Article published online: 2022-06-09

Original Article

The Physical, Chemical, and Microbiological Stability of Chloramphenicol Ophthalmic Solution

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Abstract

Aims: The aim of this work is to "predict" the remaining shelf-life of chloramphenicol (CH) eye drops, commercially marketed, using the theoretical "Longland–Rowbotham model,"" followed by confirmation of findings by practical means. **Materials and Methods:** The methods used for the evaluation of CH-eye drops included the assay of the active ingredient, sterility testing, and minimum inhibitory concentration (MIC) determination using official methods during 6 months stability study at variable temperatures (4, 25°C). Furthermore, a 3-month accelerated stability study was carried out. Statistical analysis tests included Student's *t*-test and analysis of variance. **Results:** The prediction model indicated that in pessimistic conditions, the remaining shelf life was reduced to a merely 1 month following production (this is versus the 2 years expiration date given by manufacturer). However, the samples analyzed throughout a 6-month stability study revealed that storing CH solution at 4°C or 25°C does not produce any statistical difference regarding drug content, MIC, or sterility. Accelerated stability studies for 3 months period showed that only after 2 months from storage at 55°C the drug will start to degrade and a statistical difference could be observed. **Conclusion:** Storing CH-eye drops at room temperature for up to 6 months appears to have no effect on the stability of this antibiotic.

Keywords: Accelerated conditions, chloramphenicol, eye drops, stability study, sterility

Introduction

The stability of finished pharmaceutical products depends mostly on environmental factors such as ambient temperature, humidity, atmospheric oxygen, light, and on product-related factors.[1] The objective of stability study is usually to determine the shelf life and also to assure the stability of a drug product within the determined time period. Any physical, chemical, or microbiological change in the product potentially impacts the efficiency and integrity of the final product and may therefore directly or indirectly impact patients' health. Chloramphenicol (CH) is a broad-spectrum antibiotic which is more commonly used in ophthalmic dosage forms.[2] The United States Pharmacopeia (USP) states that "CH eye drop solution should be stored at the low temperature of 2°C–8°C."[3] However, there is a common observation of noncompliance with this specific storage condition among pharmacists.[4] And that CH eye solution is stored similarly to its ophthalmic ointment dosage form at room temperature. Such noncompliance could result in potential reduction in product shelf life.[5-7] However, there are some mathematical models which can be used to estimate the "true" shelf life of a dosage form based on its actual storage temperature.[8] Hence, the aims of this work were to predict the true (remaining) shelf life of commercially marketed CH eye drops using the Q_{10} method, followed by confirmation of findings by the assay of active ingredient content, sterility testing, and minimum inhibitory concentration (MIC) determination using official methods during 6 month storage at variable temperatures (4, 25°C). Also, to conduct an accelerated stability study to characterize the effect of elevated temperature on the rate of change in the ophthalmic solution.

Access this article online

Quick Response Code:

Website: journal.limu.edu.ly

DOI: 10.4103/LIUJ.LIUJ_16_18

Materials and Methods

Materials

Phenicol® eye drops (API-Jordan), CH reference standard (API-Jordan), *Escherichia coli* standard ATCC 10536 (Becton-Dickinson, France), culture media used:

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How to cite this article: Salih TM, El-Mahdi IM. The physical, chemical, and microbiological stability of chloramphenicol ophthalmic solution. Libyan Int Med Univ J 2018;3:42-8.

Received: 02-04-2018 **Accepted:** 10-06-2018 **Published:** 18-07-2018

plate-count agar (for bacterial cultures, Himedia, India), Soybean-Casein (bacterial broth for antibiotic assay, [Becton-Dickinson, France]), antibiotic medium 19 (for antimicrobial activity, [Becton-Dickinson, France]), fluid thioglycollate (for sterility testing, Himedia, India).

