

Effect of Acid, Base, Temperature and U.V Light on Amlodipine Besylate

Wajiha Gul*, Sania Basheer, Fouzia Karim, Sidra Ayub

Faculty of Pharmacy, Jinnah University for Women, Karachi
wajihanasheed_05@hotmail.com

Abstract: Aim of the present study is to study the stability of Amlodipine besylate in acidic and basic pH, heat and under UV light. Literature survey reveals that various stability studies conducted to prepare stable dosage form and effect of temperature i.e. room temperature and refrigerator. Therefore we took Amlodipine besylate 10mg tablets and by making its dilution 25ug/ml we exposed it to acidic and basic condition, heat and u.v light and noted their absorbance at wavelength 237nm. It is found that Amlodipine absorbance decreases in all the above mentioned stress conditions. It is concluded that stability of Amlodipine besylate decreases in acidic and medium. Stability also decreases in heat and u.v sensitive.

Keywords: Amlodipine besylate, acid, base, temperature, u.v light

1. INTRODUCTION

Amlodipine besylate (AMLO), chemically is [3-ethyl-5-methyl (4RS)-2-[(2-aminoethoxy) methyl]-4-(2-chlorophenyl)-methyl-1-dihydropyridine-3, 5-dicarboxylate benzene sulfonate [1]. It is a Ca-channel blocker. It is potent and long acting member of its class (Figure 1).

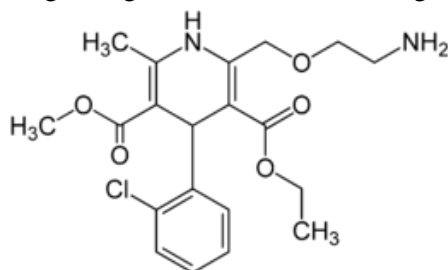


Figure1. Amlodipine besylate

It inhibits the entrance of extracellular Ca into the peripheral smooth muscles and cardiac muscles by inhibiting HMG-CoA reductase [2]. It is used as an antihypertensive agent and very successfully for treatment of cardiovascular diseases and hypertension [3]. Other members of the class include nimodipine, nifedipine, flunarizine, and nitrendipine. Amlodipine and its class members are photosensitive and also labile for degradation in acidic and basic medium as well. These drugs also greatly degraded under thermal stress and hence their therapeutic efficacy declines. [1, 4-6].

Literature survey reveals that various analytical methods have been established for the analysis of Amlodipine and many stability indicating methods have also been developed for Amlodipine alone as well as in combination including spectrophotometric [1, 7-9], HPLC, RP-HPLC, HPTLC, GC, HPLC by mass detection, fluorescence detection, amperometric detection and chemometric protocols. [1, 10-26]. Stability studies have also been conducted using different parameters on neat solutions [27], pharmaceutical preparations alone and in combination. [1,4,5]. Research has been conducted on different drugs which are prone to degrade by different parameters like heat light, acid and base [28].

Aim of present work to expose Amlodipine to various stress conditions like acid at pH 3.0, base pH 8.5, heat (80 °C, on water bath) and U.V light to study the degradation and stability in such force conditions.

2. MATERIALS AND METHODS

Amlodipine besylate 10mg tablets, analytical grade methanol, HCl, NaOH, water bath, U.V light source, UV-1600 shimadzu spectrophotometer.

Twenty tablets of Amlodipine besylate were accurately weighed and crushed and powder equivalent to 25mg was taken in 100ml volumetric flask and dissolved in methanol. Further dilutions of the resulting solution were made to obtain the concentration of 25 μ g/ml. The solution was scanned in the 200-400 nm UV region and the wavelength maxima was observed at 237 nm and that wavelength was adopted for absorbance measurement. 0.1 N HCl and 0.1 N NaOH were prepared in freshly prepared distilled water.

To 10 ml of the final solution 0.1 N HCl was added to achieve the pH of 3. Similarly to 10 ml of the final solution enough solution of 0.1 N NaOH was added so as to get the pH of 8.5. to determine the effect of UV light, the solution was placed in the UV light for around 30 mins.

Solution was also placed in water bath at 85 OC for 60 mins to study the effect of heat on the drug. The absorbance was noted at every 15 mins interval.

Absorbances of the neat sample as well as of those exposed to stress conditions were taken on Uv-1600 shimadzu spectrophotometer at 237 wavelength using methanol as a blank.

3. RESULT AND DISCUSSION

Amlodipine besylate is a potent Ca channel blocker. It is also very effective cholesterol reducing agent. Literature survey showed that various analytical methods have been developed for the analysis of Amlodipine and several stability indicating methods established. It was found that most of the stability related work was regarding method development. Therefore we aimed to observe the effects of different conditions on Amlodipine. Studies have shown that amlodipine besylate can be degraded by the factors like acidic and basic pH, heat and UV light (1-22).

