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Development and Evaluation of Swellable Elementary Osmotic Pump Tablet of Glipizide

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ABSTRACT

The medicine glipizide, which is not particularly water-soluble, may now be efficiently delivered with the help of a new kind of tablet called an elementary osmotic pump (EOP). A drug is released from the system via a delivery orifice in the form of a fine dispersion, prepared for absorption and dissolving, by use of the Swellable Elementary Osmotic Pump [SEOP]. SEOP tablets were made by compressing a convex tablet containing a combination of micronized medication and excipients. Wet and swelling agents, osmotic agents, and hydrophobic plasticizers were studied for their effects on release rate. For 24 hours, researchers looked at how several formulations of this dosage form released glipizide at a pH of 6.8. Data collected from osmotic devices revealed that the medication release profile is quite sensitive to the core formulation's polymer type. A reduction in medication release was seen when the dosage of HPMC E50-LV was raised from 30 to 60 mg. By increasing the quantity of wetting agent to 45 mg, the release rate and zero order release pattern of glipizide were much improved. Although the device's semipermeable membrane attenuated glipizide release at concentrations ranging from 20% to 30% dibutylphthalate, the highest efficacy was achieved at this concentration. The optimal orifice diameter was determined to be 500 µm according to the SEM investigations. The 24-hour release rate of GF2 was superior to that of the commercially available Glipizide extended release tablet. There was a strong in-vivo and in-vitro association for GF2 as seen by the greater Cmax and AUC values, according to the bioavailability experiments conducted on albino rabbits for glipizide SEOP and Glipizide extended release tablet. Therefore, glipizide was effectively administered over the course of 24 hours using a newly developed SEOP that achieved zero-order drug release.

Hypertonic phosphate-loaded swellable elementary osmotic pump with zero-order release; glipizide; HPMC E50LV.

INTRODUCTION

Many patients with long-term health conditions, including diabetes, asthma, and heart disease, are prescribed many medications at once. Unfortunately, this approach may lead to unwanted side effects, low patient compliance, and a gradual worsening of symptoms. Improved patient compliance and reduced issues related with multi-drug treatment may be achieved with a system that can provide various medications at a sustained pace, even though controlled drug delivery systems for these drugs have been available independently. Drugs with a short biological half life may have their safety profile and efficacy enhanced with a once-daily formulation, which would also increase patient compliance. From basic matrix tablets to more complex osmotic controlled drug release systems, there are a variety of ways to accomplish controlled release of medicine from dosage forms. [1] Although there is a vast array of osmotic devices available, osmotic systems stand out as very versatile, adaptable, and often used in medical settings. There are several benefits to using an osmotic pump, including the fact that they are straightforward to design and operate, that patients are more likely to take their medication as prescribed, that the therapeutic impact is more stable and lasts longer, and that the blood concentration is uniform. Plus, they won't break the bank. A basic osmotic pump, or EOP, is a tablet encased in a semipermeable membrane, most often made of cellulose acetate [CA], which contains an active ingredient with an appropriate osmotic pressure. Using a laser ablation system (LASER) or a high-speed mechanical driller, a tiny hole is drilled into the coating. When placed in a water-containing environment, the tablet's soluble medication absorbs water through its semi-permeable covering, creating a saturated drug solution within the device. The non-extensible membrane experiences a rise in internal hydrostatic pressure as

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its volume increases from water absorption, which in turn causes a saturated solution of the active agent to flow out of the device via the tiny opening. [2] This research aimed to develop a novel osmotic method similar to EOP for the controlled release of an insoluble medicine [Zero order release]. Similar in design to EOPs but including a unique core composition, this apparatus is known as a Swellable Elementary Osmotic Pump (SEOP). A large quantity of a water-swellable, gel-forming polymer and suspending agents make up the heart of this device. Because the membrane cannot be stretched, the medicine is expelled from the system via the opening when the hydrostatic pressure rises, mostly as a result of the osmotic agents and the swelling force of the polymer. the third

