www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating 2017: 5.03
TPI 2017; 6(7): 184-187

www.thepharmajournal.com
Received: 27-05-2017
Accepted: 28-06-2017

Vivek Kumar
SBMNIPS&R, Baba Mastnath University, Rohtak, Haryana, India

Pawan Jalwal
SBMNIPS&R, Baba Mastnath University, Rohtak, Haryana, India

Surender Singh
Pharmacist Accident & emergency PGIMS, Rohtak, Haryana, India

Correspondence
Vivek Kumar
SBMNIPS&R, Baba Mastnath University, Rohtak, Haryana, India

Formulation and evaluation of Sultamicillin dispersible tablets

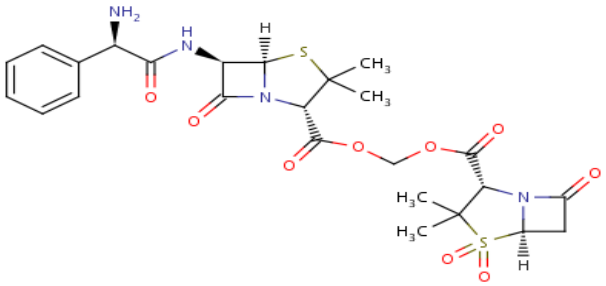
Vivek Kumar, Pawan Jalwal and Surender Singh

Abstract
The goal of this research is to formulate dispersible tablet of Sultamicillin for kids. It is a comfortable formulation for infants, toddlers and pre-school children. Dispersible tablets usually disintegrate within three minutes when put into water or a small amount of breast milk. Sultamicillin is a mutual prodrug of Ampicillin and Sulbactam. Sulbactam is β-lactamase inhibitor which in combination with Ampicillin increases the antibacterial activity of Ampicillin. The aim was achieved by using super disintegrant like crosscarmellose sodium. Due to less disintegration time, less dispersion time and having good taste, F3 was the final formulation. It was concluded that this was the better combination of ingredients for patient compliance and good taste.

Keywords: Sultamicillin, Dispersible tablets, Ampicillin, Sulbactam etc.

Introduction
With modernity in the technology and thinking upliftment towards modification in standard tablet to achieve better patient compliance and bioavailability, novel and more efficient tablet dosages forms are being developed. The main reasons behind formulation are to provide easy administration, especially for pediatric and geriatric patients. Although there is a tremendous advancement in technology, but still oral route of drug administration is most preferred route due to its ease of administration, accurate dose and self-medication and pain avoidance. Tablets and capsules are most popular solid dosage forms. But one intentionable drawback of such formulations is Dysphasia i.e. difficulty in swallowing. Generally elder patient, children, mentally disabled and unavailability of water create problems to take such types of formulation.

Dispersible tablets are one of the best alternatives to remove these problems. Dispersible tablets are uncoated or film-coated tablets intended to be dispersed in water before administration giving a homogeneous dispersion. The homogeneous dispersion makes easy administration of medicament for pediatric and geriatric patients. The present work emphasized on the formulation of dispersible tablet with good taste and hence to improve patient compliance. Sultamicillin is the broad spectrum antibiotic and used in many diseases which are common in children and old patients and formation of the dispersible tablets will help in taking dose in pediatrics and geriatric patients.



Structure of Sultamicillin
Sultamicillin is the mutual prodrug of the Sulbactam and Ampicillin. Ampicillin is the beta-lactam antibiotic and Sulbactam is the beta-lactamase inhibitor. The parenteral use of this combination causes the pain at the site of injection. To overcome this problem, the prodrug of this combination has produced in which Ampicillin and Sulbactam are linked chemically as a

double ester and the compound called Sultamicillin. It is used orally and during absorption in the gastrointestinal tract, it is hydrolyzed by enzymes to give Ampicillin and Sulbactam in equimolar quantities with antibacterial and clinical efficacy similar to those of the parenteral formulation. Sultamicillin has shown too effective against a wide range of Gram positive and Gram negative bacteria such as Staphylococcus *aureus*, Streptococcus *pneumonia*, Haemophilus *influenze* b, Moraxella *catarrhalis* and Gram negative rods and related species. These are relatively common in pediatric patients and many are resistant to the majority of beta-lactam antibiotics as a result of beta-lactamase production. The combination of Sulbactam with beta-lactam antibiotic Ampicillin restores the bactericidal activity of Ampicillin. Hence the formulation of dispersible tablets of Sultamicillin is good for pediatric patients also improve the patient's compliance.