Methods

Chloramphenicol dilution for diffusion method of assay

Several test solutions of CH from sterile eye drops were aseptically prepared for the final concentration of 2.5 µg/ml under laminar flow (Telstar, Spain) using purified water.[9] A sample of 5 ml of drug solution was aseptically withdrawn from the container and transferred to 45 ml of sterile water solution to make up a stock solution from which several dilutions were made to produce final concentrations of 500 µg/ml, 50 µg/ml, and 2.5 µg/ml, respectively.

Preparation of media

Antibiotic assay by agar medium

Ready-made medium for antibiotic assay was used for the preparation of the plates. In 100 ml flasks, a 3 g of powder was suspended in 50 ml of purified water and mixed using a hot-plate with a magnetic stirrer (SBS, Germany). The pH of the prepared solution was measured to produce 6.1 ± 1 pH. The media was sterilized by autoclaving (Sanoclav, Germany) at 121°C for 15 min at 15 lb pressure.

Soya bean casein broth for culturing reference *Escherichia coli*

This medium was used for enriching and preparing the bacterial strain which was used for measuring the potency assay of CH. Samples of 3 g of the powdered medium were placed in 100 ml of purified water and sterilized by autoclaving at 121°C for 15 min at 15 lbs.

Fluid thioglycollate medium

Fluid thioglycollate medium is primarily intended for the culture of anaerobic bacteria. However, it is suitable for the culture of both fungi and aerobic bacteria depending on incubation temperature.[3] For the preparation of 1 L of the medium, 29.75 g are suspended in purified water, heated to boiling to promote solubility, and then sterilized by autoclaving using the same conditions. The medium is stored at 2°C–25°C in a sterile, airtight container. If more than the upper third of the medium has acquired a pink color, the medium may be restored once by heating the container in a water-bath or in free-flowing steam until the pink color disappears and cooling quickly, taking care to prevent the introduction of nonsterile air into the container.[9]

Plate count agar (standard methods agar)

The plate count agar was used for the culturing of *E. coli* ATCC/10536 strain. For the preparation of 1 L of medium 23.5 g are suspended in purified water, heated to boiling to dissolve the medium completely, and then sterilized by autoclaving using the same conditions described above.

Preparation of reference bacterial strain-*Escherichia coli* ATCC/10536

The USP states that the test microorganism for CH assay is *E. coli* ATCC/10536**,** using the following procedure:

Reference strain of *Escherichi coli* ATCC No/10536 was provided by the Centre of Drug Control (Tripoli, Libya). Culture pellets were aseptically transferred into the sterile soya-bean casein digest broth and incubated at 37°C for 24 h. After incubation, the culture suspension was inoculated into the plate-count agar. Then, one colony was transferred to soya-bean casein digest broth and was allowed to be incubated overnight. The concentrated bacterial strain was used for seeding into the antibiotic medium.

Sample inoculation for cylinder-plate method (diffusion method)

Samples of 50 ml of media were poured into square-petri dishes and allowed to solidify. The media was then inoculated by swab with 0.2-ml of *E. coli* broth. Six assay cylinders were dropped on the inoculated surface from a height of 12 mm using a spacing device to produce pores of 1-cm radius. Then, 0.1 ml volume of CH dilutions (as prepared in section 2.2.1) were transferred to the pores. The plates were incubated at 37°C for 24-h. After incubation, the zone of inhibition was measured. These experiments were repeated for CH samples stored at 4°C, 25°C, and 55°C.

Sterility testing

The test for sterility is carried out under aseptic conditions, and employing laminar-flow, by using the direct-inoculation method.[3] Samples of 10 ml of sterile ophthalmic CH solution was aseptically handled and transferred into flasks-containing 100-ml of fluid thioglycollate media. The flasks were then incubated at 25°C and 37°C for 14-days for detection of growth of fungal and bacterial contamination, respectively. The inoculated media was monitored using the following protocol:

- After sample inoculation was completed, the samples were monitored everyday in the incubator
- If any turbidity was observed in flasks, it was investigated for further confirmation
- From any turbid flask, a loop full of the sample was inoculated into plate count agar and sabouraud dextrose agar plates. The plates were incubated at 37°C for bacteria and 25°C for fungi
- If any bacterial or fungal growth observed the isolated colonies are confirmed by gram stain and other primary identification test.

