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# Therapeutic effects of guggul and its constituent guggulsterone: cardiovascular benefits

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## Abstract

Oleogum resin (known as guggul) from the guggul tree, *Commiphora mukul*, found in India, Bangladesh, and Pakistan, has been used to treat various diseases including hyper-cholesterolemia, atherosclerosis, rheumatism, and obesity over several thousands of years. Guggulsterone isolated from guggul has been identified as the bioactive constituent responsible for guggul's therapeutic effects. Since the first study demonstrating the therapeutic effects of guggul in an animal model in 1966, numerous preclinical and clinical trials have been carried out. Although differences in study design, methodological quality, statistical analysis, sample size, and subject population result in certain inconsistencies in the response to therapy, the cumulative data from in vitro, preclinical, and clinical studies largely support the therapeutic claims for guggul described in the ancient Ayurvedic text. However, future clinical studies with much larger size and longer term are required to confirm these claims. The cardiovascular benefits of the therapy are derived from the multiple pharmacological activities associated with guggul or guggulsterone, notably its hypolipidemic, antioxidant, and antiinflammatory activities. It has been established that guggulsterone is an antagonist at farnesoid x receptor (FXR), a key transcriptional regulator for the maintenance of cholesterol and bile acid homeostasis. The FXR antagonism by guggulsterone has been proposed as a mechanism for its hypolipidemic effect. A recent study demonstrates that guggulsterone upregulates the bile salt export pump (BSEP), an efflux transporter responsible for removal of cholesterol metabolites, bile acids from the liver. Such upregulation of BSEP expression by guggulsterone favors cholesterol metabolism into bile acids, and thus represents another possible mechanism for its hypolipidemic activity. Guggulsterone has been found to potently inhibit the activation of nuclear factor-kappaB (NF-kappaB), a critical regulator of inflammatory responses. Such repression of NF-kappaB activation by guggulsterone has been proposed as a mechanism of the antiinflammatory effect of guggulsterone.

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