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Review

Vegan and Plant-Based Diets in Rheumatic Diseases: A Review of Current Evidence, Mechanisms, and Perspectives

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Abstract

Plant-based diets have attracted increasing interest in the context of rheumatic diseases due to their potential anti-inflammatory, antioxidant, and immunomodulatory effects. However, there is an important conceptual distinction between a vegan diet, which completely excludes animal-derived products, and a plant-based diet, which prioritizes plant foods but may include small amounts of animal-derived foods. This differentiation is essential to understand the variability in clinical outcomes reported across studies. To critically and comparatively evaluate the available evidence regarding the effects of vegan and plant-based diets on major rheumatic diseases: rheumatoid arthritis (RA), psoriatic arthritis (PsA), axial spondyloarthritis (axSpA), gout, and fibromyalgia—with an emphasis on clinical, laboratory, and metabolic outcomes. A structured narrative review with systematic elements was conducted, with searches performed in PubMed/MEDLINE, Embase, Scopus, and Web of Science databases up to October 6, 2025. Meta-analyses, systematic reviews, randomized clinical trials, and prospective cohort studies investigating vegan, vegetarian, or plant-based diets in adults with rheumatic diseases were included. Methodological quality was assessed using the AMSTAR-2, RoB 2, and Newcastle–Ottawa Scale tools, and the certainty of evidence was graded according to GRADE criteria. A total of 21 relevant studies were identified, including seven clinical trials, four systematic reviews, and ten observational studies. In RA, vegan diets—particularly

gluten-free and low-fat patterns—demonstrated significant reductions in pain, CRP, and DAS28, along with improvements in lipid profile and gut microbiota. In PsA and axSpA, data are limited but suggest a modest benefit with whole-food plant-based patterns, possibly mediated by modulation of the gut-immunity axis. Cohort studies indicated up to a 40% reduction in gout risk among vegetarians. In fibromyalgia, plant-based dietary patterns were associated with improvements in pain, fatigue, and quality of life. Overall evidence quality ranged from low to moderate depending on study design and dietary control. Vegan and plant-based diets may have potentially beneficial effects as adjunctive strategies in the management of rheumatic diseases, supporting inflammatory and metabolic control. Distinguishing between a strict vegan diet and a healthy plant-based pattern is essential, as the quality of plant foods appears to determine the magnitude of benefit. Despite methodological limitations in the existing literature, the evidence is biologically plausible. It supports the need for longer and more rigorously designed clinical trials to strengthen evidence-based dietary recommendations in rheumatology.

Keywords
Veganism; plant-based diet; rheumatoid arthritis; psoriatic arthritis; spondyloarthritis; gout; fibromyalgia; inflammation; gut microbiota

1. Introduction

The relationship between dietary patterns and rheumatic diseases has gained increasing attention, both due to potential anti-inflammatory effects and their impact on cardiometabolic comorbidities, which are common in these patients. However, it is essential to distinguish between two constructs that are sometimes used interchangeably: vegan diets and plant-based diets. The official position of the Academy of Nutrition and Dietetics defines a vegan diet as one that excludes all foods of animal origin. In contrast, vegetarian diets include subtypes such as lacto-vegetarian, ovo-lacto-vegetarian, and others. More broadly, plant-based dietary patterns emphasize foods of plant origin and, depending on the operational definition, may include small amounts of animal-derived foods—also referred to as semi-vegetarian or flexitarian diets [1].

In epidemiological research, specific indices differentiate the quality of plant-based patterns, such as the Healthful Plant-Based Diet Index (hPDI), which emphasizes whole grains, fruits, vegetables, legumes, and nuts. In contrast, the Unhealthful Plant-Based Diet Index (uPDI) prioritizes plant-derived ultra-processed foods, including refined products, sugar-sweetened items, French fries, and related foods [2]. Evidence indicates that not all plant-based patterns are equivalent in terms of inflammation and cardiometabolic risk, with healthier patterns being associated with reduced systemic inflammation and a lower risk of chronic diseases [3, 4].

