Meanwhile, 2 cross-sectional and 1 prospective study linked specific bacteria to consistent egg intake. Eggs were associated with species that produce butyrate (*E.rectale*, *F.prausnitzii*, *M.smithii*, and *R.bromii*), and protect against metabolic syndrome (*A.muciniphila*). This systematic review found that egg consumption did not increase levels of the undesirable biomarker TMAO and were associated with butyrate-producing bacteria. Evidence regarding the effect of egg intake on inflammation was inconsistent. This review revealed the general lack of available research investigating whole eggs and gastrointestinal health. Future carefully designed RCTs are required to improve understanding of how eggs may influence the gastrointestinal microbiome and colonic fermentation.

**Keywords:** eggs; gastrointestinal system; gut microbiome; inflammation

## Ethics Declaration

No

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## References

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