Materials: Sultamicillin was obtained as a gift sample from Morepen labs. India. MCC PH 102 was obtained as gift sample from Accent Microcell industries, Ahmadabad. Croscarmellose sodium was purchased from Toiah Ruitor cellulose co. ltd, china. Magnesium stearate was obtained as a gift sample from Amishi chemicals, Ahmadabad. Talc was obtained as gift sample from Golcha associates ltd. Lactose was obtained as gift sample from Morepen labs. India. Aspartame and Tartrazine supra were obtained as gift sample from Narmada foods colors Pvt. Ltd. Gujrat.

Formulation and Preparation

Formulation of Batches: All the batches were prepared by Slugging method. Ingredients used in different batches are as follows: (Table No.1)

Table 1

S. No	Ingredients	Formulation code/ amount(mg)				
		F1	F2	F3	F4	F5
1.	Sultamicillin base	258	258	258	258	258
2.	Mannitol	-	40	40	40	40
3.	MCC PH 102	-	73.35	73.35	73.35	73.35
4.	Crosscarmellose sodium	25	16	21	21	21
5.	Stearic acid	-	4.10	-	-	-
6.	Magnesium stearate	2	-	2.10	2.10	2.10
7.	Lactose	154.55	40	40	40	40
8.	Tartrazine supra	1.25	1.25	1.25	-	-
9.	Aspartame	15	18	18	18	18
10.	Menthol	2.20	2.20	2.20	2.20	2.20
11.	Pineapple flavor	12	12	12	-	-
12.	Talcum	2	5.10	2.10	2.10	2.10
13.	Erythrosine	-	-	-	1.25	1.25
14.	Mixfruit flavor	-	-	-	12	-
15.	Strawberry	-	-	-	-	12

Preparation of dispersible tablets: (Slugging method)

1. All the required ingredients were weighed accurately with the help of digital electronic balance.
2. Drug, Mannitol, MCC PH102, Crosscarmelose sodium passed through the sieve having number 40 and mixed for adequate time in a polybag.
3. Magnesium stearate passed through the sieve having number 60 and mix with the above ingredients in a polybag.
4. Then mixing was done and slugs were prepared by using 16mm flat punches.
5. Slugs were broken and granules were prepared by passed through the sieve having number 20.
6. Lactose and MCC PH102 passed through the sieve having number 40.
7. Rest of the ingredients (crosscarmellose Sodium, colour, aspartame, mannitol, flavour, and talcum) passed through the sieve having number 60.
8. Mixing was done and tablets were punched by using 12.5mm punch, lower punch plain and upper punch Break line.

Evaluation of Dispersible tablets

Table 2: Evaluation of Precompression Parametres

Formulation	Bulk density (g/cm^3)	Tapped density(g/cm^3)	Hausner's ratio	Carr's index (%)	Angle of repose
F1	0.48	0.66	1.37	27.27	34.99
F2	0.51	0.62	1.21	17.74	27.35
F3	0.56	0.65	1.16	13.84	22.54
F4	0.54	0.59	1.09	8.47	24.79
F5	0.53	0.60	1.13	11.66	23.37

Table 3: Evaluation of Post Compression Parameters

Formulation	Diameter(mm)	Thickness(mm)	Friability (%)
F1	12.5	3.65±0.01	0.90
F2	12.5	3.68±0.03	0.67
F3	12.5	3.66±0.02	0.53
F4	12.5	3.66±0.01	0.74
F5	12.5	3.67±0.02	0.79

Table 4: Evaluation of Post Compression Parameters

Formulation	Wetting time(s)	Hardness (kg/cm^2)	Disintegration time (s)
F1	29	3.5±0.4	59±5
F2	32	4.0±0.3	65±2
F3	14	4.0±0.3	29±3
F4	16	3.5±0.2	30±4
F5	17	4.0±0.4	32±2

Drug Content in the dispersible tablet of Sultamicillin

The drug content of the F3 formulation was calculated as below:

