ANTI-INFLAMMATORIES

Do anti-inflammatory foods and lifestyle habits actually lower hs-CRP?

How dietary patterns, gut barrier integrity, sleep timing, and visceral fat reduction regulate

and systemic cytokine signaling in adults.

LetsGo Editorial · LetsGo Editorial · 7 November 2026 · 12 min read

A proprietary bacterial strain in a supplement sachet does not override a low-fiber diet, late-night caloric intake, or visceral adiposity when measuring systemic inflammation in human blood.

Chronic low-grade inflammation—termed inflammaging in adults over 40—is characterized by persistent, mild elevations in circulating acute-phase proteins and cytokines, notably high-sensitivity C-reactive protein (hs-CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-alpha). Unlike acute inflammation triggered by infection or trauma, chronic systemic inflammation is driven primarily by metabolic endotoxemia, visceral adipose tissue macrophage infiltration, circadian disruption, and cellular senescence. While consumer wellness marketing heavily promotes isolated botanical extracts and single-strain probiotics as anti-inflammatory interventions, human randomized controlled trials (RCTs) demonstrate that reproducible reductions in systemic inflammatory markers require structural changes to dietary substrate intake, gut barrier signaling, visceral fat mass, and autonomic tone.

What it is

Nuclear factor kappa B

and the NLRP3 inflammasome govern the molecular cascade of chronic low-grade inflammation in human tissues. Unlike an acute pharmacological blockade of cyclooxygenase (COX-1/COX-2) enzymes by nonsteroidal anti-inflammatory drugs (NSAIDs) or broad immunosuppression by corticosteroids, an anti-inflammatory lifestyle is a coordinated set of dietary inputs, sleep-wake behaviors, and physical activity patterns that downregulate innate immune hyperreactivity. When pattern recognition receptors—specifically Toll-like receptor 4 (TLR4) and TLR2 on human macrophages, adipocytes, and endothelial cells—bind to endogenous or exogenous ligands, they trigger an intracellular signaling cascade. These ligands include bacterial lipopolysaccharide (LPS) translocated from the gut lumen, oxidized low-density lipoprotein (oxLDL), advanced glycation end-products (AGEs), and saturated free fatty acids such as palmitate. Activation of TLR4 translocates

to the cell nucleus, driving the transcription of pro-inflammatory cytokines including TNF-alpha, IL-1beta, and IL-6. IL-6 then travels via the portal and systemic circulation to the liver, where it signals hepatocytes through the JAK/STAT3 pathway to synthesize and secrete C-reactive protein (CRP). An anti-inflammatory regimen systematically reduces the luminal and metabolic supply of these triggering ligands while providing bioactive substrates—marine omega-3 polyunsaturated fatty acids, polyphenols, and fermentable dietary fibers—that actively resolve inflammatory signaling.

Why it is used

In the CANTOS randomized controlled trial (n = 10,061 patients with prior myocardial infarction and hs-CRP of 2.0 mg/L or higher followed for a median of 3.7 years), selectively inhibiting IL-1beta with a monoclonal antibody reduced major adverse cardiovascular events by 15% independent of lipid lowering, proving in humans that the IL-1beta to IL-6 to CRP pathway is a causal driver of plaque instability and atherothrombosis. While dietary and behavioral interventions do not act with the single-target potency of a biologic drug, prospective cohort studies involving tens of thousands of adults consistently show that individuals with hs-CRP below 1.0 mg/L have a significantly lower risk of myocardial infarction and ischemic stroke than those with hs-CRP above 3.0 mg/L, even at identical LDL-C or ApoB levels. In human skeletal muscle and liver tissue, persistent elevation of TNF-alpha and IL-6 impairs insulin signaling by promoting serine phosphorylation of insulin receptor substrate-1 (IRS-1), directly contributing to hyperinsulinemia, hepatic steatosis, and elevated HbA1c. Furthermore, chronic cytokine elevation accelerates neuroinflammation and age-related skeletal muscle loss (sarcopenia). Consumers also turn to anti-inflammatory guides to address functional gastrointestinal symptoms, joint stiffness, or fatigue. Here, evidence quality separates dietary substrates from commercial supplements: systematic reviews of human randomized trials show that isolated commercial probiotic strains and proprietary gut-brain sachets rarely alter systemic circulating cytokines (hs-CRP, IL-6, TNF-alpha) in the absence of dietary substrate changes. No reliable effect size exists for single-strain over-the-counter probiotics on systemic hs-CRP in generally healthy adults. The reproducible levers in human trials remain total dietary fiber diversity, whole fermented foods, visceral fat reduction, sleep regularity, and avoiding late-night caloric intake.

