Convallaria majalis

Lily of the Valley

Related Species

Convallaria keiskei (Asian or Japanese lily of the valley)

Indications

For heart conditions with weak cardiac output, cardiac irregularities, or both due to mechanical impediments or arrhythmic forms of heart failure (e.g., mitral stenosis and regurgitation and mild-to-moderate congestive heart failure) associated with symptoms such as edema, palpitations, tachycardia bradycardia, and arrhythmia.

Mechanism of Action

Cardiac glycosides are types of steroids also known as cardenolides that have long been noted to have a positive ionotropic effect on the heart. All cardiac glycosides affect ion transport across cardiac muscle cell membranes via effects on Na(+)/K(+)-ATPase enzymes, leading to increased intracellular sodium. That, in turn, increases intracellular calcium and enhances cardiac contractility.[1] Cardiac glycosides are also relied on to convert atrial flutter and fibrillation to regular sinus rhythm.[2]

Animal studies have shown *Convallaria majalis* to increase K+ in the atria and increase atrial stroke volume.[3] Although convallatoxin is vasoconstrictive,[4] the sum total of all cardiac glycosides and other constituents may have a more vasotonic action and enhance circulation and coronary flow.

Evidence-Based Research

Cardiac glycosides have been used for at least several centuries to treat congestive heart failure, weakness, and arrhythmias. *Convallaria majalis* contains at least 38 cardiac glycosides[5,6] including convallarin, convallatoxin,[7] convallasaponin,[8] strophanthidin, cannogenol, and sarmentogenin,[9] all similar in molecular structure to the better-known digoxin found in *Digitalis*.

Convallaria majalis also contains a steroidal saponin, convallamaroside, that is credited with antitumor actions via antiangiogenic effects.[10] Progesterone occurs in the leaves and underground bulbs of *C. majalis*.[11]

Safety in Pregnancy and Breastfeeding

There are no studies on *Convallaria* in pregnancy and lactation, but digoxin, a cardiac glycoside similar to those in lily of the valley, is known to readily cross the placenta and reaches equilibrium with maternal sera.[12] Although 1-mg intrafetal injections of digoxin are used to promote fetal demise before second-term abortions,[13] digoxin remains in current use during pregnancy and lactation to treat arrhythmias in women, and digoxin is used to treat fetal tachycardia.[14,15] This would suggest that whole *Convallaria* at traditional dosages would be safe to use during pregnancy and lactation.

General Safety

All cardiac glycosides have toxicity in the overdose state, but *Convallaria* was believed to be better tolerated than digitalis or foxglove according to the medical literature of the 1800s and early 1900s. Because animals and children are sometimes accidentally poisoned by plants containing cardiac glycosides,[16] lab tests have been developed to detect digoxin, convallatoxin, and other cardiac glycosides.[17]

Although some lily species have been shown to be nephrotoxic to animals, *Convallaria* is sparing to the kidneys,[18] but the cardiac glycosides can produce bradycardia in overdose.

Dosage

Whole *Convallaria* is dosed at 150–200 mg twice a day, or 150 mg of the dried leaf is dosed three times a day.

Traditional Uses

At lower doses, *Convallaria* bulbs have been used as a cardiotonic to regulate blood pressure and manage the symptoms of heart failure, improving ejection fraction and cardiac output and reducing pulmonary pressure without causing deleterious increases in heart rate or decreases in blood pressure. Although mostly recommended for hypotension due to weak circulation, it was also included in formulas for hypertension due to its regulating effects on the cardiovascular system.

Convallaria was emphasized for poor tone in the peripheral vasculature and poor circulation to the heart itself as may occur with long-term smokers. It was also considered specific for heart palpitations and irregular heart action and for valve problems such as mitral prolapse.

Convallaria extract remains a reliable herbal tool used by herbalists to treat cardiac rate and rhythm and support heart perfusion.

References

[1] **J Endocrinol.** 2014;222(1):R11–24. *Advances in understanding the role of cardiac glycosides in control of sodium transport in renal tubules.* Khundmiri SJ.

[2] **Clin Pharmacokinet.** 2014;53(5):397–407. *The role of digitalis pharmacokinetics in converting atrial fibrillation and flutter to regular sinus rhythm*. Jelliffe RW.

[3] **Life Sci.** 2006;79(12):1178–85. *The positive inotropic effect of the aqueous extract of Convallaria keiskei in beating rabbit atria.* Choi DH, Kang DG, Cui X, *et al*.

[4] **Arzneimittelforschung.** 1984;34(4):423–9. *Effect of plant glycosides on resistance and capacitance vessels.* Lehmann HD.

[5] **Planta Med.** 1985;51(5):387–90. *Studies on the turnover of cardenolides in Convallaria majalis.* Schrutka-Rechtenstamm R, Kopp B, Löffelhardt W.

[6] **Acta Pol Pharm.** 1974;31(5):689–93. *Cardenolide glycosides of Convallaria majalis. I. Isolation of locundioside.* Strzelecka H, Kowalski J, Hipsz M.

[7] **Am J Clin Pathol.** 2014;142(3):307–12. *Rapid detection of the active cardiac glycoside convallatoxin of lily of the valley using LOCI digoxin assay.* Welsh KJ, Huang RS, Actor JK, Dasgupta A.

[8] **Chem Pharm Bull (Tokyo).** 2007;55(2):337–9. *Convallasaponin A, a new 5beta-spirostanol triglycoside from the rhizomes of Convallaria majalis.* Higano T, Kuroda M, Sakagami H, *et al*.

[9] **Planta Med.** 1982;45(4):195–202. *New cardenolides from Convallaria majalis.* Kopp B, Kubelka W.

[10] **Acta Pol Pharm.** 2004;61(4):279–82. *Anti-angiogenic activity of convallamaroside, the steroidal saponin isolated from the rhizomes and roots of Convallaria majalis L.* Nartowska J, Sommer E, Pastewka K, *et al*.

[11] **Z Naturforsch C.** 1980;35(1–2):41–4. *Determination of progesterone in vegetative organs and cell organelles of Convallaria majalis L. by radioimmunoassay.* Kopp B, Loffelhardt W.

[12] **Clin Perinatol.** 1975;2(1):23–35. *Digoxin: Placental transfer, effects on the fetus, and therapeutic use in the newborn.* Soyka LF.

[13] **Contraception.** 2008;77(3):223–5. *Effectiveness and safety of digoxin to induce fetal demise prior to second-trimester abortion*. Molaei M, Jones HE, Weiselberg T, *et al*.

[14] **Chest.** 1984;85(4):573–5. *Successful treatment of fetal supraventricular tachycardia with maternal digoxin therapy*. King CR, Mattioli L, Goertz KK, *et al*.

[15] **Am J Cardiol.** 1998;82(4A):58I–62I. *Antiarrhythmic drug therapy in pregnancy and lactation.* Chow T, Galvin J, McGovern B.

[16] **J Am Vet Med Assoc.** 1989;195(4):485–7. *Apparent toxicosis associated with lily-of-the-valley (Convallaria majalis) ingestion in a dog.* Moxley RA, Schneider NR, Steinegger DH, *et al*.

[17] **Clin Toxicol (Phila).** 2014;52(7):659–63. *Rapid detection of convallatoxin using five digoxin immunoassays.* Fink SL, Robey TE, Tarabar AF, *et al*.

[18] **Top Companion Anim Med.** 2010;25(4):213–7. *Lily toxicity in the cat.* Fitzgerald KT.