AIRO JOURNALS
Free / Unpaid
Peer Reviewed
Multidisciplinary
National

ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

Comprehensive investigation of Mefenamic Acid Dissolution Properties and Mechanisms of Absorption

Nishant Parween

M.Phil, Roll No: 150018

Session: 2015-16

University Department of Chemistry

B.R.A Bihar University, Muzzaffarpur

AIRO JOURNALS
Free / Unpaid
Peer Reviewed
Multidisciplinary
National

ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

Abstract

Mefenamic acid, sometimes known as Mama, is a commonly used NSAID for sedation. Due to Mama's low water solvency and other factors, The normal negative effects of NSAIDs are also present. The purpose of this research was to improve the water solubility of Mama in order to boost its bioavailability and impact digestion. Solid dispersions of Mama were made by employing polyethylene glycol 6000 and varying types (stearate, D-1670, palmitate, P-1670, and laurate, D-1216) and amounts of sucrose esters as transporters. The absence of precious stones from Mama is confirmed by the X-ray diffraction results. Based on the results of disintegration tests conducted on fake gastric juice, the component containing 10% D-1216 significantly increased water solvency. Despite the dissolution difference, Mama showed a high apparent penetrability coefficient across human Caco-2 digestive epithelial cell layers, and the addition of chemicals did not increase drug entrance...

Keywords: mefenamic acid, sucrose esters, PEG 6000, solid dispersion, Caco-2 cells

Introduction

Most often, disintegration is described as an interaction where a solid material is solubilized into the dissolvable to produce an outcome. Since the medication retention process from solid measurements structures (particularly for drugs given by oral course) The drug disintegration trademark is a crucial quality boundary for ensuring the in vivo performance of solid medication products, as it depends on the delivery of the medication substance from the medication item, the disintegration or solubilization of the medication under physiological circumstances, and the porousness of the medication item. The underlying concept of the first two indicated phases suggests that in vitro disintegration may be significant to the prediction of in vivo execution. Mefenamic acid, also known as [2-[(2,3-dimethylphenyl amino)benzoic acid], is a common NSAID used to treat moderate-to-severe pain. It is a derivative of anthranilic acid. Based on the biopharmaceutical arrangement framework, mefenamic acid is placed in class II. There is very little solubility in water, yet it is very impermeable. The oral bioavailability of this drug is high, at 90% to 100%. Medication absorption rates in the high or acceptable range are crucial for BCS

AIRO JOURNALS
Free / Unpaid
Peer Reviewed
Multidisciplinary
National
ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

class II medications, and here is where the disintegration cycle comes in. There is a dependable oral administration measurement method for mefenamic acid in Indonesia, where it sees widespread use (case and caplet). The quality of solid measuring structures for mefenamic acid can now be assessed using any of two compendial disintegration testing procedures that have just been certified. Disintegration testing of mefenamic acid is the primary approach, and it is outlined in both USP 37 and the 2010 Chinese Pharmacopeia (PPRC 2010).

The fifth edition of the Indonesian Pharmacopeia adopts the USP approach in the interim. There are a few differences between PPRC strategy and USP technique. Mefenamic acid's solid measurement structure is subjected to a disintegration test by USP exclusively for containers. In this test, USP recommends using a type 1 (bin) test device for disintegration, rotating at 100 rpm, with disintegration medium consisting of 900 mL of tris buffer, pH 9, containing 1% sodium lauryl sulfate. After 45 minutes, the suggested acceptance requirement is for at least 75% (Q) of the marked amount of mefenamic acid to have degraded. PPRC performs a disintegration test on both the caplet/tablet and the mefenamic acid container. PPRC employs a contraption type 2 (a paddle) with a pivot speed of 75 rpm and 800 liters of phosphate cradle pH 8 with 40 mL of ethanol serving as the disintegration medium. In 45 minutes, the amount of mefenamic acid is degraded by at least 70% (Q) and at least 60% (Q), respectively., according to the acknowledgment models for mefenamic acid in infinite case measuring structures. For the quality requirements of solid measuring structures for mefenamic acid, the fifth edition of the Indonesian Pharmacopeia (FI V) competes with the USP. Only the mefenamic acid container measurement construction should be tested for disintegration trademark, whereas the crumbling test takes the role of the disintegration test in tablet and caplet dose structures. The main factor limiting the ingestion cycle of such medications in the current situation is the drug's BCS class 2 placement, which may be inferred from the rate of disintegration. Additionally, Indonesia has not yet recorded nonexclusive mefenamic acid (solid oral) data structures in that mindset to undergo a bioequivalence test..