The sterility testing was carried out on samples stored at cold storage and room temperature (25°C).

pH measurement

The pH of CH solution was measured using a calibrated pH-meter (BP3001® pH meter, Transinstrument, Singapore) and employing a sample volume of 10 ml of CH solution. The USP states that the pH should be in the range 7–7.5 except in case of unbuffered solution in which pH is within the range from 3 to 6 pH.[3]

Assay of chloramphenicol content

As per the British Pharmacopeia,[10] a 2 ml sample of CH solution was diluted to 100 ml in purified water, further diluted by a factor of 10, and the absorbance was measured spectrophotometrically (Jenway spectrophotometer, UK) at

278 nm. The unknown absorbance for the tested samples was converted into concentration by using a linear equation derived from a calibration curve.[11]

Calibration curve of chloramphenicol in purified water

An accurately weighed amount of pure CH drug was dissolved completely in purified water using a sonicator (Sonomatic, UK). Then several samples from this stock solution were withdrawn and completed to a specific volume to produce five different concentrations. The absorbance of samples was then measured spectrophotometrically at 278 nm. Then, the resulted absorbance was plotted against concentration and subjected to linear regression analysis to develop a linear equation and to estimate its linearity.[1] The resulted equation will be used in the conversion of any unknown absorbance of CH into concentration.

Effect of storage temperature on the stability of chloramphenicol ophthalmic solution

To evaluate the effect of storage temperature on the stability of CH solution, selected samples were stored at 2 temperatures: cold storage (4°C) and room temperature (25°C). The samples were stored at these conditions for 6 months, through which samples were analyzed every month for antibiotic assay, antibacterial activity, sterility, and pH measurement. The average of 5 bottles of CH ophthalmic solution was analyzed at each time point, and the results were tabulated as the average of each 5 samples analyzed. The studies were conducted on containers in its primary and secondary packaging.[11]

Accelerated stability study

Samples of CH ophthalmic solution, in its original packaging, were stored at 55°C using an oven (Memmert, Germany) for the period of 3 months and the samples were analyzed every month for antibiotic assay, antibacterial activity, and pH measurement as described above.[1,11]

Prediction of true shelf life of chloramphenicol ophthalmic solution

Longland and Rowbotham have suggested that the concept based on Q_{10} values could be useful for estimating the shelf-life at room temperature of such products.[8] The Q_{10} value is the factor by which a rate constant increase for a 10° rise in temperature; for rough estimates, a Q_{10} value is often assumed to be 2 (for an optimistic estimate) or 4 (for a pessimistic estimate). Using the Q_{10} model of prediction (Equation 1), the true shelf life of the eye drops was estimated. The average temperatures (T_2) in the calculations were determined as the average room temperature in Benghazi, Libya, which was 20°C ± 7.4°C. As a result, the remaining shelf-life was determined at three possible temperatures: 13°C, 20°C, and 27°C. The calculations were also repeated at the three possible values of $Q_{10:}$ 2, 3, and 4. Calculations are based on the following equation:

$$t_{s(T_2)} = \frac{t_{s(T_2)}}{Q_{10}^{\left(\frac{T_2 - T_1}{10}\right)}} \qquad \text{Equation (1)}$$

Where $t_{s(T1)}$ and $t_{s(T2)}$ are the shelf-lives at temperature T_1 and T_2

Statistical analysis

The Student's *t*-test was applied, where appropriate, to analyze any two sets of data. The 0.05 level of significance was used at all times. The comparisons between more than two-sample means were performed using two-way analysis of variance (ANOVA).[12] The analysis was carried out using Excel-2007 software statistical package (Microsoft, USA).

