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**DISSOLUTION SHELF LIFE
OF PACKAGED PHARMACEUTICAL TABLET
BY PREDICTION AND EXPERIMENT**

presented by

Jurmkwon Suemag

has been accepted towards fulfillment
of the requirements for

MASTER degree in **PACKAGING**

Hugh E. Lockhart

Major professor

Date MAY 15, 2001

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**DISSOLUTION SHELF LIFE OF PACKAGED PHARMACEUTICAL TABLET
BY PREDICTION AND EXPERIMENT**

By

Jurmkwon Suemag

AN ABSTRACT OF A DISSERTATION

**Submitted to
Michigan State University
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Professor Hugh E. Lockhart

ABSTRACT

DISSOLUTION SHELF LIFE OF PACKAGED PHARMACEUTICAL TABLET BY PREDICTION AND EXPERIMENT

By

Jurmkwan Suemag

This research was designed to predict shelf life of packaged pharmaceutical tablets by using dissolution as a function of moisture content and storage time. Shelf life was predicted by the amount of time required for the moisture content of the pharmaceutical product to increase until it reached equilibrium (permeation time) plus the time that the product could tolerate that storage condition (exposure time) in an open dish study. Permeation time can be calculated by using information from a sorption isotherm, WVTR and other parameters, including product dry weight, storage conditions, initial and critical moisture content.

In this study, prednisone, a moisture sensitive uncoated tablet, was stored in an open dish at 75%RH at 25°, 30° and 40°C to determine exposure time. To prove the validity of the calculation, the actual permeation time was determined by measuring the moisture content of prednisone packaged in PVC and PVC/0.6 mil Aclar blisters at certain intervals. The calculation provided an error of less than 10%. Therefore, this calculation is useful to select the packaging material that provides enough moisture barrier to the products for the stability test. The actual dissolution shelf life was determined by using as critical point a 10% reduction in dissolution. The shelf life predicted and the actual shelf life were compared. Predicted shelf life was from 8 to 44 percent less than the experimental result.

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CHAPTER 1

INTRODUCTION

Shelf life is the time lapse from manufacturing to the specified expiration date during which the characteristics of a drug product will remain within the approved specifications (Chow and Shao 1991; USP 23 <1151>). Expiration dating on the label indicates the shelf life of the pharmaceutical product¹. Shelf life depends on product properties, package properties and storage condition. Two methods used to identify the shelf life of pharmaceutical products are stability testing and prediction or calculation by equation sets. Stability testing is designed to assess the stability characteristics or the shelf life of the drug products. For stability testing, the product is packaged in the market package and stored for a period of time until failure, or lack of it, can be identified. Stability testing is required for Food and Drug Administration (FDA) permission to introduce a new drug to market (USP 23 <1077>). Another way to study the shelf life of a pharmaceutical product is prediction or calculation by mathematical model. The model can be represented by a computer program which is a tool to provide convenient calculation of shelf life, or of the barrier required to attain a specified shelf life. The computer program is based on the equation sets which include equations for permeation of packages and the moisture equilibrium isotherm for the product. Although prediction of the shelf life of the pharmaceutical product by these equation sets can not be used in place of stability testing, this prediction is very useful for calculating the barrier required to achieve a desired shelf life by selecting the appropriate packaging material. Study of

¹ Expiration date as defined on page 4

the product in package can be done in this way to minimize the trial and error process in package selection. The choice of barrier is then validated using the stability test.

Dissolution is one of the physical properties of pharmaceutical products that are listed as criteria for acceptable levels of stability in the United States Pharmacopoeia monograph for every product. In many researches, dissolution has been found to be susceptible to change during storage (Nakabayashi et al 1981; Chowhan 1994; Qian 1996; Wu 1996; Kokitkar 1997; Rohrs et al 1999 and Yoon 2000). Therefore, dissolution can define the shelf life of the products. Other physical properties are appearance, palatability, uniformity and suspendability (USP <1191>). Acceptability in appearance, for example, turning yellow in tablet, stickiness in capsule or cracking in coated tablets can be determined easily by patients. Failure to meet these limits can result in recall of the product (Murthy and Ghebre-Sellassie 1993).

In the School of Packaging, Michigan State University, pharmaceutical product packaging is studied by using dissolution as one of the indicators to determine shelf life. These researches are done using the open dish method. The open dish method of exposure to heat and humidity is a way to study behavior of product which is not packaged. Product will absorb moisture until it reaches equilibrium with the environment, and many researchers have reported that the dissolution is affected by moisture content. (Taborsky-Urdinola et al 1981, Akbuga et al 1984 and Rohrs et al 1999)

A product in open dish will meet the dissolution requirements for some time after its moisture content reaches equilibrium with the environment. Therefore, the open dish method can tell us how long the product can tolerate a specific condition after the moisture content reached equilibrium. But the moisture content of a packaged product

takes longer to reach equilibrium than the product in open dish. Equations (1) to (6), chapter 2, page 10-12, can be used to calculate the time for the product in the package to reach a moisture content in equilibrium with the storage condition. The hypothesis has been raised that shelf life can be predicted as the time during which the product in the package gains moisture until it reaches a specific condition (permeation time) plus the time that the product can tolerate such specific condition (exposure time). This portion is determined during the open dish study.

This research was designed to prove the prediction and compare the shelf life by prediction to the actual shelf life of the product in the package. In addition, the physical deterioration and dissolution of the product in the package were observed to determine whether they follow the same course as the product in open dish study. In this research, failure of prednisone in open dish and stored at 75%RH, 25°, 30° and 40°C was found at day 30, 12 and 18 respectively. Failure of prednisone tablets packaged in PVC at the same storage conditions was found at day 38, 25 and 24 and for those packaged in PVC/0.6 mil Aclar was found at day 65, 37 and 32 respectively. No physical deterioration was found before product failed dissolution.

Objectives of the Research

1. To determine whether the dissolution failure and physical failure of the drug in package follows the result from open dish study.
2. To demonstrate that the correct moisture barrier package can be chosen by calculation, using results of open dish studies and measured permeation values of packages.
3. To prove that the hypothesis predicts correctly the failure point (shelf life) under prescribed conditions.

CHAPTER 2

LITERATURE REVIEW AND PREVIOUS WORK

2.1 Stability Testing

“Stability refers to the chemical and physical integrity of the drug dosage unit and/or the ability of the dosage unit to maintain protection against microbial contamination” (USP 23 <1151>). In this reference, the stability parameters are listed as:

- Drug ingredient; therapeutically active or inactive
- Particle size, pH, the properties of water and other solvents employed
- Environmental conditions of storage; temperature, light, air, humidity
- Packaging
- Other chemicals resulting from contamination or from the intentional mixing of different products.

This research focuses only on environmental condition and packaging.

“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 such as temperature, humidity and light. The result of such stability testing shall be used in determining appropriate storage conditions and expiration date. Expiration date is the date placed on the container/labels of a drug product designating the time during which a batch of the product is expected to remain within the approved shelf life specification if stored under defined conditions, and after which it must not be used” (USP 23 <1196>). Furthermore, stability studies are intended to match the packaging performance with the needed protection by using optimal packaging material

(Murthy and Ghebre-Sellassie 1993). Stability testing is required by FDA for qualification of packaged drugs for marketing.

The storage test conditions for stability studies are as follows. These are standard conditions agreed to by the International Committee for Harmonization (ICH).

Conditions	Minimum Time Period at Submission	
Long-term testing	$25 \pm 2^{\circ} / 60 \pm 5\%RH$	12 months
Intermediate Accelerated	$30 \pm 2^{\circ} / 60 \pm 5\%RH$	6 or 12 months
Accelerated testing	$40 \pm 2^{\circ} / 75 \pm 5\%RH$	6 months

For long-term testing, the time period will continue after 12 months for the expected lifetime of the product. For intermediate accelerated condition, it must be a 12 month study but data from first 6 months can be submitted in place of accelerated data. Accelerated data is required to submit with long-term data.

Prediction of shelf life at the ambient condition by conducting the experiment only at accelerated condition is not accurate because the diffusion of moisture into the product and permeability of the package are not always linearly related to temperature and humidity at higher temperatures and humidities. “Although data obtained under accelerated conditions are not useful in predicting the dissolution shelf life of the product under ambient condition, they are of value for assessing the ruggedness of the product and its ability to withstand the varied climate conditions during transport, shipping and storage” (Murthy and Ghebre-Sellassie 1993).

2.2 Dissolution

Dissolution stability is the maintenance of the dissolution characteristics of the product, within specified limits, from the time of manufacture up to the expiration date (Grimm, W. et al 1985). During storage, the pharmaceutical product will change in properties that may affect the bioavailability of the dosage form ((Murthy and Ghebre-Sellassie 1993). In vivo bioavailabilities of several drugs in solid dosage form are closely related to their in vitro dissolution rate (Fraser 1973). Therefore, dissolution testing is used to evaluate the performance of the pharmaceutical product. The purpose of dissolution testing is to determine compliance with the USP dissolution requirements where stated in the individual monograph for a tablet or capsule dosage form, except where the label states that the tablets are to be chewed (USP 23 <711>).

2.2.1 Factors Influencing Dissolution Stability

One or a combination of factors that affect the dissolution stability of a product during aging include (Murthy and Ghebre-Sellassie 1993; Chowhan 1994).

- **Formulation:** particle-size distribution of drug substance, ratio of the active ingredient and excipients, coating materials, composite solubility and hygroscopicity, type and concentration of the disintegrant, binder and lubricant.
- **Manufacturing method:** “directly compacted tablets and direct-blend capsules in general are less prone to the deleterious effects on dissolution after aging” (Chowhan 1994).

- Processing factors: time and speed of mixing, granulation, the type and amount of granulating solvent, granulation moisture content before compaction, blending time with lubricant and tablet crushing strength.
- Storage conditions: “The condition of high heat and humidity caused the greatest change in dissolution rate” (Taborsky-Urdinola et al 1981).
Dissolution of many tablets is affected by moisture; for example, dissolutions of Delavirdine Mesylate 200 mg tablets and Phenytoin Sodium tablets were dramatically decreased after storage at high relative humidity (Akbuga et al 1984 and Rohrs 1999).
- Packaging: Tablet dissolution is affected by action of moisture (Rohrs et al 1999). One of the factors controlling the permeation of the water into the pharmaceutical products is the barrier property of packaging material. Prednisone tablets stored in higher barrier packaging material dissolved more than those in lower barrier packaging material (Taborsky-Urdinola et al 1981).

Of the five factors presented in the literature, storage conditions and packaging were selected for study in this research.

2.2.2 Effect of Packaging on Dissolution

One of the functions of packaging is to protect the product from elements of the external environment such as moisture, oxygen and light depending on the properties of the packaging material. The packaging that has a higher moisture barrier characteristic retains the stability in term of dissolution better than the packaging that has lower

moisture barrier characteristic. A prime factor that causes sensitivity of drug products to moisture is excipients (Taborsky-Urdinola et al 1981). Water up-take causes the development of intermolecular hydrogen bonding among excipients. The stronger the hydrogen bond, the less the rate of dissolution. The amount of crystallinity of an active ingredient, which has an inverse relationship with dissolution, varies according to the moisture content. (Hirasawa et al 1998). “Tablets exposed to excess moisture can either harden or soften and then crumble, depending on excipients and the drug” (Taborsky-Urdinola et al 1981).

Blister packaging made from PVC and PVC/0.6 mil Aclar was used for this experiment. “PVC is the most widely used blister material because of its good thermoforming properties, enabling high speed production. Although PVC does possess water vapor barrier properties, the water vapor transmission rate of this material is considered to be too high for moisture sensitive products” (Guise 1984). The moisture barrier property of PVC is improved by lamination with Aclar (polychlorotrifluoroethylene). Aclar film provides an excellent moisture barrier and clarity which has an attractive cost/performance ratio for pharmaceutical products. It is also heat sealable. There are 4 types of Aclar; homopolymer, Aclar RX series, copolymers Aclar 22A and 33C and Aclar NT (AlliedSignal Specialty Films 1998).

2.2.3 Dissolution of Tablet Products

A dissolution test requirement has been included in the product monographs in the National Formulary (NF) and USP (Hanson 1992). There are many dissolution methods and apparatus but the most common methods for immediate release dosage forms are the

rotating basket apparatus and the rotating paddle apparatus. Water is recommended for dissolution medium for prednisone. The volume of water is not less than three times the volume required for a saturated solution of pharmaceutical products (Murthy and Ghebre-Sellassie 1993). A standard dissolution test procedure is published by USP as <711> Dissolution. This is the method used here.

The dissolution profiles, the plot of dissolution versus stirring time, can be obtained from the dissolution test. The profile of dry fresh tablets will lie above those for tablets that have aged. As product is exposed to high temperature and relative humidity, the profiles shift downward (Figure 1).

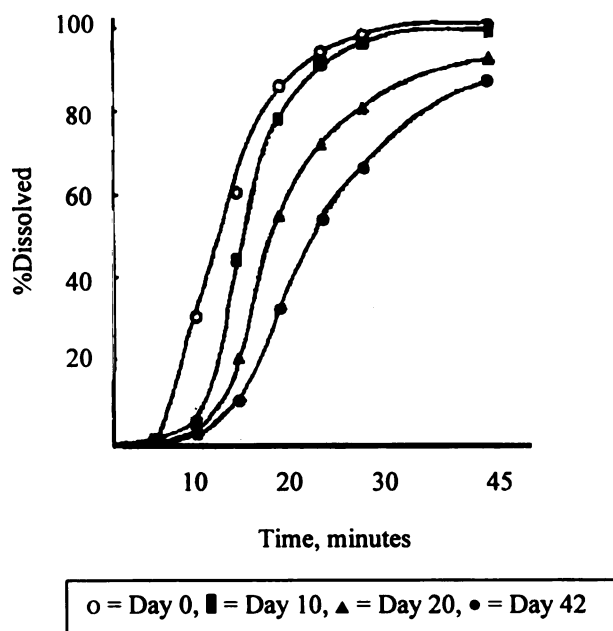


Figure 1. Dissolution Profiles of Enteric-coated Aspirin Tablets Packaged in a Two-sided Wrap USP Class B Strip Pak and Stored at 33°C, 60%RH (Hoblitzell et al 1985)

Disintegration occurs when the solvent penetrates through the pores of the tablets. Because the pores of tablets are very small, the amount of solvent that penetrates into the tablet matrix does not affect tablet disintegration and disaggregation. “For this reason, disintegrants are added to effect swelling of the granules, followed by increased strain inside the tablet boundaries and this finally leads to the tablet rupture and rapid disintegration. After deaggregation and dislodgement occurs, more drug particles become exposed to the solvent and dissolution proceeds effectively. Therefore, close correlation can exist between disintegration and dissolution” (Abdou 1989).

2.3 Mathematical Model for Shelf Life

Shelf life can be calculated by using linear, piecewise or non-linear models depending on the shape of the isotherm between the initial point which is the condition of the fresh product and the critical point which is the condition of the product when it is about to spoil (Hernandez 2000). If the line is linear, choosing a linear model is preferable. On the other hand, if it is not linear, choosing either the piecewise or the non-linear model is more accurate.

For a linear model, if the portion of the sorption isotherm between initial and critical point is a straight line, there will be only one slope. Only 2 pairs of moisture content and relative humidity data points are enough for calculation. The general equation used to calculate shelf life for the linear model (Rudolph 1986) is

$$t = \frac{IW_D \beta}{PAp_s} \ln \left[\frac{Aw_0 - Aw_{t=0}}{Aw_0 - Aw_{t=t}} \right] \quad (1)$$

The following definitions of terms apply to both equations (1) above and (2) on the next page.

t = Time during which the product in the package gains moisture until it reaches equilibrium

l = Thickness of packaging material, mils (see note below)

W_D = Product dry weight, grams

P = Permeability constant, gram-mil/m²·mmHg·day (see note below)

A = Area, m² (see note below)

p_s = Saturation partial pressure, mmHg

β = Slope of sorption isotherm

Aw_0 = Water activity of storage condition = $\frac{RH_o}{100}$

RH_o = Relative humidity of storage condition

$Aw_{t=0}$ = Water activity of product when it is fresh

$Aw_{t=t}$ = Water activity of product when it is about to spoil

For the piecewise model, when the sorption isotherm is not linear between the two points, it may be divided into several ranges, each of which has an individual linear slope. This is an approximation of non-linear curves. In some cases, this works well. The number of ranges depends on the data pairs from the experiment. If we get 5 pairs of moisture content and water activity, the sorption isotherm can be divided into 4 ranges and also provides 4 slopes. The equation used for a piecewise model (Rudolph 1986) is

$$t = \frac{lW_D}{PAp_s} \sum_{i=1}^n \left[\beta_i \ln \left[\frac{Aw_0 - Aw_{t=i}}{Aw_0 - Aw_{t=i+1}} \right] \right] \quad (2)$$

Note: For any package, it may be more convenient to measure P' , the permeance, for the whole package, closed or sealed. When this is done, the following is true.

