International Journal of Pharmacy

www.ijpjournal.org

e-ISSN: 2249 – 7684
Print ISSN: 2249 – 7692

CONTROLLED RELEASE OF TELBIVUDINE WITH MATRIX TABLETS USING NATURAL AND SYNTHETIC POLYMERS

Sukanya N*, Manova E

Department of Pharmaceutics, Sun Institute of Pharmaceutical Education and Research, Kakupalli, Nellore-524346, AP, India.

★★★★★★★★★★

ABSTRACT

The oral route of administration is likely the least invasive technique of giving pharmaceuticals; it is a route that the patient understands and accepts, and it is a route that the patient can administer. Solid oral dosage forms provide several advantages for the manufacturer: they are often the most stable forms of medications, they are small, and their appearance may be altered to generate brand recognition. Telbivudine was chosen as a medication that is soluble at the pH of the intestine. Telbivudine is an important component of HIV therapy. In this study, an attempt was made to develop matrix porous Telbivudine tablets. There were several grades of hydroxypropyl methyl cellulose and eudragit polymers utilised. All of the formulations were made using a 6mm punch on an 8-station rotary tablet punching machine using the direct compression method. The combined flow characteristics of all the formulations were satisfactory, including angle of repose, bulk density, and tapped density. The LTF3 formulation, with a percent drug release of 98.65 percent in 10 hours, was found to be the most optimal of all the formulations. HPMC K15M is included in the LTF3 formulation at a dosage of 20 mg.

Keywords: Telbivudine, Matrix tablets, HIV, HPMC

INTRODUCTION

Because of their excellent stability and convenience of administration, tablets are one of the most extensively utilised oral dosage forms. Tablet computers have been popular since the second part of the nineteenth century, and their popularity continues to rise. This is owing to the fact that designing dose forms for the oral route is more feasible than for the parenteral or any other route. Oral sustained release delivery systems are sensitive to a number of intercalated elements that might have a significant impact on their design. A controlled drug delivery system is one that employs a homogeneous dispersion of drug particles in either a lipophilic or a hydrophilic polymer matrix to administer medication [1].

Because of their versatility in providing a desired drug release profile, economic effectiveness, and widespread regulatory approval, hydrophilic and hydrophobic polymer matrix systems are frequently employed for creating oral sustained release drug delivery dosage forms. Large-scale production necessitates a simpler formulation with the most cost-effective dose form. In large-scale production, the direct compression method of matrix tablet formulation is the most appropriate [2].

Because of its water solubility and shorter half-life, telbivudine is frequently used in the treatment of Hepatitis B and AIDS, either alone or in combination with other antiviral medicines (6 hours). Because to the medication's water solubility and short half-life (6 hours), it necessitates frequent oral administration, and due to the numerous modern approaches for regulating drug release, matrix systems provide a number of benefits, including ease of formulation and improved control over the release. The study's goal is to develop and test Telbivudine matrix porosity tablets employing various polymers as diluents, such as various grades of hydroxypropyl methyl cellulose and microcrystalline cellulose.

Corresponding Author:- **Sukanya N** Email:- sukanyanallamakala30@gmail.com

MATERIALS AND METHODS

NATCO laboratories provided the telbivudine medication, while SD Fine Chem in Mumbai provided the polymers such as HPMC, Eudragit, MCC, and PVP. The only reagents and substances employed in the study were analytical grade.

Determination oF UV Absorption maxima

Telbivudine solution was produced in 0.1 N HCL and diluted to the appropriate concentration. The solution's UV spectrum was captured using a Lab India 3200 UV/Vis twin beam Spectrophotometer. UV maxima were seen in the solution at 224 nm.

Tablet formulation:

All of the components listed in Table 1 were run through a sieve with a mesh size of 60 mesh and collected separately. Ingredients were combined in a geometrical order and thoroughly mixed for 15 minutes to achieve a homogenous blend, which was then passed through mesh #20. The powder combination was mixed with talc and magnesium stearate, then crushed with 11mm round, biconcave punches on a 16-station rotating tablet compression machine [3].

Post compression parameters:

1. Weight variation:

20 tablets were selected randomly from the lot and weighted individually to check for weight variation.

2. Hardness:

Hardness or tablet crushing strength (fc), the force required to break a tablet in a diametric compression was measured using Monsanto tablet hardness tester. It is expressed in kg/cm^2[3].

3. Thickness:

Three tablets were selected randomly from each batch and thickness was measured by using Vernier Caliper [4].

4. Friability (F):

The strength of a tablet is measured by its friability. This test uses a plastic container that rotates at a speed of 25 rpm, lowering the tablets to a distance of 6 inches with each rotation, to submit a number of tablets to the combined impact of shock abrasion. A sample of pre-weighed tablets was put in a Roche friabilizer and spun for 100 revolutions. After that, the pills were dusted and reweighed. A weight decrease of less than 1% is typically seen as acceptable. The following formula was used to compute percent friability (percent F) [5].

$$F = \frac{W_{initial} - W_{final}}{W_{initial}} \times 100$$

5. In-Vitro drug release:

The dissolving profile was used to estimate the drug's release in vitro. The USP II Paddle device was utilised, with the paddle rotating at 50 rpm and the dissolving media being acid buffer 0.1N HCL (pH 1.2, 900 ml). After 2 hours, use phosphate buffer with a pH of 6.8 as a dissolving media [6].