Results

Prediction of "true" shelf-life of chloramphenicol eye-drops

Based on the prediction model, an estimate of the possible shelf-lives of the selected ophthalmic product is calculated and summarized in Tables 1 and 2. The date of manufacturing of CH eye drops was February 2015, and its expiration date is February 2017. In Table 1, the estimate was based on the date of manufacturing which was February 2, 2015, whereas in Table 2, the calculations were based on the date of the arrival

Table 1: Estimates of remaining shelf life of chloramphenicol eye drops based on the prediction model. The average temperature of storage was 20°C±7.4°C, and calculation was based on the date of manufacturing (February 1, 2015)

Q_{10}	Temperature (C°)	Days remaining	Expiration date
2	12.6	431 days	April 6, 2016
	20	258 days	October 15, 2015
	27.4	155 days	July 4, 2015
3	12.6C	317 days	December 13, 2015
	20	140 days	June 19, 2015*
	27.4	62 days	April 2, 2015*
4	12.6	255 days	October 12, 2015
	20	91 days	May 1, 2015*
	27.4	33 days	March 4, 2015*

Table 2: Estimates of remaining shelf life of chloramphenicol eye drops based on the prediction model. The average temperature of storage was 20°C±7.4°C , and calculation was based on date of arrival of product to pharmacy (June 1, 2015)

Q_{10}	Temperature (C°)	Days remaining	Expiration date
2	12.6	360 days	May 26, 2016
	20	215 days	January 31, 2016
	27.4	129 days	October 7, 2015
3	12.6	264 days	February 19, 2015
	20	117 days	September 25, 2015
	27.4	52 days	July 22, 2015
4	12.6	212 days	December 29, 2015
	20	76 days	August 15, 2015
	27.4	27 days	June 28, 2015*

*Indicates that a product is already past its expiration date from date of starting this work, which was on the month of June 2015. By the time of finishing this work, the product is potentially expired at all the used conditions in this protocol, and before its released expiration date by manufacturer

Table 3: Measurement of zone of inhibition of chloramphenicol during 6-months of study at various storage temperatures, and as a function of drug concentration. The data are the mean of 5-measurements for each experiment

Concentration	July		August		September	
	CS	RT	CS	RT	CS	RT
5 mg/ml	3.58±0.13	3.64±0.11	3.84±0.05	3.78±0.04	3.48±0.04	3.52±0.04
500 mg/ml	2.9±0.16	2.94±0.13	3.18±0.04	3.12±0.04	2.92±0.08	2.94±0.05
50 mg/ml	2.1±0.07	2.08±0.1	2.22±0.04	2.22±0.04	2.06±0.05	2.06±0.05
2.5 mg/ml	-	-	-	-	-	-
Control	-	-	-	-	-	-
Concentration	**October**		**November**		**December**	
	CS	RT	CS	RT	CS	RT
5 mg/ml	3.88±0.08	3.9±0.07	3.86±0.05	3.82±0.08	3.88±0.04	3.84±0.08
500 mg/ml	3.22±0.08	3.2±0.07	3.36±0.05	3.34±0.08	3.32±0.04	3.32±0.04
50 mg/ml	2.22±0.109	2.22±0.109	2.36±0.05	2.36±0.05	2.18±0.04	2.16±0.05
2.5 mg/ml	-	-	-	-	-	-
Control	-	-	-	-	-	-

Data is in cm ± SD. CS: Cold storage; RT: Room temperature; SD: Standard deviation

Table 4: Summary to chemical assay of chloramphenicol during the 6-months stability study

	Conditions	Assay (%)
July	CS	99.74±3.46
	RT	99.88±2.3
August	CS	98.04±1.40
	RT	98.5±1.71
September	CS	98.1±1.96
	RT	98.1±2.53
October	CS	98.18±1.64
	RT	98.84±1.86
November	CS	100.8±1.33
	RT	99.34±1.53
December	CS	100.8±1.45
	RT	100.8±1.96

Data is ± SD. CS: Cold storage; RT: Room temperature; SD: Standard deviation

at the pharmacy and the start of this work. The results show that at possible extreme conditions of storage temperature the products may already be expired before even reaching patients. Furthermore, it indicates that if there was any failure in storing this product at specific storage temperature, it will lose its activity.