$l \equiv 1$ for calculation of equation (1) or (2)

$A \equiv 1$ for calculation of equation (1) or (2)

This leads to Equations (3) and (4) which show

$$t = \frac{W_D \beta}{P' p_s} \ln \left[\frac{Aw_0 - Aw_{t=0}}{Aw_0 - Aw_{t=t}} \right] \text{ (linear model)} \quad (3)$$

$$t = \frac{W_D}{P' p_s} \sum_{i=1}^n \left[\beta_i \ln \left[\frac{Aw_0 - Aw_{t=i}}{Aw_0 - Aw_{t=i+1}} \right] \right] \text{ (piecewise model)} \quad (4)$$

Where P' = Permeance of the package, gram/package·mmHg·day

The rest of the parameters of the equations are defined as above for Equations (1) and (2).

Equation (5) show the relationship between WVTR and t.

$$P' = \frac{WVTR}{\Delta p} \text{ and } \Delta Aw = \frac{\Delta p}{p_s}$$

Therefore,
$$P' = \frac{WVTR}{\Delta Aw \cdot p_s}$$

And
$$t = \frac{W_D \beta \Delta Aw}{WVTR} \ln \left[\frac{Aw_0 - Aw_{t=0}}{Aw_0 - Aw_{t=t}} \right] \text{ (linear model)} \quad (5)$$

The non-linear model (G.A.B. Model) is a three-parameter equation which fits data very well up to 0.9Aw in many cases (Bizot 1991). Equation (6) is the non-linear model (Diosady et al 1996).

$$t = \frac{1}{(\Pi + C)\Phi} \left[M_f - M_i + \frac{2W_m C}{(\Pi + C)} \ln \left[\frac{(\Pi + C)M_f - 2W_m C}{(\Pi + C)M_i - 2W_m C} \right] \right] \quad (6)$$

where, $\Pi = \left(\frac{W_m}{M_e} \right) \cdot C - \sqrt{\left[2 + \left(\frac{W_m}{M_e} \right) \cdot C - C \right]^2 - 4 + 4C}$

$$\Phi = \frac{100 \cdot P \cdot A \cdot p_s}{W_D \cdot l \cdot (2) \cdot K \cdot (1 - C)}$$

M = Moisture content, g of water/g of dry product

C = Guggenheim constant

k = A factor correcting properties of the multi-layer molecules with respect to the bulk liquid

W_m = Water content corresponding to saturation of all primary adsorption site by one water molecule

Each model does not fit all products. Root mean square can be used to determine if the model fits the product. A low root mean square value would show that the model fits the product.

The result calculated from the equation sets may not be exactly the same as that from the actual test condition because of limitations of the program. For example, the calculation assumes constant storage temperature and relative humidity. Therefore, it may not account for the fluctuation of the actual storage condition which always occurs, even in a controlled storage chamber. The storage conditions must be managed so as to keep fluctuations at an acceptable minimum, and so provide a useful approximation.

2.4 Computer Solution of Equations

A computer program has been developed for the purpose of time saving and ease of use in a variety of applications (Yoon 2000). The computer program contains the equations (1), (2) and (6) for users to select depending on the shape of the sorption isotherm of each product. The computer program can calculate

- Shelf life when given a barrier package.
- The barrier required when given a shelf life expectation.

Data necessary to calculate the shelf life are

- Sorption Isotherm of the product.
- Moisture content at initial point and at critical point.
- Package properties: Permeability constant, Area and thickness of walls.

For blister packaging, permeance (P') is the appropriate term to show the package properties. The amount of water permeated into the blister cavity can be reported in gram or milligram of water per blister cavity without reference to the area and thickness of the material to make the blister cavity.

- Storage conditions: temperature and relative humidity.

2.5 Prednisone

Deltasone tablets contain prednisone which is a glucocorticoid. Glucocorticoids are adrenocortical steroids which are readily absorbed from the gastrointestinal tract. Prednisone is a white, odorless, crystalline powder. The chemical name for prednisone is pregna-1,4-diene-3,11,20-trione, 17,21-dihydroxy- and its molecular weight is 358.43. The structural formula is represented below.

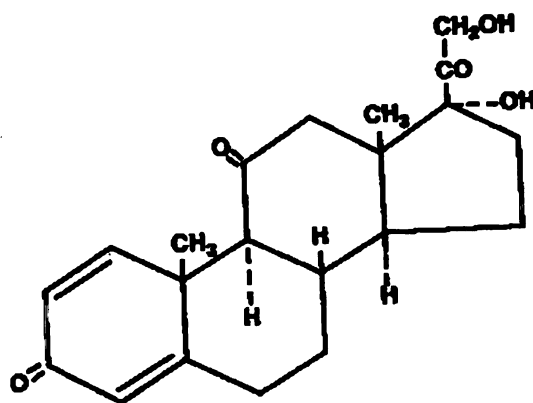


Figure 2 Structural Formula of Deltasone Tablet

Prednisone is used as replacement therapy in adrenocortical deficiency states. Their synthetic analogs are primarily used for their potent anti-inflammatory effects in disorders of many organ systems.

A 5 mg Deltasone tablet contains 5 mg of active ingredient plus the excipients, calcium stearate, corn starch, lactose, mineral oil, sorbic acid and sucrose (Pharmacia&Upjohn).

From official monographs of prednisone, prednisone tablets must contain 90.0 to 110.0 percent of the labeled amount of $C_{21}H_{26}O_5$. Not less than 80% of the labeled amount of $C_{21}H_{26}O_5$ is dissolved in 30 minutes (USP official monographs for prednisone).

From previous data, prednisone passed dissolution after storage in open dish at 65% relative humidity but failed dissolution after stored at 75% (Thomas 2000). This means the product failed at relative humidity somewhere between 66 to 75%. Therefore, 75% relative humidity was selected to be a storage condition for this experiment to make sure that the storage condition used is not below the failure point of the product. Storage the product at the relative humidity lower than critical relative humidity resulted in the product will not be deteriorated by that storage condition.

Reference standard curve is a plot of Absorbance vs %Dilution. It is necessary to construct a standard curve in order to convert the absorbance from dissolution testing procedure into dissolution percentage. For the whole research, dissolution percentages are calculated from the average of three equations obtained by the following standard curve below.

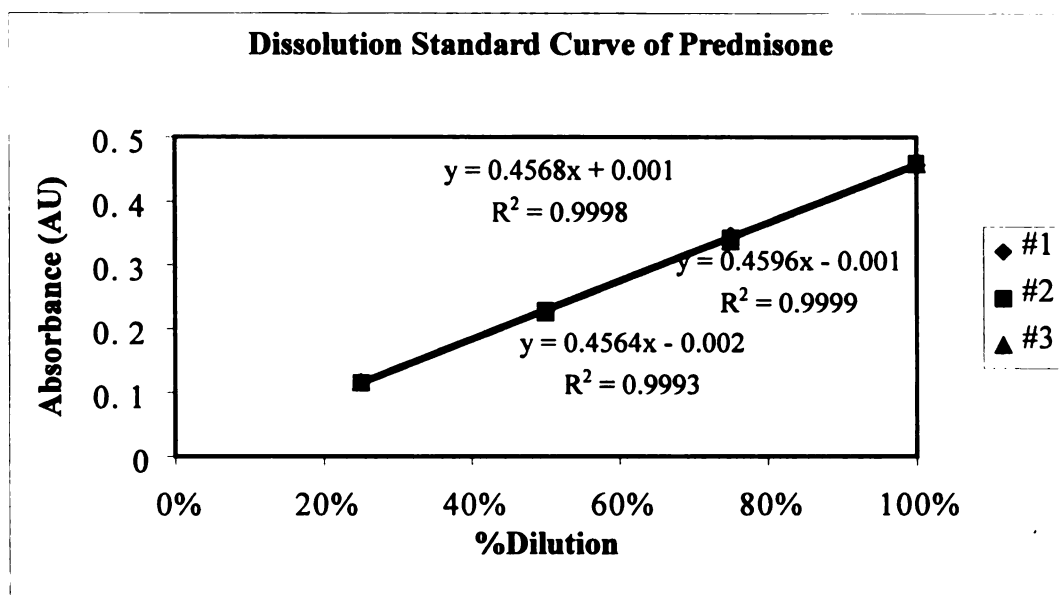


Figure 3 Dissolution Standard Curve of Prednisone (Thomas 2000)

CHAPTER 3

MATERIALS AND METHODS

MATERIALS AND EQUIPMENT

1. Prednisone, 5 mg, from Upjohn Lot 92DUW, Exp. 10/2004
2. Environmental chamber 25°, 30° and 40°C (Nor Lake Scientific and Lab-line instruments Inc.) in which temperature and relative humidity are controlled automatically
3. Saturated salt solutions for 13, 34, 51, 75, 80, 96%RH
4. Aluminum weighing pans
5. Plastic petri dishes
6. Polyethylene buckets
7. Humidity sensors (Newport Scientific Inc., accuracy $\pm 1\%$)
8. Mettler balance (Model no. AE 160, Mettler Inc.)
9. Metrohm Karl Fischer Titrator with Brinkman Polytron® Homogenizer (720 KFS Titrino, 703 Ti Stand)
10. Dissolution apparatus (Vankel VK6010)
11. UV/VIS spectrophotometer (Lambda 20, Perkin Elmer Corporation)
12. Thermometer (-1 to 51°C, 1/10, Fisher Scientific)
13. 5 ml plastic syringes (Becton Dickinson and Company)
14. Filter (0.45 μm , MILLEX®-HV)
15. Disposable culture tubes (12 x 75 mm, VWR Scientific®)
16. Parafilm 4 in x 125 ft roll

17. Fisherbrand latex examination gloves
18. Kim-wipe
19. Computer program "Shelf life 2000" developed by Seung-yil Yoon, School of Packaging, Michigan State University
20. Blister packaging fabricated from
 - 7.5 mil Polyvinyl chloride (PVC) film Lot#EA901
 - Lamination of 0.6 mil Aclar RX 160/2 mil Polyethylene/7.5 mil Pentapharm clear PVC Lot#EA886
 - Lidding: 0.8 mil foil/1.2#C133/3.5# C11551 heat seal coating
21. Molecular sieve desiccant tablets for permeation

METHODS

3.1 Determination of Moisture Sorption Isotherm of Prednisone at 25°, 30° and 40°C.

3.1.1 Prepare the saturated salt solutions to provide relative humidities as follows.

Table 1 Saturated Salt Solutions Provide Relative Humidities at 25°, 30° and 40°C

Bucket no.	Saturated Salt Solution of	%Relative Humidity at 25°C	%Relative Humidity at 30°C	%Relative Humidity at 40°C
1	Lithium Chloride	~13	~13	~13
2	Magnesium Chloride	~34	~33	~33
3	Magnesium Nitrate	~51	~51	~51
4	Sodium Chloride	~75	~74	~74
5	Ammonium Sulfate	~80	~79	~78
6	Potassium Nitrate	~96	~89	~87

3.1.2 Weigh the product before storage in each bucket and reweigh after storage for a period of time until no change in weight.

3.1.3 Determine %IMC by Metrohm Karl Fischer Titrator with Brinkman Polytron® Homogenizer (720 KFS Titrino, 703 Ti Stand).

3.1.4 Calculate the Equilibrium Moisture Content (EMC) by following equation.

$$\%EMC = \left\{ \left[\frac{W_f}{W_i} (1 + IMC) \right] - 1 \right\} \times 100 \quad (7)$$

Where, W_f = final weight of the samples, g

W_i = initial weight of the samples, g

IMC = initial moisture content of the samples, g water/ g dry product

3.1.5 Moisture Sorption Isotherm is the plot of %EMC vs %RH

3.2 Selection Packaging Material

3.2.1 Calculation Barrier Required to Provide the Specific Time to Achieve Equilibrium Moisture Content

In order to choose packaging, it is necessary to solve equation (3) for P' and choose the packaging material that provides P' matched with calculation. Samples of P' required to attain the desired time to achieve equilibrium moisture content, t, for the Prednisone used in this experiment are shown in Table 2.

Table 2 P' Required to Attain the Desired Shelf Life

Shelf life	Temperature	P' Required, g/day·mmHg·package
65 days	25°C	3.2061E-06
20 days	30°C	9.1615E-06
9 days	40°C	6.5856E-06

Note: Parameters used to calculate P' in the table above based on experimental data of Prednisone in this study.

PVC and PVC/0.6 mil Aclar were selected to form blister packaging for this experiment because they provide convenient time periods for permeation of moisture into the blister cavity until moisture content of tablets reached equilibrium. From experience, we know that the PVC is poor barrier while PVC/0.6 mil Aclar is better.

3.2.2 Determination of Water Vapor Transmission Rate (WVTR) of Blister Packaging

WVTR was determined according to USP <671> Container Permeation for Single-Unit Container and Unit-Dose Containers for Capsules and Tablets, with certain changes, as follows.

3.2.2.1 Two types of blister packaging; PVC and PVC/Aclar were filled with molecular sieve and sealed at the Packaging Laboratory, Eli Lilly.

3.2.2.2 Empty blister packs were used as a blank.

3.2.2.3 Packages were stored at 25°C, 75%RH, 30°C, 75%RH and 40°C, 75%RH.

3.2.2.4 The weight gained was measured at time intervals described in Table 3.

Table 3 Time Interval for Determining Water Vapor Transmission Rate of PVC and PVC/0.6 mil Aclar at 3 Storage Temperatures

Blister Packaging	Storage Temperature	Time Interval
PVC	25°, 30°C	24 hours
	40°C	12 hours
PVC/0.6 mil Aclar	25°, 30° and 40°C	3 days

3.2.2.5 Weighing continued at each time interval until at least 3 data points were available to establish the slope.

3.2.2.6 Calculate weight gain by the following equation.

$$\text{Weight gain, } g = (W_f - W_i) - (C_f - C_i) \quad (8)$$

Where, $(W_f - W_i)$ = The difference, in mg, between the final and initial weights of each test pack

$(C_f - C_i)$ = The average of the difference, in mg, between the final and initial weights of the control packs (blanks)

3.2.2.7 Plot weight gain versus time. The slope of this plot can be used to calculate WVTR in gram/day·package. This WVTR can be used to calculate P' which was used to calculate time, t , by equation (3). This time is not a shelf life of the pharmaceutical product but time for the moisture uptake to reach equilibrium moisture content. Shelf life is this time plus time that the product can tolerate this moisture content in the open dish study.

3.2.3 Compare Calculated P with Actual P

Table 4 shows the comparison between calculated P from 3.2.1 and actual P from 3.2.2. The actual P must be no greater than the required P . An actual P less than required P is preferred.

Table 4 Comparison of Required P Calculated and P of Material Chosen

Time to achieve equilibrium	Temperature	P Required, g/day·mmHg·package	Actual P of PVC/0.6 mil Aclar, g/day·mmHg·package
65 days	25°C	3.2061E-06	3.1156E-06
20 days	30°C	9.1615E-06	7.1208E-06
9 days	40°C	6.5856E-06	6.7636E-06

3.3 Determination of Moisture Content

Determine moisture content of

- Prednisone in Open Dish at 75%RH, 25°, 30° and 40°C
- Prednisone in PVC and PVC/0.6 mil Aclar at 75%RH, 25°, 30° and 40°C

By Metrohm Karl Fischer Titrator with Brinkman Polytron® Homogenizer (720 KFS Titrino, 703 Ti Stand)

Note: Moisture content determined by Karl Fischer Titrator is reported on wet basis. The equation below is the conversion of moisture content from wet basis to dry basis.

$$\text{Moisture Content (Dry Basis)} = \frac{\text{Moisture Content (Wet Basis)}}{1 - \text{Moisture Content (Wet Basis)}} \quad (9)$$

Table 5 Sampling Plan of Moisture Content Determination of Prednisone in Open Dish

Day	0	1	2	3
Prednisone in Open Dish @25°C	x	x	x	x
Prednisone in Open Dish @30°C	x	x	x	x
Prednisone in Open Dish @40°C	x	x	x	x

Numbers of specimens for determining moisture content of Prednisone in open dish are 3 tablets for each point or 36 tablets for total.

Table 6 Sampling Plan of Moisture Content Determination of Prednisone in PVC Blister Packaging

Day	0	1	2	3	4
Prednisone in PVC @25°C	x	x	x	x	x
Prednisone in PVC @30°C	x	x	x	x	x
Prednisone in PVC @40°C	x	x	x	x	x

Numbers of specimens for determining moisture content of Prednisone in PVC blister are 4 tablets for each point or 60 tablets for total.