Table1. Data of Amlodipine besylate before and after degradation under acidic and basic pH and UV light

Parameters	Amlodipine besylate		% Amlodipine	% drug degraded
	Standard	Sample		
Assay	0.426	0.421	98.82	-
Acidic pH	-	0.190	44.60	55.50
Basic pH	-	0.250	58.68	41.32
UV light	-	0.187	43.89	56.11

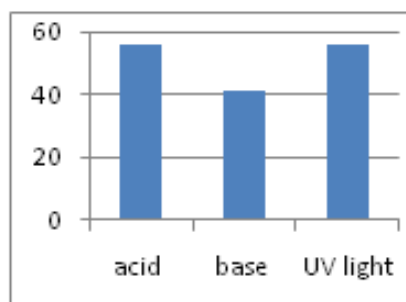


Figure2. %age of degraded drug after exposure to acidic and basic conditions and UV light

Table3. Data of % Amlodipine besylate left and degraded by heat

Time (mins.)	Absorbance	% amlodipine	% drug degraded
0	0.421	98.82	-
15	0.290	68.07	31.93
30	0.250	58.68	41.31
45	0.223	52.34	47.65
60	0.172	40.37	59.62

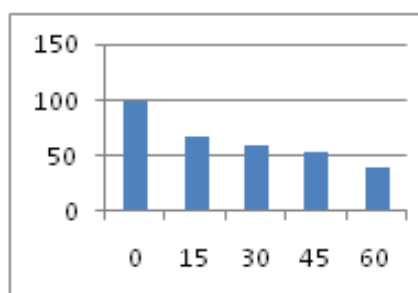


Figure2. Time versus % Amlodipine besylate degraded

The parameters chosen for the degradation of the drug were acidic condition (pH 3), basic condition (pH 8.5), U.V light and heat (water bath, 80 °C). The absorbance was found to be decreases of the conditioned samples (Table 1 and 2). It has been found that acidic pH and UV light degrade amlodipine besylate more and almost equally as compared to the basic ph. The %age of drug degraded by acid and UV light was 55.50 and 56.11 respectively while only 41.32% was degraded by the basic conditions. In case of heat it was observed that the drug is gradually destroyed on continuous exposure to heat. 4 readings were noted after the interval of every 15 mins and the last reading i.e. after 60 mins the % age of the degraded drug was 59.62%.

4. CONCLUSION

Stability of a compound can be greatly affected by the change in pH, increasing the temperature and when kept under UV light [29]. Thus above results clearly shows that Amlodipine is greatly affected by all above conditions and it is degraded, therefore its absorbance decreases which support the fact that Amlodipine degraded in all the above stress conditions.

REFERENCES

- [1] Aryal, S., & Škalko-Basnet, N. (2008). Stability of amlodipine besylate and atenolol in multi-component tablets of mono-layer and bi-layer types. *Acta pharmaceutica*, 58(3), 299-308.
- [2] O'Neil MJ, editor. The Merck Index. 13th ed. Whitehouse Station, NJ: Merck and Co Inc; 2001. P. 86
- [3] Wang JG. A combined role of calcium channel blockers and angiotensin receptor blockers in stroke prevention. *Vascular Health and Risk Management*, 2009; 5: 593-605
- [4] Nahata, M. C., Morosco, R. S., & Hipple, T. F. (1998). Stability of amlodipine besylate in two liquid dosage forms. *Journal of the American Pharmaceutical Association (Washington, DC: 1996)*, 39(3), 375-377.
- [5] Abdoh, A., Al-Omari, M. M., Badwan, A. A., & Jaber, A. M. Y. (2004). Amlodipine besylate–excipients interaction in solid dosage form. *Pharmaceutical development and technology*, 9(1), 15-24.
- [6] Gul W. Photostability testing of formulated pharmaceutical products. *IJPPS*, 2015; 2(3): 65-68.
- [7] Khan MR and Jain D. Simultaneous spectrophotometric determination of atorvastatin and amlodipine besylate in tablets. *Ind. J. Pharm. Sci.*, 2006; 68: 546-548.
- [8] e. Rahman N and Hoda MN. Validated spectrophotometric method for the determination of amlodipine besylate in drug formulation using 2,3-dichloro 5,6-dicyano 1,4-benzoquinone and ascorbic acid. *J. Pharm. Biomed. Anal.*, 2003; 31(2): 381-392.
- [9] Sridar K, Sastry CSP, Reddy MN, Sankar DG, Srinivas KR. Spectrophometric determination of amlodipine besylate in pure forms and tablets. *Anal. Letters*, 1997; 30(1): 121-133.
- [10] Wankhede, S. B., Raka, K. C., Wadkar, S. B., & Chitlange, S. S. (2010). Spectrophotometric and HPLC methods for simultaneous estimation of amlodipine besilate, losartan potassium and hydrochlorothiazide in tablets. *Indian journal of pharmaceutical sciences*, 72(1), 136.
- [11] Sahu, R., & Patel, V. B. (2007). Simultaneous spectrophotometric determination of amlodipine besylate and atorvastatin calcium in binary mixture. *Indian journal of pharmaceutical sciences*, 69(1), 110.
- [12] Beresford, A. P., Macrae, P. V., Stopher, D. A., & Wood, B. A. (1987). Analysis of amlodipine in human plasma by gas chromatography. *Journal of Chromatography B: Biomedical Sciences and Applications*, 420, 178-183.
- [13] Shimooka, K., Sawada, Y., & Tatematsu, H. (1989). Analysis of amlodipine in serum by a sensitive high-performance liquid chromatographic method with amperometric detection. *Journal of pharmaceutical and biomedical analysis*, 7(11), 1267-1272.
- [14] Josefsson, M., Zackrisson, A. L., & Norlander, B. (1995). Sensitive high-performance liquid chromatographic analysis of amlodipine in human plasma with amperometric detection and a single-step solid-phase sample preparation. *Journal of Chromatography B: Biomedical Sciences and Applications*, 672(2), 310-313.
- [15] Feng, Y., Zhang, L., Shen, Z. H. E. N. G., Pan, F. E. N. G. Y. U. N., & Zhang, Z. (2002). Analysis of amlodipine in human plasma by liquid chromatography-mass spectrometry. *Journal of chromatographic science*, 40(1), 49-53.

