

Instability of Cefpodoxime Proxetil Oral Suspension at Different Temperature Storage Conditions

Abstract

The advantages of oral dosage form over other dosage forms are responsible for its popularity which includes its ease of administration, patient compliance and stability of the formulation. This study compared the stability of three Cefpodoxime proxetil products available in Nigeria market at fridge temperatures (2-8 °C), room temperature (25 °C) and elevated temperature (42 °C). Flow properties, rheological and the physicochemical parameters of both powder and reconstituted powder were used to evaluate the stability of different brands of Cefpodoxime proxetil available in Nigeria. This study shows that the potencies of all the reconstituted samples stored at 25 °C were within the specified standard range within the evaluating period of 90 days, while the potencies of those samples under refrigerated condition were within the specified standard range within the evaluating period of 14 days. For powdered samples, there was a considerable loss of potencies (<85%) at elevated temperature (42 °C) in all the samples after day 60. Physicochemical evaluation also agrees with the outcome of the drug assay for all the samples except Tambac® which deviated from specification as from day 14. The study therefore emphasizes the need for the storage of both reconstituted and un-reconstituted suspensions at refrigerated and temperature less than 25 °C.

Keywords: Cefpodoxime; Stability; Reconstitution; Suspensions

Introduction

Drugs like living organisms do react to the external stimuli such as heat, humidity, light, microbial agents and dust. In many of such cases, the reactions can only lead to physical changes such as discolouration of the product, change in taste and offensive odour. The fact, that drug products have the potential to degrade on storage has been known for ages. This instability can sometimes be so acute as to result in not only therapeutic failure, which is lacking in acceptance safety, efficacy or product acceptability within short time-in extreme cases in only a few days but also cause adverse effects on the patient's health [1].

However, there is a good reason to believe that pharmaceutical products in the proper drug distribution channel are often not always stored according to the manufacturers label instruction [2]. Thus, the need to establish the stability of drug products most especially when the product gets to the end user. A product with stability issue is most likely going to fail both therapeutic and pharmaceutical tests. It is therefore imperative to make stability studies a prerequisite for the acceptance and approval of any pharmaceutical product by the drug regulatory agency.

Stability of a pharmaceutical product may be defined as the capability of a particular formulation in a specific container/closure system to remain within its physical, chemical, microbiological,



Abayomi Omotoso Ebenezer*, Chinaka Chioma and Iwaka Marvin Omoegbe

Department of Pharmaceutical and Medicinal Chemistry, University of Port Harcourt, Nigeria

Address for Correspondence

Abayomi Omotoso Ebenezer, Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Nigeria, E-mail: abayomi.omotoso@uniport.edu.ng

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toxicological, protective and informational specifications [3]. Although there are exceptions, 90% of the labeled potency is generally recognized as the maximum acceptable potency level [4]. Thus stability study maintains the product quality, safety and efficacy throughout the product shelf-life [3]. The stability of pharmaceutical products depends on many factors, such as stability of the active pharmaceutical ingredient, the potential interaction between the active ingredient and the excipient, the dosage form, the storage condition, handling and length of time between manufacture and final usage. Although factors like environmental influence like light, moisture and heat are important in stability study of pharmaceutical products [5].

Dry powders for oral suspension are powder mixtures which require reconstitution at the time of administration mostly for paediatric use [6]. We therefore investigated the effect of temperature on the physicochemical characteristics of some oral reconstitutable Cefpodoxime proxetil dry powder and suspension available in Nigerian pharmaceutical market and also to be able to select and recommend the best from the series of possible choices. This study specifically aimed to achieve these objectives by applying a simple, accurate and less time consuming validated UV spectroscopic method for the quantification of Cefpodoxime proxetil in samples subject to variable storage conditions, thus their physicochemical stability assessment over a period of time.

Materials and Methods

Materials

The pure sample Cefpodoxime proxetil was obtained from Qingdao Tai Hong Da Chemical Co., Ltd. China. Three brands of Cefpodoxime (40 mg/5mL, 50 mg/5mL and 40 mg/5mL) containing 800 mg, 1000 mg and 800 mg respectively for reconstitution in water for oral use were used in this study. The brands used (A: Innovator product, B: Generic product-Indian origin, and C: Generic product-Indian origin). The samples were purchased from reputable and registered pharmacies and were within the stated expiry dates as at

Table 1: R_f values for the non-reconstituted samples on days 0, 30, 60 and 90 (Mobile phase; Chloroform (4): Methanol (2): Toluene (4)).