Table 7 Sampling Plan of Moisture Content Determination of Prednisone in PVC/0.6 mil Aclar Blister Packaging

Day	0	3	5	6	9	10	14	15	20	25	30	40	50	60	65	70	76
25°C	x					x			x		x	x	x	x	x	x	x
30°C	x		x			x		x	x	x							
40°C	x	x		x	x		x		x								

Numbers of specimens for determining moisture content of Prednisone in PVC/0.6 mil Aclar are 4 tablets for each point or 92 tablets for total.

3.4 Determination of Dissolution

Dissolution test was done by using Vankel VK6010 dissolution tester with rotating paddle by Vankel Industries, Inc, Edison, NJ. Dissolution test was performed according to USP <711>Dissolution and Official monographs of prednisone as follows.

3.4.1 Deaerate the deionized water by boiling the water for an hour.

3.4.2 Place 500 ml of dissolution medium (deaerated deionized-water) into the controlled temperature dissolution vessel.

3.4.3 Equilibrate the dissolution medium to $37 \pm 0.5^{\circ}\text{C}$.

3.4.4 Place one tablet into each vessel and operate the apparatus at the rate specified, 50 rpm., in the individual monograph.

3.4.5 Withdraw the solution at 5, 10, 20 and 30 minutes from the zone midway between the surface of the dissolution medium and the top of the blade, not less than 1 cm from the vessel wall.

3.4.6 Filter the solution by inert filter, $0.45\ \mu\text{m}$, MILLEX[®]-HV for Prednisone that does not cause adsorption of active ingredient.

3.4.7 Measure absorbance by using UV/VIS spectrophotometer Lambda 20, Perkin Elmer Corporation, at the wavelength specified, 242 nm for Prednisone, in the individual monograph.

3.4.8 Convert absorbance value reading from the spectrophotometer to %dissolution by using dissolution standard curve of prednisone.

Table 8 Sampling Plan of Dissolution Determination of Prednisone in Open Dish

Day	0	6	12	18	24	30	36	42
Prednisone in Open Dish @25°C	x	x	x	x	x	x	x	x
Prednisone in Open Dish @30°C	x	x	x	x	x	x	x	
Prednisone in Open Dish @40°C	x	x	x	x	x	x	x	

Numbers of specimens for determining dissolution of Prednisone in open dish are 6 tablets for each point or 126 tablets for total.

Table 9 Sampling Plan of Dissolution Determination of Prednisone in PVC Blister Packaging

Day	0	6	7	8	12	13	14	18	19	20	24	25	26	30	31	32	36	37	38	42	43	44	49	50	56	62
Prednisone in PVC @25°C	x			x			x			x			x			x			x			x		x	x	
Prednisone in PVC @30°C	x		x			x			x			x						x			x					
Prednisone in PVC @40°C	x	x			x			x			x			x			x			x						

Numbers of specimens for determining dissolution of Prednisone in open dish are 6 tablets for each point or 168 tablets for total.

Table 10 Sampling Plan of Dissolution Determination of Prednisone in PVC/0.6 mil Aclar Blister Packaging

Day	0	3	5	6	9	10	14	15	20	25	26	30	31	32	37	38	40	43	44	49	50	55	60	61	65	67	71	77	83	89	95	
Prednisone in PVC/Acliar @25°C	x					x			x			x					x				x		x		x	x	x	x	x	x	x	
Prednisone in PVC/Acliar @30°C	x					x		x	x	x			x		x			x	x	x		x		x		x						
Prednisone in PVC/Acliar @40°C	x	x		x	x		x		x		x					x																

Numbers of specimens for determining dissolution of Prednisone in open dish are 6 tablets for each point or 216 tablets for total.

CHAPTER 4

RESULTS

4.1 Sorption Isotherm of Prednisone at 25°, 30° and 40°C

The purpose of the sorption isotherm study is to understand the product behavior. Each product has its individual behavior in absorption of water. The tablets gain weight when exposed to a humid environment because water molecules diffuse into the tablets. Once tablets reach equilibrium with the environment, the weight remains constant.

The sorption isotherm is a plot of equilibrium moisture content versus relative humidity at each temperature. From data in Table 11, as the relative humidity increases, the weight or moisture content increases until equilibrium with the environment is reached.

In general, the sorption isotherm at higher temperature lies below that of the lower temperature because the water holding capacity decreases as temperature increases. However, in Figure 4, sorption isotherms of prednisone at the three temperatures appeared not to be separated from each other, but this was a result of the vertical scale used. The water holding capacities of prednisone at 25°, 30° and 40°C tended to be lower with increasing temperature, but the differences may be negligible (Table 11).

Table 11 Relative Humidity and Equilibrium Moisture Content (Dry Basis) at 25°, 30° and 40°C for Prednisone Tablets

25°C		30°C		40°C	
%Relative Humidity	%Equilibrium Moisture Content (dry basis)	%Relative Humidity	%Equilibrium Moisture Content (dry basis)	%Relative Humidity	%Equilibrium Moisture Content (dry basis)
13	5.40	13	5.43	13	5.50
34	5.64	33	5.56	33	5.60
51	5.80	51	5.80	51	5.78
75	6.15	74	6.03	74	5.94
80	6.27	79	6.44	78	6.05
96	11.47	89	8.58	87	6.62

Figure 4 shows the shape of the whole isotherms of prednisone from the relative humidity of 13% up to almost 100% at 25°, 30° and 40°C. Because the failure of prednisone was at 75% relative humidity, it was unnecessary to utilize the whole isotherm. The regions of 13% to 80% relative humidity in the sorption isotherms were of interest because the initial points and critical points were within this range. The useful regions of sorption isotherms of prednisone at three temperatures were straight lines. Therefore, the linear model or equation (3) was appropriate to be used to calculate the time to reach equilibrium moisture content, t .

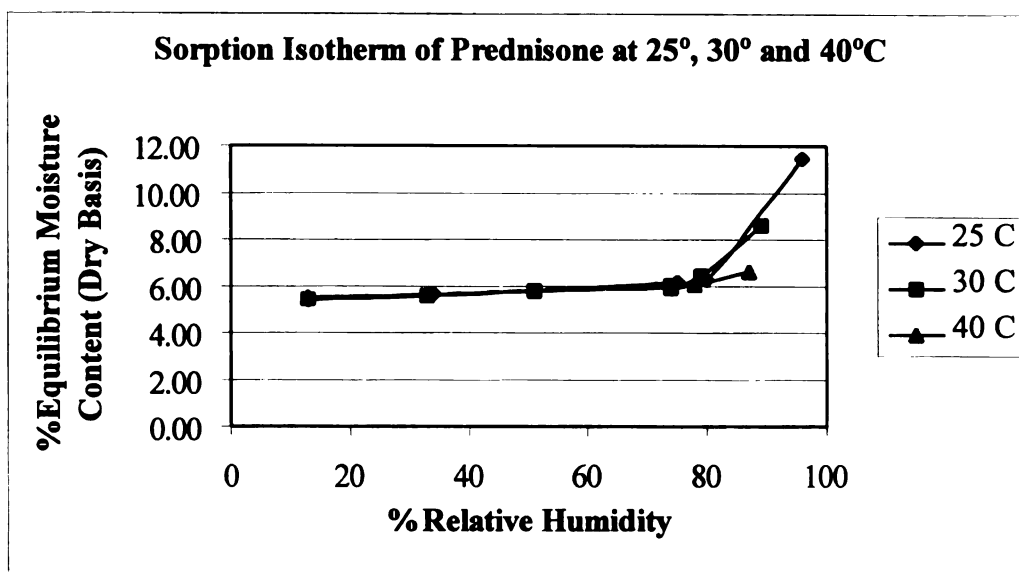


Figure 4 Sorption Isotherm of Prednisone at 25°, 30° and 40°C

Figures 5, 6 and 7 show linear trend lines and their equations of isotherms at 25°, 30° and 40°C respectively. From the relation between X (%relative humidity) and Y (%moisture content) in equations in Figures 5, 6 and 7, %relative humidity could be predicted from %moisture content. Since the initial moisture content in dry basis of fresh prednisone was 5.45% (more detail in 4.3.1 page 37), the relative humidity of prednisone inside the bottle was 19% at 25°C. Because the isotherms were so close, the relative humidity inside the bottle was probably around 19% throughout this range of temperature.

The equilibrium moisture content of prednisone at 75%RH was 6.15%, 6.04% and 5.94% at 25°, 30° and 40°C respectively. Since the difference of initial and equilibrium moisture content was small (less than 1%), the time it took to achieve equilibrium moisture content, t , was short.

The slope of each sorption isotherm was necessary to calculate the time needed to achieve equilibrium moisture content, t , for each storage condition (calculation shown in appendix C).

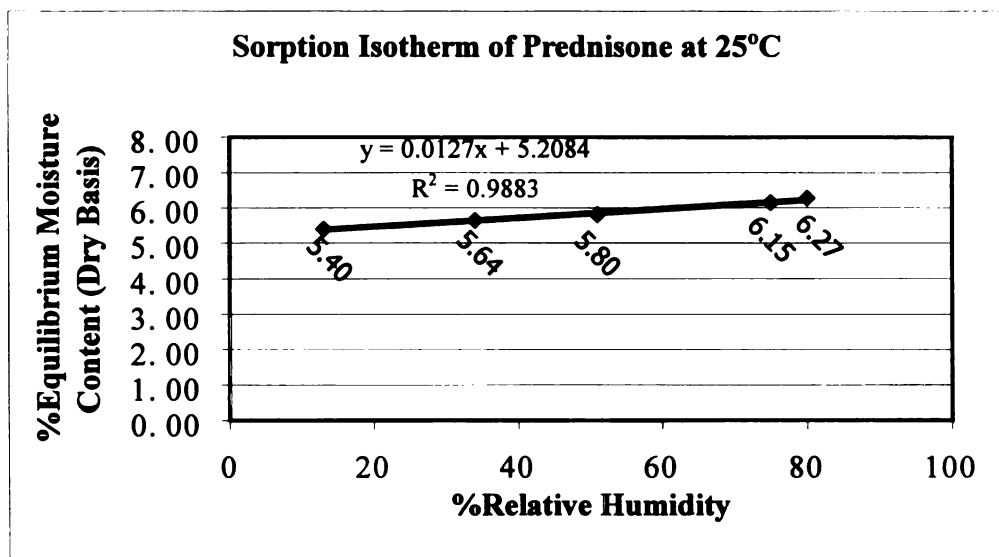


Figure 5 Sorption Isotherm of Prednisone at 25°C

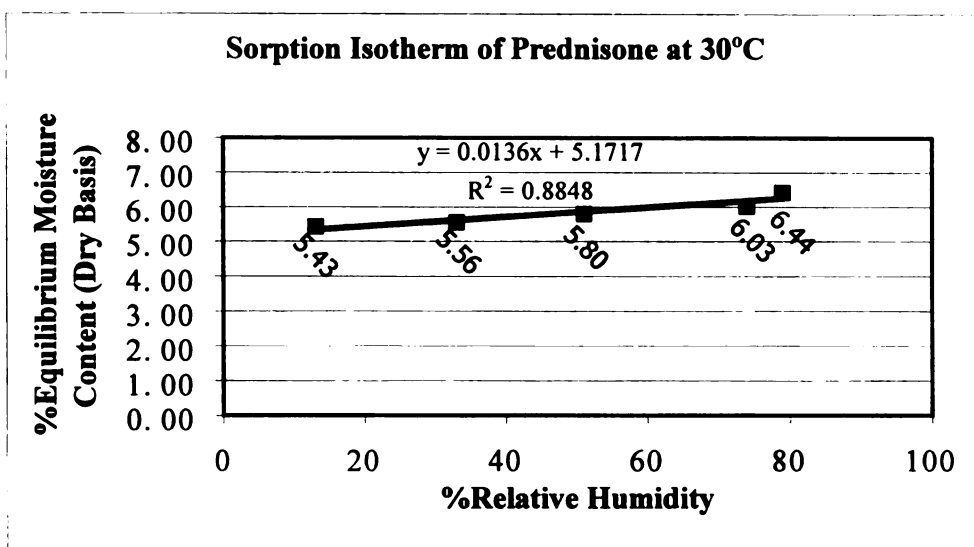


Figure 6 Sorption Isotherm of Prednisone at 30°C

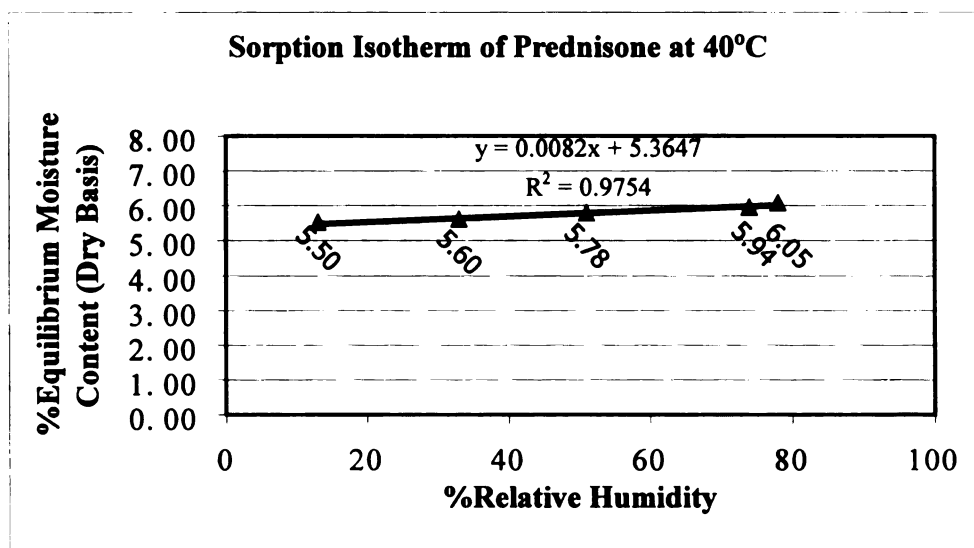


Figure 7 Sorption Isotherm of Prednisone at 40°C

4.2 Water Vapor Transmission Rate (WVTR) Determination

In Tables 12 and 13, as time passed by, the weight of desiccant increased. When the desiccant was almost saturated with water, the rate of weight gain decreased. Those data points were disregarded and do not show in Tables 12, 13, or in Figures 8 and 9.

Because of the limitation of the balance, it was necessary to weigh the card of 2x5 blisters (10 cavities) and then divide that weight by ten to get the weight gained for each cavity or tablet. The total weight gained values shown in Tables 12, 13, Figures 8 and 9 are the total weight gained of a card of 2x5 blisters. Therefore, the slopes in Figures 8 and 9 are WVTR of a 2x5 blister card. However, Tables 14 and 15 show WVTR and the permeance of each cavity of PVC and PVC/0.6 mil Aclar blister which are 1/10 of the values calculated per blister card. The values in these tables will be used to calculate the time required to achieve equilibrium moisture content, t .