Patients with type II diabetes mellitus are often administered glipizide, an oral hypoglycemic medication that is weakly water-insoluble and belongs to class II of the biopharmaceutical categorization system. Despite being nearly insoluble in water, it has an absolute bioavailability close to 1 and is absorbed from the gastrointestinal tract at a pace limited by its dissolution, making it an effective factor. It requires twice-daily treatment in a significant number of patients, which frequently leads to noncompliance, since its elimination half-life is quite short, lasting just 2-4 hours. This research set out to create a swellable elementary osmotic pump tablet of Glipizide, a medication that dissolves at a rate of 37.2 mg/l in water but is otherwise weakly soluble. To create a novel formulation for Glipizide zero-order delivery, many formulation factors were investigated and adjusted. A strong in vivo-in vitro correlation was seen in the bioavailability experiments of Glipizide SEOP and the commercial extended release tablet conducted in albino rabbits. As a result, Glipizide's new SEOP was effectively developed. [4]

MATERIALS AND METHODS

The Glipizide was acquired from Aurobindo Laboratories in Hyderabad as a complimentary sample. Loba chemie Pvt. Ltd. of Mumbai supplied the cellulose acetate [CA] with 40% acetyl groups that served as the semipermeable membrane. The laboratory in New Delhi, Ranbaxy Laboratories Pvt Ltd, supplied the DBP. We used HPMCE50LV, a water-swellable and gelling agent, from Dr. Reddy Laboratories Pvt. Ltd, Hyd. As an osmotically active agent and a suspending agent, potassium chloride [KCl], polyethylene glycol-400 [PEG-400], and sodium lauryl sulphate [SLS] were all sourced from Finar reagents in Ahmadabad.

Making the Base Tablets

The Glipizide core pills were made using the non-aqueous granulation process, which is known as wet granulation. After passing the glipizide through a 60-mesh sieve, the other materials were put through a 100-mesh sieve. With the exception of the lubricant, glidant, and binder, all of the sieved materials were mixed together by hand for 10 minutes using geometric dilution. Wet mass was obtained by granulating the combination in the PVP K-30 alcohol system and then passing it through filter no. 18. After the granules were dried at 50°C for about 10 minutes, they were passed through filter no. 22 to get a loss on drying [LOD] value ranging from 0.9 to 1.1 percent. The granules were ground with talc and magnesium stearate after passing through filter no. 60. A single stroke tablet punching machine from Cemach, India, equipped with 8mm round standard concave punches, was used to compress the mixture into 250 mg tablets.

Table 1 displays the formulas of several Glipizide core formulations. We measured the consistency of the drug content, hardness, thickness, diameter, and weight of a small sample of randomly selected tablets throughout the compression run. [5]

Tablets Containing Glipizide Osmotic Core Coated and Drilling

A pan coater from VJ Instruments in Mumbai was used to coat the Glipizide core pills. Table 2 lists the ingredients in the coating solution and the various orifice sizes of Glipizide SEOP tablets. A coating solution comprising 0% DBP [GF14], 20% DBP [GF1-GF13], 30% DBP [GF15], 20% PEG-400, and 4% cellulose acetate was applied to the formulations. The coating solution's various components were added one by one. Before adding the next component, the one that was introduced initially was given time to dissolve. Glipizide SEOP core pills and 200 grammes of filler tablets were added to the coating pan. The process began with passing hot air through the tablet bed while the pan was spun at a modest speed of 2–5 RPM. Once the exit temperature hits 28°C, the coating process is initiated. We sprayed the coating solution at a rate of 6-9 ml/min while keeping the pan RPM in the range of 10-15. The entrance air temperature was controlled between 50 and 55°C, and the atomization pressure was maintained at 1 kg/cm2. This allowed the output

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temperature to remain above 28°C. The active pills were coated until the required weight gain was achieved. To prepare the active tablets for testing, they were dried at 50°C for 16 hours. A percentage of weight increase was calculated by randomly taking a few pills throughout the coating run. The range of 130± 10µm was used to adjust the membrane thickness of the basic formulation. [5]

Table 1: Formulation with different core related parameters

Formulations	Swelling agent HPMCE50LV(mg)	Wetting agent SLS (mg)	Osmotic agent KCl (mg)
GF1	15	45	100
GF2	30	45	100
GF3	45	45	100
GF4	60	45	100
GF5	30	15	100
GF6	30	30	100
GF7	30	60	100
GF8	30	45	50
GF9	30	45	75
GF10	30	45	120

* Membrane composition was DBP -20%, PEG-400 -20%, orifice size-500µm and cellulose acetate- 4%. The amount of Glipizide was 10 mg for all formulations

