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RAACFDb: Rheumatoid arthritis ayurvedic classical formulations database

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ABSTRACT

Ethnopharmacological relevance: In the past years, the treatment of rheumatoid arthritis (RA) has undergone remarkable changes in all therapeutic modes. The present newfangled care in clinical research is to determine and to pick a new track for better treatment options for RA. Recent ethnopharmacological investigations revealed that traditional herbal remedies are the most preferred modality of complementary and alternative medicine (CAM). However, several ayurvedic modes of treatments and formulations for RA are not much studied and documented from Indian traditional system of medicine. Therefore, this directed us to develop an integrated database, RAACFDb (acronym: Rheumatoid Arthritis Ayurvedic Classical Formulations Database) by consolidating data from the repository of Vedic Samhita – The Ayurveda to retrieve the available formulations information easily.

Materials and methods: Literature data was gathered using several search engines and from ayurvedic practitioners for loading information in the database. In order to represent the collected information about classical ayurvedic formulations, an integrated database is constructed and implemented on a MySQL and PHP back-end.

Results: The database is supported by describing all the ayurvedic classical formulations for the treatment rheumatoid arthritis. It includes composition, usage, plant parts used, active ingredients present in the composition and their structures.

Conclusion: The prime objective is to locate ayurvedic formulations proven to be quite successful and highly effective among the patients with reduced side effects. The database (freely available at www.beta.vit.ac.in/raacfdb/index.html) hopefully enables easy access for clinical researchers and students to discover novel leads with reduced side effects.

1. Introduction

Rheumatoid Arthritis [RA] is a chronic multi-systemic autoimmune inflammatory disorder, characterized by chronic synovitis, joint erosions, a predilection for development of joint damage and deformity (bone destruction), systemic features, including pulmonary, cardiovascular, ocular, psychological and skeletal disorders. RA affects around 0.5–1% of the adult population worldwide alongside 5 and 50 per 100,000 people newly developing the condition each year. The etiology of RA is still unknown (Grossman and Brahn, 1997; Murphy et al., 2009; Aletaha et al., 2010). As the progression of rheumatoid arthritis, the inflamed synovium attacks and destroys bone and the cartilage within the joint (Murphy et al., 2009). The weakness of joint alleviates with the support of surrounding muscles, ligaments and tendons. These above effects lead to the pain and joint damage frequently seen in RA patients (Das and Samanta, 2015). This disease can make it hard to carry out even regular activities and impact the capability to fulfill social roles and obligations.

The current research situation shows that the critical progress of RA is inflammation, which results in bone and cartilage destruction. The process is driven by antigen-presenting cells, T cells and B cells that result in the expansion of inflammatory cytokines, such as interleukin (IL)-1, IL-6 and TNF-α (Fig. A.1.). Recent years have perceived substantial advances in the understanding of mechanisms underlying the RA disease. It is identified that chronic joint inflammation is induced by the activated T cells infiltrating in the synovial membrane. T cells are activated by the antigen–presenting cell, presenting the antigen to the T-cell receptor. Activated T cells, in turn, activate B cells either directly or via pro-inflammatory mediators. These activated B cells then get differentiated into antibody-producing