Spotted Samples	R _f
Cefpodoxime(a)	1=0.64
A	2=0.64
B	3=0.63
C	4 =0.67

Table 2: R_f values for the reconstituted samples on days 60 and 90 (Mobile phase; Methanol (10): Ammonium hydroxide (0.1)).

Spotted Samples	R _f	R _f
Cefpodoxime	1=0.54	-
A	2=0.57	5=0.93
B	3=0.55	6=0.93
C	4=0.56	7=0.93

the time of this study.

Instrument/Reagents

All other reagents used were of analytical grade (JHD, China and Sigma-Aldrich, Germany). UV-VIS Spectrophotometer (Single beam-295), Ostwald U-tube Viscometer (England), Aluminium plated silica gel plates, Pycnometer (Pyrex[®], England), pH meter (PEC Medical, USA).

Methods

Protocol

The dry powder blend (Product A, B and C) ready for reconstitution and the prepared suspension (100 mL) were individually subjected to short term stability study for a period of three months as per ICH guidelines [7]. Six (6) bottles of each brand were used for the study consisting of; reconstituted (3 bottles) and un-reconstituted (3 bottles). The variable storage conditions commented were; refrigerator condition (2 °C-8 °C/40% RH), room temperature (25 °C/60% RH) and elevated temperature conditions (42 °C/75% RH). For each of the environmental conditions stated above one sample each of the reconstituted and un-reconstituted was used.

Preparation of stock solution

Stock solution of Cefpodoxime (100 µg/mL) was prepared by dissolving accurately weighed 10 mg pure sample of Cefpodoxime proxetil in 100 mL of methanol.

Determination of wavelength of maximum absorption

Scanning for wavelength of maximum absorption was carried out using Stock solution of pure Cefpodoxime proxetil using UV/VIS Spectrophotometer within the range of 200-800 nm.

Preparation of working solution

The prepared stock solution (100 µg/mL) was further diluted with methanol to get working standard solutions of 4-24 µg/mL (Table 1).

Assay of Cefpodoxime in the Samples

Non-reconstituted samples

The weight of powdered sample of Product “A” equivalent to 10 mg Cefpodoxime was accurately transferred to a volumetric flask containing 70 mL of methanol, sonicated for 15 min and then filtered. The residue was washed with 2x10 mL portion of methanol and made up to 100 mL with methanol (100 µg/mL). The absorbances of each of the resulting solution were read at 281 nm in triplicates. The above procedure was repeated for the other two brand sat day 0, 30, 60 and 90 under the various storage conditions [8,9].

Reconstituted samples

Samples of Product “A” was reconstituted with portable water according to the instruction of the manufacturer, shaken and 5 mL of the suspension so produced was transferred into a 50 mL volumetric flask containing 25 mL of methanol, shaken and made up to volume before sonication and filtration. The filtrate (5 mL) was transferred into a 50 mL volumetric flask and made up to the 50 mL mark. The absorbance of the resulting solution was read at 281 nm and their corresponding concentration (µg/mL) determined by using the Beer-Lambert’s plot. The above procedure was repeated for Products B and C at days 0, 7, 14, 30, 60 and 90 at the different stated storage conditions.

Determination of pH

The pH meter was calibrated before each measurement was taken after transferring the sample into a beaker and the probe of the meter inserted into the samples. The pH of the reconstituted suspension was read on the screen of the meter for all the samples at days 0, 7, 14, 30, 60 and 90 at their various storage conditions.

Moisture content determination

The moisture content of the dry powders were determined by weighing 3.0 g of powder into a pre-weighed ceramic crucible which was then placed in an oven set at 105 °C for 1 hr, cooled, weighed and placed again in the oven until a constant weight was achieved. This procedure was repeated for the other samples at day 0, 30, 60 and 90 at their respective storage conditions. The moisture content was calculated according to the equation below;

$$\% \text{ Moisture content} = \frac{\text{Weight of the sample before heating} - \text{Weight of the sample after heating}}{\text{Weight of the sample before heating}} \times 100$$

Thin layer chromatography (TLC)

The reconstituted samples were analyzed for degradation products by TLC on days 0, 30, 60 and 90 using both mixtures of Chloroform: Methanol: Toluene (4:2:4 v/v/v) and Methanol: Ammonium Hydroxide (10:0.1 v/v) separately as the mobile phase with aluminium backed Silica gel 60F₂₅₄ TLC plate serving as the stationary phase [10].