Table 2: Formulations with different semi permeable membrane related parameters [CA 4%, PEG-400 20%]

Formulations	Orifice size (µm)	% DBP
GF11	300	20
GF12	400	20
GF13	600	20
GF14	500	0
GF15	500	30

*Core composition for formulations GF11-GF15 was the same as GF2 [Glipizide 10 mg, HPMCE50LV 30 mg, SLS 45 mg, KCl 100 mg]

Table 3: Pharmacokinetic parameters of Glipizide SEOP and Glipizide extended release Tablet (mean±SD, n=3)

Parameters	Glipizide Extended release Tablet	GF2 [optimized formula]
Cmax	2.6 ng/ml	2.3 ng/ml
Tmax	6 h	6.2 h
$AUC_{0-\infty}$	2754 ng-h /ml	2817.6 ng-h /ml
Ka	0.34 /h	0.29 /h
Ke	0.17 /h	0.16 /h
Vd	13 L	14.5 L
$t_{½}$ (absorption half life)	1.82 h	2.36 h
$t_{½}$ (elimination half life)	4.10 h	9.17 h
CL	11 ml/h	8.1 ml/h

A normal mechanical driller was used to drill a tiny hole through one side of each coated tablet for the tablets.

The compositions were perforated using various orifice sizes, including 300 µm for GF11, 400 µm for GF12, and 500 µm for GF1-GF10, GF14, and GF15. The size of the orifice was regulated and quantified microscopically using SEM after drilling. the third

Assessing the Smotic Coatings on Glipizide Tablets

It was necessary to measure the bulk and tapped density of the Glipizide powder mixes before compression. The Hausner ratio and compressibility index were determined using these numbers. The weight fluctuation and content homogeneity of Glipizide osmotic tablets, both coated and uncoated, were assessed after compression. We used Vernier calipers to measure the thickness and diameter. A hardness tester (Monsanto hardness tester, Pharma lab, Ahmadabad) was used to evaluate the hardness of the randomly chosen tablets. Twenty correctly weighted uncoated osmotic tablets were tested for friability on a friabilator (Roche friabilator, Mumbai).

Controlled Release Experiment

The in-vitro drug release from the Glipizide osmotic tablets was determined using the USP-II Paddle dissolving equipment, which was manufactured by Electro Lab in Mumbai. The dissolving media used was 900 cc of phosphate buffer solution [SIF, pH 6.8] kept at 37±0.5°C and 100 RPM under sink conditions. Spectroscopic analysis was performed using UV-Visible spectroscopy, a technique developed by Schimadzu in Japan, at a wavelength of 274 nm, on 5 ml drug samples that had been replaced with new medium at different times. At least three tablets were tested for release in order to provide average results with standard deviation.

Researchers Examined Release Kinetics

The kinetics of drug release were described by analyzing in-vitro dissolution data acquired for different formulations using several mathematical models [zero order, first order]. Osmotic systems should adhere to zero-order kinetics and release a large proportion of their medication content at a consistent pace. Methods such as tL [time needed for water to imbibe through the semipermeable membrane, gel formation process and its volume augmentation, and migration of the created gel carrying drug particles out of the tiny aperture] were used to compare different formulations. An further crucial parameter is the RSQ zero, which stands for the R-squared value of the release data that was fitted to the zero-order equation. We analyzed the various formulas using the RSQ zero and discarded the one

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with a tL greater than 4 hours. A one-hour lag time is required to wet the device and allow water to penetrate the core since the active ingredient in the pill cannot create an osmotic action because of its limited aqueous solubility. Research using SEM Surface of the coated tablets before and after dissolving tests were conducted using a Scanning Electron Microscope [SEM] to clarify the process of drug release from in-house formulations. Efficacy and Safety of Glipizide Oral Solution for Rabbits [6] Following prior reports, a pharmacokinetic investigation was conducted using rabbits. The research was reported in full to the animal ethics committee at the institution. The research could proceed if the ethics commission gave its stamp of approval. Prior to the trial, the rabbits were split into two groups and given an overnight fast. It took four hours after injection before the test animal could freely consume food and water. The rabbits in one group received a 10 mg extended-release pill of Glipizide, whereas the rabbits in the other group received a 10 mg SEOP that they had prepared themselves. At 0, 3, 6, 9, 12, and 24 hours, heparinized tubes were used to collect 2 ml of blood samples from the ear vein. There was a 10-minute centrifugation run on the blood samples. Before further examination, the plasma was frozen at -20°C. The plasma samples were mixed with 0.05M hydrochloric acid in 1 ml of sample fluid and vortexed for 30 seconds. The resultant samples were then extracted twice with ethyl acetate, each time using 3 ml of the solvent and three minutes of intense ultrasound. Following a 10-minute centrifugation run at 2000 RPM, the ethyl acetate layers were removed and allowed to evaporate until completely dry in an air stream. The remaining substance was mixed with 50µl of mobile phase using a vortexing device, and then 20µl of the mixture was introduced into the HPLC system to determine the concentration of Glipizide. high-performance liquid chromatography [7]