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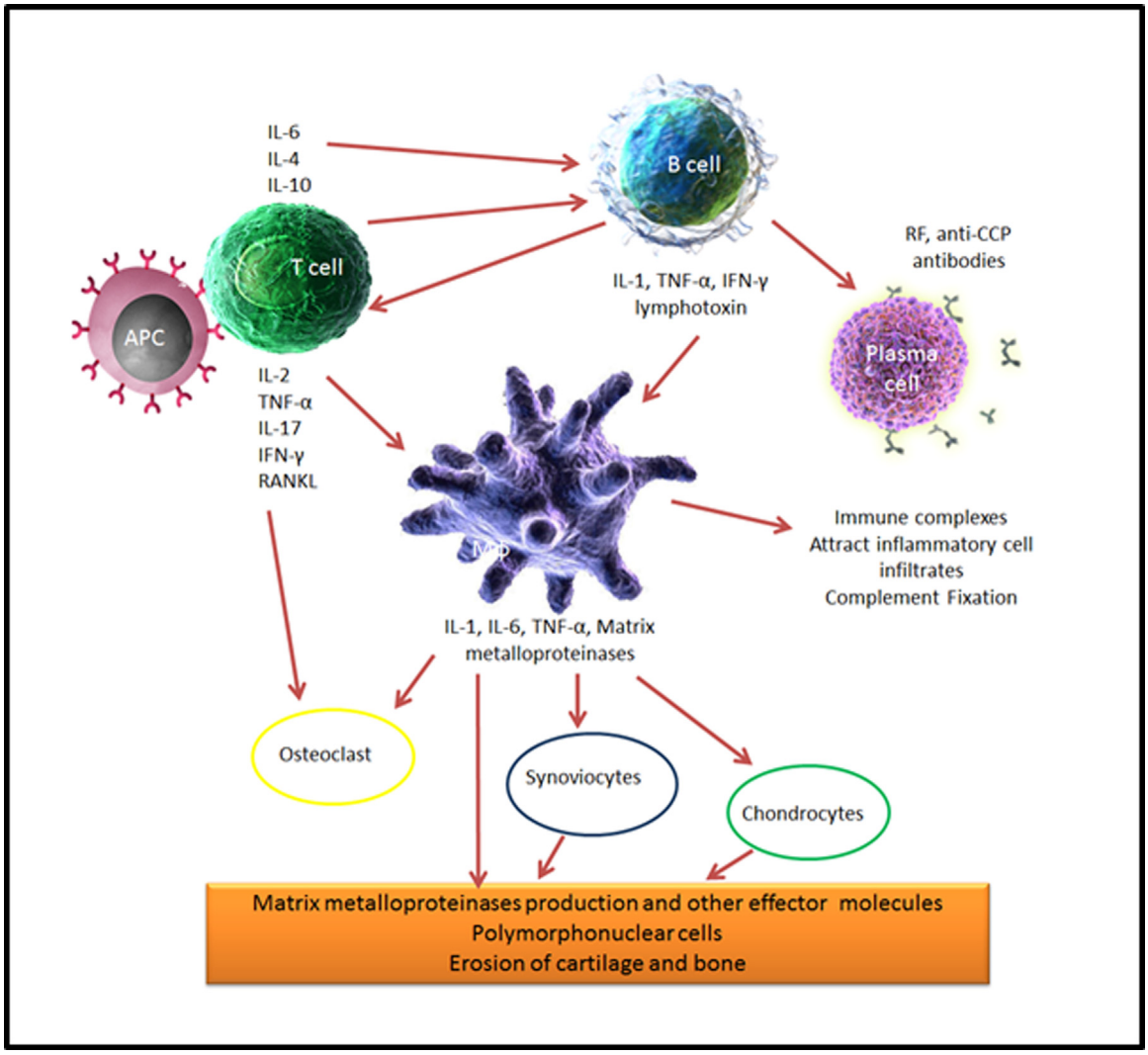

Fig. A.1. The mechanism of rheumatoid arthritis studied from Choy et al. (2001), Smolen et al. (2003), Silverman et al. (2003).

plasma cells. The anticitrullinated C peptide (anti-CCP) and rheumatoid factor (RF) antibodies form complexes to activate, attract and complement other inflammatory cells to the synovium. Activated B cells also produce a number of pro-inflammatory mediators including IL-1, IL-21, IL-6, TNF-α, interferon gamma, and lymphotoxin. T cells and B cells activate macrophages via pro-inflammatory mediators. Macrophages produce TNF-α, IL-1, IL-6 and interferon-γ. Dendritic cells produce IL-1, IL-6, TNF-α attracting cell to the inflammatory cells infiltrating the synovium. In addition to this, macrophages directly secrete matrix metalloproteinase and other proteolytic enzymes damaging synovial tissue. A cluster of cell types are drawn into the downstream effector mechanisms like endothelial cells and synoviocytes undergoing morphological changes and resulting in inflamed, synovial hyperplasia leading to joint destruction and damage (Brennan and Mclnnes, 2008; Choy, 2012; Niu and Chen, 2014; Das and Samanta, 2015).

Over the past two decades, the treatment of RA has been revolutionized by advances in the understanding of its pathologic mechanisms and transcriptional signaling factors which are regulating them, and the development of novel biologic drugs which target them (Vincenti and Brinckerhoff, 2002; Brennan and Mclnnes, 2008). These novel medications have shown great potential refining disease outcomes, but they come up with notable side effects which can pose long-term treatment challenges and complications in the perioperative arena. Therefore, an exploration for efficient alternative and additional therapies for this disease still continues (Venkatraman and Assefi, 2002; Deane et al., 2010; Furst et al., 2011). Consequently, concern about traditional medicines includes Ayurveda [India], Unani [India], Siddha [Arabic] are renewed and growing exponentially due to the adverse drug reactions and economic burden associated with the modern system of medicines (Krishna, 2011; Basisht et al., 2012). Ayurveda is very systemic and considered to be the best Indian system of Medicine, having more approachable ways of treatment. According to Ayurveda, RA is caused due to an imbalanced *Vata Dosha* (Airy Bioelement) that leads to the accumulation of *Ama* (toxin) in the body. The classical ayurvedic formulation treatment includes several pharmacological form of internal herbal medicines [*Arishtams* (Alcoholic preparations), *Bhasmas* (Ash), *Choornas* (Powder), *Grithams* (Medicated Ghee), *Gulikas* (Tablet) *Lehyams* (Herbal Jam), *Kashayams* (Water Extract) and *Thailams* (Oil)] which eliminates the toxins and retaining back to the balance to *Vata Dosha* (Airy Bioelement) in the body (Basisht et al., 2012; Mahapatra, 2013).

To best of our insights, there is no integrated database which affords for *plants and herbs part used, active ingredients, composition, usage of compound* and *structure of compound* present in the herbo-mineral preparatory medicines knowledge and information on RA treatment in one platform. Therefore to resolve this issue, we design and implement a freely accessible web interface RAACFDb that emphasizes the significance of knowledge and