Physical properties determination

The samples (reconstituted and non-reconstituted) were evaluated for physical stability by determining the aesthetic appeal (odour, taste, colour and texture), sedimentation volume, ease of re-dispersion, viscosity, particle size, flow rate, angle of repose, bulk density, tapped density, compressibility index and Hausner’s ratio as applicable. All parameters were performed in triplicate.

Table 3: Physico-chemical parameters at refrigerator temperature (2 °C-8 °C/40% Rh).

Parameters	Product A						Product B						Product C					
	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90
% of label claim (non-reconstituted)	102.88	-	-	101.25	98.75	92.5	98.1	-	-	97	93	89	101.75	-	-	101.25	97.5	97.5
% of label claim (reconstituted)	102.36	102.5	101.25	88.75	111.25	118.75	99	98	95	88	112	122	101.13	101.25	97.5	87.5	113.8	121.25
pH	6.33	5	5	4	3	3	5.76	5	5	4	3	2	6.33	5	5	3	3	3
% moisture content (%w/w)	2.33	-	-	23	15	14	1.33	-	-	30.67	13	13.67	0.67	-	-	26.67	16	20.2
Powders flow rate (g/sec)	28.01	-	-	43.48	22.73	21.24	22.22	-	-	37.04	22.39	20.21	37.45	-	-	43.48	24.59	23.44
Angle of repose (°)	36.03	-	-	33.25	29.28	25.15	34.44	-	-	33.11	29.97	23.45	34.14	-	-	36.7	29.28	23.45
Viscosity of reconstituted samples (cp)	70.58	89.61	100.49	82.75	73.36	59.88	38.42	16.99	18.11	18.92	23.21	20.39	24.24	29.01	30.5	33.81	50.12	62.67
Bulk density (g/mL)	0.5	-	-	0.48	0.63	0.63	0.76	-	-	0.83	0.74	0.77	0.69	-	-	0.74	0.91	0.95
Tapped density (g/mL)	0.59	-	-	0.59	0.71	0.77	0.91	-	-	1	0.77	0.83	0.87	-	-	0.77	1	1
Compressibility index(CI)%	15.25	-	-	18.64	11.27	18.18	16.48	-	-	17	3.9	7.23	20.69	-	-	3.9	9	5
Hausner's ratio(HR)	1.18	-	-	1.23	1.13	1.22	1.2	-	-	1.21	1.04	1.08	1.26	-	-	1.04	1.1	1.05

Table 4: Physico-chemical parameters at room temperature (25 °C/60% Rh).

Parameters	Product A						Product B						Product C					
	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90
% label claim (non-reconstituted)	102.88	-	-	100.75	101.25	97.5	98.1	-	-	97	97	95	101.75	-	-	101	96.25	95
% label claim (reconstituted)	102.36	101.25	97.5	83.75	110	121.25	99	97	94	71	118	121	101.13	98.75	92.5	77.5	116.25	110
pH	6.33	5.5	4	3	3	3	5.67	5.5	4	3	3	3	6.33	5.5	4	3	3	3
% moisture content (%w/w)	2.33	-	-	10.33	11	8.67	1.33	-	-	6.67	6.67	6.1	0.67	-	-	3.33	4.33	7.33
Powders flow rate (g/sec)	28.01	-	-	31.25	26.32	28.4	22.22	-	-	21.74	25.42	21.07	37.45	-	-	38.46	23.08	30.5
Angle of repose (°)	36.03	-	-	40.4	31.48	25.8	34.44	-	-	33.99	27.55	26.77	34.14	-	-	36.87	28.61	24.42
Viscosity of reconstituted samples (cp)	70.58	70.6	35.78	24.17	17.53	15.98	38.42	15.42	13.74	20.52	23.56	22.77	24.24	37.24	38.83	114.31	-	-
Bulk density (g/mL)	0.5	-	-	0.5	0.67	0.74	0.76	-	-	0.83	0.83	0.83	0.69	-	-	0.83	0.91	0.74
Tapped density (g/mL)	0.59	-	-	0.59	0.77	1	0.91	-	-	1	0.91	0.91	0.87	-	-	0.91	1	0.95
Compressibility index (CI)%	15.25	-	-	15.25	12.99	26	16.48	-	-	17	8.79	8.79	20.69	-	-	8.79	9	22.11
Hausner's ratio (HR)	1.18	-	-	1.18	1.15	1.35	1.2	-	-	1.21	1.09	1.09	1.26	-	-	1.09	1.1	1.05

The aesthetic appeal

The colour, odour, taste and texture were randomly determined.