An HPLC system manufactured by Shimadzu in Japan was used to analyze the drug in plasma. The apparatus was equipped with a column C18 measuring 4.8 × 250 and 5 µm, and the mobile phase was a 35:65 combination of acetonitrile and 0.01 M phosphate buffer with a pH of 3.5. The flow rate of the mobile phase was 1 ml/min. A temperature of 35°C and a wavelength of 274nm were maintained for the column. [8]

RESULTS AND DISCUSSION

Every one of the formulations met the compendial requirements for homogeneity of content, compressibility index, weight variation, and Hausner ratio. All of the formulations had hardness values between four and five kilograms per square centimeter. For every batch, the proportion of weight lost during friability was less than 1%. So, it was determined that the Glipizide SEOPs were high-quality and met all the regulatory standards. Investigated were the effects of the orifice diameter, membrane parameters, and core parameters.

A Swelling Agent's Impact on the Release Profile

Polymer swelling, in addition to osmotic pressure, plays a crucial role in regulating the dosage of drugs released by osmotic devices. Swelling of the polymer provides an additional driving force for the release of the medicine from these devices, in addition to the basic osmotic action. Because the medication [Glipizide] is poorly soluble in water, a swelling polymer was used for osmotic distribution. The medicine is delivered at a rather consistent pace due to the uniform rate of swelling of the polymer. The gadget also does not burst due to the pressure that is generated during the swelling process. The osmotic devices' cores were filled with various formulations made with HPMC E50 LV at concentrations of 15 mg, 30 mg, 45 mg, and 60 mg. Figure 1 featured the release profiles of different formulations. After 24 hours, only 61% of the 15 mg [GF1] HPMC E50 LV had been released. A minor increase to 30 mg [GF2] of HPMCE50LV resulted in a release of 93.2% of the medication within 24 hours. Nevertheless, there was no discernible increase in drug release when the dosage of HPMCE50LV was raised from 30 mg to 45 mg [GF3] and 60 mg [GF4]. The high viscosity of HPMCE50LV may have contributed to this impact by making it more difficult for the medication to be released from the system via the semipermeable coating's opening. In order to construct the osmotic pump, it is essential to choose an appropriate polymer concentration. The osmotic device will rupture with a high concentration of polymer and will have low viscosity within with a low concentration. Core formulations comprising 30 mg of HPMCE50LV [GF2] had a stronger correlation coefficient for zero order release, as shown by the results of the kinetic analysis of all release data [GF1 (0.980), GF2 (0.987), GF3 (0.965) and GF4 (0.981)]. So, for the sake of doing more research, the GF2 formulation was chosen.

How the Wetting Agent Affects the Release Profile

Reportedly, controlled porosity osmotic pumps and basic osmotic pumps may not be able to achieve relevant release rates for medicines that are insoluble

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in water. Reason being, drug solubility in the core has a direct bearing on the kinetics of osmotic drug release. The use of SLS as a solubility modifier allowed the release rate of Glipizide to be increased, despite the fact that the medication is nearly insoluble in water. Distributed throughout the mixture, SLS often serves as a wicking agent, increasing the drug's contact surface area with entering water. Soluble drug release via the membrane's delivery hole is therefore a possible outcome. [9] Various combinations were made using varying amounts of SLS (15 mg, 30 mg, 45 mg, and 60 mg), and the resulting dissolving profiles are shown in Figure 2. With 15 mg [GF5] of SLS, just a little fraction of the medication was released within 24 hours (49.8%). Increases in dosage from 15 mg to 30 mg and 45 mg resulted in 73.2% and 93.2% drug release after 24 hours, respectively, demonstrating a significant improvement in the drug release rate. Even after increasing the dosage to 60 mg [GF7, 88.6%], neither the release rate nor the correlation coefficient were improved. The results showed that increasing the amount of SLS from 45 mg to 60 mg had no effect on the correlation coefficient, and the GF2 formulation had the best correlation coefficient (RSQzero values of 0.932 for GF5, 0.968 for GF6, 0.987 for GF2, and 0.972 for GF7). The findings indicated that a concentration of 45 mg of SLS in the GF2 formulation was optimal.

