RESEARCH ARTICLE

Evaluation of Ciprofloxacin HCl Resin Complex

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ABSTRACT

The primary goal of a number of research study in the pharmaceutical sector is to block the taste and enhance the palatability of the dosage forms for bitter taste API. Taste plays a crucial role in the formulation of dosage forms, and the bitter and unpleasant taste of medications, particularly in pediatric patients, can have negative psychological effects. This study aimed to assess the drug release characteristics from the drug-resin complex. The effectiveness of drug complexity depends on factors such as resin type, ratio, and mixing duration. In this study, we evaluated the complex formation process of ciprofloxacin with the resin and subsequently examined the release of the drug from this complex.

Keywords: Ciprofloxacin, Ion exchange resin, Drug-resin complex, Amberlite 314.

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INTRODUCTION

Among pharma companies, the art of taste-masking possesses a wide range of physiological and physio chemical techniques to prevent APIs or drugs from coming into contact with the tongue. In this way, the response to the sensory nerve either reduced or eliminated.[1]

Physiological approaches involve the incorporation of specific agents onto a pharmaceutical formulation to inhibit or modify the bitter taste elicited by certain APIs. By engaging with the taste buds' receptors, substances including flavors, phosphatidic acid , and sodium chloride can mitigate bitterness. Keep in mind that a lot of drugs that you consume orally have a somewhat harsh taste. As a result, solid preparations often overlay with instructions to consume the tablet whole without chewing it first.[2-4]

However, this approach is not always suitable for small children, as administering an entire tablet is typically not recommended, and in some cases, administering tabs. in overall, is discouraged. Instead, liquid preparations are supposed be used, or else those are unavailable, the tab. must be crumpled into a suspension then administered using a tablespoon. Particularly in these instances, the problem of bitter taste poses a formidable obstacle.[5]

MATERIALS AND METHODS

Ciprofloxacin hydrochloride drug has been received as a gift sample from pharma company. Sample quantities of other additives were obtained at the college level.

Ciprofloxacin Hydrochloride Standard Curve Preparation[6,7]

About 500 mg ciprofloxacin HCl has been dissolved into minor volume of vol was made up to 500 mL 0.1 M hydrochloride mixture. An aliquant of stock solution has been used and additional diluted along with the 0.1 M hydrochloride mixture to get samples of different dilutions. These dilutions were scanned under UV-visible spectrophotometer to ascertain the absorbance.

Preparation of Drug Complex with the Resin[7,8,9]

The activated resin was placed into a SS container filled with deionized water to form a complex. Subsequently, ciprofloxacin-HCl, API, was slowly introduced into the container having the resin while mixing. The drug & resin slurry was mixed for nearly 4 hours. We kept an eye on the slurry's pH at various points in time and used a dilute potassium hydroxide (KOH) solution to keep it at 6.9. Upon the completion of the stirring time, the drug-resin complex was separated from the mixture through a combination of decantation and filtration processes.

The drug-resin complex was then subjected to a thorough wash with DI water and subsequently dry at 75°C. After drying, the material was passed across an appropriate screen to further turn it into granules. Complexed resin was evaluated for drug loading efficiency, differential scanning calorimetry (DSC) & IR evaluation.

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Table 1: Ciprofloxacin HCl standard graph

Concentration(µg/mL)	*Absorbance*
1	0.085
2	0.181
3	0.280
4	0.363
5	0.463

Table 2: Impact of drug-resin proportion upon the formation of complexes

Drug-resin ratio	*Time (Hours)*	*%Drug loading*
1:1		70.31
1:2	3	87.46
1:3		96.25

Table 3: Drug loading efficiency for drug – Amberlite314 complex

Drug-resin ratio	*Time (Hours)*	*%Drug loading*
1:3	3	96.25

Table 4: DSC studies of ciprofloxacin – Amberlite 314 complex

DRC	*DSC(°C)*	
	T peak (°C)	*ΔH_{fusion} (J/g)*
Ciprofloxacin	205.1	162.9
CA- 314 (1:1)	219.6	133.7
CA- 314 (1:2)	210.9	129.8
CA- 314 (1:3)	220.6	122.9

RESULTS AND DISCUSSION

Ciprofloxacin HCl Standard Graph

The standard plot of the drug into the 0.1N HCl is observed to be linear and follows the Beer's & Lambert's law (Table 1 & Figure 1).