Particle size determination

The average particle size of the formulation was examined using the nest of sieve method. The sieves were arranged in descending order of their aperture size, with the sieve of largest aperture on

top. 5.0 g of the powder for reconstitution was placed on the upper sieve and the sieves are supported through on a collecting pan at the bottom. The sieves with the powders were subjected to mechanical vibration for 5 min. After which the quantity of the powder retained by each of the sieves were determined and the average particle size diameter (D_{ave}) calculated using;

Table 5: Physico-chemical parameters at elevated temperature (42°C/75% Rh).

Parameters	Product A						Product B						Product C					
	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90	Day 0	Day 7	Day 14	Day 30	Day 60	Day 90
% label claim (non-reconstituted)	102.88	-	-	97.5	88.75	85	98.1	-	-	89	78	72	101.75	-	-	96.25	88.75	73.75
% label claim (reconstituted)	102.36	98.75	92.5	76.25	113.75	131.25	99	95	91	72	120	132	101.13	100	90	70	115	132.5
pH	6.33	6	4	4	3	3	5.67	6	3	3	3	2	6.33	6	3	4	3	2
% moisture content (%w/w)	2.33	-	-	2	10	13	1.33	-	-	2.5	8.5	9.67	0.67	-	-	1.33	6.67	7.33
Powders flow rate (g/sec)	28.01	-	-	43.48	20.83	24.67	22.22	-	-	37	14.71	22.45	37.45	-	-	46.5	25	28.44
Angle of repose (°)	36.03	-	-	36.36	26.95	22.4	34.44	-	-	35.86	26.19	21.58	34.14	-	-	36.03	26.95	22.46
Viscosity of reconstituted samples (cp)	70.58	67.89	42.8	25.59	11.81	10.89	38.42	14.19	12.69	21.69	25.99	28.75	24.24	39.98	40.59	150.52	-	-
Bulk density (g/mL)	0.5	-	-	0.48	0.63	0.83	0.76	-	-	0.83	0.71	0.71	0.69	-	-	0.71	0.91	0.65
Tapped density (g/mL)	0.59	-	-	0.61	0.77	0.91	0.91	-	-	1	0.83	0.83	0.87	-	-	0.91	1	0.95
Compressibility index (CI) %	15.25	-	-	21.13	18.18	8.79	16.48	-	-	17	14.46	14.46	20.69	-	-	14.46	9	12.16
Hausner's ratio (HR)	1.18	-	-	1.27	1.22	1.2	1.2	-	-	1.21	1.17	1.17	1.26	-	-	1.17	1.1	1.14

$$D_{ave} = \frac{\sum [(\% \text{ retained}) \times (\text{average sieve aperture in pairs})]}{100}$$

Angle of repose determination

The funnel exit orifice was placed at a height (h) of 2.0 cm above the horizontal surface the powder under consideration was poured into the funnel gently until the tip of the powder heap formed touch the tip of the orifice. The diameter (D) of the formed powder heap base was obtained. The angle of repose (θ) was determined using the equation;

$$\theta = \tan^{-1} \left(\frac{2h}{D} \right)$$

These procedures were repeated for the other samples at day 0, 30, 60 and 90 at their respective storage conditions

Flow rate determination

A 10.0 g of the powder was placed in a plastic funnel held in position by a retort stand with its exit orifice closed and 10.0 cm from the horizontal surface. The time for 10.0 g of the powder to flow from the funnel down to horizontal surface after opening the exit orifice was determined using a stopwatch. The flow rate in weight per unit time [W (g)/t (secs)] was obtained. These procedures were repeated for the other samples at day 0, 30, 60 and 90 at their respective storage conditions.

Bulk and tapped densities determination

The method adopted in brief: A 5.0 g quantity of the powdered samples were placed in clean and dry 25 mL stoppered measuring

cylinder, the volume (V₀) occupied by each of the samples without tapping was determined. After 250 taps the volumes (V₂₅₀) occupied were determined. The bulk and tap densities were calculated as the ratio of weight to volume (m/V₀ and m/V₂₅₀ respectively). This procedure was carried out on all the different samples at days 0, 30, 60 and 90 at their respective storage conditions [11].