4.2.1 Water Vapor Transmission Rate of 7.5 mil Polyvinyl Chloride (PVC)

Table 12 Total Weight Gained vs Time of Desiccant Tablets in a 2x5 (10 Cavities) PVC Blister Card at 25°, 30° and 40°C

25°C		30°C		40°C	
Time, day	Total Weight Gained, g	Time, day	Total Weight Gained, g	Time, day	Total Weight Gained, g
0	0	0	0	0	0
1	0.0102	1	0.0141	0.5	0.0142
2	0.022	2	0.0316	1	0.0273
3	0.0347	3	0.0485	1.5	0.075
4	0.0466	4	0.0627		

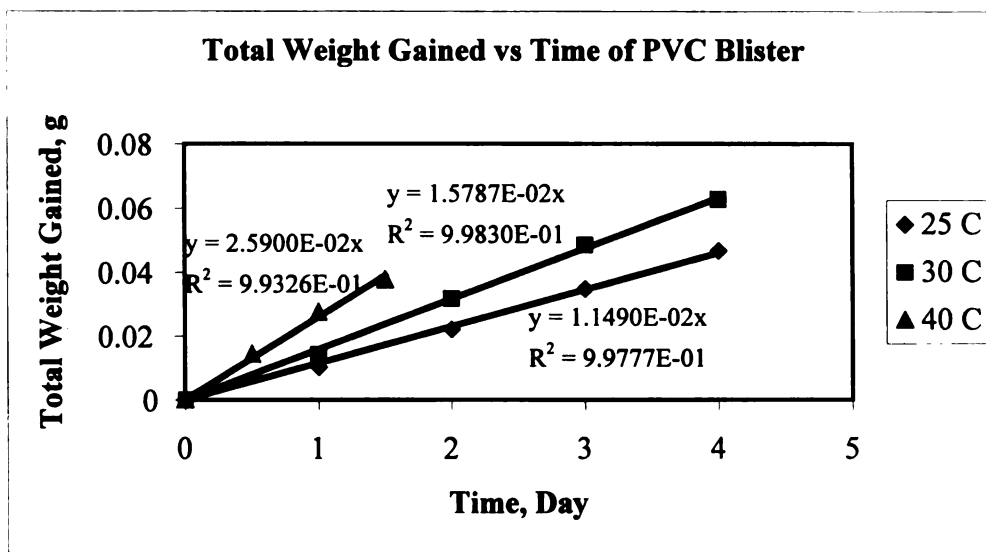


Figure 8 Total Weight Gained vs Time of Desiccant Tablets in a 2x5 (10 Cavities)

PVC Blister Card at 25°, 30° and 40°C

4.2.2 Water Vapor Transmission Rate of PVC/0.6 mil Aclar

**Table 13 Total Weight Gained vs Time of Desiccant Tablets in a 2x5 (10 Cavities)
PVC/0.6 mil Aclar Blister Card at 25°, 30° and 40°C**

25°C		30°C		40°C	
Time, day	Total Weight Gained, g	Time, day	Total Weight Gained, g	Time, day	Total Weight Gained, g
0	0	0	0	0	0
3	0.0017	3	0.0035	3	0.0071
6	0.0029	6	0.0083	6	0.0162
9	0.0047	9	0.0133	9	0.0250
12	0.0065	12	0.0191	12	0.0336
15	0.0080	15	0.0223	15	0.0412
21	0.0115	21	0.0355	21	0.0601
24	0.0135	24	0.0431		
27	0.0154	27	0.0476		

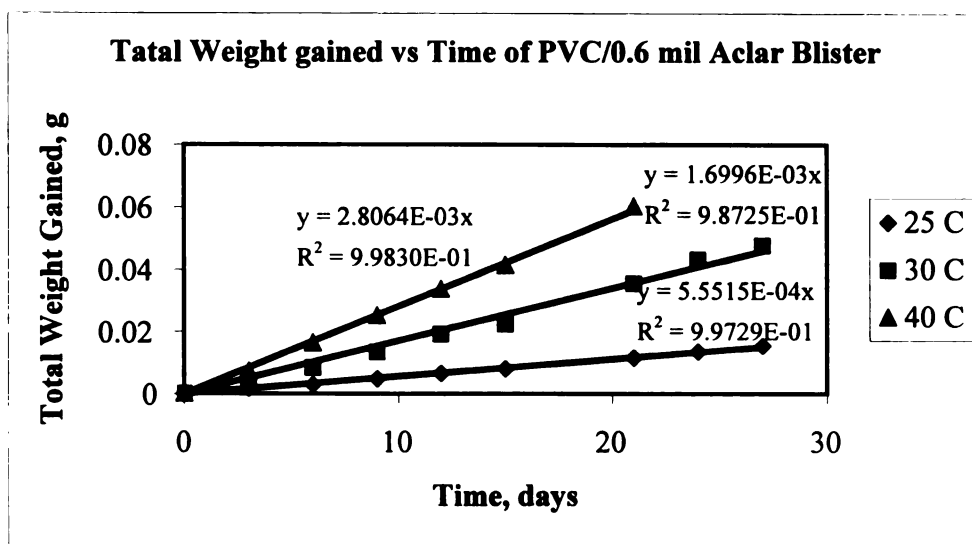


Figure 9 Total Weight Gained vs Time of Desiccant Tablets in a 2x5 (10 Cavities)

PVC/0.6 mil Aclar Blister Card at 25°, 30° and 40°C

From equation (5), the higher the WVTR, the less the time to reach equilibrium moisture content and the shorter the shelf life. From WVTR shown in Table 14 and 15, PVC/0.6 mil Aclar has low WVTR compared with PVC at all 3 temperatures. This means Aclar allowed permeation of water at a slower rate than PVC. As a result, it provided better protection to the Prednisone than PVC.

Table 14 Water Vapor Transmission Rate (WVTR) and Permeance (P') of PVC Blister Cavity

Temperature	WVTR (g/day·cavity)	P' (g/day·cavity·mmHg)
25°C	1.1489E-3	6.4483E-5
30°C	1.5787E-3	6.6143E-5
40°C	2.5900E-3	6.2420E-5

Table 15 Water Vapor Transmission Rate (WVTR) and Permeance (P') of PVC/0.6 mil Aclar Blister Cavity

Temperature	WVTR (g/day·cavity)	P' (g/day·cavity·mmHg)
25°C	5.5515E-5	3.1158E-6
30°C	1.6996E-4	7.1208E-6
40°C	2.8064E-4	6.7636E-6

4.3 Moisture Content

4.3.1 Initial Moisture Content

Initial moisture content is the moisture content of tablets fresh from the bottle. It shows the initial condition of the product. Relative humidity inside the bottle, which is necessary to calculate the time required to achieve equilibrium moisture content, can be determined by projecting from the initial moisture content in the isotherm. Karl Fisher equipment reports the percent of moisture content in wet basis. It is necessary to convert to moisture content in dry basis by using equation (9) to be compatible with the result of equilibrium moisture content in the sorption isotherm.

Table 16 Initial Moisture Content of Prednisone

Sample No.	Moisture Content from Equipment in Wet Basis, g water/100 g wet product	Moisture Content in Dry Basis, g water/100 g dry product
1	5.18	5.46
2	5.23	5.52
3	5.25	5.54
4	5.02	5.29
Average	5.17	5.45
STDEV	0.104	0.114

4.3.2 Moisture Content of Prednisone in Open Dish

Table 17 shows the moisture content of the prednisone in open dish at 25°, 30° and 40°C at the three time intervals chosen for measurement. From the sorption isotherm, we learned that the equilibrium moisture content of prednisone at 75%RH, 25°, 30° and

40°C was about 6.15%, 6.03% and 5.94% respectively. The moisture content of prednisone in the open dish achieved equilibrium within a day. After the moisture content of tablets reached equilibrium, it varied around the mean as shown in Table 17.

Table 17 Moisture Content of Prednisone in Open Dish

Day	0	1	2	3
Moisture Content (Dry Basis) at 25°C	5.45	6.13	6.00	5.95
Moisture Content (Dry Basis) at 30°C	5.45	6.00	6.10	6.00
Moisture Content (Dry Basis) at 40°C	5.45	5.94	6.03	5.95

4.3.3 Moisture Content of Prednisone in PVC and PVC/0.6 mil Aclar Blister

Tables 18 to 21 show the moisture content of the prednisone in PVC and PVC/0.6 mil Aclar at 25°, 30° and 40°C at the time intervals chosen for measurement. In Table 22, times to achieve equilibrium moisture content of prednisone packaged in PVC/0.6 mil Aclar were longer than those in PVC at the same temperature. Therefore, the higher the barrier of packaging material, the longer time to reach equilibrium moisture content at the same storage condition. Regardless of the packaging material, as the temperature increased, the time to reach equilibrium decreased.

Table 18 Moisture Content of Prednisone in PVC Blister

Day	0	1	2	3	4
Moisture Content (Dry Basis) at 25°C	5.45	5.82	6.04	6.11	6.05
Moisture Content (Dry Basis) at 30°C	5.45	5.86	6.02	6.02	6.00
Moisture Content (Dry Basis) at 40°C	5.45	6.04	5.99	6.14	6.02

Table 19 Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister at 25°C

Day	0	10	20	30	40	50	60	65	70	76
Moisture Content (Dry Basis)	5.45	5.40	5.71	5.88	5.97	5.98	6.01	6.15	6.11	6.14

Table 20 Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister at 30°C

Day	0	5	10	15	20	25	31
Moisture Content (Dry Basis)	5.45	5.61	5.67	5.78	6.04	6.04	6.10

Table 21 Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister at 40°C

Day	0	3	6	9	14
Moisture Content (Dry Basis)	5.45	5.62	5.81	5.94	5.94

Table 22 Time to Achieve Equilibrium Moisture Content of Prednisone from the Experiment

Temperature	25°C	30°C	40°C
Open dish	1 day	1 day	1 day
PVC	3 days	2 days	1 day
PVC/0.6 mil Aclar	65 days	20 days	9 days

4.4 Dissolution

4.4.1 Dissolution Profiles of Prednisone Fresh from the Bottle

The dissolution profile shows the dissolution characteristic of an individual product. Profiles changes, as described on page 9, under the conditions of heat, moisture and aging.

Figure 10 shows the dissolution profiles of prednisone tablets fresh from the bottle. The profiles for six tablets were nearly superimposed one upon the other. The standard deviations of dissolution values of six tablets at 5, 10, 20 and 30 minutes stirring time were small. The average dissolution value of the prednisone fresh from the bottle at 30 minutes was 93.0%. The standard deviation of dissolution value at 30 minute stirring time of six tablets was 0.972.

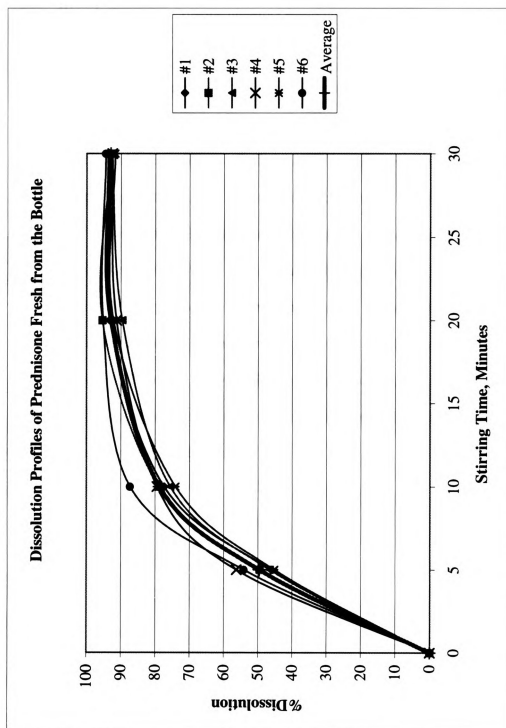


Figure 10 Dissolution Profiles of Prednisone Fresh from the Bottle

4.4.2 Dissolution Profiles of Prednisone after Aging

Dissolution of prednisone changed considerably after aging at all storage conditions. Figure 11 shows dissolution profiles of prednisone in open dish after storage at 30°C, 75%RH. As time passed, the dissolution curve shifted well below that of fresh prednisone. Even though the tablets meet the monograph requirement of 80% dissolved at 30 minutes stirring time, the profile has moved steadily downward. Profiles of prednisone packaged in PVC and PVC/0.6 mil Aclar shifted in the same way as those in open dish. Figures 12 and 13 show dissolution profiles of prednisone tablets in PVC/0.6 mil Aclar stored at 25°C, 75%RH at day 30 and 65 respectively. Compared with the profiles of 6 tablets of prednisone fresh from the bottle (Figure 10), the gaps between profiles of six tablets at day 30 and 65 were wider than the closely packed profiles of fresh prednisone. Therefore, the variability of profiles which got greater as time went on was an early warning of deterioration of tablets, so increased standard deviation can be used as an early warning indication.