Results and Discussion

Solubility test

AIRO JOURNALS
Free / Unpaid
Peer Reviewed
Multidisciplinary
National
ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

According to the results of the solubility test (shown in Fig. 1), mefenamic acid was most soluble in USP medium (at a concentration of roughly 2 mg/mL). USP media had a solubility roughly fourfold more than PPRC medium (approximately 0.5 mg/mL) and approximately thirtyonefold greater than FaSSIF medium (0.06 mg/mL). These results suggest that a 900-mL volume of USP or PPRC disintegration medium is optimal for dissolving a high-dose drug (500 mg) (mefenamic acid). Meanwhile, the FaSSIF medium is not ideal for the drug's disintegration study due to the poor solubility of mefenamic acid in that medium. Many different solvents and disintegration media have been tested to determine how mefenamic acid dissolves, and the findings have varied. The poor water solubility of mefenamic acid is approximately 0.004 mg/mL at 37 °C and 0.2 mg/mL at 25 °C. While mefenamic acid is insoluble in water, it dissolves well in ethanol (14.8 mg/mL at 25 °C) and polyethylene glycol 400 (11.5 mg/mL at 25 °C), two natural water-miscible solvents. In PPRC, the medicine is employed as a co-dissolvable for the mefenamic acid disintegration medium due to its high natural water-miscibility dissolvability. The swelling of the hydrophilic surfactants Brij35, sodium lauryl sulfate (SLS), and Tween 80 improved the drug's solubility in water. The medication's solubility was improved with the addition of SLS in concentrations between 2 and 10 percent, reaching a maximum of 0.85 mg/mL. The solubility of mefenamic acid in water was almost drastically affected by the pH level. Since mefenamic acid is an acidic medication, its solubility in water increased as the pH rose. It's possible that the solubility of the drug at 37°C and pH 9.0 is larger than 0.1 mg/mL. The expansion of SLS for the mefenamic acid case's disintegration mechanism in the USP monograph provides further support for the approach, as does the pH influence...

AIRO JOURNALS
Free / Unpaid
Peer Reviewed
Multidisciplinary
National
ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

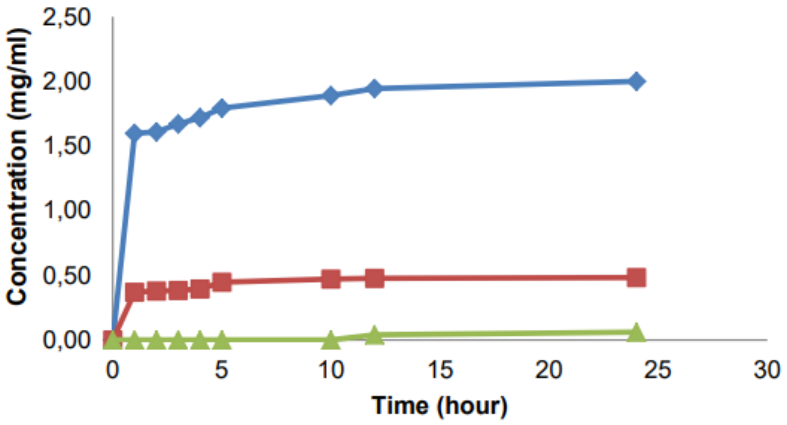

Fig 1. Solubility test results in USP (—◆—), PPRC (—■—) and FaSSIF (—▲—) medium.

Conclusion

It is significant that drugs belonging to the BCS II class have their water dissolvability increased. Due to Mama, Using hydrophilic auxiliary molecules, these methods can also reduce the drug's potent antagonistic effects while improving the drug's biopharmaceutical properties. The degree to which porousness is influenced by particular APIs could be altered by the addition of aiding compounds that boost water solubility. Several Mama designs were put to the test, and the correlation between their solvency and their penetrability was measured. PEG 6000 polymer with sucrose ester surfactants and Mama put inside.. According to the Gompertz-capability bounds and the findings of the disintegration test, the 10% D-1216-containing item produced the best results. Additionally, this item turned out to be quite probably the best strategy in the Caco-2 cell poisoning test. After 120 minutes, Mama's disintegrated volume only slightly increased, but after 30 minutes, there was a noticeable increase in Mama's dissolvability. Therefore, under in vivo settings, the higher shredded amount of Mama that is available for retention may speed up Mama's assimilation.

References

1. Ryoto Sugar Ester Technical Information, Ryoto Sugar Ester (Food grade)/ Surfhope™ SE Pharma, Mitsubishi-Kagaku Foods Corporation 2015.

ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

2. E. Pallagi, G. Regdon, Jr., Z. Aigner and P. Szabó-Révész, Study of thermal behaviour of sugar esters, Int. J. Pharm. 336 (2007).
3. Zs. Makai, R. Rajkó and P. Szabó-Révész, Study of the effects of drugs on the structures of sucrose esters and the effects of solid-state interactions on drug release, J. Pharm. Biomed. Anal. 48 (2008).
4. European Pharmacopoeia 8th ed., Council of Europe, Strasbourg 2013.
5. Y. Zhang, M. Huo, J. Zhou, A. Zou, W. Li, C. Yao and S. Xie, DDSolver: an add-in program for modeling and comparison of drug dissolution profiles, AAPS J. 12 (2010).
6. P. Costa and J. M. Sousa Lobo, Modeling and comparison of dissolution profiles, Eur. J. Pharm. Sci. 13 (2001).
7. Fülöp, Á. Gyéresi, M. A. Deli, L. Kiss, M. D. Croitoru, P. Szabó-Révész and Z. Aigner, Ternary solid dispersions of oxicams: Dissolution and permeability study, Farmacia 63 (2015).
8. M. Dixit, A. Kini and P. K. Kulkarni, Enhancing the dissolution of polymorphs I and II of mefenamic acid by spray drying, Turk. J. Pharm. Sci. 9 (2012).
9. S. Romero, B. Escalera and P. Bustamante, Solubility behavior of polymorphs I and II of mefenamic acid in solvent mixtures, Int. J. Pharm. 178 (1999).
10. S. G. Vijaya Kumar and D. N. Mishra, Preparation, characterization and in vitro dissolution studies of solid dispersion of meloxicam with PEG 6000, Yakugaku Zasshi (J. Pharm. Sci. Japan) 126 (2006).
11. H. Lokhandwala, A. Deshpande and S. Deshpande, Kinetic modelling and dissolution profiles comparison: an overview, Int. J. Pharm. Biol. Sci. 4 (2013).
12. Beig, R. Agbaria and A. Dahan, Oral delivery of lipophilic drugs: The tradeoff between solubility increase and permeability decrease when using cyclodextrin-based formulations, Plos One 8 (2013).
13. G. E. Amidon, W. I. Higuchi and N. F. Ho, Theoretical and experimental studies of transport of micelle-solubilized solutes, J. Pharm. Sci. 71 (1982).

ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

14. J. M. Miller, A. Beig, R. A. Carr, G. K. Webster and A. Dahan, The solubility-permeability interplay when using cosolvents for solubilization: revising the way we use solubility-enabling formulations, Mol. Pharm. 9 (2012).
15. Beiq, J. M. Miller and A. Dahan, Accounting for the solubility-permeability interplay in oral formulation development for poor water solubility drugs: the effect of PEG-400 on carbamazepine absorption, Eur. J. Pharm. Biopharm. 81 (2012).
16. L. Kiss, E. Hellinger, A. M. Pilbat, A. Kittel, Z. Török, A. Füredi, G. Szakács, S. Veszelka, P. Sipos, B. Ózsvári, L. G. Puskás, M. Vastag, P. Szabó-Révész and M. A. Deli, Sucrose esters increase drug penetration, but do not inhibit P-glycoprotein in Caco-2 intestinal epithelial cells, J. Pharm. Sci. 103 (2014).
17. Szűts and P. Szabó-Révész, Sucrose esters as natural surfactants in drug delivery systems – a mini-review, Int. J. Pharm. 433 (2012).
18. K. R. Rao, M. V. Nagabhushanam and K. P. Chowdary, In vitro dissolution studies on solid dispersions of mefenamic acid, Indian J. Pharm. Sci. 73 (2011).
19. G. Owusu-Ababio, N. K. Ebube, R. Reams and M. Habib, Comparative dissolution studies for mefenamic acid-polyethylene glycol solid dispersion systems and tablets, Pharm. Dev. Technol. 3 (1998).
20. Dahan A and J. M. Miller, The solubility-permeability interplay and its implications in formulation design and development for poorly soluble drugs, AAPS J. 14 (2012).

Author's Declaration

I as an author of the above research paper/article, here by, declare that the content of this paper is prepared by me and if any person having copyright issue or patent or anything other wise related to the content, I shall always be legally responsible for any issue. For the reason of invisibility of my research paper on the website/amendments /updates, I have resubmitted my paper for publication on the same date. If any data or information given by me is not correct I shall always be legally responsible. With my whole responsibility legally and formally I have intimated the publisher (Publisher) that my paper has been checked by my guide (if any) or expert to make it sure that paper is technically right and there is no unaccepted plagiarism and the entire content is genuinely mine. If any issue arise related to Plagiarism / Guide Name / Educational Qualification / Designation/Address of my university/college/institution/ Structure or Formatting/ Resubmission / Submission /Copyright / Patent/ Submission for any higher degree or Job/ Primary Data/ SecondaryData Issues, I will be solely/entirely responsible for any legal issues.I I informed that the most of the data from the website is invisible or shuffled or vanished from the data basedue to some technical faultor hacking and therefore the process of resubmission is there for the scholars/students who finds trouble in getting their paper on the website. At the time of resubmission of my paper

AIRO JOURNALS

Free / Unpaid
Peer Reviewed
Multidisciplinary
National

ISSN: 2321-3914
Volume 2 Issue 2
May 2022
Impact Factor: 10.2
Subject: Chemistry

I take all the legal and formal responsibilities, If I hide or do not submit the copy of my original documents (Aadhar/Driving License/Any Identity Proofand Address Proof and Photo) in spite of demand from the publisher then my paper may be rejected or removed I website anytime and may not be consider for verification.I accept the fact that as the content of this paper and theresubmission legal responsibilities and reasons are only mine then the Publisher (Airo International Journal/Airo National Research Journal) is never responsible. I also declare thatifpublisher finds any complication or erroror anything hidden or implemented otherwise, my paper may be removed from the website or the watermark ofremark/actuality may be mentioned on my paper. Even if anything is found illegal publisher may also take legal actionagainst me

Nishant Parween

******