- [16] Sivakumar, T., Manavalan, R., Muralidharan, C., & Valliappan, K. (2007). An improved HPLC method with the aid of a chemometric protocol: simultaneous analysis of amlodipine and atorvastatin in pharmaceutical formulations. *Journal of separation science*, 30(18), 3143-3153.
- [17] Bahrami, G. H., & Mirzaeei, S. H. (2004). Simple and rapid HPLC method for determination of amlodipine in human serum with fluorescence detection and its use in pharmacokinetic studies. *Journal of pharmaceutical and biomedical analysis*, 36(1), 163-168.
- [18] Chitlange, S. S., Bagri, K., & Sakarkar, D. M. (2008). Stability Indicating RP-HPLC Method for Simultaneous Estimation of Valsartan and Amlodipine in Capsule Formulation. *Asian Journal of Research in Chemistry*, 1(1), 15-18.
- [19] Meyyanathan, S. N., & Suresh, B. (2005). HPTLC method for the simultaneous determination of amlodipine and benazepril in their formulations. *Journal of chromatographic science*, 43(2), 73-75.
- [20] Shah, S. K., Asnani, A. J., Kawade, D. P., Dangre, S. C., Arora, S. K., & Yende, S. R. (2012). Simultaneous quantitative analysis of olmesartan medoxomil and amlodipine besylate in plasma by high-performance liquid chromatography technique. *Journal of Young Pharmacists*, 4(2), 88-94.
- [21] Rahman, N., Singh, M., & Hoda, M. N. (2004). Application of oxidants to the spectrophotometric determination of amlodipine besylate in pharmaceutical formulations. *Il Farmaco*, 59(11), 913-919.
- [22] Patil, P. R., Rakesh, S. U., Dhabale, P. N., & Burade, K. B. (2009). RP-HPLC method for simultaneous estimation of losartan potassium and amlodipine besylate in tablet formulation. *International Journal of Chemical Technology and Research*, 1(3), 464-469.
- [23] Mohammadi, A., Rezanour, N., Dogaheh, M. A., Bidkorbeh, F. G., Hashem, M., & Walker, R. B. (2007). A stability-indicating high performance liquid chromatographic (HPLC) assay for the simultaneous determination of atorvastatin and amlodipine in commercial tablets. *Journal of Chromatography B*, 846(1), 215-221.
- [24] Naidu, K. R., Kale, U. N., & Shingare, M. S. (2005). Stability indicating RP-HPLC method for simultaneous determination of amlodipine and benazepril hydrochloride from their combination drug product. *Journal of pharmaceutical and biomedical analysis*, 39(1), 147-155.
- [25] Ragno, G., Cione, E., Garofalo, A., Genchi, G., Ioele, G., Risoli, A., & Spagnoletta, A. (2003). Design and monitoring of photostability systems for amlodipine dosage forms. *International journal of pharmaceuticals*, 265(1), 125-132.
- [26] Aryal, S., & Škalko-Basnet, N. (2008). Stability of amlodipine besylate and atenolol in multi-component tablets of mono-layer and bi-layer types. *Acta pharmaceutica*, 58(3), 299-308.
- [27] Mason, R. P., Walter, M. F., Trumbore, M. W., Olmstead Jr, E. G., & Mason, P. E. (1999). Membrane antioxidant effects of the charged dihydropyridine calcium antagonist amlodipine. *Journal of molecular and cellular cardiology*, 31(1), 275-281.
- [28] Shah DA, Bhatt KK, Mehta RS, Baldania SL, Gandhi TR. Stability indicating RP-HPLC estimation of atorvastatin calcium and amlodipine besylate in pharmaceutical formulation. *Ind. J. Pharm. Sci*, 2008; 70(6): 754-760.
- [29] Gul W. Degradation study of ascorbic acid by UV spectroscopy. *IJCRCPS*, 2015; 2(2): 19-24.