In the field of rheumatic diseases, plausible mechanisms link diet to systemic inflammation, including modulation of the gut microbiome and its metabolites—such as short-chain fatty acids (SCFAs)—improvement in intestinal permeability, regulation of the immunometabolic axis, and body weight control [5, 6]. Reviews addressing gut dysbiosis in rheumatoid arthritis (RA) support an

important role of the microbiome in pathogenesis and in regulating Th17/Treg responses, providing pathways through which fiber-rich dietary patterns may attenuate inflammation [7].

Randomized controlled clinical trials evaluating gluten-free vegan diets have shown clinical improvement and reductions in inflammatory markers in patients with RA when compared with balanced omnivorous diets [8, 9]. Interventions involving low-fat vegan diets have also reported improvements in pain and morning stiffness, although with methodological limitations [10]. Prospective cohort studies conducted in individuals with gout have demonstrated that those adhering to vegetarian diets had a significant reduction in the risk of developing the disease, independently of alcohol intake or the presence of baseline hyperuricemia [11]. For fibromyalgia, a recent systematic review reported improvements in quality-of-life outcomes, pain at rest, and biochemical parameters in patients following predominantly plant-based dietary patterns. However, the studies showed heterogeneity and variable risk of bias [12]. Finally, observational data indicate that in individuals with psoriatic arthritis (PsA) and spondyloarthritis, greater adherence to the Mediterranean diet—characterized by high intake of vegetables, fruits, olive oil, and nuts—is associated with lower disease activity. These findings reinforce the notion that the quality of the plant-based pattern is more determinant than the absolute exclusion of animal-derived foods [13].

Taken together, these findings support that “vegan” (complete exclusion of animal-derived foods) and “plant-based” (emphasis on plant foods with varying degrees of animal exclusion) are not equivalent, and that plant-based quality (hPDI vs. uPDI) likely modulates the effect on inflammation and clinical outcomes [1-4]. The growing interest in veganism and plant-based diets reflects not only a social and ethical trend, but also increasing scientific recognition of their potential impact on chronic and autoimmune diseases. In this context, understanding how these dietary patterns influence inflammatory and immunometabolic processes in rheumatic diseases is essential for guiding evidence-based clinical recommendations.

Thus, the objective of this article is to critically review the available scientific evidence regarding the effects of vegan and plant-based diets in major rheumatic diseases, including rheumatoid arthritis, psoriatic arthritis, axial spondyloarthritis, gout, and fibromyalgia. The study aims to integrate clinical, metabolic, and immunological findings, highlighting conceptual differences between veganism and plant-based patterns, and discuss potential biological mechanisms, methodological limitations, and implications for rheumatology clinical practice. This review is novel in that it explicitly differentiates vegan diets from broader plant-based dietary patterns and integrates clinical outcomes with mechanistic insights, including immunometabolic and microbiome-related pathways, across multiple rheumatic diseases. Throughout this manuscript, the terms “vegan diet”, “plant-based diet”, and “whole-food plant-based diet” are used with standardized definitions to improve conceptual clarity and consistency.

2. Methods

This structured narrative review with predefined methodological criteria aimed to evaluate the available evidence on the impact of vegan and plant-based diets on rheumatic diseases, including rheumatoid arthritis (RA), psoriatic arthritis (PsA), spondyloarthritis (axSpA), gout, and fibromyalgia, in adult populations. Searches were conducted in multiple databases, including PubMed/MEDLINE, Embase, Scopus, and Web of Science, ensuring full traceability of the sources. The search period included all records from inception through October 6, 2025, with indexing confirmed in PubMed.

Search strategies combined controlled terms (MeSH Terms) and free-text terms related to “rheumatoid arthritis”, “psoriatic arthritis”, “spondyloarthritis”, “gout”, “fibromyalgia”, “vegan”, “vegetarian”, “plant-based”, “whole-food plant-based”, “diet”, “randomized”, “systematic review”, and “meta-analysis”, with filters for adults and human studies [14].

Article eligibility was defined according to the PICO framework (Population, Intervention, Comparator, and Outcomes). Studies were included if they evaluated adults diagnosed with inflammatory rheumatic diseases, according to recognized clinical or classification criteria. Interventions included strictly vegan diets, defined as the complete exclusion of animal-derived products [1], and plant-based diets, characterized by a predominance of plant-derived foods and potentially including small amounts of animal-derived products, according to the operational definition proposed by Satija et al. [2]. When available, dietary patterns were classified according to the hPDI and uPDI indices [3, 4].

