Echinacea species (Echinacea angustifolia (DC.) Hell., Echinacea pallida (Nutt.) Nutt., Echinacea purpurea (L.) Moench): a review of their chemistry, pharmacology and clinical properties

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Abstract

This paper reviews the chemistry, pharmacology and clinical properties of Echinacea species used medicinally. The Echinacea species Echinacea angustifolia, Echinacea pallida and Echinacea purpurea have a long history of medicinal use for a variety of conditions, particularly infections, and today echinacea products are among the best-selling herbal preparations in several developed countries. Modern interest in echinacea is focused on its immunomodulatory effects, particularly in the prevention and treatment of upper respiratory tract infections. The chemistry of Echinacea species is well documented, and several groups of constituents, including alkamides and caffeic acid derivatives, are considered important for activity. There are, however, differences in the constituent profile of the three species. Commercial echinacea samples and marketed echinacea products may contain one or more of the three species, and analysis of samples of raw material and products has shown that some do not meet recognized standards for pharmaceutical quality. Evidence from preclinical studies supports some of the traditional and modern uses for echinacea, particularly the reputed immunostimulant (or immunomodulatory) properties. Several, but not all, clinical trials of echinacea preparations have reported effects superior to those of placebo in the prevention and treatment of upper respiratory tract infections. However, evidence of efficacy is not definitive as studies have included different patient groups and tested various different preparations and dosage regimens of echinacea. On the basis of the available limited safety data, echinacea appears to be well tolerated. However, further investigation and surveillance are required to establish the safety profiles of different echinacea preparations. Safety issues include the possibility of allergic reactions, the use of echinacea by patients with autoimmune diseases and the potential for echinacea preparations to interact with conventional medicines.