How an Osmotic Agent Affects the Rate of Release

The rate of medication release from the internal compartment to the outside environment may be controlled by optimizing the osmotic agent, the primary component. Only when the core tablet's osmotic pressure rises to a certain point does SEOP release its medication. Hydrostatic pressure allows the medicine to be released from the orifice after solubilization, which occurs when water penetrates into the core of an SEOP because of the difference in osmotic pressure between the inside and outside of the device. When the internal and external osmotic pressures are equal, the process will end. To the exterior of SEOP, the medicine and osmotic agent are forced out by this pressure. Figure 3 shows the effects of adding KCl into the osmotic core at different concentrations (50 mg, 75 mg, 100 mg, and 120 mg). The findings show that the rate of Glipizide SEOP release was significantly affected by the KCl concentration. Within 24 hours, the GF8 formulation released 52.6% of the medication while using a modest osmogen dose of KCl (50 mg). With each increment of 50 mg KCl, the release rate improved, reaching 75 mg [GF9, 76.5%] and 100 mg [GF2, 93.2%]. However, the integrity of the membrane was entirely compromised when the concentration was raised above 100 mg, resulting in burst and fast drug release in the GF10 formulation that included 120 mg of KCl. Additionally, this formulation exhibited non-zero order kinetics and released 91.6% of the medication within 16 hours [tL > 4 h]. Consequently, this formulation was disregarded. Formulation GF10, which did not follow zero-order kinetics and displayed burst release after 16 hours, as well as RSQ zero for GF8 [0.937], GF9 [0.972], and GF2 [0.987]—all improved when the KCl content was increased to 100 mg. Further research were contemplated for the formulation containing 100 mg of KCl [GF2] in light of the aforementioned findings.

Effects of Plasticizer and Coating Solution on Release Rate

The cellulose acetate coating solution included DBP, a lipophilic plasticizer, and PEG-400, a hydrophilic plasticizer. Since PEG-400 is a hydrophilic plasticizer, it may be readily leached off, resulting in a completely porous structure that enhances the drug release rate and permeability. The drug release rate was reduced because residual DBP would resist water diffusion, due to its hydrophobic property and the fact that it is insoluble in water. The coating solution was modified by adding varying doses of DBP. Figure 4 shows the release patterns of this formulation. The three formulations GF14, GF2, and GF15 all include 20% w/w PEG-400 and 4% CA, however the amounts of the hydrophobic plasticizer DBP range from 0% w/w to 30% w/w. Due to the presence of only hydrophilic plasticizer in the tablet, the sample containing 0% w/w [GF14] of DBP had the maximum release rate [93.4%] after 16 hours, according to the data. The osmotic device remained intact throughout the release process and released 93.2% of the medication when the concentration of DBP was raised from 0% w/w [GF14] to 20% w/w [GF2]. No cracks were seen in the device. The findings also shown that the drug release rate was reduced by 80.9% [GF15] when the concentration of DBP was raised from 20% w/w to 30% w/w, likely due to its hydrophobic nature. Leaching became more challenging as DBP incorporation increased, leading to a decrease in permeability and release rate. Findings suggest that SPM's hydrophilic and lipophilic components must be well-balanced for the desired release profile and zero-order kinetics to be realized. The tenth The optimal percentages in the SPM to achieve a zero-order release device were determined to be the coating solution [CA-4% w/w] including 20% w/w of DBP and 20% w/w of PEG-400, according to the findings.