How it helps

Four primary physiological mechanisms, validated in human clinical trials and mapped in cellular models, explain how specific dietary and behavioral inputs lower systemic cytokines: 1. Gut Microbiome Fermentation and Barrier Integrity: When adults consume diverse soluble and insoluble fibers (beta-glucans, inulin, resistant starch, pectins), commensal colonic bacteria such as Faecalibacterium prausnitzii and Roseburia species ferment these carbohydrates into short-chain fatty acids (SCFAs): acetate, propionate, and butyrate. In human colonocytes, butyrate serves as the primary mitochondrial energy source, promoting tight-junction assembly (upregulating claudins and occludin) and maintaining the protective mucin layer. This physical barrier prevents the paracellular translocation of Gram-negative bacterial endotoxin (LPS) into the portal circulation. In gnotobiotic mouse models and human ex vivo tissue studies, fiber deprivation causes gut microbes to degrade host mucus glycoproteins, thinning the barrier and increasing LPS-driven TLR4 activation. In a 10-week human randomized trial (Wastyk et al., n = 36 healthy adults), consuming 6 servings per day of fermented foods (yogurt, kefir, fermented vegetables, kombucha) significantly increased gut microbiome alpha-diversity and reduced 19 circulating inflammatory proteins, including IL-6, IL-10, and IL-12b, demonstrating that live microbial metabolites and fermented substrates directly modulate human immune cell signaling. 2. Eicosanoid Switching and Specialized Pro-Resolving Mediators (SPMs): Human cell membranes incorporate fatty acids directly from dietary intake. High membrane concentrations of arachidonic acid (an omega-6 fatty acid) relative to eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) favor the synthesis of pro-inflammatory prostaglandins (PGE2) and leukotrienes (LTB4) via cyclooxygenase and lipoxygenase enzymes. Consuming marine omega-3 fatty acids (from fatty fish like salmon, sardines, and mackerel) competitively displaces arachidonic acid in cell membrane phospholipids. Furthermore, in human tissues and peripheral blood, EPA and DHA serve as enzymatic precursors for specialized pro-resolving mediators—resolvins, protectins, and maresins. Rather than passively blocking inflammation, SPMs bind to specific G-protein-coupled receptors (GPR32 and ChemR23) on human neutrophils and macrophages to actively halt neutrophil infiltration and stimulate efferocytosis (the phagocytic clearance of apoptotic cells and debris). 3. Polyphenol Activation of Nrf2 and Inhibition of

Extra-virgin olive oil contains oleocanthal, hydroxytyrosol, and oleuropein; berries, dark leafy greens, and

culinary spices (turmeric, ginger) contain anthocyanins, flavonoids, and curcuminoids. In human feeding trials (such as PREDIMED sub-studies) and ex vivo peripheral blood mononuclear cell (PBMC) assays, these polyphenols activate nuclear factor erythroid 2-related factor 2 (Nrf2). Nrf2 translocates to the nucleus and binds to the Antioxidant Response Element (ARE), upregulating endogenous antioxidant enzymes including heme oxygenase-1 (HO-1), superoxide dismutase (SOD), and glutathione peroxidase. Simultaneously, these polyphenols inhibit