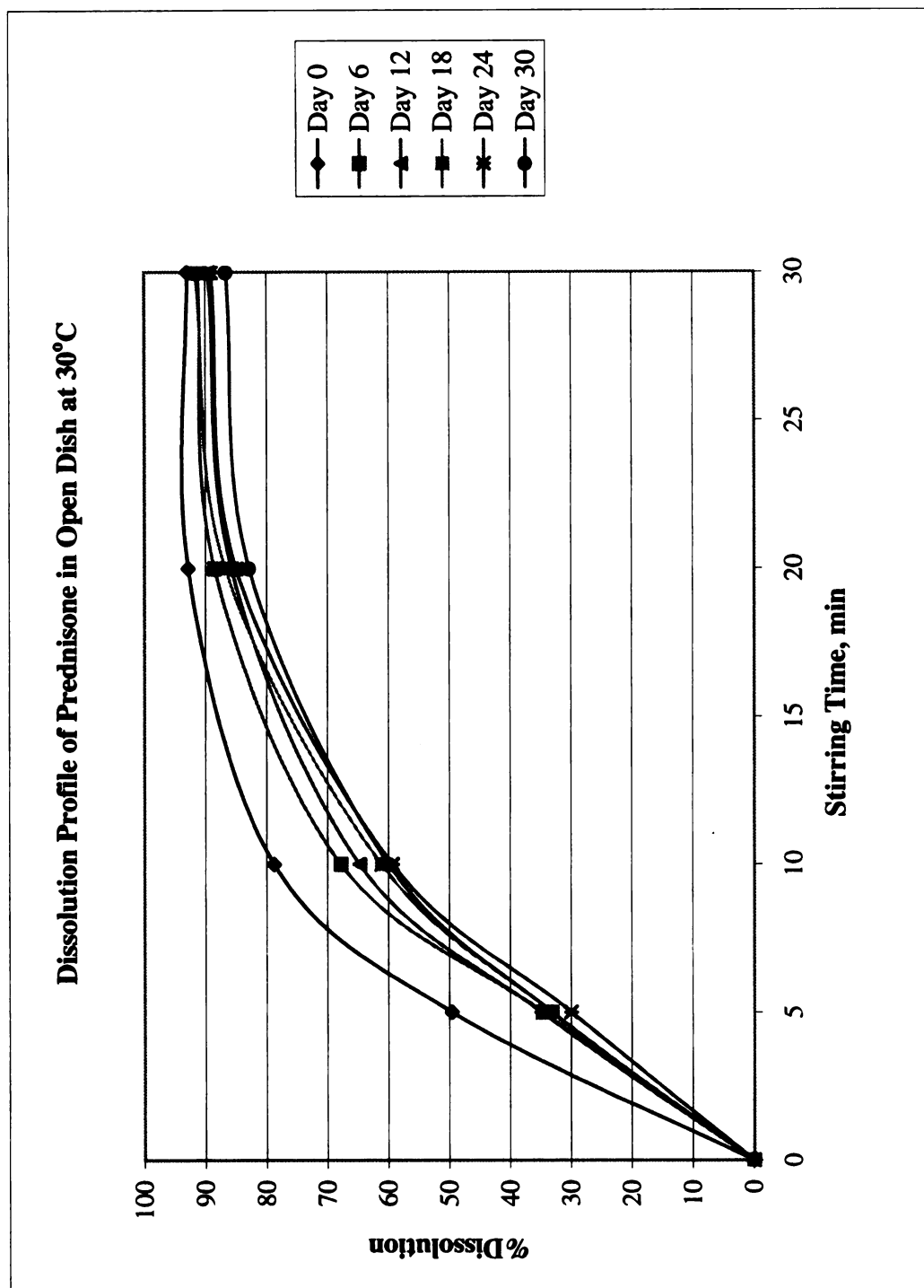
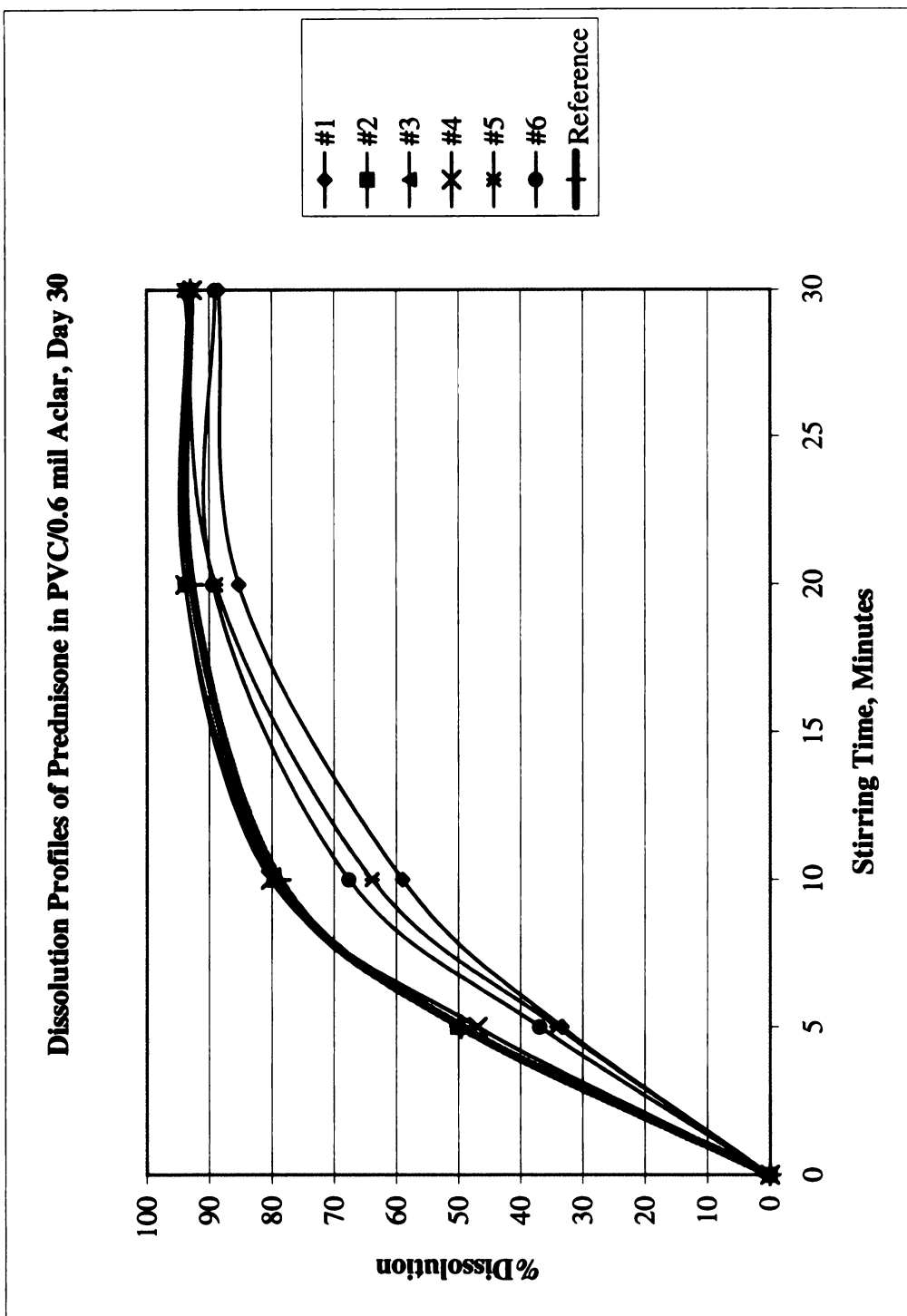
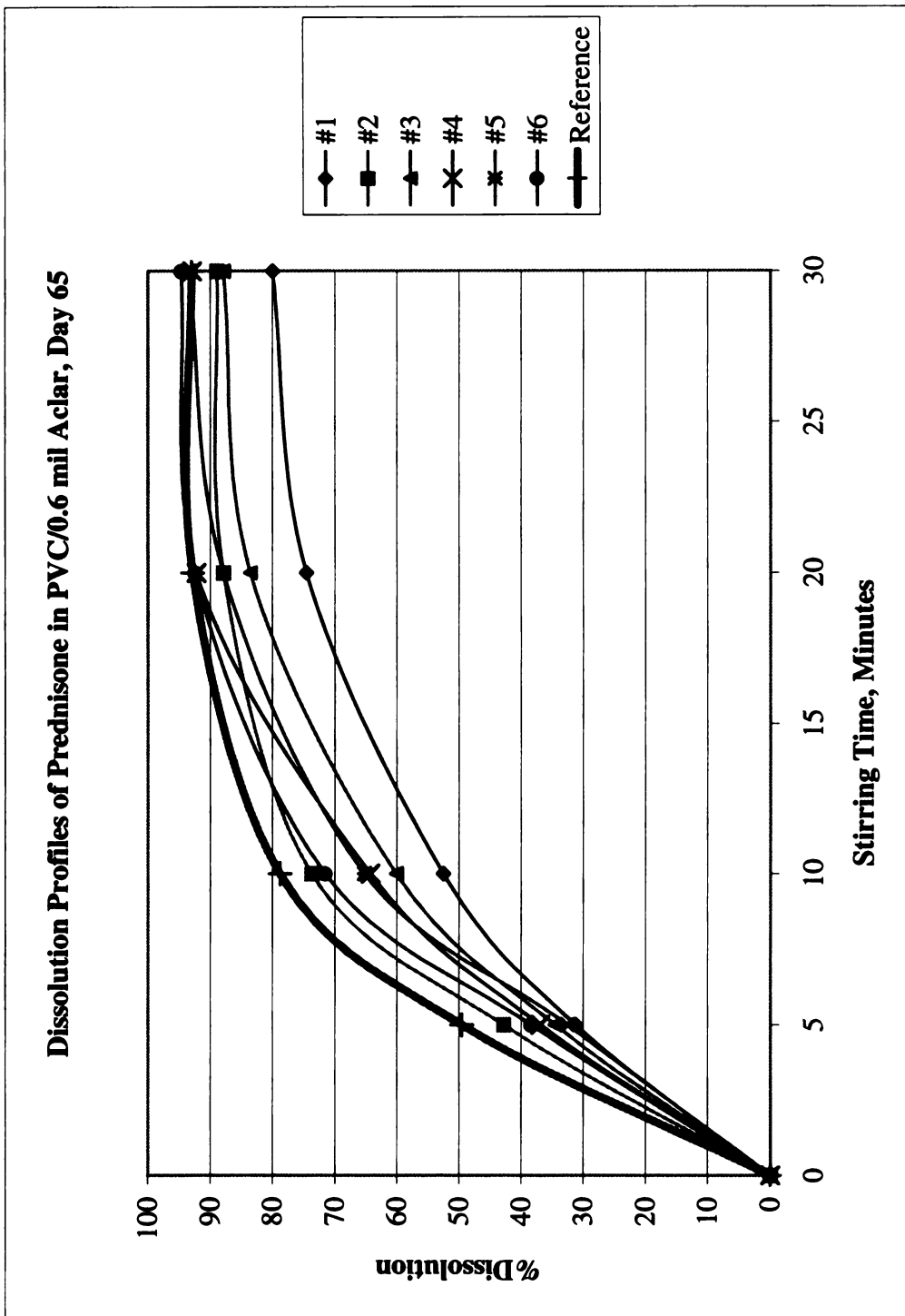


Figure 11 Dissolution Profiles of Prednisone in Open Dish after Storage at 30°C, 75% RH



Note: Reference profile is an average profile of 6 tablets of prednisone fresh from the bottle.

Figure 12 Dissolution Profiles of Prednisone in PVC/0.6 mil Aclar after Storage at 25°C, Day 30



Note: Reference profile is an average profile of 6 tablets of prednisone fresh from the bottle.

Figure 13 Dissolution Profiles of Prednisone in PVC/0.6 mil Aclar after Storage at 25°C, Day 65

Dissolution of prednisone at 5, 10, 20 and 30 minute stirring time decreased as storage time increased. Figures 14 to 16 depict the trend in decreasing dissolution of prednisone in open dish, prednisone packaged in PVC blister and prednisone packaged in PVC/0.6 mil Aclar blister and stored at 30°C. Negative slope, the rate of decreasing dissolution, of the plot of dissolution versus storage time demonstrates the degree of deterioration at each storage condition. Prednisone in open dish had the highest slope (Figure 14) while prednisone in PVC/0.6 mil Aclar had the lowest slope (Figure 16). In conclusion, the rate of decrease in dissolution or deterioration of prednisone in open dish (without packaging) was greatest while that of prednisone in the best barrier packaging was smallest. Table 23 shows the slopes of the plots of dissolution versus storage time for prednisone in open dish, prednisone in PVC and prednisone in PVC/0.6 mil Aclar stored at 25°, 30° and 40°C. Slopes of prednisone in open dish at 40°C were very close to those of prednisone packaged in PVC at 40°C especially at 5 and 10 minutes stirring time because PVC at 40°C did not provide the protection to the product. The moisture content of prednisone packaged in PVC at 40°C reached equilibrium within a day of that in open dish.

In Figures 14 to 16, since the R^2 of linear trend lines were not high, linear equations should not be used to calculate storage time at 80% dissolution.

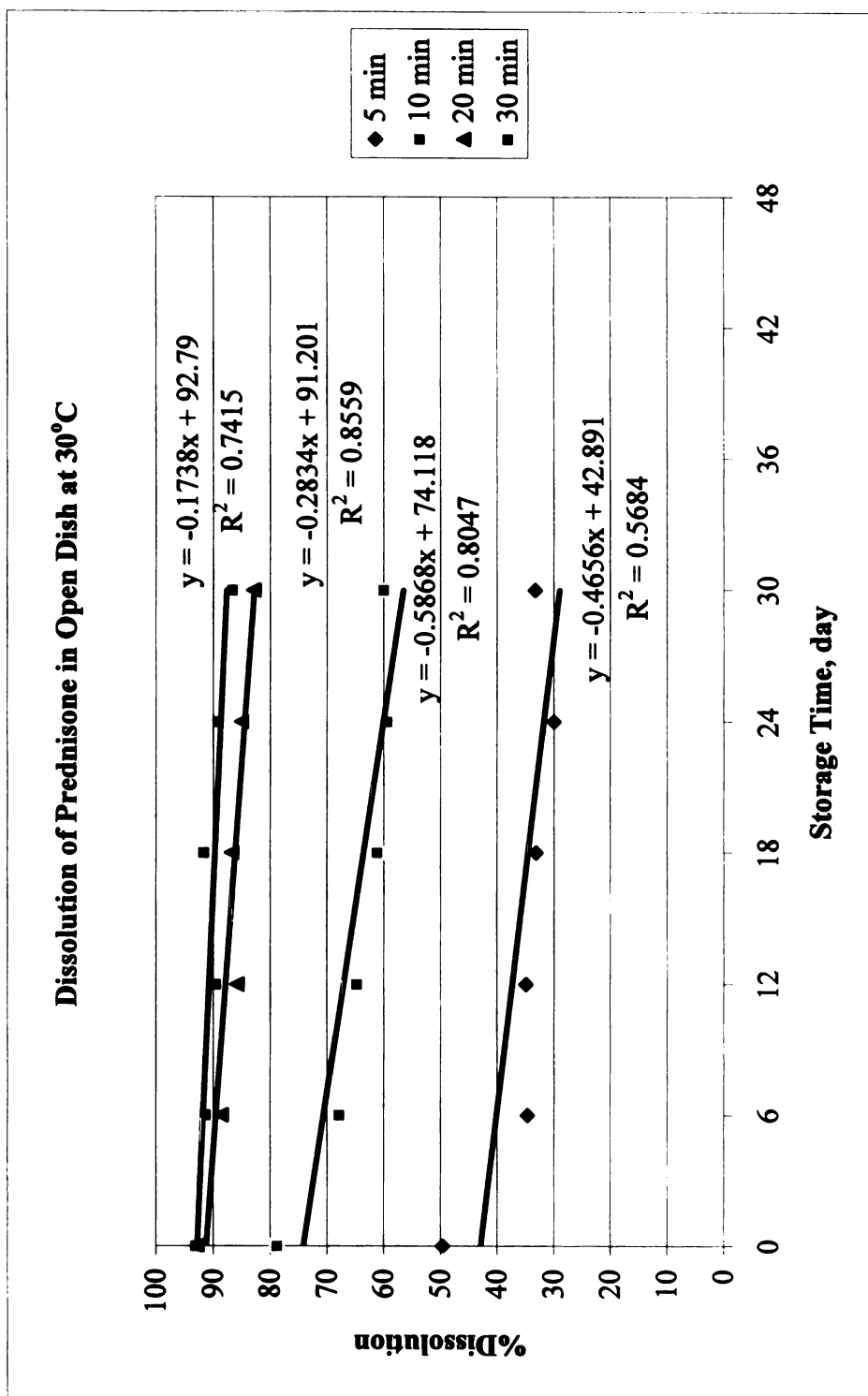


Figure 14 Dissolution at 5, 10, 20 and 30 Minute Stirring Time vs Storage Time of Prednisone in Open Dish Stored at 30°C

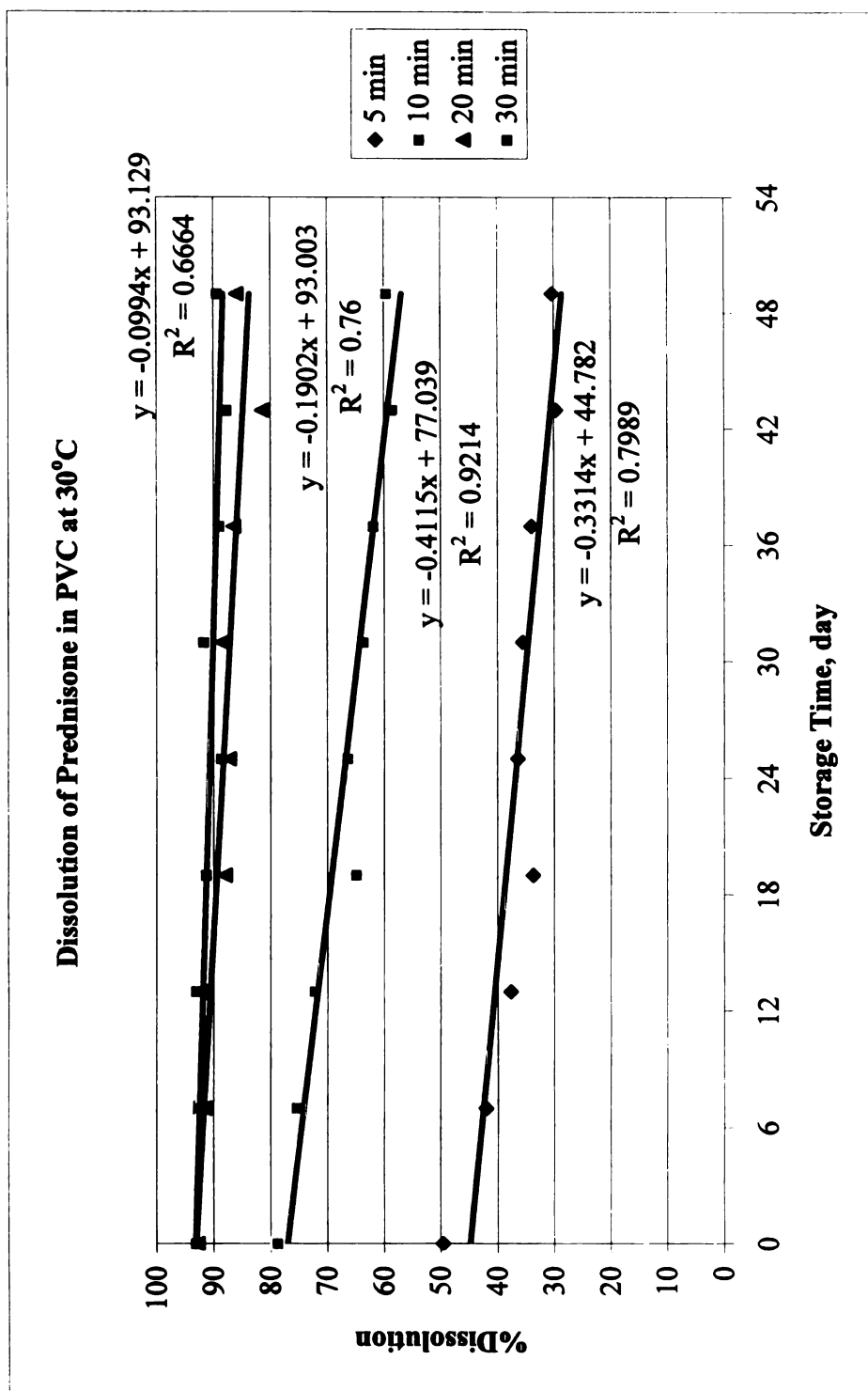


Figure 15 Dissolution at 5, 10, 20 and 30 Minute Stirring Time vs Storage Time of Prednisone Packaged in PVC and Stored at 30°C

