WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Method Development and Estimation of Cephradine by UV Spectroscopy

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ABSTRACT-

UV spectroscopy is commonly used to analyze the purity and concentration of pharmaceutical compounds, including cephradine. By measuring the absorbance of light at specific wavelengths, UV spectrophotometry can provide information about the chemical composition and structural characteristics of a substance, as well as its stability and degradation over time.

Cephradine, a new cephalosporin antibiotic whose structure is similar to that of cephalexin, was used to treat 53 episodes of urinary, bronchopulmonary and wound infections in patients presenting a disseminated cancer. Under these particular circumstances were 42% excellent responses, 21% favourable results and 37% bacteriological and clinical failures. The drug was particularly effective in treating infectoins in anatomically normal urinary-tract and wound infections. Cephradine, like other antibiotics, faces the challenge of emerging resistance among bacterial species.

However, there are potential future applications for cephradine and other cephalosporin antibiotics beyond their current clinical use. For example, recent studies have explored the use of cephalosporins in combination with other drugs or therapies for the treatment of tuberculosis, cancer, and other diseases. In addition, there is ongoing research into modifying the structure of cephalosporins like cephradine in order to improve their pharmacokinetic and pharmacodynamic properties, reduce toxicity, and enhance their efficacy against resistant bacteria. These modifications may include changes to the chemical structure or the addition of functional groups that can enhance the drug's activity or facilitate its delivery to target tissues.

The assay was determined by comparing with the absorbance of available brand.

The % assay of 2 available brands have been done and by applying t-test it is concluded that there is no significant difference among three local and one brand leader so they are interchangeable where compliance may occur due to un-affordability of cost to suppress other non compliance issues.[3]

Aim -

To develop a simple spectrophotometeric method for the determination of cephradine in pharmaceutical preparations.

1. Introduction

Cephradine (Cefradine) is a broad-spectrum and orally active cephalosporin. Cephradine is active against both gram-positive and gram-negative pathogens. Cephradine is effective in eradicating most penicillinase-producing organisms.

To treat bacterial infection various antibiotics are used. -lactams (β-LCs), tetracyclines (TCs),macrolides (MCs), aminoglycosides (AGs), amphenicols (AMPs), quinolones (Qs)/fluoroquinolones (FQs), sulfonamides (SAs), and polyether ionophores (IPhs) are the groups of antibiotic used in human . Penicillins and cephalosporins are the most prescribing drugs among β-lactams group. With high potency against gram negative organisms,Cephalosporins are broad spectrum antibiotics.They are widely used to cure bacterial infection . They show maximum resistance against deactivation due to β-lactamases enzyme released by organism]. They are prescribed usually against urinary and upper respiratory tract infection causing organism.

Cephradine is included in cephalosporins first generation class. It is one of the semisynthetic cephalosporin series and posses broad spectrum against variety of organisms. Cefalexin and cephradine has parallel spectrum of activity. Cephradine being antibiotic of the cephalosporin first group (I group) acts bactericidal agents against organisms . It acts by trussing to explicit penicillin-binding receptor(PBP's) positioned inside bacterial cell was which inturns inhibits third and last stage of bactrerial synthesis of cell wall. It is effective for the management of

infections origined by the following microorganisms:All types of gram positive microorganism, Streptococcus pneumoniae, Beta-hemolytic streptococcus, Staphylococcus (coagulase-negative/ positive, penicillinase-producing strains), Escherichia coli, Proteus mirabilis, Klebsiella species,

Moraxella (Brancatarrhalis, Bacteroides species (except fragilis and Bacteroides), subtype of sensitive G- gram-negativemicroorganism (Haemophilus influenzae, Salmonella, Shigella) .

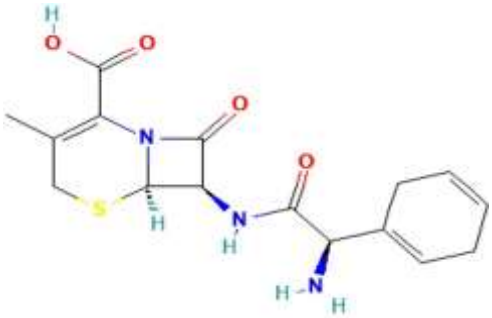
cephalosporins First-generation including cephradine, has and excellent effect when used for the treatment of skin and soft tissue infections caused by S. aureus and the S.pyogenes.

