INTERNATIONAL JOURNAL IN PHARMACEUTICAL SCIENCES

Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

To Prepare Suspension Of Digitalis For Congestive Heart Failures

Dnyandeep Jadhav* , Dipak Borse, Chaitanya Baviskar, Arvind K. Hatkar, Rajendra M. Kawade

Nandkumar Shinde Collage of Pharmacy, Vaijapur, Chhatrapati Sambhajinagar.
Dr. Babasaheb Ambedkar Tecnological University Lonere ,Raigad, Maharashtra.

ARTICLE INFO

Received: 15 Dec 2023
Accepted: 19 Dec 2023
Published: 23 Dec 2023

Keywords:
Digitalis, CHF(congestive heart failures), Digoxin, Digitoxin,etc.

DOI:
10.5281/zenodo.10426636

ABSTRACT

This study outlines the preparation of a digitalis suspension for congestive heart failure (CHF) management. The method involves extracting digitalis glycosides from Digitalis purpurea leaves, followed by meticulous processing to achieve a stable suspension. The formulation's efficacy in addressing CHF symptoms is assessed, providing insights into its potential therapeutic value. This research contributes to the exploration of alternative formulations for digitalis administration in congestive heart failure patients. Digitalis, commonly derived from the foxglove plant, is a medication used to treat congestive heart failure. It helps strengthen the heart's contractions, improve circulation, and alleviate symptoms. However, it should be prescribed and monitored by a healthcare professional due to its narrow therapeutic range and potential for toxicity. Regular check-ups are essential to ensure the medication is effective and safe for the individual.

INTRODUCTION

Congestive heart failure (CHF) poses a significant challenge in healthcare, necessitating effective therapeutic interventions to manage its symptoms and improve patients' quality of life. Digitalis, a medication derived from the foxglove plant, has long been utilized in the treatment of CHF due to its positive inotropic effects on the heart. This introduction will provide an overview of the rationale for using digitalis, its mechanism of action, and the importance of developing a well-prepared suspension for optimal therapeutic outcomes in CHF patients.

Preparing a suspension of digitalis for congestive heart failure involves obtaining a reliable source of digitalis, often derived from the foxglove plant. Begin by measuring the required amount of digitalis extract or powder, considering the prescribed dosage. Next, choose a suitable suspension vehicle such as simple syrup or glycerin. Gradually add the digitalis to the chosen vehicle, ensuring proper mixing to achieve a

***Corresponding Author:** Dnyandeep Jadhav
Address: *Nandkumar Shinde Collage of Pharmacy, Vaijapur, Chhatrapati Sambhajinagar*
Email : djadhav4322@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

uniform suspension. Pay close attention to the concentration to maintain dosage accuracy. Regularly assess the suspension for stability and homogeneity, and store it in a dark, cool place to preserve its potency. It's crucial to follow precise measurements and consult with a healthcare professional to ensure the formulation meets the specific needs of the patient with congestive heart failures. Congestive heart failure occurs when the heart is unable to pump blood effectively, leading to fluid buildup in the lungs and other tissues. Symptoms may include shortness of breath, fatigue, and swelling. Treatment involves lifestyle changes, medications, and in severe cases, surgical interventions like heart transplant. If you have concerns about your health, consult a healthcare professional. Digitalis, derived from foxglove plants, is primarily used in medicine. Its main application is in treating heart conditions. Digitalis contains compounds called cardiac glycosides, such as digoxin, which can enhance the force and efficiency of heart contractions. This makes it useful in managing certain heart disorders like congestive heart failure and atrial fibrillation. It's important to note that the use of digitalis should be carefully monitored by healthcare professionals due to its narrow therapeutic range and potential for toxicity. Always consult a doctor for personalized advice on its usage.

Fig.1 Digitalis Plant.