Table 1. Formulation of Telbivudine matrix porus tablets

INGREDIENT	LTF_1	LTF_2	LTF_3	LTF_4	LTF_5	LTF_6	LTF_7	LTF_8	LTF_9
Telbivudine	20	20	20	20	20	20	20	20	20
HPMC K4M	10	20	-	-	-	-	-	-	-
HPMC K15M	-	-	10	20	-	-	-	-	-
HPMC K100M	-	-	-	-	10	20	-	-	-
Eudragit L-100	-	-	-	-	-	-	10	20	-
Eudragit S 100	-	-	-	-	-	-	-	-	10
PVP K30	5	5	5	5	5	5	5	5	5
Mg Stearate	2	2	2	2	2	2	2	2	2
MCC	QS	QS	QS	QS	QS	QS	QS	QS	QS

All ingredients are expressed in mg only

Table 2: Post compression tablet evaluation parameters

FD	Weight variation (mg)	Hardness (kg/cm)	Thickness (mm)	Disintegration Time (min)	Friability (%)	Assay (%)
LTF_1	105.3	4.51	1.59	20.39	0.43	97.52
LTF_2	104.3	4.61	1.64	22.72	0.34	98.84
LTF_3	110.3	4.41	1.59	30.42	0.49	98.45
LTF_4	109.3	4.81	1.58	19.05	0.47	99.63

LTF5	99.69	4.61	1.59	30.42	0.49	98.45
LTF6	102.3	4.81	1.64	22.72	0.34	98.84
LTF7	101.3	5.01	1.59	30.42	0.49	98.45
LTF8	107.3	4.81	1.56	17.05	0.34	99.54
LTF9	102.3	4.61	1.56	17.05	0.34	99.54

Table 3: Invitro dissolution data

Time(hrs)	LTF1	LTF2	LTF3	LTF4	LTF5	LTF6	LTF7	LTF8	LTF9
1	20.26	14.29	15.05	17.24	14.69	16.25	21.14	19.54	23.59
2	32.72	20.69	22.6	29.59	28.5	25.5	32.93	31.95	38.41
3	49.79	39.38	40.98	40.21	43.95	36.97	43.33	49.39	44.35
4	55.36	59.68	48.33	56.97	66.03	42.92	66.64	61.25	51.12
5	60.48	77.75	54.6	67	79.43	58.59	75.02	79.14	67.01
6	74.41	80.83	59.9	76.8	96.34	62.84	84.44	82.76	79.16
7	88.48	98.85	66.77	85.31		75.4	95.78	94.87	84.45
8	97.77		74.52	97.92		84.45			97.21
9			89.19			98.21			
10			98.65						