Compressibility index and Hausner's ratio determination

The Carr's compressibility index and Hausner's ratio were determined from the values of the bulk and tapped densities results obtained above using the equations below:

$$\text{Carr's Index (CI)\%} = \frac{\text{Tapped density} - \text{bulk density} \times 100}{\text{Tapped density}}$$

$$\text{Hausner's ratio (HR)} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

Sedimentation volume and redispersibility

The reconstituted suspension sedimentation volume and redispersibility were determined thus; 5.0 g quantity of dry powder was poured into a 50 mL stoppered graduated measuring cylinder, water was added to mark to make a suspension that was dispersed thoroughly by tumbling the stoppered measuring cylinder up and down three times. The suspension was allowed to settle for three minutes and the volume of sediment (H₀) noted. This was kept undisturbed for 14 days. The volume of sediment at 0 day, on 7th and 14th day (H₁₄) was noted [12].

Viscosity determination

The viscosity of the reconstituted suspension was carried out using

Table 6: Particle size determinations. Weight of powder used=5.0 g.

S/N	Product	Powders diameter(µm)
1	A	14.38±1.2
2	B	19.52±2.3
3	C	14.62±1.4

an Ostwald U-tube viscometer at 25 °C. The reconstituted suspension was passed through the capillary arm of the viscometer, and the time required for the reconstituted suspension to pass between the upper and lower marks of the sample reservoir under gravity was compared with that of water. The viscosity of the reconstituted suspensions were determined using the equation;

$$\frac{n_1}{n_2} = \frac{\sigma_1 t_1}{\sigma_2 t_2}$$

Where: n_1 =the viscosity of standard liquid; n_2 = the viscosity of the reconstituted suspension; t_1 =flow time of water; t_2 =flow time of reconstituted suspension; σ_1 =the density of water and σ_2 =the density of the reconstituted suspension.

Stability studies

Stability studies were carried on the reconstituted and non-reconstituted suspension to assess their physical and chemical stabilities. The conditions for this study were chosen to simulate conditions which may influence the efficacy of Cefpodoxime suspension. Samples were stored in a fridge temperature (2-8 °C), room temperature (25 °C) and at elevated temperature (42 °C) for a period of 90 days. Samples were withdrawn and analyzed for Cefpodoxime content, pH, moisture content, particle size, angle of repose, flow rate, bulk and tapped density, drug content, sedimentation rate and volume, redispersibility and viscosity at a predetermined time intervals of 0, 7, 14, 30, 60 and 90days [13]. The drug content assay was carried out using a UV-Vis validated method.

Results and Discussion

The primary reason why drugs are formulated as a suspension for reconstitution is inadequate chemical stability of the drug in aqueous vehicle [14]. In this study we investigated the effect of temperature on the physicochemical characteristics of some brands of oral reconstitutable Cefpodoxime proxetil in order to determine their stability profile. All the samples were within the expiry period and registered with appropriate drug regulatory agency in Nigeria. The colours of the unreconstituted product varies from off white to cream colour (sample “A”) and yellow to brown (sample “B”) in spite of the fact that sample “C” maintaining its cream colour all through the duration of the study. The colours of individual sample depend on other formulation excipients. The reconstituted samples were banana flavoured, sweet with smooth texture. Chemical stability was analyzed through the drug content assay and by chromatography for possible degradation product of active drug (Cefpodoxime proxetil). The percentage of the labelled claim of the non-reconstituted samples decreased with time, across the different samples and at different storage conditions. Product “B” had the least percentage content across all storage conditions used. The drug content of samples in

the refrigerator were within the USP specification for the duration of the study, except Product “B” whose drug content could not meet the specification on day 90 at room temperature [15]. Degradation of Cefpodoxime occurs either acidic, alkaline, oxidative, photolytic stabilities or combination thereof, but in this study as a result of the type of dissolution medium and the ester functional group present in the drug one is tempted to say hydrolysis must have play an important role in the degradation of Cefpodoxime proxetil [16]. The decrease in drug content of the samples as the sample ages for the non-reconstituted samples were reversed on day 60, across all brands and storage conditions. The chromatographic analysis of the reconstituted products showed two distinct retention factor values on days 60 and 90 (Tables 1 and 2). The implication of this is that before/on day 60 another product (possibly the degradation product) has been formed which possibly might have a similar wavelength of maximum absorption close to that of the pure Cefpodoxime proxetil, thereby increasing the absorbance value obtained and therefore the corresponding increase in the calculated amount of the Cefpodoxime present in the samples (Further research is ongoing in our laboratory to characterize the product that gave the second R_f value). Changes in concentration may be caused by the mechanisms associated with hydrolytic decomposition and higher temperatures during the long period of storage [17]. Weakly acidic or basic drugs show good solubility as a result of ionization and thus their degradation rate is faster. For the reconstituted samples, the pH decreases as the suspension ages across all the storage conditions and brands (Tables 3-5). The decrease in pH value is expected Cefpodoxime being an ester which readily hydrolysed in water to form carboxylic acid, though the acid produced is either poorly soluble or it exceed its solubility product thereby leading to product colour change or cloudiness [18]. This explains the colour changes earlier discussed.