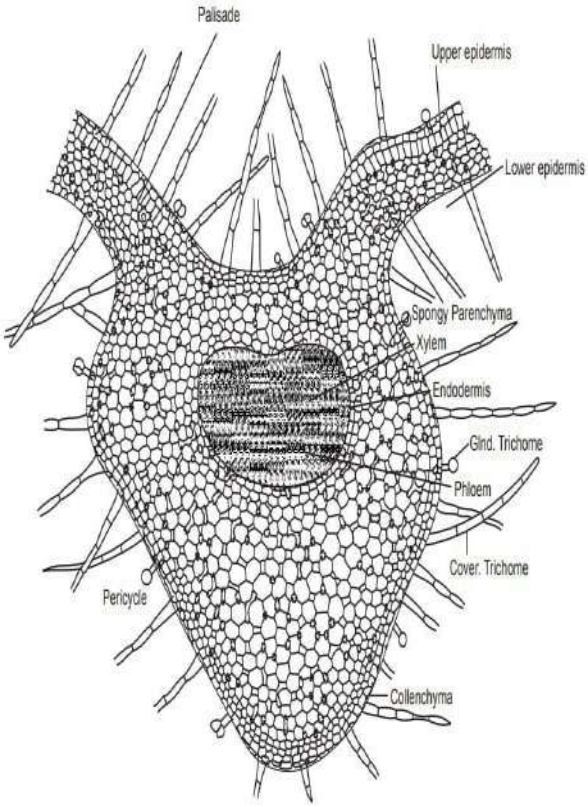

Fig.2.T.S. of Digitalis Plant.

MECHANISM OF ACTION

The combined inotropic-bradycardic action is unique for digoxin compared to all other sympathomimetic inotropes that cause tachycardia. Its principal mechanism of action is by the inhibition of the intrinsic membrane protein Na+-K+ ATPase (a sodium pump), which in turn promotes calcium influx by a sodium-calcium exchange mechanism.This effect is responsible for the inotropic and electrophysiological effects of the drug. Digoxin also causes parasympathetic activation, which results in sinus-slowing and atrioventricular (AV) nodal inhibition. In patients with heart failure, digoxin reduces plasma renin activity and norepinephrine and serum aldosterone levels, and induces diuresis.

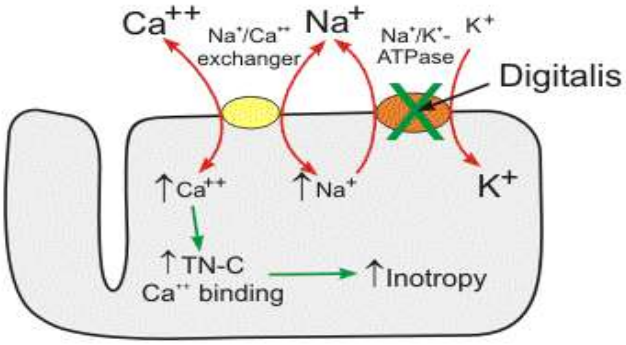

Fig.3. Mechanism of Digitalis.

Pharmacokinetics:-

Digoxin is excreted exponentially by the kidneys, with an elimination half-life of 36 to 48 hours in case of normal renal function.The elimination half life may be as high as 61–170 hours in premature neonates. Starting therapy with maintenance doses results in steady-state plateau concentrations after 4 to 5 half-lives (7–10 days) in subjects with normal renal function. In patients with renal failure, the volume of distribution of digoxin is decreased, necessitating reduction in the loading as well as maintenance doses.Digoxin crosses the placenta, and fetal umbilical cord venous blood levels of the drug are similar to maternal blood levels. About 30% of the drug is excreted by the fecal route and hepatic metabolism.

Preparation:

The content and potency of the foxglove medicines available on the market differ significantly. pulverized Tablet form is used to give digitalis leaf. The pharmacopoeial tincture, the mixture used in most widely used, administered in dosages of 5.15 micrograms, and the infusion is the remarkably tiny dosage of two to four drachms, the An ounce or more is the dosage for other infusions. The tincture has a reasonable amount of Digitalin and The poison digitiz.