Figure 1: standard graph of Telbivudine in 0.1 N HCl

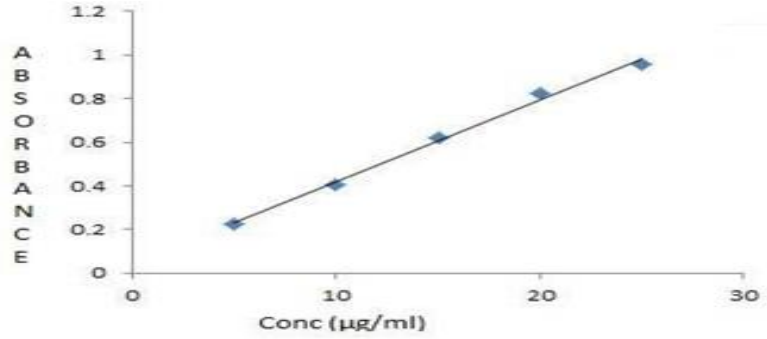


Figure 2: Disintegration time of prepared tablet formulations

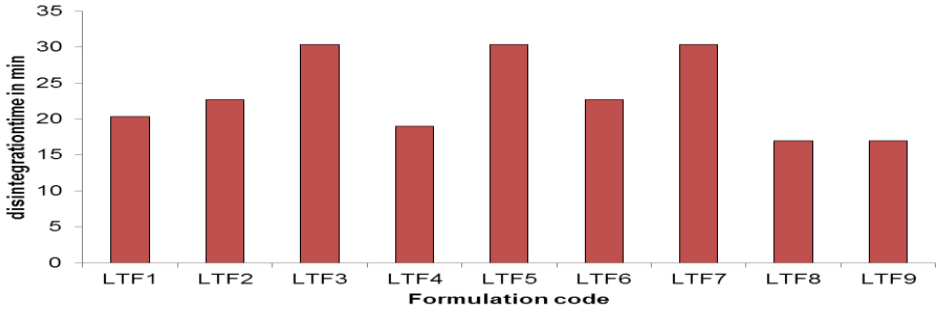
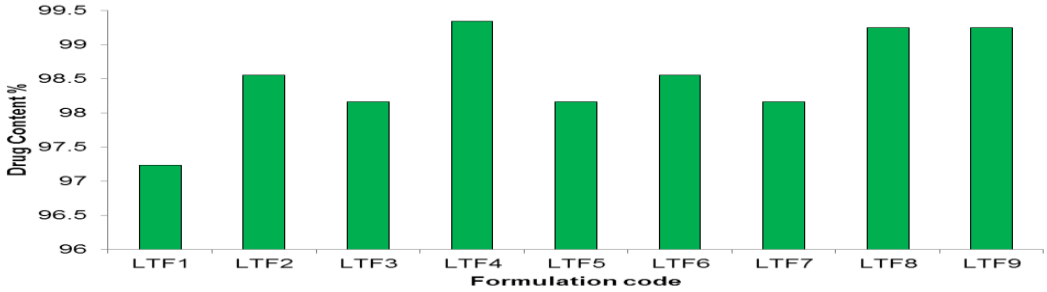


Figure 3: % drug content of prepared tablet formulations



RESULTS AND DISCUSSION

Standard Calibration curve of Telbivudine:

It was found that the estimation of Telbivudine by UV spectrophotometric method at λ_{max} 224.0 nm in 0.1N Hydrochloric acid had good reproducibility and this method was used in the study. The correlation coefficient for the standard curve was found to be closer to 1, at the concentration range, 5- 25µg/ml.

Evaluation of Telbivudine Matrix porous tablets:

Post compression Parameters:

The surface nature of the tablets was visually examined, and it was determined that there were no faults such as capping, chipping, or lamination. The thickness, diameter, hardness, friability, weight fluctuation, and drug content of Telbivudine matrix tablets (LTF1 to LTF9) were measured, and the findings are presented in table 2.

A tablet is made to hold a specified amount of medication. The pharmacopoeial limit for percentage variation is 5% when the average weight of the pill is 400 mg. All formulations passed the weight variation test according to the pharmacopoeial requirements IP 2007 since the percentage deviation from average tablet weight was determined to be within the specified limits for all tablets. Percentage friability of all the formulations was found to be in the range from 0.050 to 0.150 %. This indicates good handling property of the prepared matrix tablet. The drug content of all the formulation was found to be in the range from 98.48 ± 0.52 to 100.90 ± 0.45 % w/w, which was within the specified limit as per IP 2007.

Invitro Dissolution studies:

In vitro dissolving investigations were performed using 500ml of 0.1 N HCl in a USP dissolution equipment for 2 hours, followed by 6.8ph phosphate buffer using the paddle technique. The dissolution tests lasted roughly 8 hours and 15 minutes.

CONCLUSION

The sustained release matrix tablets of Telbivudine were made in this study employing a direct compression approach and release retardant polymers such as hydroxypropyl methylcellulose, methylcellulose, and ethyl cellulose. Only physiochemical characterization, such as angle of repose, Carr's index, hausner ratio, weight fluctuation, hardness, thickness, friability, drug content, and in vitro assessment of Telbivudine matrix tablets, were done in this study. In addition to in vitro investigations, in vivo drug testing is critical. In the future, in vivo investigations will be needed to establish the in vitro-in vivo correlation (IVIVC), which is required for the creation of effective formulations, as well as long-term stability studies.

REFERENCES

1. Chien Y.W., Controlled- and modulated-release drug-delivery systems. Ency- clopedia of pharmaceutical technology. New York, Dekker, pgs 281-313, 1992.
2. D. Krishnarajan, C. Mahesh Reddy , Sasikanth Kanikanti , N. Senthil Kumar and M. Purushothaman Formulation And Evaluation Of Sustained Release Matrix Tablets Of Levofloxacin Using Natural Polymer Pharmacophore 2013, Vol. 4 (5), 146-157
3. Aastha Saxena, N. Srinivas and M. Sravanthi Formulation and In-Vitro Evalu- ation of Matrix Type Sustained Release Tablets of Paliperidone Innovations in Pharmaceuticals and Pharmacotherapy Vol 1 (3), 185-198, 2013
4. Bhavani Boddeda, P.V. Kamala Kumari , K.P.R. Chowdary Formulation and evaluation of glipizide sustained release tablets Int J Pharm Biomed Res 2012, 3(1), 44-48
5. P. Suresh Kumar, S. Navaneetha Krishnan, S. Pavani, Y. Surendarnath, S. Divya and Y. Sahithi. Formulation and evaluation of rabeprazole sodium delayed release tablets Der Pharmacia Lettre, 2012, 4 (1):287-296
6. Karunapriya Chitra, Srinath N., Rama Devi Bhimavarapu, N. Gowthami, Haritha Meda, Dhavani Kanikanti and Manasa Anne Development And In Vitro Eval- uation Of Sustained Release Matrix Tablets Of Salbutamol Sulphate Using Hydro-philic And Hydrophobic Polymers Bulletin of Pharmaceutical Research 2012;2(3):112-7