Minimum inhibitory concentration of chloramphenicol by diffusion method

Measurement to the zone of inhibition of CH was carried out for 6 months. The ophthalmic product was stored at room and refrigerated temperatures. Table 3 summarizes the various measurements to zones of inhibition as a function of drug concentration for the two storage temperatures. It was evident that the zone of inhibition increases in area as drug concentration was increased. Moreover, it appears that there are only slight differences in such measurements as the storage temperature was changed.

The statistical analysis of the produced data was analyzed using two-way ANOVA. It was found that there is no significant difference between the two storage temperatures based on the zone of inhibition. The analysis also showed that the concentration of the antibiotic was a significant factor on the zone of inhibition dimensions. These observations were found throughout the 6 months study.

Analysis of chloramphenicol concentration during stability study

The data derived from the spectrophotometric analysis was converted to concentration by the linear equation $y = 0.011 + 0.029 \times$ ($R^2 = 0.999$) derived from the data of calibration curve. The average of the chemical assay of CH concentration during the 6-month stability study at the two different storage temperatures is given in Table 4. The results showed that drug concentration during the study was always within the acceptance limit stated by the USP (90-130%). Furthermore, it showed that the storage temperature did not affect CH concentration throughout the study. Based on statistical analysis of the mean using *t*-test, the results showed no significant difference at the tested temperatures.

Sterility testing during the 6-months stability study

Testing for sterility of CH eye drops was carried out for the period of the study. The results indicate that the samples stored at either room temperature or under cold storage maintained their sterility throughout the study. Neither bacterial nor fungal growth was observed for the period of 6 months. This implies that the storage temperature does not have any effect on sterility of this ophthalmic product.

Accelerated stability study on chloramphenicol eye-drops

Accelerated stability study was carried out on selected samples stored at 4°C and 55°C. The results are given in Table 5. Although the data show a decrease in measurements of the zone of inhibition at the higher temperature, statistically the differences were significant only in the 3rd month of the stability study. Furthermore, the results of the chemical assay

Table 5: Measurement of zone of inhibition of chloramphenicol during 3-months of the study at various storage temperatures, and as a function of drug concentration. The data are the mean of 5 measurements for each experiment

Concentration	December		January		February	
	4°C	55°C	4°C	55°C	4°C	55°C
5 mg/ml	3.65±0.07	3.65±0.07	3.65±0.07	3.3±0	3.95±0.07	3.5±0.14
500 mg/ml	3.05±0.07	3.05±0.07	3.2±0	2.25±0.07	3.3±0	2.8±0
50 mg/ml	2.35±0.07	2.25±0.07	2.45±0.07	1.15±0.07	2.55±0.07	1.85±0.07
Control	-	-	-	-	-	-
pH	7.42	7.20	7.42	7.10	7.42	6.92

Data is in cm ± SD. pH at room temperature=7.32. SD: Standard deviation

were inconclusive due to the formation of color as a result of storage at elevated temperature and the intensity of the color increases as storage period was prolonged at 55°C. The presence of color interfered with the spectrophotometric assay readings. Color production is an indication of CH degradation and the formation of glycols.[13,14] In addition, pH-measurements showed a decrease in the pH of the solution as a result of heat treatment. Although it should be noted that even with the drop in pH, the data is reasonably within the official acceptable range.