Dissolution of Prednisone in PVC/0.6 mil Aclar at 30°C

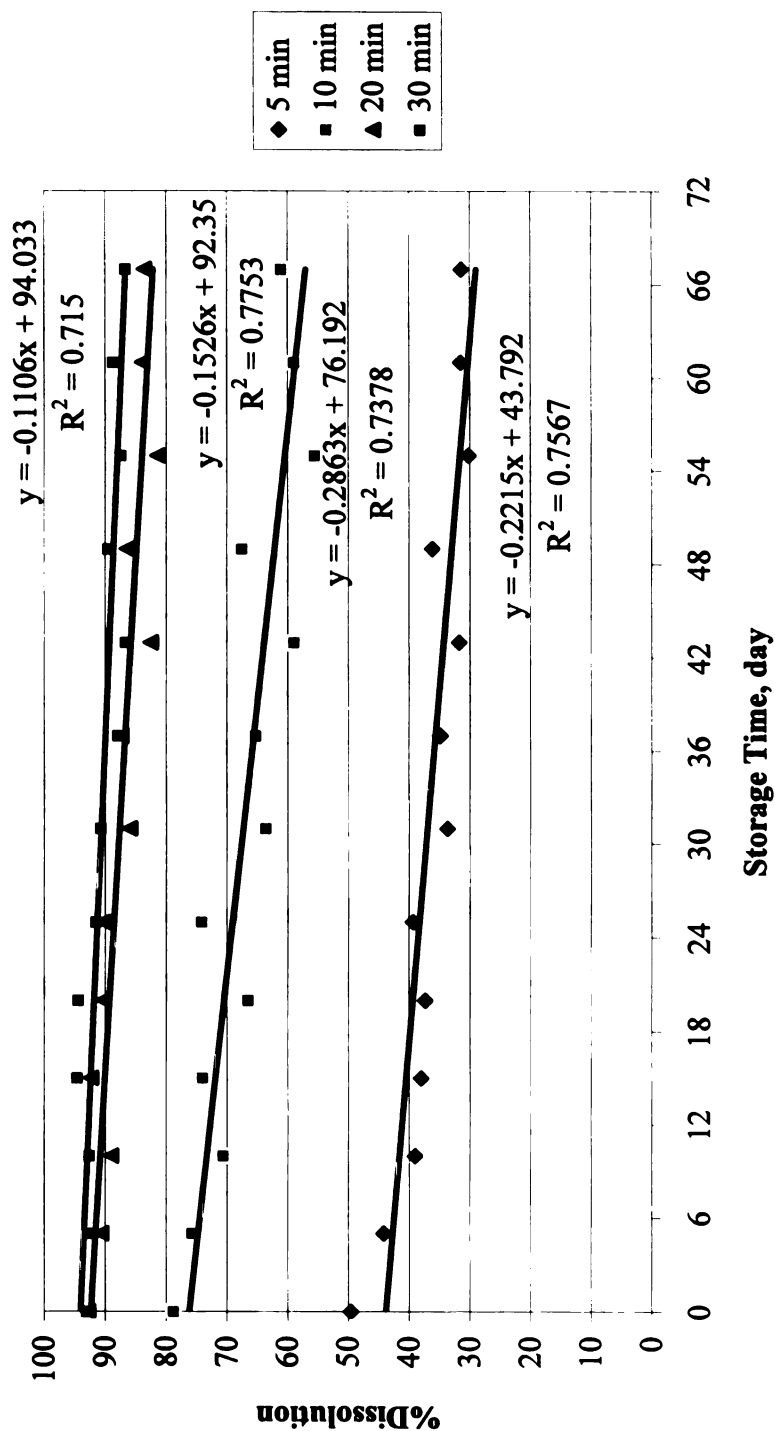


Figure 16 Dissolution at 5, 10, 20 and 30 Minute Stirring Time vs Storage Time of Prednisone Packaged in PVC/0.6 mil Aclar and Stored at 30°C

Table 23 Slopes of the Plots of Dissolution versus Storage Time

Temperature	Stirring Time, minutes	Open Dish	PVC	PVC/0.6 mil Aclar
25°C	5 minutes	0.383	0.186	0.123
	10 minutes	0.489	0.254	0.163
	20 minutes	0.313	0.117	0.096
	30 minutes	0.134	0.080	0.044
30°C	5 minutes	0.466	0.331	0.222
	10 minutes	0.587	0.412	0.286
	20 minutes	0.284	0.190	0.153
	30 minutes	0.174	0.099	0.111
40°C	5 minutes	0.428	0.432	0.318
	10 minutes	0.543	0.524	0.393
	20 minutes	0.264	0.335	0.156
	30 minutes	0.144	0.212	0.076

In Figure 17, the temperatures also affected the dissolution profiles. The higher the temperature, the further the profiles shift below the curve of fresh prednisone.

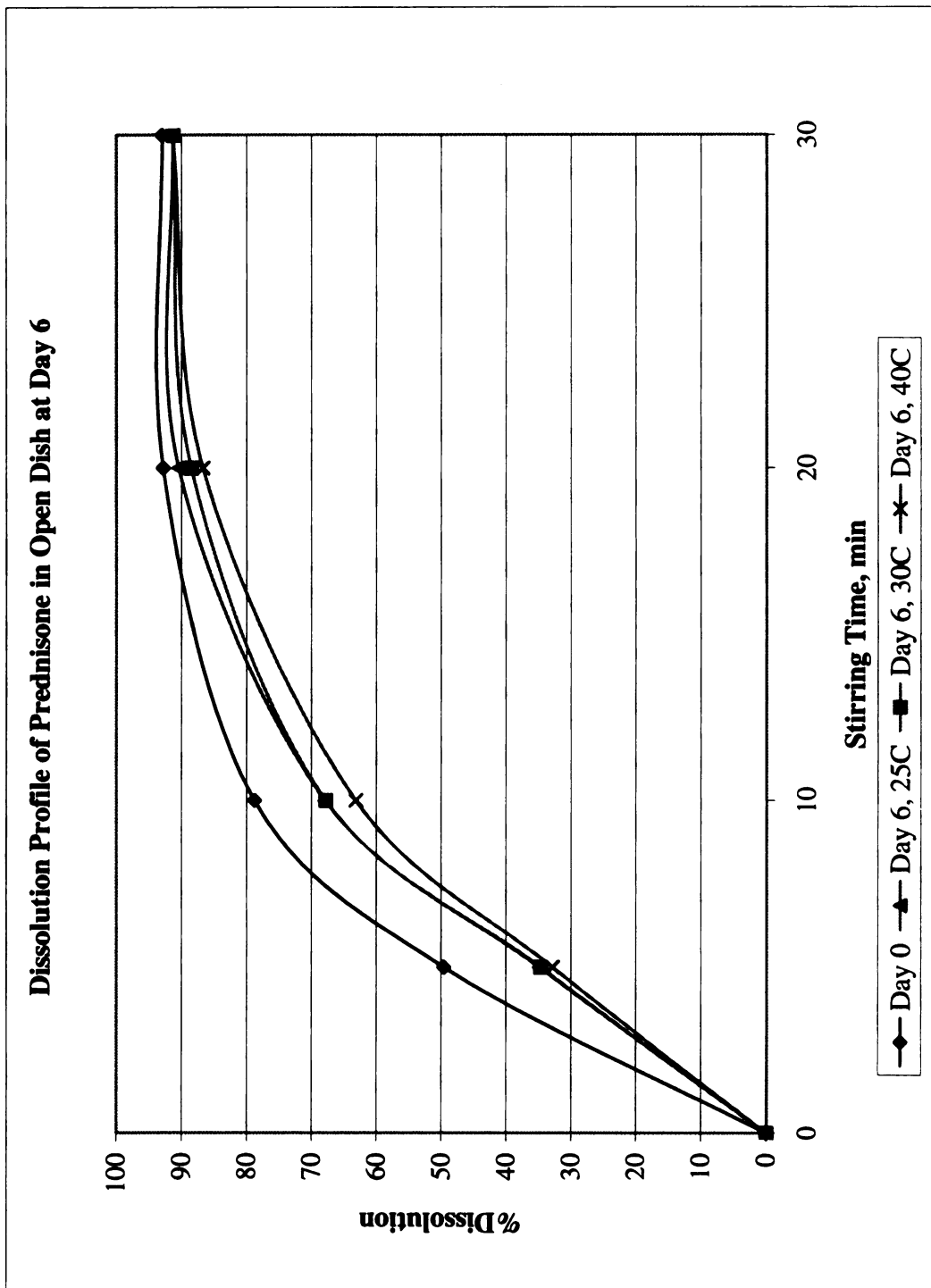


Figure 17 Dissolution Profiles of Prednisone in Open Dish after Storage at 25, 30 and 40°C, 75% RH at Day 6

4.4.3 Failure of Prednisone

According to its USP monograph, prednisone that dissolves less than 80% at 30 minutes stirring time is unacceptable. In order to detect the failure point as early as possible, a 10% reduction in dissolution was designated to be a failure point for this research. For this prednisone product, a dissolution at 10% decrease from initial dissolution was $93.0 \times 0.90 = 83.7\%$. At each time interval, six tablets of prednisone were sampled to measure the dissolution. If one or more tablets dissolved less than 83.7%, this indicated the dissolution failure.

Tables 24 to 26 show the failure of prednisone in open dish, PVC and PVC/0.6 mil Aclar at 25°, 30° and 40°C. The dissolution test was done on the days shown in the tables. These days were chosen as the test dates because they represented the number of days of added shelf life as provided by the barrier. The dissolution of prednisone in open dish was tested in six day intervals. We learned that the moisture content of prednisone in open dish reached equilibrium within a day. Packaged prednisone tablets took a longer period of time to reach equilibrium moisture content. Since the permeation time of the PVC at 25°C was 3 days (2 days more than open dish), the first test date of prednisone in PVC was day 8 at 25°C and then every six days from day 8.

In Table 25, dissolution change of more than 5% of three out of six tablets was used to point out the failure of prednisone in PVC blister stored at 40°C at day 24 instead of 10% change in dissolution of a single tablet. The failure on the following days also showed signs of deterioration.

Table 27 summarizes the first day that failure was found after storage. The deterioration or 10% change in dissolution of prednisone at all three temperatures can be

found earlier in open dish than that in PVC and PVC/0.6 mil Aclar because of the protection provided by the package. Since PVC/0.6 mil Aclar provided better moisture protection than PVC, the failure of Prednisone packaged in PVC/0.6 mil Aclar occurred later than that in PVC. Prednisone in open dish at 30°C failed earlier than that at 40°C because not only heat causes the failure of prednisone but also moisture content. Moisture content of the tablets at 30°C is higher than at 40°C. Therefore, the combination of heat and moisture content might have caused the prednisone stored at 30°C to fail earlier than at 40°C. This was also found in aspirin tablets in a previous study; first dissolution failure of aspirin found on day 45 at 30°C but not until day 75 at 40°C (Adams 1998).

Table 24 Summary of Failure of Prednisone in Open Dish Stored at 75%RH, 25°, 30° and 40°C

Day	25°C	30°C	40°C
6	OK	1/6 has D* < 88.4%	1/6 has D* < 88.4%
12	OK	1/6 has D* < 83.7%	2/6 have D* < 88.4%
18	OK	1/6 has D* < 88.4%	1/6 has D* < 88.4%, 2/6 have D* < 83.7%
24	2/6 have D* < 88.4%, 1/6 has D* < 83.7%	1/6 has D* < 83.7% 1/6 has D* < 88.4%, 1/6 has D* < 83.7% 1/6 failed dissolution	3/6 have D* < 88.4%, 2/6 have D* < 88.4%
36	1/6 has D* < 83.7%		2/6 have D* < 88.4%, 1/6 has D* < 83.7% 1/6 failed dissolution
42	3/6 have D* < 88.4%, 1/6 has D* < 83.7% 1/6 failed dissolution		

Note: D* = Dissolution result in percent of label claim

Table 25 Summary of Failure of Prednisone Packaged in PVC Blister and Stored at 75%RH, 25°, 30° and 40°C

Day	25°C	Day	30°C	Day	40°C
8	OK	7	OK	6	1/6 has D* $\leq$ 88.4%
14	OK	13	OK	12	OK
20	1/6 has D* $\leq$ 88.4%	19	OK	18	1/6 has D* $\leq$ 88.4%
26	1/6 has D* $\leq$ 88.4%	25	1/6 has D* $\leq$ 83.7%	24	3/6 have D* $\leq$ 88.4%
32	1/6 has D* $\leq$ 88.4%	31	OK	30	2/6 have D* $\leq$ 88.4%
38	1/6 has D* $\leq$ 83.7%	37	1/6 has D* $\leq$ 88.4% 1/6 has D* $\leq$ 83.7%	36	4/6 have D* $\leq$ 88.4% 1/6 has D* $\leq$ 83.7%
44	1/6 has D* $\leq$ 88.4%	43	3/6 have D* $\leq$ 88.4% 1/6 has D* $\leq$ 83.7%	42	1/6 has D* $\leq$ 88.4% 1/6 has D* $\leq$ 83.7% 2/6 failed dissolution
50	3/6 have D* $\leq$ 88.4%	49	1/6 has D* $\leq$ 88.4% 1/6 failed dissolution		
56	3/6 have D* $\leq$ 88.4%				
62	1/6 has D* $\leq$ 88.4% 1/6 failed dissolution				

Note: D* = Dissolution result in percent of label claim

Table 26 Summary of Failure of Prednisone Packaged in PVC/0.6 mil Aclar and Stored at 75%RH, 25°, 30° and 40°C

Day	25°C	Day	30°C	Day	40°C
10,20,30 40,50	OK	5,15,15 20,25	OK	3,6,9,14	OK
60	1/6 has D*<88.4%,	31	1/6 has D*<88.4%	20	1/6 has D*<88.4%
65	1/6 has D*<88.4%, 1/6 has D*<83.7%	37	2/6 have D*<88.4%, 1/6 has D*<83.7%	26	1/6 has D*<88.4%
71	4/6 have D*<88.4%	43	4/6 have D*<88.4%, 1/6 has D*<83.7%	32	1/6 has D*<88.4%, 1/6 has D*<83.7%
77	3/6 have D*<88.4%, 1/6 has D*<83.7%	49	3/6 have D*<88.4%	38	1/6 has D*<88.4%, 1/6 has D*<83.7%
83	3/6 have D*<88.4%, 2/6 have D*<83.7%	55	1/6 has D*<88.4%, 2/6 have D*<83.7%	44	1/6 failed dissolution
89	4/6 have D*<88.4%,	61	1/6 has D*<88.4%, 1/6 has D*<83.7%		
95	2/6 have D*<83.7% 1/6 failed dissolution	67	2/6 have D*<88.4%, 1/6 failed dissolution		

Note: D* = Dissolution result in percent of label claim

Table 27 The First Day that Failure was Found

Prednisone in	The first day that failure was found		
	25°C	30°C	40°C
Open Dish	30	12	18
PVC blister	38	25	24
PVC/0.6 mil Aclar blister	65	37	32

High standard deviation of dissolution values at 30 minutes stirring time is another indicator to point out the dramatic change of the tablets. Tables 28 to 30 show standard deviations of dissolution values at 30 minutes for prednisone in open dish, prednisone packaged in PVC blister and prednisone packaged in PVC/0.6 mil Aclar blister. The bold numbers in the tables show the high standard deviation values that occurred on the same day that 10% decrease in dissolution was found.

Table 28 Standard Deviation of Dissolution at 30 Minute Stirring Time of Prednisone in Open Dish after Aging

Open dish	25°C	Day	0	6	12	18	24	30
		STDEV	0.972	1.053	1.755	1.673	3.197	4.380
	30°C	Day	0	6	12			
		STDEV	0.972	1.710	4.387			
	40°C	Day	0	6	12	18		
		STDEV	0.972	3.611	2.501	4.715		

Table 29 Standard Deviation of Dissolution at 30 Minute Stirring Time of Prednisone Packaged in PVC Blister after Aging

PVC	25°C	Day	0	8	14	20	26	32	38
		STDEV	0.972	1.223	1.026	2.824	3.568	2.731	4.764
	30°C	Day	0	7	13	19	25		
		STDEV	0.972	1.604	0.688	1.168	3.027		
	40°C	Day	0	6	12	18	24		
		STDEV	0.972	1.740	0.609	2.888	2.395		

Table 30 Standard Deviation of Dissolution at 30 Minute Stirring Time of Prednisone Packaged in PVC/0.6 mil Aclar Blister after Aging

PVC/ 0.6 mil Aclar	25°C	Day	0	10	20	30	40	50	60	65
		STDEV	0.972	2.263	2.53	2.594	1.776	1.940	2.695	5.402
	30°C	Day	0	5	10	15	20	25	31	37
		STDEV	0.972	1.060	1.317	1.346	2.384	0.979	2.789	2.864
	40°C	Day	0	3	6	9	14	20	26	32
		STDEV	0.972	1.427	1.926	1.345	2.268	1.733	2.539	4.500

4.5 Verification of Calculation

4.5.1 Moisture Content

Table 31 shows the results of using equation (3) to predict the time to achieve equilibrium moisture content. Predicted moisture contents were compared with the actual moisture contents of the Prednisone tablets from the experiment. The only difference between actual and predicted time to achieve equilibrium moisture content was found in prednisone packaged in PVC/0.6 mil Aclar and stored at 30°C which was 20 days instead of 22, less than 10% difference.

Table 31 Time to Achieve Equilibrium Moisture Content of Prednisone by Prediction and Experiment

Packaging	Storage Condition	Prediction	Experiment
PVC	25°C	3 days	3 days
	30°C	2 days	2 days
	40°C	1 day	1 day
PVC/0.6 mil Aclar	25°C	65 days	65 days
	30°C	22 days	20 days
	40°C	9 days	9 days

4.5.2 Shelf Life

Table 32 shows the predicted shelf life or failure time resulting from calculation of permeation time plus exposure time. Exposure time is the time required to produce 10% change in dissolution of prednisone as found in the open dish study.