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Orifice Size's Effect on Release Rate

Orifice diameters of 300 εm [GF11], 400 µm [GF12], 500 µm [GF2], and 600 µm [GF13] were used to drill different formulations. With an increase in the orifice size, the rate of release of Glipizide from SEOP increased, as shown in Fig. 5, which indicates the influence of orifice size on the drug release rate. After 24 hours, 52.6%, 76.5%, and 93.2% of the drug was released from the 300µm, 400µm, and 500µm orifice size tablets, respectively. However, the GF13 formulation exhibited a burst effect and released 85.6% of the medication after 16 hours (tL > 4 h) after being drilled with an orifice size of 600 µm. Tables with orifice sizes of 300µm, 400µm, and 500µm had RSQ zero values of 0.937, 0.972, and 0.987, respectively, according to the kinetics of release data for zero-order kinetics. The GF13 formulation, with an orifice size of 600 µm, exhibited non-zero order kinetics, as shown by the RSQ zero value of 0.860. In light of the findings, it was determined that the best formulations had an orifice size of 500 µm.

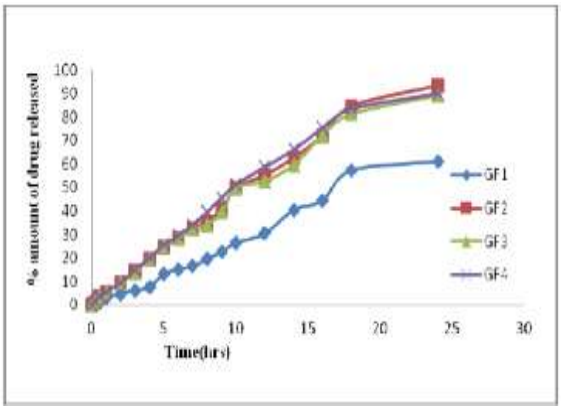

Fig. 1: Influence of swelling agent on the release profile of GF1-GF4

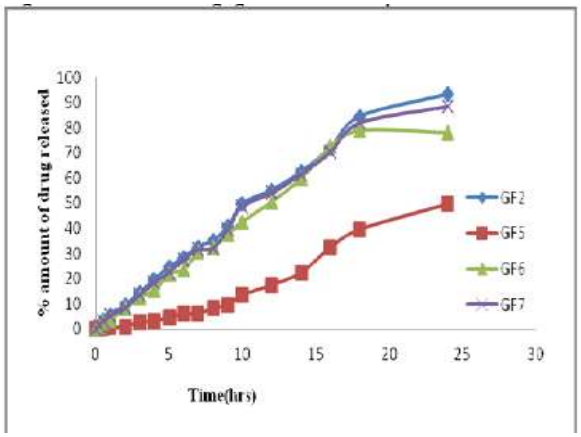

Fig. 2: Influence of wetting agent on the release profile of GF2&GF5- GF7

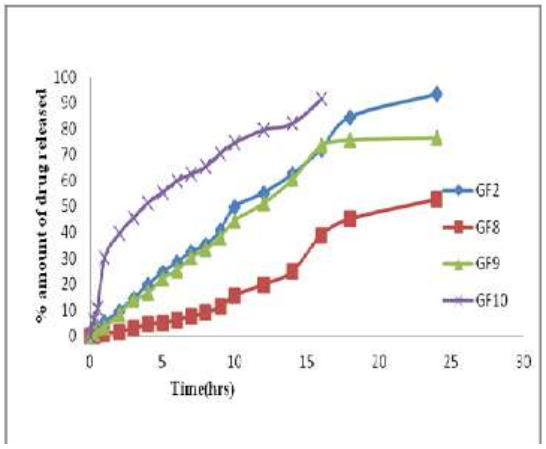

Fig. 3: Influence of osmotic agent on the release profile of GF2&GF8- GF10

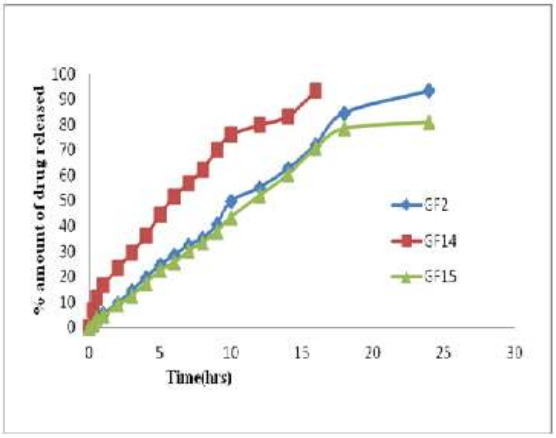

Fig. 4: Influence of % DBP on the release rate of GF2, GF14 & GF15

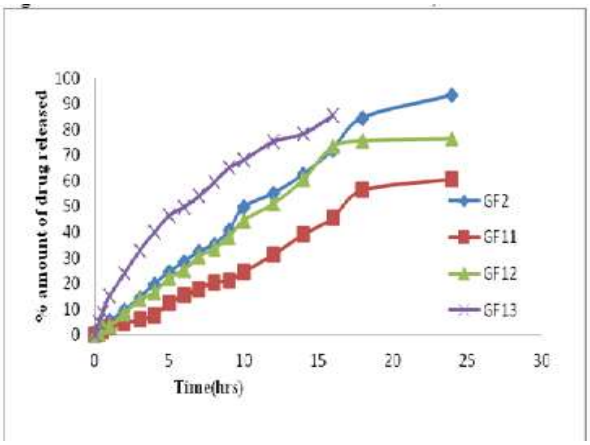

Fig. 5: Influence of orifice size on the release profile of GF2& GF11- GF13