Comparators included usual omnivorous diets, other dietary interventions (e.g., Mediterranean diet), or internal comparisons by adherence quantiles. Primary outcomes included pain (visual analog scale, VAS) and disease activity scores [Disease Activity Score-28 (DAS28) for RA, Disease Activity in Psoriatic Arthritis (DAPSA) for PsA, Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) or Assessment of SpondyloArthritis International Society (ASDAS) for axial spondyloarthritis (axSpA)]. Inflammatory markers (C-reactive protein and erythrocyte sedimentation rate), metabolic parameters, quality of life, and disease incidence were also considered in studies involving patients with gout. Experimental studies, in vitro models, and interventions in which the dietary effect could not be isolated were excluded.

Study screening was conducted independently by two reviewers, with disagreements resolved by consensus. Data extraction followed a standardized form containing information on study type, sample size, population characteristics, the exact definition of the dietary pattern (vegan, plant-based, presence or absence of gluten, fat content), intervention duration, assessed outcomes, adherence, and loss to follow-up.

Methodological quality was assessed according to study design: the AMSTAR 2 tool was used for systematic reviews and meta-analyses [15], the RoB 2.0 tool for randomized clinical trials [16], and the Newcastle–Ottawa Scale (NOS) for cohort studies [17]. Certainty of evidence was synthesized according to GRADE principles [18] in a narrative manner, without performing any new quantitative meta-analyses.

Finally, results synthesis was structured by disease and by dietary pattern type (vegan versus plant-based), highlighting dietary quality (hPDI vs. uPDI) and differentiating specific vegan interventions, such as gluten-free or low-fat diets, from whole-food plant-based diets. Biological mechanisms, including modulation of the gut microbiota, short-chain fatty acid production, adipokine regulation, and metabolic effects, were integrated into the critical analysis of the findings [5-7, 19]. This is a narrative review with systematic elements, conducted in accordance with PRISMA 2020 recommendations, without prior protocol registration.

3. Results

Detailed characteristics of the included studies are presented in Supplementary Table S1 and Table S2.

3.1 Rheumatoid Arthritis (RA)

The literature on the impact of plant-based diets in rheumatoid arthritis is the most robust among inflammatory rheumatic diseases. Randomized clinical trials and systematic reviews suggest that vegan or vegetarian dietary patterns may reduce systemic inflammation, improve clinical symptoms, and modulate metabolic factors. However, the overall methodological quality has been considered low to moderate [20-22]. The characteristics of the studies included in rheumatoid arthritis are summarized in Supplementary Table S1.

In a seminal trial, Hafström et al. randomized 66 patients with active RA to either a gluten-free vegan diet or a balanced omnivorous diet for 12 months. The vegan group showed a significant reduction in DAS28 and C-reactive protein, as well as improvements in morning stiffness and fatigue. These benefits were correlated with reduced antibody levels against food antigens [8]. In subsequent follow-up, Elkan et al. demonstrated that the same diet reduced serum levels of LDL. They oxidized LDL and increased levels of anti-phosphorylcholine antibodies, suggesting a potential atheroprotective effect [9].

Another controlled study by McDougall et al. evaluated a low-fat vegan diet for 4 weeks and observed significant reductions in pain and morning stiffness (as measured by VAS and HAQ) [10]. Despite the short duration and the absence of blinding, this study reinforces the clinical plausibility of these findings.

A recent meta-analysis by Schöenenberger et al. (2022), published in *Nutrients*, synthesized seven trials (n = 326) involving anti-inflammatory dietary patterns, including vegetarian and Mediterranean diets. The pooled analysis showed a significant reduction in pain and inflammatory markers compared with control diets, although the certainty of evidence was rated as low due to heterogeneity across studies [20]. Hartmann et al. further supported the potential role of fasting followed by a plant-based diet in rheumatoid arthritis, reporting favorable effects on disease activity, nutritional behavior, and metabolic outcomes [21]. In addition, reports suggest that therapeutic fasting followed by a plant-based diet may induce partial remission in patients with RA [22]. Additionally, post hoc analyses from the NutriFast trial have provided further insights into the feasibility and metabolic effects of fasting followed by a plant-based diet in rheumatoid arthritis, reinforcing its potential role as an adjunctive therapeutic strategy [21].