Table 32 Shelf Life Prediction by Using a 10% Decrease in Dissolution as a Critical Point

Blister Packaging	Storage Condition	Permeation time, day	Time to 10% change in dissolution from open dish, day	Predicted failure time, day
PVC	25°C	3	30	33
	30°C	2	12	14
	40°C	1	18	19
PVC/0.6 mil Aclar	25°C	65	30	95
	30°C	22	12	34
	40°C	9	18	27

In Table 33, predicted failure times were less than the actual failure times for prednisone packaged in PVC stored at all 3 temperatures and PVC/0.6 mil Aclar at 30° and 40°C. Therefore, it was safe to use this prediction for the packaging that provided low barrier. For higher barrier packaging, the time to achieve the equilibrium moisture content was long. The permeation time shown in table 33 of prednisone packaged in PVC/0.6 mil Aclar was 65 days. The mechanism of failure was in fact operating before equilibrium moisture content was established.

Table 33 Shelf life by Prediction and Experiment by Using a 10% Decrease in Dissolution as a Critical Point

Blister Packaging	Storage Condition	Predicted failure time, day	Actual failure time, day
PVC	25°C	33	38
	30°C	14	25
	40°C	19	24
PVC/0.6 mil Aclar	25°C	95	65
	30°C	34	37
	40°C	27	32

Since the experiment was continued after the 10% change in dissolution was found, we have an additional result of failure by using the dissolution of less than 80%, according to individual monograph of prednisone, as a failure point. The predicted shelf lives were shown in Table 34. Table 35 shows a comparison of the predicted and the actual failure time. The validity of prediction agreed with those using a 10% change in dissolution as a failure point. The prediction reasonably correctly predicted the failure of prednisone packaged in PVC. Prednisone in PVC/0.6 mil Aclar failed earlier at 25°C than predicted using both criteria as the failure points. Failure at the other two temperatures was about the same as or later than predicted.

Table 34 Shelf Life Prediction by Using the Dissolution of Less Than 80% as a Critical Point

Blister Packaging	Storage Condition	Permeation time, day	Time to the dissolution of less than 80% was found in open dish on day	Predicted failure time, day
PVC	25°C	3	42	45
	30°C	2	30	32
	40°C	1	36	37
PVC/0.6 mil Aclar	25°C	65	42	107
	30°C	22	30	52
	40°C	9	36	45

Table 35 Shelf life by Prediction and Experiment by Using the Dissolution of Less Than 80% as a Critical Point

Blister Packaging	Storage Condition	Predicted failure time, day	Actual failure time, day
PVC	25°C	45	62
	30°C	32	49
	40°C	37	42
PVC/0.6 mil Aclar	25°C	107	95
	30°C	52	67
	40°C	45	44

CHAPTER 5

CONCLUSIONS AND FUTURE WORK

In sections 4.1 to 4.3, since the difference of initial and critical moisture content of prednisone was small (less than 1%), the time it took to achieve equilibrium moisture content was short. PVC did not provide enough moisture protection to a moisture sensitive tablet such as prednisone which has a narrow range of initial and critical moisture content. However, PVC might be suitable for other products which have a broad range of initial and critical moisture content. Equation (3) reasonably accurately predicted the time it took to achieve equilibrium moisture content with an error less than 10%. It is useful to apply this equation in order to select the packaging material that provides an adequate moisture barrier for pharmaceutical products.

In section 4.4, dissolution decreased as temperature increased or storage time passed. In plotting dissolution versus storage time, the slope indicated the rate of deterioration. The decrease in dissolution of prednisone in an open dish was highest while that of prednisone packaged in PVC/0.6 mil Aclar was lowest.

In order to use this testing and calculation for finding packaging for drugs, we needed to consider that the shelf life ended when there was an important change, not necessarily the complete failure of the drug. The critical point for the drug was something that occurred sooner than actual failure. It was appropriate to show specific changes such as high standard deviation, greater variability of dissolution profiles or a 10% change from initial dissolution, which is 83.7%, to indicate the failure.

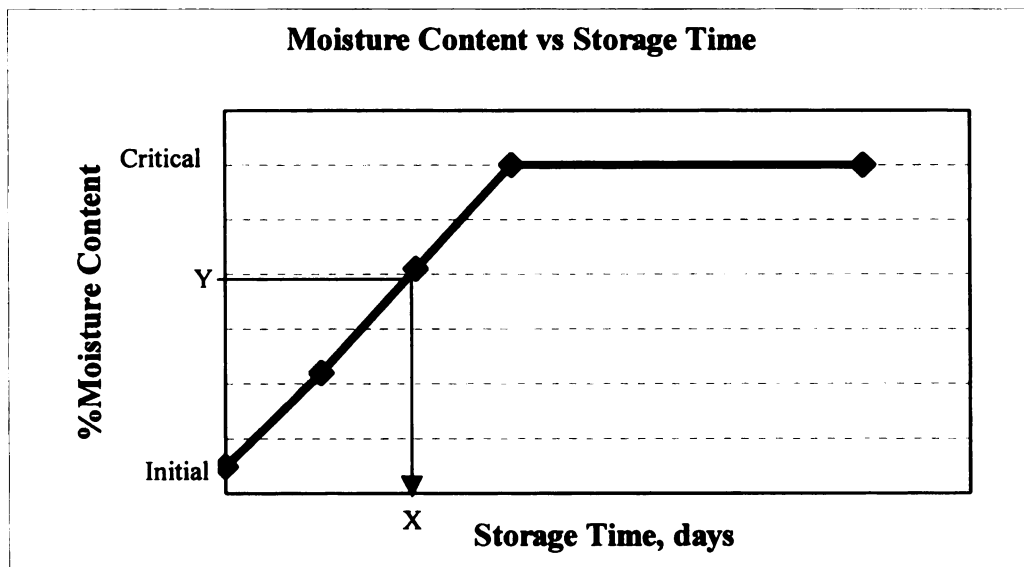
In section 4.5, the hypothesis predicted correctly the shelf life of prednisone packaged in low barrier packaging such as PVC that provided a short permeation time. For prednisone packaged in PVC/0.6 mil Aclar and stored at 25°C, the experimental shelf life was shorter than the predicted shelf life. Because the permeation time was a long term, dissolution deterioration may have begun before tablets even reached equilibrium moisture content; permeation was slow enough to lag behind the dissolution rate change. However, the permeation times at higher temperature (30° and 40°C) were shorter, this caused the predicted shelf life of prednisone packaged in PVC/0.6 mil Aclar to be acceptable.

However, the prediction is useful to avoid the trial and error process to select the barrier for the stability test. The barrier that provided calculated shelf life less than whatever shelf life we want can be discarded immediately.

Future Work

The prediction of shelf life by using permeation time plus exposure time should be correct if there is no deterioration that occurs during the permeation time. The deterioration must start after the moisture content reaches equilibrium, as did prednisone in the open dish. For the high barrier packaging in this experiment, permeation time was long. Deterioration had begun before the moisture content had reached equilibrium. Therefore, the predicted shelf life was longer than the actual shelf life. From Figure 18, prediction by counting the shelf life from day “X” in which the percent moisture increased from the initial to “Y” might be more accurate. Experiments should be done by using high barrier packaging to package prednisone and collect enough data on actual

shelf life. Then, evaluate which value of “Y” will provide the most accurate “X” as a starting point to count for the shelf life. After getting the “Y” value which predicts most accurately the shelf life, the next experiment should determine if this method can be used consistently with other pharmaceutical products.



Note: Y is a percent moisture content increased from the initial moisture content that causes the dissolution change.
X is a starting date to count for shelf life.

Figure 18 Moisture Content vs Storage Time

APPENDIX A

Sorption Isotherm Raw Data

Water Vapor Transmission Rate Raw Data

Moisture Content Raw Data

Table 1A Raw Data of Sorption Isotherm of Prednisone at 25°C

Weight of	Dish, g	Dish+Product at day 0, g	Product, g	Dish+Product at day 4, g	Dish+Product at day 6, g	Dish+Product at day 7, g	Product, g	%EMC
13%RH	1.2883	3.2637	1.9754	3.2634	3.2640	3.2628	1.9745	5.40
34%RH	1.2927	3.2699	1.9772	3.2727	3.2733	3.2734	1.9807	5.64
51%RH	1.2925	3.2664	1.9739	3.2732	3.2734	3.2730	1.9805	5.80
75%RH	1.2872	3.2638	1.9766	3.2767	3.2769	3.2770	1.9898	6.15
80%RH	1.2918	3.2661	1.9743	3.2804	3.2806	3.2815	1.9897	6.27
96%RH	1.2849	3.2593	1.9744	3.373	3.3893	3.3720	2.0871	11.47

Table 2A Raw Data of Sorption Isotherm of Prednisone at 30°C

Weight of	Dish, g	Dish+Product at day 0, g	Product, g	Dish+Product at day 4, g	Dish+Product at day 6, g	Dish+Product at day 7, g	Product, g	%EMC
13%RH	1.3027	2.2877	0.0985	2.2889	2.2887	2.2875	0.09848	5.43
33%RH	1.2876	2.2727	0.09851	2.274	2.2741	2.2737	0.09861	5.56
51%RH	1.2965	2.2839	0.09874	2.2876	2.2878	2.2872	0.09907	5.80
74%RH	1.2973	2.2825	0.09852	2.2875	2.2872	2.2879	0.09906	6.03
79%RH	1.3032	2.2904	0.09872	2.2952	2.2957	2.2997	0.09965	6.44
89%RH	1.2897	2.277	0.09873	2.2880	2.2879	2.3063	0.10166	8.58

Table 3A Raw Data of Sorption Isotherm of Prednisone at 40°C

Weight of	Dish, g	Dish+Product at day 0, g	Product, g	Dish+Product at day 4, g	Dish+Product at day 6, g	Dish+Product at day 7, g	Product, g	%EMC
13%RH	1.2902	2.2754	0.09852	2.2634	2.2759	2.2759	0.09857	5.50
33%RH	1.2888	2.2781	0.09893	2.2727	2.2795	2.2795	0.09907	5.60
51%RH	1.2923	2.2813	0.0989	2.2732	2.2840	2.2844	0.09921	5.78
74%RH	1.2855	2.2666	0.09811	2.2767	2.2712	2.2712	0.09857	5.94
78%RH	1.2966	2.2862	0.09896	2.2923	2.2920	2.2918	0.09952	6.05
87%RH	1.284	2.2738	0.09898	2.3730	2.2841	2.2848	0.10008	6.62

Table 4A Raw Data of Weight of PVC Blister vs Time at 25°C

25°C	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Blank, g							
#1	4.3927	4.3989	4.3987	4.3953	4.3960	4.3955	4.3960
#2	4.4015	4.4084	4.4082	4.4050	4.4056	4.4059	4.4060
#3	4.4157	4.4222	4.4229	4.4197	4.4197	4.4198	4.4204
#4	4.4371	4.4434	4.4441	4.4407	4.4425	4.4408	4.4415
Average	4.4118	4.4182	4.4185	4.4152	4.4160	4.4155	4.4160
Blister filled with desiccants, g							
#1	5.0473	5.0636	5.0755	5.0846	5.0971	5.1067	5.1142
#2	5.0529	5.0699	5.0820	5.0916	5.1045	5.1153	5.1241
#3	5.0509	5.0676	5.0794	5.0885	5.1014	5.1126	5.1206
#4	5.0660	5.0828	5.0951	5.1047	5.1174	5.1280	5.1380
Average	5.0543	5.0710	5.0830	5.0924	5.1051	5.1157	5.1242

Table 5A Raw Data of Weight of PVC Blister vs Time at 30°C

30°C	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Blank, g							
#1	4.4417	4.4487	4.4490	4.4465	4.4462	4.4465	4.4470
#2	4.4343	4.4425	4.4415	4.4391	4.4391	4.4387	4.4397
#3	4.4263	4.4329	4.4330	4.4307	4.4306	4.4306	4.4312
#4	4.4101	4.4165	4.4168	4.4146	4.4144	4.4143	4.4148
Average	4.4281	4.4352	4.4351	4.4327	4.4326	4.4325	4.4332
Blister filled with desiccants, g							
#1	5.0333	5.0555	5.0735	5.0880	5.1020	5.1109	5.1161
#2	5.0482	5.0689	5.0863	5.1008	5.1150	5.1230	5.1277
#3	5.0627	5.0835	5.1005	5.1149	5.1288	5.1362	5.1412
#4	5.0606	5.0813	5.0988	5.1134	5.1276	5.1353	5.1399
Average	5.0512	5.0723	5.0898	5.1043	5.1184	5.1264	5.1312

Table 6A Raw Data of Weight of PVC Blister vs Time at 40°C

40°C	Day 0	Day 0.5	Day 1	Day 1.5	Day 2	Day 2.5
Blank, g	#1	4.4168	4.4218	4.4227	4.4226	4.4222
	#2	4.4048	4.4107	4.4113	4.4110	4.4105
	#3	4.3875	4.3934	4.3943	4.3942	4.3939
	#4	4.3894	4.3945	4.3947	4.3952	4.3948
Average		4.3996	4.4051	4.4058	4.4054	4.4043
Blister filled with desiccants, g	#1	5.1227	5.1425	5.1555	5.1654	5.1717
	#2	5.0910	5.1105	5.1241	5.1343	5.1406
	#3	5.0857	5.1052	5.1195	5.1307	5.1384
	#4	5.0808	5.1007	5.1146	5.1242	5.1327
Average		5.0951	5.1147	5.1284	5.1387	5.1453
						5.1478

Table 7A Raw Data of Weight of PVC/0.6 mil Aclar Blister vs Time at 25°C

25°C	Day 0	Day 3	Day 6	Day 9	Day 12	Day 15	Day 21	Day 24	Day 27
Blank, g									
#1	5.4345	5.4346	5.4357	5.4365	5.4368	5.4379	5.4390	5.4374	5.4382
#2	5.4288	5.4290	5.4303	5.4308	5.4313	5.4326	5.4335	5.4319	5.4327
#3	5.4430	5.4436	5.4475	5.4478	5.4482	5.4513	5.4546	5.4530	5.4533
#4	5.3760	5.3766	5.3776	5.3783	5.3785	5.3795	5.3808	5.3792	5.3802
Average	5.4206	5.4210	5.4228	5.4234	5.4237	5.4253	5.4270	5.4254	5.4261
Blister filled with desiccants, #1	6.0707	6.0726	6.0758	6.0780	6.0801	6.0832	6.0886	6.0890	6.0919
#2	6.0844	6.0866	6.0894	6.0918	6.0941	6.0973	6.1027	6.1032	6.1161
#3	6.0962	6.0982	6.1013	6.1036	6.1055	6.1089	6.1137	6.1140	6.1062
#4	6.1231	6.1255	6.1284	6.1308	6.1330	6.1361	6.1409	6.1415	6.1438
Average	6.0936	6.0957	6.0987	6.1011	6.1032	6.1064	6.1115	6.1119	6.1145

Table 8A Raw Data of Weight of PVC/0.6 mil Aclar Blister vs Time at 30°C

30°C	Day 0	Day 3	Day 6	Day 9	Day 12	Day 15	Day 21	Day 24	Day 27
Blank, g									
#1	5.4163	5.4182	5.4198	5.4199	5.4210	5.4225	5.4250	5.4229	5.4236
#2	5.3911	5.3919	5.3934	5.3936	5.3982	5.3991	5.4000	5.3983	5.3990
#3	5.4025	5.4031	5.4046	5.4052	5.4099	5.4104	5.4113	5.4083	5.4090
#4	5.4095	5.4111	5.4127	5.4125	5.4132	5.4145	5.4155	5.4140	5.4141
Average	5.4049	5.4061	5.4076	5.4078	5.4106	5.4116	5.4130	5.4109	5.4114
Blister filled with desiccants, #1	6.0689	6.0704	6.0754	6.0782	6.0822	6.0869	6.1197	6.1223	6.1278
#2	6.0870	6.0913	6.0967	6.1004	6.1148	6.1166	6.1242	6.1296	6.1348
#3	6.0824	6.0867	6.0961	6.1061	6.1111	6.1166	6.1258	6.1282	6.1328
#4	6.0674	6.0762	6.0817	6.0859	6.0968	6.1018	6.1105	6.1221	6.1270
Average	6.0764	6.0812	6.0875	6.0927	6.1012	6.1055	6.1201	6.1256	6.1306