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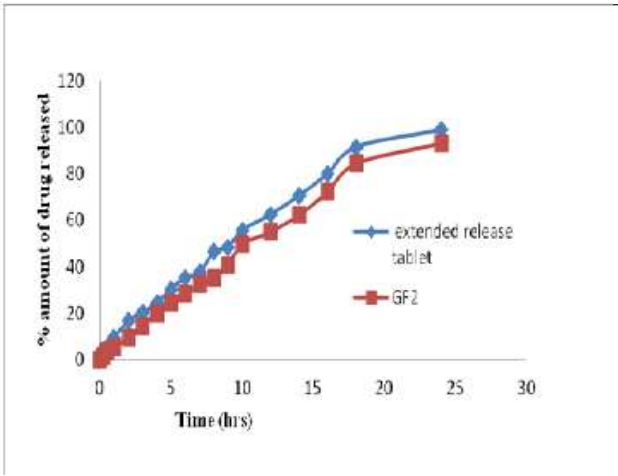

Fig. 6: Drug release kinetics of glipizide SEOP and commercial extended release Tablet

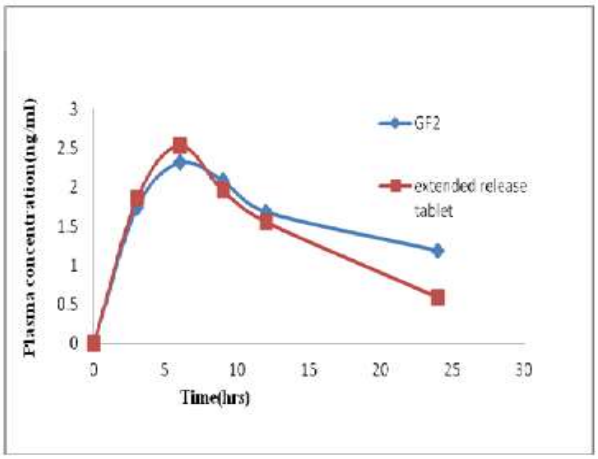

Fig. 7: Plasma concentration time profile of commercial extended release Tablet and GF2 [optimized formula]

Scanning Electron Microscopy [SEM]

For the promising formulation [GF2], the surface of the coated tablet and the orifice size were examined using SEM to understand the mechanism of drug release from in-house formulations. The optimal orifice size was determined to be 500µm.

Glipizide Seop's Drug Release Kinetics

The Glipizide SEOP's characteristics were confirmed by comparing it to the commercially available Glipizide extended release tablet; both release profiles are shown in Figure 6. Mathematical models were fitted to the experimental data to determine the drug release process. When comparing Glipizide SEOP tablet RSQ zero values from first order release models [0.891-0.977] to those from zero order release models [0.932-0987], the former showed a significant improvement. Due to a greater increase in intracellular osmotic pressure, first-order release kinetics RSQ zero values were greater than zero-order release values in formulations containing 120 mg of KCl. Although the RSQ zero value of GF2 [0.987] was marginally greater than that of the commercial extended tablet [0.977], the zero order rate constant [Ko] for both the promising formulation [GF2] and the commercial formulation was 4.205. Because of this, this formulation [GF2] was contemplated for more research.