Cephradine is available in different dosage forms such as capsule, dry suspension and IV intravenous injection. From previous research it is reported that cephradine itself quite stable at pH 4 .our research group has done this type of assay for different drugs and they were helpful for selection of drugs.For the determination of cephradine a novel method has been developed by using sodium nitroprusside as a chromogenic reagent . Cephradine, cefotaxima and ceftriaxone has been determined in pharmaceutical formulations, urine and in serum of human] as well. A rapid development of chromatographic determination method for pharmaceutical is also been

established which is used for the detemenation of cephradine in a given pharmaceutical formulations . A novel accurate simple and sensitive spectrophotometric method by using

O-phthaldhyde as a reagent isdeveloped for the determination of Cephradine in dosage forms and bulk.

Figure . Cephradine structure



IUPAC Name

-7-{[Amino(1,4-cyclohexadien-1-yl)acetyl]amino}-3-methyl-8-oxo-5-thia-1-azabicyclo]oct-2-en e-2-carboxylic acid

Molecular formula -C16H19N3O4S

Physical & chemical properties

Molecular formula -C16H19N3O4S Molar mass -349.41 g·mol−1

Colour- white crystalline poweder , polymorphic

Solubility - sparingly soluble in water , very slightly soluble in alcohol , practically insoluble in chloroform & ether

Melting point - 140°c

Pharmacological properties

1 Pharmacodynamic properties

Mechanism of action

Cephradine is a broad-spectrum, bactericidal first generation cephalosporin antibiotic active against both Gram-positive and Gram-negative bacteria. It is also highly active against most strains of penicillinase producing Staphylococci. Cephradine belongs to the group of antibiotics known as cephalosporins. Like other beta-lactam antibiotics, cephradine works by inhibiting the final stage of bacterial cell wall synthesis , which ultimately leads to bacterial cell death. More specifically, cephradine binds to the penicillin-binding proteins (PBPs) involved in cell wall synthesis, which prevents the formation of new peptidoglycan chains and weakens the existing cell wall. This causes the bacterial cell to become more susceptible to osmotic pressure, leading to cell lysis and death.

The pharmacodynamics of cephradine involve its bactericidal action against susceptible bacteria. Cephradine works by inhibiting the synthesis of bacterial cell walls and ultimately causing cell death. Its activity is concentration-dependent and is influenced by the site of infection, the pathogen's susceptibilities, and the duration of exposure. The bactericidal effect of cephradine is generally greater against rapidly growing bacteria, such as those found in the respiratory tract and skin and soft tissue infections.

Cephradine has a broad spectrum of activity against both Gram-positive and Gram-negative bacteria, including Escherichia coli, Klebsiella species, Proteus species, Staphylococcus aureus, and Streptococcus pyogenes, among others.

Overall, the pharmacodynamics of cephradine support its use in the treatment of bacterial infections, though its efficacy may be influenced by various factors related to the pathogen and host.

Pharmacokinetic properties

Absorption: Cephradine is rapidly absorbed after oral administration, with peak serum levels observed within 1 to 2 hours.

Distribution: Cephradine is widely distributed in body fluids and tissues, including the lungs, kidneys, and bone. It has a low degree of protein binding.

Elimination-

Over 90% of the drug is excreted unchanged in the urine within 6 hours. Peak urine concentrations are approximately 1600 micrograms/ml following a 250mg dose, 3200 micrograms/ml following a 500mg dose, and 4000 micrograms/ml following a 1000mg dose. After 48 hours administration of 100mg/kg/day of cefradine for the treatment of otitis media, cefradine has been measured in the middle ear exudate at an average level of 3.6 microgram/ml.

Application

Bacterial infections of the respiratory and urinary tracts and of the skin and soft tissues. These include the following:

- Upper respiratory tract infections -
- Sinusitis
- Pharyngitis
- Tonsillitis,
- Laryngo-Tracheo Bronchitis
- Otitis Media.

Cephradine dosing information

The dosing information for cephradine depends on the specific indication and the patient's age and weight.