Discussion

It is well documented that CH solution should be stored at low temperature to maintain stability. Moreover, all of the manufacturers of this particular dosage form usually recommend strict adhesion to this specific storage condition. Based on the Q_{10} mathematical model to estimate/predict, the effect of inappropriate storage temperature on the shelf life of CH eye drops, it was found that if CH solution was stored at room temperature, the product could already be past its expiration date. Moreover, potentially a patient could be using an ineffective product. This observation is similar to conclusions-derived from other workers, which was based on similar prediction using another brand name of CH eye-drops.[15]

Attempts were made to quantitatively assess the stability of CH solution stored at room temperature and to validate the conclusion derived from the mathematical model. The stability study was carried out for 6 months and included evaluation of sterility, measurement of MIC, and assay of active ingredient concentration. The tested samples were stored at both room temperature and under cold storage. The results revealed that all the products stored at both temperatures exhibited the same behavior to the following: both maintained their sterility, both have the same MIC effects, drug content was unchanged at both temperatures. Moreover by using suitable statistical tools such conclusion was confirmed and that there is no significant difference between the compared three parameters. This is in disagreement with previous conclusions documented by Boer and Pijnenburg which indicate that CH degrades in solution by 15% after 1 year from storage at 21°C.[16] It should be noted that the conclusions assumed by Boer and Pijnenburg did not include measurements of MIC and only based on chemical assay of the active ingredient. These current findings are in agreement with the work reported by Han-Jun *et al*. in which the authors concluded after a stability study that CH solution could be stored at room temperature up to 4 months.[17]

The accelerated stability study was carried out employing an extreme of storage conditions using high temperature to accelerate the rate of change in the dosage form. The experiment was conducted for 3 months and the results revealed that drug concentration of CH is decreasing with time. This decrease was statistically nonsignificant during the first 2 months and changed to significant at the 3rd month of the study. The instability was also confirmed by production of color which increases in intensity with the progress of time at elevated temperature, accompanied by a drop in pH. This is similar to some of the results obtained by other reports in which after 90 days of storage at 50°C only 4% decrease in drug concentration was observed.[16,18]

Conclusions

The prediction model of Q_{10} value should be used with precaution as false conclusions may be derived. Based on the conducted experiments, it can be concluded that CH solution for ophthalmic administration could be stored at room temperature for a period of up to 6 months without any significant change in its activity.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Florence A, Attwood D. In Physicochemical Principles of Pharmacy: Manufacture, Formulation and Clinical Use. 6th ed. UK: Pharmaceutical Press; 2016.
2. British National Formulary (BNF-54). 54th ed. UK: BMJ Publishing Group Limited; 2007.
3. Chloramphenicol ophthalmic solution. USP 35/NF 30. USP: Rockville, MD; 2013. p. 2609.
4. Aboshiha J, Weir R, Singh P, Ewings P, Lovering A. To what extent does a lack of refrigeration of generic chloramphenicol eye-drops used in India decrease their purity and what are the implications for Europe?