Evaluation of Ciprofloxacin HCl- Amberlite 314 Complex

Impact of drug-resin proportion upon the formation of complexes

In various drug resin proportions, it was observed as the amount of resin increases interaction of drug with the resin increases (Table 2). When comparing other quantities, the 1:3 ratio showed the least amount of drug loss during the synthesis of drug resin complexes (Table 3).

Differential scanning salorimetry

As per the differential scanning calorimetry (DSC) graph (Figure 2) & the observed value of melting temperature (Table 4). Neither the pure drug nor its complexes undergo any appreciable changes in melting point. This suggests that there is no incompatibility between the drug and various propositions of resin.

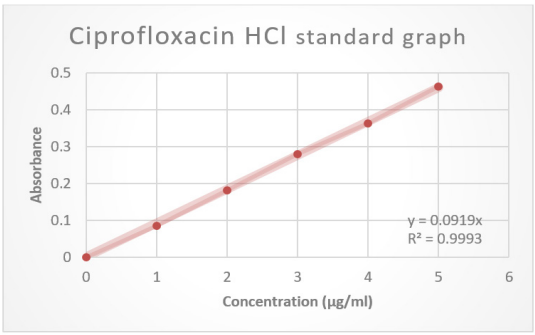

Figure 1: Ciprofloxacin HCl standard curve

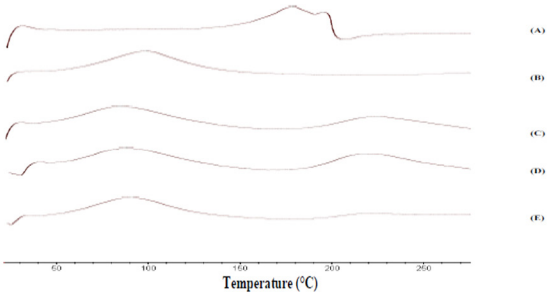

Figure 2: DSC Thermograms of (A) Ciprofloxacin, (B) Amberlite 314, (C) Cipro- Amberlite 314 (1:1), (D) Cipro - Amberlite 314 (1:2), (E) Cipro- Amberlite 314 (1:3)

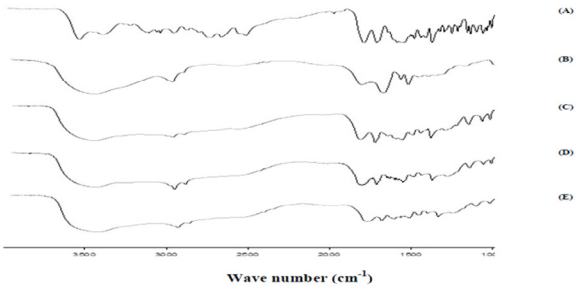

Figure 3: FTIR Spectrum of (A) Ciprofloxacin, (B) Amberlite 314, (C) Cipro- Amberlite 314 (1:1), (D) Cipro - Amberlite 314 (1:2), (E) Cipro - Amberlite 314 (1:3)

Investigation using fourier transform infrared

As per IR graph (Figure 3) there is no change in the major peaks of pure drug and their complexes. This suggests that there is no incompatibility between the drug and various propositions of resin.

CONCLUSION

Combining it with ion exchange resin is an easy and successful way to hide the bitter taste of ciprofloxacin HCl. The prime aim of this investigation was to examine the complex of drug with resin as a means to block the drug's bitter sense of taste. Therefore, the resinate chosen for the study was amberlite 314, with the intention of assessing the feasibility of utilizing drug-resin complexes to control the API's bitter taste.

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