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File: ■ Oats (*Avena sativa*, Poaceae)
■ Inflammation
■ Systematic Review/Meta-analysis

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RE: Oat Intake and Inflammation: A Systematic Review and Meta-analysis

Kim SJ, Jung CW, Anh NH, et al. Effects of oats (*Avena sativa* L.) on inflammation: a systematic review and meta-analysis of randomized controlled trials. *Front Nutr*. August 2021;8:722866. doi:10.3389/fnut.2021.722866.

Inflammation maintains physiological homeostasis and helps the body's immune system respond to infection; however, excess inflammation can cause atherosclerosis, autoimmune diseases, cancer, depression, and other acute and chronic diseases. Some contributors to abnormal inflammation responses include high-calorie and high saturated fatty acid diets and overeating. Oats (*Avena sativa*, Poaceae) contain constituents that are known to help modulate inflammatory reactions. Some studies confirm this reaction in trials; however, other studies have shown no anti-inflammatory response. The authors propose a systematic review and meta-analysis of randomly controlled trials (RCTs) to assess whether oats have a beneficial effect on inflammation.

The authors followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and searched PubMed, Embase, Web of Science, ClincalTrial.gov, and CENTRAL databases. The search terms included different terms for oats and inflammatory markers, and the search was conducted between March 30, 2021 and April 30, 2021. Inclusion criteria included RCTs with a treatment group that consumed oats, oat-related products, or oat-specific compounds; a control group that used no or limited oats, oat-related products, or oat-specific compounds; and that assessed any inflammatory markers or measures. Exclusion criteria were inappropriate intervention for treatment or control groups, outcomes unrelated to inflammation, not an RCT, were duplicated or part of an extensive RCT, or were a secondary report. The intervention duration was two weeks or longer.

All inflammation markers or measurements were extracted from the selected RCTs. If the authors did not specify the type of processed oats, the treatment was categorized as whole oats. Markers analyzed were C-reactive protein (CRP), tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), and interleukin-8 (IL-8). If markers were used in fewer than three studies, they were not included in the analysis. Crossover RCTs were incorporated and the difference of the two post-treatment groups were used. An assumption that the wash-out period eliminated any carry-over effects was made for crossover RCTs.

Subgroup analyses were conducted for the type of inflammatory measurement, the basal condition, the type of oat product, and the type of control. The risk of bias was assessed using the second version of the Cochrane risk of bias tools for randomized trials.

Of the 4,119 studies found, 2,495 were duplicates. Abstracts of the 1,624 remaining articles were screened, and 33 were examined as full texts. Ten were then excluded, and 23 were selected for the systematic review and meta-analysis. These studies were published between 2008 and 2020 and included a range of 16 to 362 participants each. Sixteen included parallel group, and seven included crossover studies. Five studies included only one sex while the rest included both male and female identified participants. Most studies were with healthy adults, but four trials used patients with hypercholesterolemia, four used patients with type 2 diabetes, two used patients that were overweight and obese, and one used patients who were geriatric hospital residents. Ten studies used fiber-rich fraction oats, nine used whole oats, and four used avenanthramide or oat proteins.

Of the 76 inflammatory markers recorded from the 23 studies, 53 showed no significant change, 22 had a reduction, and one exhibited an increase. Twelve RCTs measured IL-6, three demonstrated a significant reduction, and the rest did not. The meta-analysis using eligible data showed no significant change in IL-6; however, there was a significant reduction for patients who were unhealthy and had hypercholesterolemia ($P = 0.006$). Five RCTs reported IL-8 markers and only one had a significant reduction. The meta-analysis used data from three RCTs and indicated no significant reduction. Three of the seven RCTs reported a significant reduction for TNF-α; however, there was no signification reduction in the meta-analysis of three of the eligible RCTs.

Twenty RCTs measured CRP and provided 24 CRP measurement results. Of the 24, six revealed a significant reduction. The meta-analysis included nine of the RCTs and showed no significant change; however, the subgroup analysis demonstrated a decrease for hs-CRP ($P = 0.03$) and for patients who were unhealthy ($P = 0.05$). Although a meta-analysis could not be measured for other inflammatory markers, it was noted that neutrophil respiratory burst, granulocyte colony-stimulation factor, and soreness decreased in studies.

The authors conclude that there is insufficient evidence to state that oats reduce inflammation; however, there were reductions in some markers and a significant reduction in patients that were unhealthy. More robust trials are needed to understand the full effect of oats and if long-term use could reduce inflammation. The limitations to this review and meta-analysis include not being able to investigate a dose-dependent correlation, inputted data was at risk of providing a distorted outcome, only a small number of RCTs were included in the meta-analysis, and a potential language bias.

—Dani Hoots

Referenced article can be accessed at https://www.frontiersin.org/articles/10.3389/fnut.2021.722866/full.