kinase (IKK), preventing the phosphorylation of

and blocking the nuclear translocation of

Mechanistic caveat: most botanical polyphenols—especially unformulated curcumin—exhibit very poor oral bioavailability in human pharmacokinetic studies and act primarily within the gut lumen or via colonic microbial phenolic metabolites rather than reaching high micromolar concentrations in peripheral plasma. 4. Autonomic Regulation, Circadian Alignment, and Myokines: Human visceral adipose tissue is an active endocrine organ infiltrated by M1-polarized pro-inflammatory macrophages that secrete IL-6 and TNF-alpha directly into the portal vein. Caloric restriction and regular exercise shrink visceral adipocytes, shifting adipose tissue macrophages toward an anti-inflammatory M2 phenotype; meta-analyses of weight-loss RCTs in overweight and obese adults show that a 5% to 10% reduction in total body weight lowers hs-CRP by roughly 0.5 to 1.5 mg/L. During skeletal muscle contraction in humans, muscle fibers release myokines—including an acute, transient spike of muscle-derived IL-6 without accompanying TNF-alpha. This transient muscle-derived IL-6 stimulates the systemic appearance of IL-1 receptor antagonist (IL-1ra) and the anti-inflammatory cytokine IL-10, lowering starting point hs-CRP over time. Conversely, meta-analyses of human cohort and experimental sleep deprivation studies (Irwin et al., 72 studies, n > 50,000) demonstrate that sleep curtailment and circadian misalignment—such as eating late at night—desynchronize peripheral circadian clock genes (CLOCK and BMAL1) in the gut and liver, elevating evening cortisol, impairing glucose tolerance, and raising circulating CRP and IL-6.

Who should try it

Adults aged 40 to 65 with persistent subclinical vascular inflammation—defined by the American Heart Association and CDC as starting point hs-CRP between 1.0 and 3.0 mg/L (moderate risk) or above 3.0 mg/L (high risk), once acute infection or trauma is excluded—derive the clearest cardiometabolic benefit from an anti-inflammatory dietary and behavioral regimen. It is also indicated for individuals with insulin resistance (fasting insulin above 8 uIU/mL, triglycerides above 150 mg/dL, elevated ApoB, or increased waist-to-height ratio above 0.5) and those tracking biological age markers (such as through a LetsGo BioAge assessment) where immune and inflammatory subdomains show accelerated drift relative to chronological age. Trade-offs, Side Effects, and Contraindications: - Gastrointestinal distress from rapid fiber or fermentable food increases: Abruptly increasing legumes, cruciferous vegetables, or fermented foods causes luminal gas production, bloating, flatulence, and osmotic diarrhea, particularly in adults with low starting point microbiome diversity or Small Intestinal Bacterial Overgrowth (SIBO). In the 10-week human RCT comparing high-fiber and fermented-food diets (n = 36), participants with lower starting point microbial diversity who rapidly increased fiber intake experienced greater gastrointestinal symptoms and dampened immunomodulatory benefit compared to those who introduced fermented foods or titrated fiber gradually. - Histamine intolerance: Fermented foods (aged cheeses, sauerkraut, kimchi, kombucha, kefir) contain high concentrations of biogenic amines, including histamine and tyramine. Adults with reduced intestinal diamine oxidase (DAO) enzyme activity or mast cell activation syndromes experience headaches, flushing, nasal congestion, urticaria, or tachycardia when consuming high-histamine fermented foods, and must rely on non-fermented prebiotic fibers and

polyphenols instead. - Botanical and supplement drug interactions: Concentrated omega-3 fatty acid supplements and botanical extracts (curcumin, ginger, concentrated garlic, ginkgo) inhibit platelet aggregation via thromboxane A2 suppression and interact with prescription anticoagulants or antiplatelet agents (warfarin, apixaban, rivaroxaban, clopidogrel, aspirin), increasing clinical bleeding risk. Furthermore, isolated curcumin supplements—particularly those formulated with piperine to bypass hepatic glucuronidation—are linked in human pharmacovigilance registries and clinical case series to idiosyncratic drug-induced liver injury (DILI), presenting as acute elevations in ALT, AST, and bilirubin. - Financial and opportunity cost: Purchasing specialty anti-inflammatory functional beverages, proprietary synbiotic sachets, and exotic botanical powders frequently costs $80 to $250 per month with no clear human RCT evidence for systemic cytokine reduction. The opportunity cost is diverting budget and adherence away from high-evidence culinary staples (extra-virgin olive oil, wild-caught fatty fish, legumes, diverse vegetables) and behavioral regularity. Clinical synthesis on biomarker interpretation: Lowering a circulating inflammatory marker does not automatically mean an intervention prevents clinical disease; the physiological pathway matters. For example, prescription and over-the-counter NSAIDs inhibit COX enzymes and reduce prostaglandin-mediated pain, yet increase myocardial infarction risk, hypertension, and gastrointestinal ulceration by blocking endothelial prostacyclin (PGI2) and gastric mucosal PGE2. Conversely, high-intensity eccentric exercise causes an acute, transient rise in CRP and IL-6 for 24 to 72 hours due to localized myofibrillar remodeling, yet longitudinally lowers resting hs-CRP and reduces all-cause mortality. Tracking inflammatory markers requires standardized rest windows and clinical context.