Cultivation:

A small number of farmers in this nation plant foxglove in order to produce a medication with consistent activity from A real case of purpurea Digitalis. It is imperative that you do this. to possess authentic medical seeds to feed the pharmaceutical industry: It is necessary to use carefully chosen wild seed to produce crops. and every variant of the novel kind failed. The vegetation will grow most readily on loose, well-drained soil, ideally of siliceous origin, albeit somewhat subdued. The vegetation growing in sunny environments have the lively characteristics of the plant to a far higher extent than those shaded by trees, and research has shown that those planted in hot, Best results are obtained on a sunny bank shaded by a timber.

Medicinal action and uses:

Since ancient times, digitalis has been used for heart conditions. All types of muscle tissue are more active as a result of it, but the heart and arterioles are particularly affected.a key characteristic of the medication is its impact on the movement. The initial result of its assimilation is a heart and artery contraction, resulting in a very high an increase in blood pressure.Following the ingestion of a moderate dosage, a noticeable slowing of the pulse Additionally, digitalis makes an erratic pulse regular. A constant tonic is added to the increased force of heart contraction. the

organ's contraction, resulting in its internal capacity being decreased, which is a favorable outcome in cardiac dilatation, and it enhances the heart's nourishment by boosting the blood volume.Under typical circumstances, it takes up to twelve hours for the effects on the heart muscle to become apparent. For this reason, it must always be used in conjunction with other treatments to help the patient get through this time. It should also never be prescribed in large doses at first, as some patients may not be able to take it due to the drug's tendency to cause significant digestive disturbances, which vary depending on the patient.Digitonin is an unwanted component that is most likely the cause of this behavior. The drug's effect on circulation is more significant than its effect on the kidneys. It is an effective diuretic in modest to moderate dosages and a useful treatment for dropsy, particularly when it is associated with cardiac diseases.In addition, it has been used with actual or potential advantages to treat delirium tremens, epilepsy, internal hemorrhage, inflammatory disorders, severe mania, and a host of other conditions. When taking Digitalis in any form, it should be used carefully and monitored closely because, when taken over an extended period of time, it can build up in the body and suddenly show its poisonous effects, which include irregular heartbeat, low blood pressure, and the onset of gastrointestinal irritation.Constant usage of Digitalis also causes the heart to enlarge because it increases heart activity. When administered as a hypodermic injection, digitalis is a highly effective countermeasure for acetone toxicity. If Digitalis does not have the intended effect on the heart, Lily-of-the-Valley can be used in its place and is frequently found to be helpful. When Digitalis is used in large quantities, it can induce a variety of brain symptoms, including seeing everything blue and other disruptions to the senses. When someone has been poisoned by Digitalis and has a very sluggish, irregular pulse, all that is usually required is the use of atropine. When the condition is more serious and the heartbeat is extremely fast, a stomach pump must be utilized, and medication maybe employed, as well as medications like chloral and chloroform that lower and depress the heart's excitability.

HEALTH BENEFITS OF DIGITALIS:

Digitalis is useful in the treatment of arrhythmia of simple dilatation, mild ventricular dilatation, palpitations caused by heart strain, overwork, and cardiac asthenia. It is particularly recommended for soldiers with irritable hearts from prolonged marches and combat, as this leads to a loss or reduction of inhibitory control and impending heart-muscle exhaustion.In cases where palpitations are solely nerve-related, cactus is a more effective treatment. Additionally, it frequently fails in paroxysmal tachycardia, which is primarily a neurological condition. It doesn't cure Grave's disease, but it can occasionally fix the erratic heartbeat.The herb improves the heart's nutrition by pushing more blood into the coronaries. Digitalis assists in restoring and regulating cardiac function when blood circulation is compromised and dropsy develops. It facilitates urination by clearing blockages in the kidneys and enhancing the blood flow to the kidneys. Digitalis is applied locally to burns and wounds and has been utilized with satisfying results in several ointments. It works wonders to save badly damaged cells in burn cases.