In summary, the available data point to a modest symptomatic and metabolic benefit, supported by biological plausibility, but with limited certainty (GRADE level: low), mainly due to risk of bias and heterogeneity in dietary definitions.

It is important to note that the included studies comprise heterogeneous dietary interventions, including vegan diets, vegetarian patterns, Mediterranean diet adherence, and fasting-based approaches, which limit direct comparability and may affect the interpretation of pooled clinical effects.

3.2 Psoriatic Arthritis (PsA)

The evidence base regarding plant-based diets in PsA remains limited, consisting of few observational studies and case reports. The characteristics of studies evaluating psoriatic arthritis, axial spondyloarthritis, gout, and fibromyalgia are summarized in Supplementary Table S2. In a multicenter cross-sectional study including 223 patients, Caso et al. demonstrated that greater adherence to the Mediterranean diet (assessed using the PREDIMED score) was associated with

lower disease activity (DAPSA) and lower CRP levels [13]. In addition, Lewandowska et al. reported a clinical case of sustained PsA remission with a whole-food plant-based (WFPB) diet, accompanied by the gradual discontinuation of methotrexate. The patient maintained clinical and functional remission for 18 years, with regression of both cutaneous and articular manifestations [23]. Although the level of evidence is low, these findings suggest that plant-based patterns—particularly high-quality ones (hPDI)—may support inflammatory and metabolic control, possibly through antioxidant mechanisms, weight reduction, and improvements in the gut microbiota.

3.3 Axial Spondyloarthritis (axSpA)

The evidence for axSpA is even more limited. Recent systematic reviews have identified only a few clinical studies on dietary interventions, most of which have focused on supplements such as omega-3 and synbiotics [21]. A randomized clinical trial by Ahangari-Maleki et al. investigated a 12-week plant-based diet combined with synbiotics, demonstrating reductions in IL-17 and IL-23 and an improvement in the BASDAI score [24]. Despite the small sample size (n = 40), the results are consistent with the immunomodulatory effects mediated through the gut–microbiota axis. Isolated cases have also described clinical remission of HLA-B27–positive sacroiliitis after transition to a strict vegan diet; however, these remain anecdotal reports [25]. Therefore, the evidence in axSpA is considered very low (GRADE: very low), although it is biologically plausible.

3.4 Gout

The relationship between dietary patterns and gout risk has been examined in large prospective cohorts. In a study including more than 12,000 individuals, Chiu et al. observed that a vegetarian diet was associated with a 39% reduction in the risk of developing gout compared with an omnivorous diet (HR 0.61; 95% CI 0.40-0.92) [11]. The benefit persisted after adjustment for BMI, alcohol consumption, and metabolic syndrome. It has been proposed that plant-derived purines, unlike those of animal origin, are embedded within fiber- and antioxidant-rich food matrices, which may reduce NLRP3 inflammasome activation and modulate renal urate excretion [26, 27]. These findings are supported by recent evidence demonstrating that uric acid actively contributes to inflammatory pathways, particularly through IL-1β and IL-6 signaling [27]. Subsequent findings from the same cohort showed that replacing meat and seafood with plant proteins was associated with a lower risk of hyperuricemia [11]. Thus, the evidence for gout is considered moderate (GRADE: moderate), based on high-quality observational studies (NOS ≥ 8).

3.5 Fibromyalgia

The literature on plant-based diets in fibromyalgia is limited, yet consistent regarding the direction of the findings. The systematic review by Nadal-Nicolás et al. included six studies (four clinical trials and two cohort studies) and found that vegetarian or vegan diets improve pain, fatigue, sleep, and quality of life, and promote weight reduction and metabolic improvements [12]. One of the included trials, Kaartinen et al., randomized 18 patients with fibromyalgia to a raw vegan diet rich in lactobacilli or a habitual omnivorous diet for three months. The vegan group showed a significant reduction in pain and improvement in functional capacity (FIQ) [28]. Although the available studies are small and heterogeneous, the consistency of the results and biological

plausibility (cytokine reduction and improved gut microbial balance) support a potential adjunctive effect of plant-based diets in fibromyalgia (GRADE level: low to moderate).