Br J Ophthalmol 2008;92:609-11.
5. Pugh W. In: Aulton M, editor. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. 3rd ed., Ch. 7. UK: Elsevier; 2007. p. 99-107.
6. Jithan AV, Mohan CK, Vimaladevi M. Development and evaluation of a chloramphenicol hypertonic ophthalmic solution. Indian J Pharm Sci 2008;70:66-70.
7. Ahmed S, Rajia S, Rahman A, Islam A. Potency and antibacterial efficacy of degraded chloramphenicol in marketed eye drop preparations. Bangladesh Pharm J 2013;16:165-9.
8. Lund W. The Pharmaceutical Codex: Principles and Practice of Pharmaceutics. UK: The Pharmaceutical Press; 1994. p. 277-310.
9. Kar A. Pharmaceutical Microbiology. India: New Age International Limited; 2008.
10. British Pharmacopoeia. UK: HMSO Books; 2007.
11. AlAani H, Alnukkary Y, Alashkar I. Stability and kinetic studies for the estimation of shelf-life of chloramphenicol, dexamethasone, sodium phosphate, and tetrahydrozoline hydrochloride opthalmic solution. Int J Pharm Sci Rev Res 2015;30:327-30.
12. Fowler J, Cohen L, Jarvis P. Practical Statistics for Field biology. 2nd ed. UK: Wiley; 1999.
13. Lv FF, Zheng LQ, Tung CH. Phase behavior of the microemulsions and the stability of the chloramphenicol in the microemulsion-based ocular drug delivery system. Int J Pharm 2005;301:237-46.
14. Lv FF, Li N, Zheng LQ, Tung CH. Studies on the stability of the chloramphenicol in the microemulsion free of alcohols. Eur J Pharm Biopharm 2006;62:288-94.
15. Abachi F, Bander F, AL-Deeb N, Gaafar Z. Formulation and stability studies of chloramphenicol as ophthalmic eye drop. Tikrit J Pharm Sci 2010;6:70-7.
16. Boer Y, Pijnenburg A. HPLC determination of chloramphenicol degradation in eye drops. Pharm Weekbl Sci 1983;5:95-101.
17. Han-Jun H, Xiang-Bing L, Fan T. Study on stability of dexamethasone-chloramphenicol eye drops. J Nanhua Univ (Med Educ) 2006;1:034.
18. Nicoleta T, Adrian C, Emőke R, Ion V, Luminiţa L, Emese S. Limitations when use chloramphenicol-bcyclodextrins complexes in ophthalmic solutions buffered with boric acid/borax system. Acta Med Marisiensis 2014;60:269-74.

ملخص المقال باللغة العربية

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الهدف: الهدف من هذا العمل هو "التنبؤ" بمدة الصلاحية المتبقية من قطرات الكلورامفينيكول (CH) ، المسوقة تجاريا باستخدام النموذج النظري"Longland - Rowbotham" ، متبوعًا بتأكيد النتائج بالوسائل العملية.

المواد والطرق: لتقييم قطرات العين CH – ثم تعيين تركيز المادة الفعالة، اختبار العقم، والتركيز المثبط الأدنى للبكتريا (MIC) وذلك باستخدام الطرق المعتمدة لدراسة الثباتية الدوائية خلال 6 أشهر عند درجات حرارة متغيرة (4-25 درجة مئوية). وعلاوة على ذلك، تم دراسة الثباتية الدوائية المسرعة لمدة 3 أشهر. شملت اختبارات التحليل الإحصائي للنتائج اختبار t للطالب وتحليل التباين.

النتائج: أشار نموذج التنبؤ إلى أنه في الظروف المتشائمة، تم تقليل فترة الصلاحية المتبقية إلى شهر واحد بعد الإنتاج (وهذا مقابل تاريخ انتهاء الصلاحية لسنتين من قبل الشركة المصنعة). ومع ذلك، فإن العينات التي تم تحليلها خلال دراسة الثباتية الدوائية خلال 6 أشهر كشفت أن تخزين CH عند 4 درجات مئوية إلى 25 درجة مئوية لا ينتج عنه تحلل الدواء كما أنه لا يوجد فرق إحصائي فيما يتعلق بتركيز المادة الفعالة، أو اختبار العقم، أو التركيز المثبط الأدنى للبكتريا. غير أن دراسات الثباتية الدوائية المسرعة لمدة 3 أشهر أظهرت أنه بعد شهرين فقط من التخزين عند درجة حرارة 55 درجة مئوية سوف يبدأ الدواء بالتحلل بفروق إحصائية واضحة.

الاستنتاج: يبدو إن تخزين قطرات العين CH في درجة حرارة الغرفة لمدة تصل إلى 6 أشهر ليس له أي تأثير على ثباتيه هذا المضاد الحيوي.

الكلمات المفتاحية: الثباتية المسرعة، كلورامفينيكول، قطرة العين، دراسة الثباتية، التعقيم.