CHEMISTRY :

D. purpurea ornamental strains usually have low levels of active ingredients. At least 30 distinct glycosides, with total concentrations ranging from 0.1% to 0.6%, have been found in the leaves of wild species that have been used medicinally. These glycosides are mainly glycoside A from purpurea, which produces digitoxin, and glycoside B, which is the precursor to gitoxin. Digitoxin and Gitoxin hydrolyze and release their respective aglycones, digitoxigenin and gitoxigenin, as a

result of losing sugar molecules.The lanatosides, A through E, are the primary glycosides found in D. lana

Digitoxin, gitoxin, digoxin, digitalin, and gitaloxin are formed when acetate groups and sugars are removed. D. lanata is a significant source of digoxin and lanatoside C, however it is not commonly utilized in powder form in the United States.

DRUG INTERACTION

One of the most frequent causes of digoxin toxicity is drug interactions. Certain drugs raise plasma levels of digoxin directly; other drugs change the way the kidneys excrete waste products or cause imbalances in electrolytes.

The following medications have been linked to digoxin toxicity reports:

Amiloride:

May lessen digoxin's inotropic reaction.

Amiodarone

Reduces renal and nonrenal clearance of digoxin and may have additive effects on the heart rate

Alprazolam and diazepam, two benzodiazepines, have been linked to a few sporadic cases of digoxin poisoning.

Beta-blockers such metoprolol, and atenolol are beta-blockers that may have additive effects on heart rate; digoxin blood levels may rise as a result of carvingilol in addition to its heart rate-inducing effects.

Calcium channel blockers

Diltiazem and verapamil increase serum digoxin levels; not all calcium channel blockers share this effect Digoxin levels may rise when using cyclosporine, presumably as a result of decreased renal excretion. Tetracyclines, erythromycin, and clarithromycin may raise digoxin levels. Digoxin level is raised by propafenone; consequences vary. Herb/Nutraceutical: Steer clear of natural licorice (which increases potassium loss and promotes sodium and water retention) and ephedra (which carries a risk of heart stimulation).

A complicated interaction between digoxin and other electrolyte and renal problems results in clinical digoxin toxicity. Compared to a patient with high digoxin levels and no renal or electrolyte abnormalities, a patient with normal digoxin levels (0.5-2 ng/mL) but significant hypokalemia or renal insufficiency may experience more severe cardiotoxicity.

Precautions:

When taken in prescribed amounts, digitalis typically has mildly harmful side effects. Headache, exhaustion, drowsiness, nausea, vomiting, and impaired vision are among the harmful consequences. Therefore, in order to prevent these consequences, the dosage must be regulated in a certain way. It is important to closely monitor the harmful effects indicated and adjust the dosage accordingly.

MECHANISM OF ACTION:

Direct Action:

Digitalis attaches to the myocardial cell membrane's sodium pump1 and prevents it from working. When this pump is blocked, the heart cell's internal sodium content rises. The heart cell then uses the increased calcium to exchange sodium for calcium across the cell membrane, strengthening and optimizing the contractile mechanism.

Indirect Action:

Bradycardia is the outcome of sinus node slowness caused by parasympathetic nerve activity. Moreover, it suppresses the Atrioventricular Node.

Pharmacokinetics:

1.5 days is the half-life.60% excreted by the kidneys and 30% by the liverAs in the case of a tiny child with low skeletal muscle mass, body weight is important in establishing the loading dose because less of it will bind to skeletal muscles and instead raise the blood level of digoxin and induce toxicity.

DIGITALIS USES AND PHARMACOLOGY

Digitoxin is fast and thoroughly absorbed from the gastrointestinal tract, and it has 1,000 times the potency of the powdered leaves. The potency of digoxin is 300 times more than that of the D. purpurea powder. Enhancing cardiac conduction and, consequently, the potency of cardiac contractility is a common trait among all cardiac glycosides. Although some medications have some antiarrhythmic properties as well, they will cause arrhythmias increased dosage ranges. To function, digitalis blocks sodium-potassium ATPase. Due to a passive decrease in the activity of the sodium-calcium exchanger in the sarcolemma, this raises the concentration of sodium inside cells, which raises intracellular calcium. An advantageous inotropic effect is produced by the increased intracellular calcium. Due to its vagal action on the parasympathetic nervous system, it is also used to treat atrial fibrillation and reentrant arrhythmias by slowing the ventricular rate. Due to its reliance on the vagal action, digitalis is ineffective during physical activity and in patients with strong system drives, such as those who are very sick.