Measurements that show improvement

Objective blood biomarkers and autonomic metrics tracked over an 8- to 12-week intervention window verify whether dietary and behavioral changes are reducing systemic inflammation. Blood draws for inflammatory markers must be collected after an overnight fast when the individual is free of acute viral or bacterial infections, dental procedures, or heavy eccentric exercise within the prior 48 to 72 hours. 1. High-Sensitivity C-Reactive Protein (hs-CRP): The primary clinical marker for systemic low-grade inflammation and hepatic acute-phase response. In healthy adults, the optimal target is < 1.0 mg/L (with minimal vascular risk at < 0.5 mg/L). Moving from a starting point of 2.5 mg/L to below 1.0 mg/L represents a clinically meaningful reduction. Because hs-CRP exhibits significant intra-individual biological variability, two measurements taken two weeks apart establish a more reliable starting point than a single blood draw. Any reading > 10.0 mg/L typically indicates an acute infectious, traumatic, or rheumatologic process rather than chronic metabolic inflammation and should be repeated in 2 to 3 weeks. 2. Fasting Insulin, HbA1c, and ApoB: Because visceral adiposity and hepatic de novo lipogenesis drive

activation and IRS-1 inhibition, resolution of metabolic inflammation manifests as a reduction in fasting insulin (target < 6 uIU/mL), a decrease in HbA1c (target < 5.3% in non-diabetics), a reduction in the triglyceride-to-HDL-C ratio (target < 1.5 when measured in mg/dL), and lower Apolipoprotein B (ApoB < 80 mg/dL for primary prevention, or < 60 mg/dL in higher-risk adults). 3. GlycA (Glycoprotein Acetylation): Measured via proton nuclear magnetic resonance (NMR) spectroscopy, GlycA quantifies the integrated concentration and glycosylation state of multiple acute-phase proteins (alpha-1-acid glycoprotein, haptoglobin, alpha-1-antitrypsin, transferrin). In large prospective human cohorts (such as the Women's Health Study and MESA), GlycA displays much lower intra-individual biological variability (< 5% coefficient of variation) than hs-CRP and independently predicts incident cardiovascular events and type 2 diabetes. A downward trend toward < 350 to 400 umol/L indicates reduced systemic inflammation. 4. Erythrocyte Omega-3 Index: Measures the combined percentage of EPA and DHA in red blood cell membranes, reflecting dietary tissue incorporation over the preceding 90 to 120 days. Moving from a typical Western starting point of ~4% to an target range of 8% to 11% confirms sufficient membrane substrate availability for specialized pro-resolving mediator (SPM) synthesis. 5. Liver Enzymes (ALT, AST, GGT): Gamma-glutamyl transferase (GGT) and alanine

aminotransferase (ALT) serve as sensitive proxies for hepatic oxidative stress, glutathione turnover, and metabolic dysfunction-associated steatotic liver disease (MASLD). A decrease in ALT (toward < 25 U/L in men and < 19 U/L in women) and GGT (toward < 20 U/L) reflects reduced hepatic lipid accumulation and Kupffer cell inflammation. 6. Nocturnal Heart Rate Variability (HRV) and Resting Heart Rate (RHR): The vagus nerve regulates the human cholinergic anti-inflammatory pathway; acetylcholine released by efferent vagus nerve fibers binds to alpha-7 nicotinic acetylcholine receptors

on tissue macrophages, directly inhibiting nuclear translocation of

and suppressing TNF-alpha release. A sustained upward trend in nocturnal HRV (measured as RMSSD in milliseconds) and a downward trend in RHR by 3 to 5 beats per minute over 4 to 8 weeks—particularly after eliminating late-night meals and alcohol—reflect improved vagal tone and autonomic suppression of systemic inflammation.