The usual adult dose for most indications is 250-500 mg taken orally every 6 hours .

However, depending on the severity of the infection, a higher dose may be prescribed, such as

1-2 grams taken orally every 6-12 hours. The duration of treatment may vary from a few days to several weeks depending on the type and severity of the infection.

For pediatric patients, the dosing of cephradine is based on the child's weight and overall health. The usual dose is 25-50 mg/kg/day divided into several doses. The maximum daily dose is 6 grams per day.

It is important to follow the dosing instructions provided by your healthcare provider and to take the full course of treatment even if you start to feel better before the medication is finished.

Usual Adult Dose for Otitis Media:

250 mg orally every 6 hours or 500 mg orally every 12 hours

Usual Adult Dose for Pharyngitis:

250 mg orally every 6 hours or 500 mg orally every 12 hours

Usual Adult Dose for Upper Respiratory Tract Infection: 250 mg orally every 6 hours or 500 mg orally every 12 hours

Usual Pediatric Dose for Bacterial Infection:

9 months or older: 25 to 50 mg/kg/day in divided doses every 6 to 12 hours Maximum dose: 4 g per day

Methodology

- 1)For the measurement of spectra UV visible 1601 double beam spectrophotometer was used.
- The water was used as solvent.
- 2). Wavelength Selection
- In water 100 ppm of cephradine was prepared exactly.
- 200-40nm UV region was selected for scanning.
- Lamda max was found at 254 nm wavelength, which was used for the absorbance of drug.

2. **Standard Stock Solution**

- 100 ml solution was prepared by dissolving 10mg of cephradine available dosage form.

3. **Sample Preparation**

- From different medical store located in India residential, two different brands , velod, velos, r were purchased.
- Each brands was drawn from one marketed batch and contained 500mg per capsules.
- Each brand was given a serial number for identification and average weight of capsule was taken and powder
- containing 10mg of cephradine was drawn from each brand
- capsule and transferred in 10ml of water and dissolved.
- After dissolving drug volume was makeup to 100ml with water.

4. **Procedure**

- By preparing standard and sample solution having strength of 100ppm/100ml and dilutions, absorbance was taken by using 1cm cell at maximum wavelength 254nm. By applying
- formula quantity of cephadrine (mg) present in each capsule was calculate

Need of work

Technology has made pharmacies more efficient in dealing with patients' medications and quickly accessing medical and patient information.Drug discovery and development among most important class national science activities that contribute to human health and wellbeing of drug discovery including discovering drug targets identifying and optimising lead compounds the development of instruments and design for preclinical development of early fund formulation prototypes and related analytical method. Apart from the pharmacies, technological involvement has also increased the accuracy of drugs in the medical field.

For cephradine specifically, UV spectrophotometry has been used to develop assays for quantifying the drug in different formulations and to analyze its stability in various conditions. UV spectroscopy has also been used in studies to detect the presence of cephradine in biological samples and to evaluate the effectiveness of different drug delivery systems.

Overall, UV spectroscopy is a powerful analytical tool for studying the properties and behavior of cephradine and other pharmaceuticals, and can help ensure their effectiveness and safety for use in clinical and research settings.

Major advantages of uv-vis spectroscopy are

1) High sensitivity.

2) Require only small volume of sample.

3) Linearity over wide range of concentration

4) In astronomy research, an UV / Vis spectrophotometer helps the scientists to analyze the galaxies, neutron stars, and other celestial objects.

5) UV–Vis is another low-cost, fast, and facile characterization technique that is usually applied for NMs study.

Conclusion

- Since cephradine is one of the most prescribing antibiotic in health care system as it covers majority of the infection usually occurring in population
- In this study we have determined the % assay of 2 available brands and byapplying t-test it is concluded that there is no significant difference among three local and one brand leader so they are interchangeable where compliance may occur due to unaffordability of cost to suppress other non compliance issues.

Table- Average weight ,assay & assay of brand of cephradine -

Brand name	Average weight	WT.of 100 ppm	Absorbance at 254 nm	% assay
Velod	549	10.99	2.67	100.1
Velosef	597	11.94	2.66	100

Brand name	Retail price
Velod	189.3
Velosef	212.75

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