DIGITALIS TOXICITY

The plant is poisonous in every aspect. Animal poisoning happens when they are grazing. Sucking on the blooms or eating the seeds or sections of the leaves has sickened children in the past. Although the bitter taste of digitalis is often enough to discourage intake or cause vomiting due to its emetic qualities, deaths have been documented among those who drank tea produced from the plant that was incorrectly thought to be comfrey. Because digitalis glycosides are slowly eliminated and build up, intoxications during treatment are frequent. It has been calculated that the incidence of digitalis poisoning varies between 5% and 23%. The occurrence of therapeutic overdose has been significantly decreased by stricter dosing recommendations and monitoring methods.Adolescents and adults who intentionally consume digitalis are frequently linked to cases of digitalis poisoning, sometimes with suicidal thoughts. Contracted pupils, blurred vision, a strong but slowed pulse, nausea, vomiting, dizziness, frequent urine, exhaustion, muscle weakness, and tremors are symptoms of plant or refined drug poisoning; in extreme cases, stupor, confusion, convulsions, and death ensue. Atrioventricular block and atrial arrhythmias are examples of cardiac symptoms.The most hazardous consequences are those on the heart. Yellow-green vision, gastrointestinal distress, and visual halos are the hallmarks of chronic Digitalis intoxication. When atrial fibrillation with a sluggish ventricular response or sporadic ectopic beats are the signs of mild toxicity, stopping the medication temporarily and keeping an eye on the ECG are adequate measures. Acute poisonings have been treated with gastric lavage or emesis in conjunction with supportive measures including electrolyte replacements, antiarrhythmics (such lidocaine and phenytoin), atropine, and other medications that can counteract the glycosides' cardiovascular effects. Digibind, an antibody fragment specific to digoxin, is useful in treating acute intoxications brought on by digitalis and related cardioactive glycosides. For the patient who has been seriously poisoned, this therapy is revolutionary. Certain plant cardiac glycosides can be effectively counteracted by infusion of digoxin Fab fragment antibodies15, but not for Digitalis at all times.

CONCLUSION

The use of Herbal gel getting more popular When treating chronic valvular heart disease with failing or broken compensation, digitalis is very helpful. However, it must be used carefully, taking into account the necessity in cases of weak, fast, and irregular pulse, insufficient urine, and dropsy. Digitalis is likely to worsen the disease or cause other problems when arterial hyperaemia is

evident and cardiac hypertrophy outweighs dilatation. The best conditions for digitalis medication to work in are likely mitral insufficiency and regurgitation, if there are no extensive cardiac degeneration or pericardial adhesions that could limit its effects. By contracting the ventricle rings, it helps to achieve a more flawless closure of the mitral valves by overcoming the ventricular strain that is based on pulmonic vascular resistance.It primarily accomplishes this purpose by making the heart more contractible. According to estimates from the World Health Organization (WHO), one billion people, or % of the global population, currently receive primary healthcare in some form from herbal medicine. All indigenous peoples' traditional medical practices heavily use herbal medicine, as do naturopathic, homeopathic, Ayurvedic, and traditional oriental medicine systems. The many kinds of digitalis medications vary in their chemical composition.