3.6 Overall Synthesis

Collectively, the evidence suggests that predominantly plant-based diets exert favorable anti-inflammatory and cardiometabolic effects in rheumatic diseases, with variable magnitudes across conditions. The overall certainty of the evidence remains limited due to heterogeneity in dietary definitions, lack of blinding, and short follow-up periods. Nevertheless, the findings are biologically plausible and converge toward modest yet consistent clinical benefits. Distinguishing between strict vegan diets and healthy plant-based patterns (hPDI) is essential for future research and clinical recommendations, since the quality of plant foods—rather than exclusivity alone—appears to determine metabolic and immunological impact [1-4, 11, 20-28]. In summary, the strength of evidence varied by condition assessed: moderate for rheumatoid arthritis and gout, low for fibromyalgia and psoriatic arthritis, and very low for axial spondyloarthritis, reflecting differences in study design, sample size, and dietary control across studies.

4. Discussion

The findings of this review indicate that predominantly plant-based dietary patterns, including vegan diets and whole-food plant-based (WFPB) diets, are associated with modest clinical and metabolic improvements. However, evidence remains limited and heterogeneous across several rheumatic diseases, particularly rheumatoid arthritis, with more limited evidence for psoriatic arthritis, axial spondyloarthritis, gout, and fibromyalgia. Although effect sizes are generally modest and the certainty of the evidence ranges from low to moderate, the consistency of findings and biological plausibility suggest a potential adjunctive role for these dietary patterns in rheumatologic care, which should be interpreted with caution.

Modulation of the gut microbiota emerges as one of the most relevant mechanisms to explain the anti-inflammatory effects of plant-based diets. Studies show that fiber- and phenolic compound–rich patterns promote the expansion of short-chain fatty acid (SCFA)–producing bacteria, such as *Faecalibacterium prausnitzii* and *Roseburia* spp., which exert immunoregulatory actions through activation of G-protein–coupled receptors (GPR43) and an increased proportion of regulatory T cells [29-31]. These changes reduce intestinal permeability and decrease lipopolysaccharide translocation, attenuating systemic inflammatory stimulation, a process widely implicated in the pathogenesis of RA and other autoimmune diseases [32].

In parallel, plant-based diets promote weight reduction and improvements in lipid profile, factors that modulate low-grade inflammation and the production of pro-inflammatory adipokines such as leptin and resistin [33]. In clinical trials, plant-based–mediated weight loss has been correlated with lower disease activity and reduced inflammatory cytokines, including IL-6 and TNF-α [22, 34]. In addition, antioxidant compounds such as polyphenols, carotenoids, and isoflavones—present in vegetables and legumes—help reduce oxidative stress and inhibit the activation of nuclear factor kappa B (NF-κB), a key regulator of the transcription of pro-inflammatory genes [35, 36].

In gout, plant-derived purines, because they are embedded in food matrices rich in fiber, antioxidants, and magnesium, do not exhibit the same inflammatory potential as animal-derived purines [26]. There is evidence that vegetarian diets attenuate NLRP3 inflammasome activation,

reducing the release of IL-1β and IL-18 and, consequently, joint inflammation [37]. These effects may also extend to renal mechanisms, with improved urate excretion and lower incidence of hyperuricemia [11].

In fibromyalgia, the anti-inflammatory and antioxidant effects of plant foods are complemented by modulation of neurotransmitters and improvements in mitochondrial energy metabolism [38, 39]. Reduced oxidative stress and increased dietary tryptophan availability may enhance serotonin and melatonin synthesis, potentially explaining the observed effects on pain, sleep, and fatigue [40].

Interpretation of the findings also depends on the definition adopted for each dietary pattern, which justifies clearly distinguishing these concepts. The evaluated studies reinforce that “veganism” and “plant-based” are not synonymous. Whereas the former refers to a dietary choice, often also ethical in nature, that completely excludes animal-derived products, the latter is a nutritional concept that emphasizes the predominance of plant foods, while potentially allowing small amounts of animal-derived foods [1, 2].