Research on Pharmacokinetics

In Fig. 7, a single-compartment model was able to track the profiles of the mean plasma concentration vs time for both the Glipizide SEOP and the commercial extended release tablet. In Table 3 we can see the average pharmacokinetic variables. Lipizide SEOP has a relative bioavailability of 102.3% when compared to the commercially available extended formulation. In comparison to commercial extended tablets, SEOP had a lower half-life (Ka) of 0.29 hours and a peak concentration (Tmax) of 6.2 hours; in contrast, commercial extended tablets had a maximum concentration (Cmax) of 2.6 nanograms per milliliter of blood. According to these findings, the zero-model release of Glipizide from SEOP resulted in more stable Glipizide concentrations in the blood compared to Lipizide prolonged release tablets, and SEOP offered a safer therapeutic window than the commercially available extended-release tablets. Compared to the commercial prolonged release tablet, SEOP had a lower clearance [CL] of 8.1 ml/h, suggesting that the in-vivo retention duration of SEOP was longer and that the therapeutic effects might remain for a longer period. The present study explores the development of Glipizide Swellable Elementary Osmotic Pump [SEOP] tablets with the following ingredients: KCl for swelling, sodium lauryl sulphate for wetting, and DBP for hydrophobic plasticizer. The tablets are coated with a cellulose acetate membrane and have an orifice drilled into one side. Since a push chamber wasn't necessary, the SEOP was easy to assemble. To optimize the SEOP for the delivery of the model medication Glipizide, we adjusted the constituent quantities and the size of the orifice until we reached zero-order release kinetics. The improved system demonstrated the ability to release Glipizide in a pH 6.8 medium for 24 hours with zero-order kinetics. Lipizide SEOP had a relative bioavailability of 102.3% when compared to the commercially available extended formulation, suggesting that the

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GF2 formulation may have beneficial pharmacological effects in living organisms. The facts presented here lend credence to the idea that SEOP might be used to transport drugs like Glipizide, which are insoluble in water, to the patient.

REFERENCES

1. Ouyang D, Nie S, Liluai, Guo H, Liu H, Pan W. In vitro- in vivo evaluation of two extended release preparations of combination metformin and glipizide. Drug Development and Industrial Pharmacy 2005; 31: 677-685.

2. Suresh PV, Prabhakaran D, Paramjit S, Parijat K. Effect of hydrophilic polymers on release of diltiazem hydrochloride from elementary osmotic pump. International Journal of Pharmaceutics 2003; 259: 173-179.

3. Nokhodchi A, Mohammed NM, Javad S, Mahbobah S, Parinaz A, Parise R. Factors affecting the release of nifedipine from a swellable elementary osmotic pump. Drug Delivery 2008; 15: 43- 48.

4. Sanjay G, Rajan KV. Development and evaluation of osmotically controlled oral drug delivery system of glipizide. European Journal of Pharmaceutics and Biopharmaceutics 2004; 57: 513-525.

5. Mahalaxmi R, Phanidhar S, Ravikumar, Atin K, Pritam KD, Narhede R. Enhancement of dissolution of glipizide from controlled porosity osmotic pump using a wicking agent and a solubilizing agent. International Journal of Pharmatech Research 2009; 1(3): 705-711.

6. Charulatha R, Kumaravel RR. Design and evaluation of swellable delivery of anti hypersensitive drugs by swellable elementary osmotic pump (SEOP). Journal of Pharmacy Research 2012; 5(4): 2141-2145.

7. Xiong KC, Minsua, Yan G, Fengliang C, Guangxi Z. Design and evaluation of osmotic pump based controlled release system of ambroxol hydrochloride. Pharmaceutical Development and Technology 2010; 1-8.

8. Hakan E. High performance liquid chromatographic determination of glipizide in human plasma and urine. Journal of Chromatography 1987; 421: 319-326.

9. Sanjay G, Rajan KV, Divi MK. Formulation aspects in the development of osmotically controlled oral drug delivery systems. Drug Development and Industrial Pharmacy 2000; 26(7): 695-708.

10. Ali N, Javad S, Parinaz A, Parise R, Mahbobah S, Ali RS. Swellable elementary osmotic pump (SEOP): An effective device for delivery for poorly water soluble drugs. European Journal of Pharmaceutics and Biopharmaceutics 2008; 68: 289-297.