Products and services

These LetsGo products and services sit next to this subject. They are not a prescription. A link is not evidence that the product causes the change discussed above. - [LetsGo supplement shelf](/supplements) — Bottles LetsGo stocks for members. Read the label before the first order. A link is not a dose. - [LetsGo programmes](/programs) — Coached programmes. Not a clinic menu and not a promise of a result.

Practical takeaways

- Track plant diversity and fermented food intake over a 10-week window: Consume 30 or more distinct whole plant foods per week (legumes, nuts, seeds, intact whole grains, vegetables, fruits) plus 2 to 4 daily servings of unsweetened fermented foods (kefir, yogurt, kimchi, sauerkraut) to lower IL-6 and hs-CRP. Titrate fiber intake up gradually over 4 weeks, and stop or replace fermented foods with soluble prebiotic fibers if histamine symptoms (flushing, headache, rhinitis) occur.
- Shift primary lipid intake to extra-virgin olive oil and marine omega-3s for 12 weeks: Use polyphenol-rich extra-virgin olive oil as the primary culinary fat and consume low-mercury fatty fish (sardines, mackerel, wild salmon, anchovies) 3 times per week. Re-test the erythrocyte Omega-3 Index after 12 weeks to confirm an increase above the 8% threshold.
- Enforce a 3-hour pre-sleep fasting window daily: Finish all caloric and alcohol intake at least 3 hours before sleep onset and keep daily wake and sleep times within a 45-minute window. Verify autonomic response over 4 weeks by tracking a decrease in nocturnal resting heart rate (RHR) and an upward trend in nocturnal heart rate variability (HRV RMSSD).
- Target a 5% to 10% reduction in body weight if visceral adiposity is present: Combine a moderate caloric deficit with 150 to 300 minutes per week of Zone 2 aerobic conditioning and 2 to 3 sessions of progressive resistance training to reduce waist-to-height ratio below 0.5 and lower hs-CRP toward < 1.0 mg/L.
- Standardize blood draw conditions and apply supplement stop rules: Re-test hs-CRP, fasting insulin, ALT, and GGT after 8 to 12 weeks following a 48- to 72-hour abstinence from heavy eccentric exercise. Discontinue any concentrated botanical anti-inflammatory supplement (such as curcumin) immediately if ALT or AST rises above the normal reference range or if starting prescription anticoagulant or antiplatelet therapy.

Safety note

Rapidly increasing dietary fiber can cause gastrointestinal bloating and cramping; increase intake gradually over several weeks with adequate hydration. Fermented foods may trigger symptoms in individuals with histamine intolerance. Consult a physician before taking concentrated botanical or omega-3 supplements, especially if

taking anticoagulant or antiplatelet medications, or if you have underlying liver or gallbladder disease.

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Human randomized controlled trials demonstrate that reproducible reductions in systemic inflammatory markers like hs-CRP and IL-6 require altering the upstream physiological drivers of

and NLRP3 inflammasome activation rather than relying on isolated probiotic strains or botanical extracts. Losing 5% to 10% of body weight to shrink visceral adipose macrophage depots, supplying the colonic microbiome with diverse fermentable fibers and live fermented foods, displacing membrane arachidonic acid with marine EPA and DHA, and aligning caloric intake and sleep with peripheral circadian clocks reliably quiet innate immune hyperreactivity. Tracking objective biomarkers—specifically hs-CRP (< 1.0 mg/L), fasting insulin (< 6 uIU/mL), GlycA, ALT, and the erythrocyte Omega-3 Index (> 8%)—under standardized rest conditions over 8 to 12 weeks provides clear verification that these interventions are lowering systemic vascular and metabolic inflammation.