Drug content = $\frac{Abs\ of\ test}{Abs\ of\ Std} \times \frac{W1}{100} \times \frac{5}{50} \times \frac{100}{W2} \times \frac{50}{5} \times \frac{P}{100} \times Avg.wt$

Now drug content = $\frac{0.811}{0.806} \times \frac{25.2}{100} \times \frac{5}{50} \times \frac{100}{45.3} \times \frac{50}{5} \times \frac{96.7}{100} \times 470$

= 254.39mg

Or 98.60%

Where

W1 = wt. of the standard

W2 = wt. of the test

P = potency of the drug

***In vitro* dissolution studies**

Calculation of the Factor was done by the following formula

$F = \frac{1}{\textbf{abs of std}} \times \frac{\textbf{W1}}{\textbf{100}} \times \frac{\textbf{5}}{\textbf{50}} \times \frac{\textbf{900}}{\textbf{Claim}} \times \frac{\textbf{50}}{\textbf{5}} \times \frac{\textbf{P}}{\textbf{100}} \times 100$

Where

W1 = wt. of standard

Claim = tablet claim

P = Potency of the drug

$F = \frac{1}{0.859} \times \frac{25.2}{100} \times \frac{5}{50} \times \frac{900}{258} \times \frac{50}{5} \times \frac{96.7}{100} \times 100$

= 112.70

Now % drug release = Absorbance × Factor (F)

The percentage release of the F3 formulation are as shown in the below Table No. 5

Table 5: Dissolution Result of six tablets of F3 Formulation after 10 mins.

S. No.	Absorbance	% Drug release	Factor
1	0.834	93.99	112.70
2	0.843	95.00	112.70
3	0.843	95.00	112.70
4	0.819	92.30	112.70
5	0.841	94.78	112.70
6	0.845	95.23	112.70

Table 6: Dissolution Result of six tablets of F3 Formulation after 20 mins

S. No	Absorbance	% Drug release	Factor
1	0.870	98.04	112.70
2	0.879	99.06	112.70
3	0.881	99.28	112.70
4	0.825	92.97	112.70
5	0.862	97.14	112.70
6	0.864	97.37	112.70

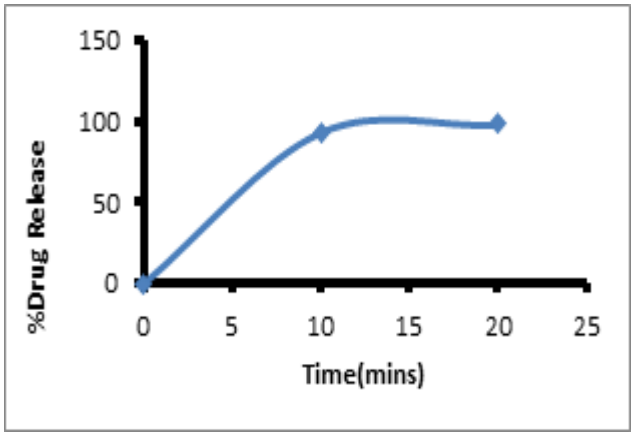


Fig 1: Percentage Drug Release

Conclusion

Finally we conclude that the combination of crosscarmellose sodium, MCC PH 102, mannitol and magnesium stearate was used to achieve good disintegration time and flow properties. The tablets were prepared and evaluated for color, thickness, diameter, weight, hardness, and friability, visual inspection for any defects, wetting time and in-vitro disintegration. The tablets of formulation F3 were selected for in-vitro dissolution studies and showed the good percentage drug release and good patient compliance. The *in-vitro* dissolution studies were carried out for tablets using USP dissolution apparatus type II. So, finally it can be concluded that crosscarmellose sodium, mannitol, MCC PH 102 and magnesium stearate (as used in F3 formulation) are promising for dispersible tablets of sultamicillin. So, it is really possible to fabricate dispersible tablets of sultamicillin, with good disintegration time and better patient compliance.

