Anti-inflammatory Effects of Luteolin: A Review of in Vitro, in Vivo, and in Silico Studies

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Abstract

Ethnopharmacological relevance: Luteolin (3', 4', 5,7-tetrahydroxyflavone) has been identified as commonly present in plants. Plants with a high luteolin content have been used ethnopharmacologically to treat inflammation-related symptoms. Both isolated luteolin and extracts from luteolin-rich plants have been studied using various models and exhibited anti-inflammatory activity.

Aim of the review: This paper uses recent research findings with a broad range of study models to describe the anti-inflammatory activity of luteolin, particularly its mechanisms at the molecular level; provide guidance for future research; and evaluate the feasibility of developing luteolin into an anti-inflammatory drug.

Materials and methods: We summarize reports about the anti-inflammatory activity of luteolin published since 2009, which we found in MEDLINE/PubMed, Scopus, Web of Knowledge, and Google Scholar. To acquire broad information, we extended our search to online FDA documents.

Results: Luteolin is a flavonoid commonly found in medicinal plants and has strong anti-inflammatory activity in vitro and in vivo. Some of its derivatives, such as luteolin-7-O-glucoside, have also shown anti-inflammatory activity. The action mechanism of luteolin varies, but Src in the nuclear factor (NF)-κB pathway, MAPK in the activator protein (AP)- 1 pathway, and SOCS3 in the signal transducer and activator of transcription 3 (STAT3) pathway are its major target transcription

factors. A clinical trial with a formulation containing luteolin showed excellent therapeutic effect against inflammation-associated diseases.

Conclusion: In silico, in vitro, in vivo, and clinical studies strongly suggest that the major pharmacological mechanism of luteolin is its anti-inflammatory activity, which derives from its regulation of transcription factors such as STAT3, NF-κB, and AP-1.