Moreover, the quality of plant foods is a key determinant. Satija et al. proposed a distinction between the healthful and unhealthful plant-based diet indexes, demonstrating that only the former is associated with lower systemic inflammation and a more favorable cardiometabolic profile [2]. Thus, an ultra-processed vegan pattern rich in refined flours and sugars does not reproduce the benefits of a whole-food plant-based diet, which may explain the heterogeneity of results observed across rheumatic diseases [3, 4, 41, 42].

Despite the consistent direction of the findings, this review highlights important methodological limitations. Most trials include small sample sizes ($n < 100$), short durations, and lack of blinding, which increase the risk of performance bias. Diets vary widely in composition, fat content, gluten inclusion, and degree of processing, limiting direct comparisons and robust meta-analyses. In addition, few studies rigorously control for dietary adherence, which is a major determinant of clinical effect magnitude [20, 21]. Another limitation is the absence of objective biomarkers of response in many studies. Integrating metabolomics and microbiome analyses may offer more reproducible measures of adherence and help elucidate biological mechanisms [43, 44]. The generic use of the term “vegetarian diet” without specifying the degree of animal-food exclusion also introduces conceptual imprecision. It complicates the attribution of specific effects to vegan diets or healthy plant-based patterns. These limitations do not invalidate the findings, but they reinforce the need for terminological and methodological standardization in future research on dietary interventions in rheumatic diseases.

From a clinical perspective, the available results suggest that plant-based diets may be a safe, potentially beneficial adjunctive intervention in rheumatic diseases. Although they do not replace disease-modifying antirheumatic drugs (DMARDs), they may reduce residual inflammation, improve metabolic profile, and support weight control—factors that are well recognized as relevant to rheumatologic prognosis [45]. Adherence to a whole-food plant-based pattern requires appropriate nutritional follow-up, particularly supplementation with vitamin B12, iron, and zinc, nutrients with lower bioavailability in strictly vegan diets [46]. Therefore, integration between rheumatologists and nutritionists is essential for the safe implementation of these interventions.

There is a need for randomized, controlled, longer-duration clinical trials with standardized dietary definitions and long-term metabolic and immunological follow-up. The use of digital technologies for dietary and microbiota monitoring may improve measurement accuracy. In addition, studies directly comparing strict vegan diets versus healthy plant-based patterns (hPDI)

are essential to determine whether benefits derive from complete exclusion of animal foods or from overall dietary quality. Another promising field is the investigation of personalized gut microbiome modulation mediated by plant-based dietary patterns, with the potential to identify responder subgroups based on microbial or metabolic profiles [47, 48].

Overall, the certainty of evidence remains low to moderate across most conditions and should be interpreted consistently throughout disease-specific analyses and overall conclusions.

5. Conclusion

Current evidence indicates that vegan and healthy plant-based diets may have anti-inflammatory, antioxidant, and immunomodulatory potential. It may serve as adjunctive strategies, although evidence remains limited in the management of rheumatic diseases. Although the certainty of evidence remains limited due to methodological issues, findings are biologically plausible, consistent across studies, and supported by robust physiological mechanisms. Clinical implementation requires individualized approaches and professional follow-up, with a priority on food quality and nutritional adequacy. Future research should focus on well-designed clinical trials and mechanistic assessments that integrate biomarkers of inflammation and the gut microbiota to strengthen the scientific basis for dietary recommendations in rheumatology practice.

Author Contributions

Jozélio Freire de Carvalho: conceptualization, literature search, data extraction, data interpretation, manuscript drafting, critical revision, and final approval. Rosangela Passos de Jesus: study supervision, interpretation of nutritional aspects, critical revision of the manuscript, and final approval.

Competing Interests

The authors have declared that no competing interests exist.

AI-Assisted Technologies Statement

AI tools were utilized exclusively to assist in language editing and improving the clarity of sentences in the manuscript. All ideas, data synthesis, and conclusions presented in this study are entirely the responsibility of the authors.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Table S1: Included studies on vegan and plant-based dietary patterns in rheumatoid arthritis, categorized by dietary exposure type.
2. Table S2: Included studies on vegan and plant-based dietary patterns in psoriatic arthritis, axial spondyloarthritis, gout, and fibromyalgia.

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