

Assessment Points

| System | Effect | Test |
|--------|-----------------------------------------------|----------------------------------------------|
| IMMUNE | Immunostimulation, anti-inflammatory activity | Phagocytic activation, IL-1 and TNF activity |
| HEPAT | P450 CYP1A2 inhibition | Caffeine clearance test |

Key References: Karsch-Völkl M, Barrett B, Linde K: Echinacea for preventing and treating the common cold, *J Am Med Assoc* 313(6):618–619, 2015; Charrois TL, Hrudej J, Vohra S, et al.: Echinacea, *Pediatr Rev* 27(10):385–387, 2006.

Perioperative Implications

- Possible antagonism of antirejection drugs used following bone marrow or organ transplantation.
- Possibly related to two case reports of liver failure, one in a child and one in an adult.

Ephedra (Ma-Huang)

Bracken J. De Witt

Uses

- Ephedra is a plant that contains a variety of ephedrine alkaloids, including ephedrine and pseudoephedrine.
- Dietary supplements containing ephedra were marketed in USA as agents that may aid in wt reduction and energy enhancement. Ephedra may be used in the manufacture of methamphetamine.
- In 2004, USA banned the sale of ephedra-containing supplements with a subsequent marked decrease in reported poisonings.
- Although banned in USA, sale of ephedra-containing supplements continues via internet resources.
- Some supplements have been marketed as “ephedrine-free” or as legal ephedra products, in which ephedra is replaced with other herbal stimulants such as bitter orange.

- Ephedra-containing substances are also known as ma-huang, Mormon tea, squaw tea, and herbal ecstasy.

Perioperative Risks

- Risks associated with an increase in the sympathetic nervous system activity and dysrhythmias and Htn

Worry About

- Lethal cardiac arrhythmias, Htn, myocarditis, MI, angina, increased thermogenesis
- Hemorrhagic and/or ischemic stroke, subarachnoid hemorrhage, cerebral vasculitis, seizures
- Bronchial dilation, acute hepatitis
- Preterm labor

Overview/Pharmacology

- Mechanism of action is via increases in sympathetic stimulation.
- Ephedrine is an indirect-acting sympathomimetic that exerts its effects mainly by stimulating release of norepinephrine.
- Other ephedrine alkaloids in ephedra have direct-acting effects on both α - and β -adrenoceptors.
- Ephedra is often packaged with guarana-derived caffeine, which may synergistically augment adrenergic stimulation.

Drug Class/Mechanism of Action/Usual Dose

- Works via stimulation of the sympathetic nervous system.

Assessment Points

| System | Effect | Assessment by Hx | PE | Test |
|--------|---------------------------------------------------------|-------------------------------------|-----------------------------|--------------------------------------------------|
| CV | Arrhythmias, Htn, myocarditis, MI, angina thermogenesis | Chest pain | BP Increased temperature | BP/HR, ECG, cardiac enzymes Temperature probe |
| GU | Acute hepatitis | | | LFTs |
| CNS | Stroke, subarachnoid hemorrhage, vasculitis, seizure | Decreased mental status Headache | Neuro exam | CT, vascular biopsy, EEG |
| RESP | Bronchial dilation | | | PFTs |

Key References: Ang-Lee MK, Moss J, Yuan CS: Herbal medicines and perioperative care, *J Am Med Assoc* 286(2):208–216, 2001; Wang CZ, Yuan CS, Moss J: Anesthetic implications of complementary and alternative medications. In Miller RD, editor: *Miller's anesthesia*, ed 8, Philadelphia, 2015, Elsevier, pp 1226–1239.

Perioperative Implications**Preoperative Period**

- Ephedra may produce adverse pt reactions with medications such as MAO inhibitors, digoxin, cold medications containing ephedrine, diuretics, and antihypertensives.
- Assess preop BP, HR, and ECG.
- Consider as a potential cause of preterm labor.

Preinduction/Induction Period

- Control hemodynamics before induction.
- Observe ECG for arrhythmias.

Maintenance Period

- Response to ephedrine may be hampered secondary to tachyphylaxis; therefore, control hypotension

with direct-acting adrenergic agonists, like phenylephrine.

- Ephedra may interact with volatile anesthetics (e.g., enflurane) to promote dysrhythmias.

Postoperative Period

- Assess postop BP, HR, and ECG for CV changes.

Evening Primrose

John A. Helmstetter | Alan David Kaye

Uses

- Evening primrose oil (EPO) is obtained from the seed of the plant species *Oenothera biennis*.
- EPO is also known as fever plant, huile d'onagre, king's cureall, night willow-herb, scabish, suncups, and sundrops.
- EPO may be used as a food supplement for the essential fatty acids, linoleic acid (LA), and γ -linolenic acid (GLA).

- Infusion of the whole plant has been used for asthma, GI disorders, whooping cough, and as a sedative pain killer.
- Other evidence indicates that orally administered primrose oil does not relieve symptoms of premenstrual syndrome and does not have any effect in shortening the length of pregnancy and labor.
- EPO had been licensed in Britain for treatment of atopic eczema and cyclic and noncyclic mastalgia.

Cochrane meta-analysis found that evening primrose oil capsules were ineffective for eczema.

- Other potential uses for EPO include PMS, psoriasis, MS, hypercholesterolemia, rheumatoid arthritis, Raynaud phenomenon, Sjögren's syndrome, postviral fatigue syndrome, asthma, and diabetic neuropathy. Without solid evidence it is effective, but with recurrent anecdotal evidence of beneficial outcomes.