REFERENCES

1. McGuffin M, Hobbs C, Upton R, Goldberg A, eds (1997). American Herbal Products Association's Botanical Safety Handbook. Boca Raton, FL: CRC Press.
2. Nesher, M., Spolansky, U., Rosen, H. and Lichtstein, D(2007). The endogenous digitalis- like compounds -A new family of steroid hormones. Life Sci. Vol.80:2093-2107.
3. Shumaik GM, Wu AW, Ping AC (1988). Oleander poisoning: treatment with digoxin-specific Fab antibody fragments. Ann Emerg Med. Vol.17:732-735.
4. Schoner, W (2002). Endogenous cardiac glycosides, a new class of steroid hormones. Eur J Biochem Vol.269:2440-2448.
5. Schoner, W., Bauer, N., Muller-Ehmsen, J., Kramer, U., Hambarchian, N., Schwinger, R., Moeller, H., Kost, H., Weitkamp, C., Schweitzer, T., Kirch, U., Neu, H., Grunbaum, E.G (2003). Ouabain as a mammalian hormone. Ann N Y Acad Sci. Vol.986:678-684.
6. Schoner, W. and Scheiner-Bobis, G (2007). Endogenous and exogenous cardiac glycosides and their mechanisms of action. Am J Cardiovasc Drugs. Vol.7:173-189.
7. Dick M, Curwin J, Tepper D (1991). Digitalis intoxication recognition and management. J Clin Pharmacol .Vol.31:444-447.
8. Hood WB, Dans A, Guyatt GH, Jaeschke R, McMurray JJ(2004). Digitalis for treatment of congestive heart failure in patients in sinus rhythm. Cochrane Database Syst Rev (2):CD002901.
9. Johansson S, Lindholm P, Gullbo J, Larsson R, Bohlin L, Cleason P(2001). Cytotoxicity of digitoxin and related cardiac glycosides in human tumor cells. Anticancer Drugs. Vol. 12:475-483.
10. Lopez-Lazaro M, Palma De La Pena N, Pastor N, et al(2003). Anti-tumour activity of Digitalis purpurea L. subsp.heywoodii. Planta Med .Vol.69:701-704.
11. Lindholm P, Gullbo J, Claeson P, et al(2002). Selective cytotoxicity evaluation in anticancer drug screening of fractionated plant extracts. J Biomol Screen . Vol.7:333-340.
12. Lacassie E, Marquet P, Martin-Dupont S, Gaulier JM, Lachatre G(2000). A non-fatal case of intoxication with foxglove, documented by means of liquid chromatography-electrospray-mass-spectrometry. J Forensic Sci .Vol.45:1154-1158.
13. Bagrov, A.Y., Fedorova, O.V (2005). Cardenolide and bufadienolide ligands of the sodium pump. How they work together in NaCl sensitive hypertension. Front Biosci Vol.10: 2250-2256.

14. Buckalew, V.M (2005). Endogenous digitalis-like factors. An historical overview. Front Biosci 1,Vol.0:2325-2334.
15. Blaustein, M.P., Zhang, J., Chen, L., Hamilton, B.P (2006). How does salt retention raise blood pressure? Am J Physiol Regul Integr Comp Physiol; Vol.290:R514-R523.
16. Dec GW (2003). Digoxin remains useful in the management of chronic heart failure. Med Clin North Am .Vol.87:317
17. Tatro DS, ed. Drug Interaction Facts. St. Louis, MO(2002): Wolters Kluwer Health, Inc.; 2004. Jowett N. Foxglove poisoning. Hosp Med.Vol.63:758-759.
18. Wickersham RM, Novak K (2004), managing eds. Drug Facts and Comparisons. St. Louis, MO: Facts and Comparisons
19. Meyer JE (2002). The Herbalist. Hammond, IN: Hammond Book Co; 1934: 96.Belcastro PF. Digitalis: from folklore remedy to valuable drug. J Am Pharm Assoc.Vol. 42:857.

HOW TO CITE: Dnyandeep Jadhav* , Dipak Borse, Chaitanya Baviskar, Arvind K. Hatkar, Rajendra M. Kawade.*, To Prepare Suspension Of Digitalis For Congestive Heart Failures, Int. J. in Pharm. Sci., 2023, Vol 1, Issue 12, 714-721.
https://doi.org/10.5281/zenodo.10426636