References

1. Campoli-Richards DM, Brodgen RN, Sultamicillin. A Review of its Antibacterial Activity, Pharmacokinetic Properties and Therapeutic Use, Drugs. 1987; 33:577-609.
2. Vamshidhar Reddy D, Doddayya H, Saisirisha A, Bharathi T. Development and *in-vitro* evaluation of taste masked Ondansteron HCL dispersible tablets by direct compression method by using different diluents, Int. J Pharm. Pharm. Sci. 2012; 4(1):254-260.
3. Milind Wagh P, Chetan Yewale P, Santosh Zate U, Paresh Kothawade I, Ganesh Mahale H. Formulation and evaluation of fast dispersible tablets of aceclofenac using different superdisintegrant. Int J Pharm Pharm Sci. 2010; 2:154-7.
4. Sandeep Patil B, Sadhana Shahi R, Yogananad Udavant K, Sandeep Atram C, Ravindra Salunke, Neb JB. Formulation and evaluation of quick dispersible tablet of olanzapine, Int. J. Pharm. Res. Dev. 2009; 7:1-14.
5. Mohanachandran PS, Krishnamohan PR, Fels Saju, Shalini KK. Formulation & evaluation of mouth dispersible tablets of amlodipine besylate. Int J Appl Pharm. 2010; 2(3):1-6.
6. Suresh Kulkarni V, Ranjit Kumar P, Nikunj Patel, Someshwara Rao B, Ramesh B, Ashok Kumar P. Formulation and evaluation of fast disintegrating meloxicam tablets and its comparision with marketed product. Int J Drug Deliv Technol. 2010; 2(2):42-6.
7. Basawaraj Patil S, Upendra Kulkarni, Parik Bhavik, Srinivas Soodam R, Prakash Korwar G. Formulation and evaluation of mouth dissolving tablets of nimesulide by new coprocessed technique. Res J Pharm Biol Chem Sci. 2010; 1(4):588-92.
8. Avani R. Gosai, Sanjay B. Patil, Krutika Sawant K. Formulation and evaluation of Oro dispersible tablets of ondansetron hydrochloride by direct compression using superdisintegrants, Int. J Pharm. Sci. Nanotechnology. 2008; 1(1):106-11.
9. Campoli-Richards DM, Brodgen RN, Sultamicillin. A Review of its Antibacterial Activity, Pharmacokinetic Properties and Therapeutic Use, Drugs. 1987; 33:577-609.
10. Ms. Subhasri Mohapatra, Dr. Ghatuary SK, Dr. Patra S. Formulation and evaluation of Roxithromycin dispersible tablets using super disintegrants, IOSR. J. Pharm. Bio. Sci. 2012; 3(2):17-20.

11. Vamshidhar Reddy D, Doddayya H, Saisirisha A, Bharathi T. Development and in-vitro evaluation of taste masked Ondansteron HCL dispersible tablets by direct compression method by using different diluents, Int. J Pharm. Pharm. Sci. 2012; 4(1):254-260.
12. Rajesh S, Smit P, Nikunj L, Jayesh A, Sangeeta K, Sandeep. Formulation, development and evaluation of orodispersible tablets of Tramadol hydrochloride tablets, Int. J Sci. Pharm. Edu. Res. 2012; 2:47-51.
13. Bhoyar PK, Baheti JR, Mishra SH, Jain SS, Muralidharan R. Formulation and characterization of taste masked oro-dispersible tablets of Metformin hydrochloride, world J. Pharm. Res. 2012; 1(2):183-196.
14. Chamarthi H, Kannuri R, Senthil Kumar MG, Pauluri S, Karishna KV. Formulation and evaluation of orodispersible tablets of Escitalopram oxalate by super disintegrants addition method, Int. J Pharm. Res. Develop. 2011; 3(8):65-72.
15. Kamboj M, Goyal S, Rakha P, Arora G, Dureja H, Nagpal M. Formulation and evaluation of Metformin oro-dispersible tablets, Acta Poloniae Pharmaceutica Drug Res. 2011; 68(5):717-723.
16. Paul Y, Tyagi S, Singh B. Formulation and evaluation of taste masked dispersible tablets of Zidovudine, Int. J Pharm. Bio. Sci. 2011; 2(2):20-30.
17. Kiron SS, Shirwaikar S, Saritha M. Influence of storage conditions on the potency of Amoxicillin dispersible tablets stored in hospital and community pharmacies in different regions of Kerala, Asian J Pharm. Clin. Res. 2011; 4(3):101-102.