Most disperse systems are stable over a pH range of 4-8. The pH of the sample decreases as the samples ages. Products “A” and “C” have similar pH variation, although the pH of product “B” (3.00) deviate from the standard pH range stated above as early as day 14 at elevated temperature while, the pH values of products “A” and “C” only deviated from the standard range on day 60 across the storage conditions. The three brands evaluated were banana flavoured and sweet to taste throughout the duration of the study for refrigerated and room temperature conditions while the taste turned sour on the 30th day for all the brands at elevated temperature. Sour tastes rely on ion current to conduct the taste signal, thus stronger ionic taste. Recall that hydrolysis of Cefpodoxime lead to more ionic degradation products. Particle size has profound effect on the dissolution of a formulation. The bigger the particle size the lower the dissolution rate and the less intense the taste of the particle. The particle sizes for products “A” and “C” were similar and significantly smaller than that of product “B” (Table 6). Within the first 30 days of this study all the reconstituted samples were of smooth and sticky texture with the exception of those kept in the refrigerator which is smooth. The increase in temperature at both room and elevated temperature might have increase the kinetic energy of the individual particles of the molecules, thereby leading to an increase in their rate of collision which resulted in the samples being sticky.

The allowed moisture content should not be more than 10%, because higher moisture content may encourage the growth of

microorganisms and an increase in the rate of the drug hydrolysis. With exception of the samples stored in the refrigerator whose percentage moisture content were greater than the allowable percentage, other samples at room temperature and elevated temperature have percentage moisture content within the allowable percentage moisture content. As a result of this, fungal growths were observed on the inner cover of the samples kept in the refrigerator.

The frictional force in a loose powder can be measured using the maximum angle possible between the surface of a pile of powder and the horizontal plane (angle of repose, θ). Powders with a low angle of repose flows freely and vice versa. This powder flow property is determined by both shape and particle size. For amenable particle shape, powders with size range of 250-2000 μm flows freely while powders with particle sizes $<100 \mu\text{m}$ have flow problem. Angle of repose decreases as the sample ages with product B having the lowest angle of repose at the elevated temperature (Table 5). This implies that since the particle size of product B is lowest angle of repose. The limitation of this study is that our experiments have thus far been conducted for three months rather than 6 months or one year, however the results for many of drug degradation/stability studies such as those examining the effect of physicochemical effect on the product shelf life shows similar results [18,19]. Our experiment, however, were designed to examine the effect of oral reconstitutable dry powder scenario rather than determination of product shelf life.

Our demonstration that elevated temperature do alter the physicochemical parameters of the oral reconstitutable Cefpodoxime proxetil adversely implies that patients should adhere strictly to the storage conditions specified by the producers of the evaluated Cefpodoxime brands in Nigerian market.

In summary our study shows that the physicochemical characteristics of the Cefpodoxime formulations is adversely affected at elevated above room temperature and by extension the product shelf life might be affected.

Conclusion

The purpose of stability testing is to provide evidence on how the quality of a drug substance or drug product varies with time under the influence of a variety of environmental factors, and it enables us to predict the storage condition, predict the period of time in which the product should be re-tested and finally determine the product shelf life. This research studied three brands of Cefpodoxime proxetil formulation (Products A,B and C) at potential temperature of exposures, which shows that the refrigerator temperature condition ($2^\circ\text{C} - 8^\circ\text{C}/40\% \text{ Rh}$) is best for storing the reconstituted suspensions and the non reconstituted samples is best stored a room temperature condition ($25^\circ\text{C}/60\% \text{ Rh}$). Product A showed a very good chemical, physicochemical and physical stability profile over time when compared with Product B and Product C. Thin layer chromatography show the presence of the degradation product after prolonged storage which underscores the importance of manufacturer instruction for

storage and disposal of the product after usage. The increase in the absorbance of the reconstituted suspension after day 30.

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