Table 9A Raw Data of Weight of PVC/0.6 mil Aclar Blister vs Time at 40°C

40°C	Day 0	Day 3	Day 6	Day 9	Day 12	Day 15	Day 21	Day 24
Blank, g	#1	5.3494	5.3530	5.3543	5.3540	5.3550	5.3570	5.3552
	#2	5.3717	5.3730	5.3745	5.3741	5.3751	5.3814	5.3795
	#3	5.3969	5.3985	5.3998	5.3998	5.4000	5.4030	5.4012
	#4	5.3642	5.3662	5.3678	5.3674	5.3681	5.3700	5.3682
Average		5.3706	5.3727	5.3741	5.3738	5.3746	5.3779	5.3760
Blister filled with desiccants, #1	#1	6.0689	6.0775	6.0876	6.0952	6.1041	6.1302	6.1351
	#2	6.0803	6.0888	6.0990	6.1073	6.1165	6.1430	6.1476
	#3	6.0921	6.1024	6.1138	6.1234	6.1338	6.1740	6.1757
	#4	6.0834	6.0928	6.1033	6.1118	6.1208	6.1471	6.1524
Average		6.0812	6.0904	6.1009	6.1094	6.1188	6.1486	6.1527

Table 10A Raw Data of Moisture Content of Prednisone in Open Dish Stored at 25°C, 75%RH

Day	0	1	2	3
#1	5.16	5.75	5.85	5.60
#2	5.18	5.80	5.55	5.66
#3	5.17	5.78	5.57	5.59
Average	5.17	5.78	5.66	5.62
Dry basis	5.45	6.13	6.00	5.95
STDEV	0.010	0.025	0.168	0.038

Table 11A Raw Data of Moisture Content of Prednisone in Open Dish Stored at 30°C, 75%RH

Day	0	1	2	3
#1	5.16	5.70	5.77	5.69
#2	5.18	5.61	5.67	5.90
#3	5.17	5.67	5.81	5.39
Average	5.17	5.66	5.75	5.66
Dry basis	5.45	6.00	6.10	6.00
STDEV	0.010	0.046	0.072	0.256

Table 12A Raw Data of Moisture Content of Prednisone in Open Dish Stored at 40°C, 75%RH

Day	0	1	2	3
#1	5.16	5.70	5.68	5.60
#2	5.18	5.58	5.72	5.62
#3	5.17	5.55	5.66	5.62
Average	5.17	5.61	5.69	5.61
Dry basis	5.45	5.94	6.03	5.95
STDEV	0.010	0.079	0.031	0.012

Table 13A Raw Data of Moisture Content of Prednisone in PVC Blister Stored at 25°C, 75%RH

Day	0	1	2	3	4
Moisture content (Wet basis)					
#1	5.18	5.28	5.69	5.76	5.73
#2	5.28	5.59	5.72	5.73	5.65
#3	5.31	5.47	5.70	5.89	5.71
#4	5.41	5.65	5.69	5.67	5.73
Average	5.30	5.50	5.70	5.76	5.71
Dry basis	5.59	5.82	6.04	6.11	6.05
STDEV	0.095	0.163	0.014	0.093	0.038

Table 14A Raw Data of Moisture Content of Prednisone in PVC Blister Stored at 30°C, 75%RH

Day	0	1	2	3	4
Moisture content (Wet basis)					
#1	5.18	5.47	5.54	5.54	5.68
#2	5.28	5.62	5.66	5.83	5.74
#3	5.31	5.49	5.80	5.72	5.49
#4	5.41	5.55	5.73	5.61	5.72
Average	5.30	5.53	5.68	5.68	5.66
Dry basis	5.59	5.86	6.02	6.02	6.00
STDEV	0.095	0.068	0.111	0.127	0.114

Table 15A Raw Data of Moisture Content of Prednisone in PVC Blister Stored at 40°C, 75%RH

Day	0	1	2	3	4
Moisture content (Wet basis)					
#1	5.18	5.59	5.65	5.79	5.46
#2	5.28	5.61	5.84	5.85	5.58
#3	5.31	5.80	5.61	5.66	5.80
#4	5.41	5.77	5.50	5.84	5.88
Average	5.30	5.69	5.65	5.79	5.68
Dry basis	5.59	6.04	5.99	6.14	6.02
STDEV	0.095	0.108	0.142	0.087	0.194

Table 16A Raw Data of Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister Stored at 25°C, 75%RH

Day	0	10	20	30	40	50	60	65	70	76
Moisture content (Wet basis)										
#1	5.57	5.05	5.41	5.56	5.63	5.68	5.54	5.79	5.81	5.77
#2	5.18	5.21	5.44	5.65	5.66	5.62	5.66	5.74	5.76	5.82
#3	4.92	5.12	5.48	5.56	5.69	5.71	5.73	5.80	5.78	5.71
#4	5.05	5.12	5.44	5.43	5.55	5.56	5.74	5.83	5.70	5.84
Average	5.18	5.13	5.40	5.55	5.63	5.64	5.67	5.79	5.76	5.79
Dry basis	5.46	5.40	5.71	5.88	5.97	5.98	6.01	6.15	6.11	6.14
STDEV	0.281	0.066	0.029	0.091	0.060	0.067	0.092	0.037	0.046	0.058

Table 17A Raw Data of Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister Stored at 30°C, 75%RH

Day	0	5	10	15	20	25	30
Moisture content (Wet basis)							
#1	5.57	5.31	5.43	5.47	5.70	5.75	5.78
#2	5.18	5.25	5.42	5.37	5.76	5.58	5.80
#3	4.92	5.37	5.25	5.50	5.63	5.69	5.73
#4	5.05	5.31	5.38	5.50	5.69	5.78	5.69
Average	5.18	5.31	5.37	5.46	5.70	5.70	5.75
Dry basis	5.46	5.61	5.67	5.78	6.04	6.04	6.10
STDEV	0.281	0.049	0.083	0.062	0.053	0.088	0.050

Table 18A Raw Data of Moisture Content of Prednisone in PVC/0.6 mil Aclar Blister Stored at 40°C, 75%RH

Day	0	3	6	9	14
Moisture content (Wet basis)					
#1	5.57	5.54	5.61	5.57	5.59
#2	5.18	5.23	5.54	5.48	5.52
#3	4.92	5.20	5.31	5.76	5.51
#4	5.05	5.32	5.50	5.60	5.81
Average	5.18	5.32	5.49	5.60	5.61
Dry basis	5.46	5.62	5.81	5.94	5.94
STDEV	0.281	0.154	0.128	0.117	0.140

APPENDIX B

Dissolution Raw Data

Table 1B Dissolution of Prednisone Fresh from the Bottle

5 min	Abs	#1	#2	#3	%D			
#1	0.210	45.9	45.8	46.4	46.0			
#2	0.226	49.4	49.3	49.9	49.5			
#3	0.212	46.3	46.2	46.9	46.5		Average	49.6
#4	0.257	56.1	56.0	56.7	56.3		STDEV	4.64
#5	0.206	45.0	44.9	45.6	45.2			
#6	0.247	54.0	53.9	54.5	54.1			
10 min	Abs	#1	#2	#3	%D			
#1	0.353	77.1	77.2	77.8	77.4			
#2	0.360	78.6	78.7	79.3	78.9			
#3	0.346	75.4	75.4	76.1	75.6		Average	78.8
#4	0.363	79.3	79.3	79.9	79.5		STDEV	4.62
#5	0.339	73.9	73.9	74.5	74.1			
#6	0.399	87.0	87.1	87.7	87.3			
20 min	Abs	#1	#2	#3	%D			
#1	0.426	93.0	93.1	93.7	93.3			
#2	0.436	95.1	95.2	95.8	95.4			
#3	0.410	89.3	89.5	90.1	89.6		Average	92.8
#4	0.417	91.1	91.2	91.8	91.3		STDEV	2.25
#5	0.421	91.9	92.0	92.6	92.2			
#6	0.435	94.9	95.0	95.6	95.2			
30 min	Abs	#1	#2	#3	%D			
#1	0.429	93.5	93.6	94.2	93.8			
#2	0.425	92.7	92.8	93.4	92.9			
#3	0.424	92.4	92.6	93.2	92.7		Average	93.0
#4	0.423	92.2	92.4	93.0	92.5		STDEV	0.97
#5	0.419	91.4	91.5	92.1	91.7			
#6	0.432	94.1	94.3	94.9	94.4			

Table 2B Dissolution of Prednisone in Open Dish at 25°C, Day 6

5 min	Abs	#1	#2	#3	%D
#1	0.149	32.6	32.4	33.1	32.7
#2	0.149	32.6	32.4	33.1	32.7
#3	0.134	29.4	29.1	29.8	29.4
#4	0.154	33.7	33.5	34.2	33.8
#5	0.173	37.9	37.7	38.4	38.0
#6	0.195	42.6	42.5	43.2	42.8
10 min	Abs	#1	#2	#3	%D
#1	0.304	66.3	66.3	67.0	66.5
#2	0.301	65.7	65.7	66.3	65.9
#3	0.288	62.9	62.8	63.5	63.1
#4	0.317	69.1	69.1	69.8	69.4
#5	0.310	67.6	67.6	68.3	67.8
#6	0.344	75.0	75.0	75.6	75.2
20 min	Abs	#1	#2	#3	%D
#1	0.409	89.1	89.2	89.9	89.4
#2	0.409	89.1	89.2	89.9	89.4
#3	0.405	88.3	88.4	89.0	88.6
#4	0.425	92.8	92.9	93.5	93.0
#5	0.411	89.6	89.7	90.3	89.8
#6	0.421	91.9	92.0	92.6	92.2
30 min	Abs	#1	#2	#3	%D
#1	0.412	89.9	90.0	90.6	90.2
#2	0.420	91.6	91.7	92.3	91.9
#3	0.412	89.9	90.0	90.6	90.2
#4	0.424	92.4	92.6	93.2	92.7
#5	0.416	90.8	90.9	91.5	91.0
#6	0.421	91.8	91.9	92.5	92.1
				Average	91.4
				STDEV	1.05

Table 3B Dissolution of Prednisone in Open Dish at 25°C, Day 12

5 min	Abs	#1	#2	#3	%D
#1	0.109	23.9	23.6	24.4	24.0
#2	0.141	30.9	30.6	31.4	31.0
#3	0.151	33.1	32.8	33.5	33.2
#4	0.177	38.7	38.5	39.2	38.8
#5	0.145	31.8	31.5	32.2	31.8
#6	0.175	38.3	38.1	38.8	38.4
10 min	Abs	#1	#2	#3	%D
#1	0.243	53.0	52.9	53.6	53.1
#2	0.283	61.8	61.8	62.4	62.0
#3	0.294	64.2	64.1	64.8	64.4
#4	0.318	69.4	69.3	70.0	69.6
#5	0.293	64.0	63.9	64.6	64.2
#6	0.315	68.7	68.7	69.3	68.9
20 min	Abs	#1	#2	#3	%D
#1	0.398	86.8	86.9	87.5	87.1
#2	0.396	86.4	86.5	87.1	86.6
#3	0.410	89.3	89.5	90.1	89.6
#4	0.411	89.6	89.7	90.3	89.8
#5	0.409	89.1	89.2	89.9	89.4
#6	0.429	93.6	93.7	94.3	93.9
30 min	Abs	#1	#2	#3	%D
#1	0.439	95.8	96.0	96.6	96.1
#2	0.429	93.5	93.6	94.2	93.8
#3	0.417	91.0	91.1	91.7	91.3
#4	0.419	91.4	91.5	92.1	91.7
#5	0.426	92.9	93.0	93.6	93.2
#6	0.423	92.2	92.4	93.0	92.5
				Average	93.1
				STDEV	1.76

Table 4B Dissolution of Prednisone in Open Dish at 25°C, Day 18

5 min	Abs	#1	#2	#3	%D
#1	0.134	29.4	29.1	29.8	29.4
#2	0.128	28.1	27.8	28.5	28.1
#3	0.129	28.3	28.0	28.7	28.3
#4	0.159	34.8	34.6	35.3	34.9
#5	0.132	28.9	28.7	29.4	29.0
#6	0.172	37.6	37.4	38.1	37.7
10 min	Abs	#1	#2	#3	%D
#1	0.241	52.6	52.4	53.1	52.7
#2	0.301	65.7	65.7	66.3	65.9
#3	0.270	59.0	58.9	59.6	59.2
#4	0.265	57.9	57.9	58.5	58.1
#5	0.276	60.3	60.2	60.9	60.5
#6	0.313	68.3	68.3	68.9	68.5
20 min	Abs	#1	#2	#3	%D
#1	0.377	82.3	82.4	83.0	82.6
#2	0.415	90.4	90.5	91.1	90.7
#3	0.389	84.9	85.0	85.6	85.1
#4	0.403	87.9	88.0	88.6	88.1
#5	0.397	86.6	86.7	87.3	86.8
#6	0.419	91.5	91.6	92.2	91.8
30 min	Abs	#1	#2	#3	%D
#1	0.406	88.6	88.8	89.4	88.9
#2	0.415	90.5	90.7	91.3	90.8
#3	0.406	88.6	88.8	89.4	88.9
#4	0.417	91.0	91.1	91.7	91.3
#5	0.408	89.1	89.2	89.8	89.3
#6	0.426	92.9	93.0	93.6	93.2

Average	31.3
STDEV	4.05

Average	60.8
STDEV	5.66

Average	87.5
STDEV	3.44

Average	90.4
STDEV	1.67

Table 5B Dissolution of Prednisone in Open Dish at 25°C, Day 24

5 min	Abs	#1	#2	#3	%D
#1	0.186	40.7	40.5	41.2	40.8
#2	0.232	50.7	50.6	51.2	50.8
#3	0.162	35.5	35.2	35.9	35.6
#4	0.173	37.9	37.7	38.4	38.0
#5	0.169	37.0	36.8	37.5	37.1
#6	0.184	40.3	40.1	40.8	40.4
10 min	Abs	#1	#2	#3	%D
#1	0.277	60.5	60.5	61.1	60.7
#2	0.280	61.2	61.1	61.8	61.4
#3	0.208	45.5	45.3	46.0	45.6
#4	0.277	60.5	60.5	61.1	60.7
#5	0.290	63.3	63.3	63.9	63.5
#6	0.297	64.8	64.8	65.5	65.0
20 min	Abs	#1	#2	#3	%D
#1	0.379	82.7	82.8	83.4	83.0
#2	0.377	82.3	82.4	83.0	82.6
#3	0.319	69.7	69.7	70.4	69.9
#4	0.367	80.0	80.0	80.6	80.2
#5	0.401	87.4	87.5	88.1	87.7
#6	0.381	83.2	83.2	83.9	83.4
30 min	Abs	#1	#2	#3	%D
#1	0.393	85.7	85.8	86.4	86.0
#2	0.418	91.2	91.3	91.9	91.5
#3	0.384	83.8	83.9	84.5	84.1
#4	0.418	91.2	91.3	91.9	91.5
#5	0.414	90.3	90.5	91.1	90.6
#6	0.414	90.3	90.5	91.1	90.6

Average	40.4
STDEV	5.47

Average	59.5
STDEV	7.03

Average	81.1
STDEV	6.00

Average	89.0
STDEV	3.20

Table 6B Dissolution of Prednisone in Open Dish at 25°C, Day 30

5 min	Abs	#1	#2	#3	%D
#1	0.101	22.2	21.9	22.6	22.2
#2	0.121	26.5	26.3	27.0	26.6
#3	0.121	26.5	26.3	27.0	26.6
Average					30.1
STDEV					7.05
#4	0.125	27.4	27.1	27.9	27.5
#5	0.168	36.8	36.6	37.3	36.9
#6	0.185	40.5	40.3	41.0	40.6
10 min	Abs	#1	#2	#3	%D
#1	0.228	49.8	49.6	50.3	49.9
#2	0.260	56.9	56.8	57.4	57.0
#3	0.258	56.4	56.3	57.0	56.6
Average					60.6
STDEV					9.10
#4	0.263	57.5	57.4	58.1	57.7
#5	0.345	75.2	75.2	75.8	75.4
#6	0.307	67.0	67.0	67.6	67.2
20 min	Abs	#1	#2	#3	%D
#1	0.347	75.7	75.7	76.4	75.9
#2	0.379	82.7	82.8	83.4	83.0
#3	0.395	86.1	86.2	86.9	86.4
Average					84.8
STDEV					5.95
#4	0.371	81.0	81.1	81.7	81.3
#5	0.416	90.6	90.7	91.4	90.9
#6	0.417	91.1	91.2	91.8	91.3
30 min	Abs	#1	#2	#3	%D
#1	0.372	81.3	81.3	81.9	81.5
#2	0.421	91.8	91.9	92.5	92.1
#3	0.416	90.8	90.9	91.5	91.0
Average					89.9
STDEV					4.38
#4	0.408	89.1	89.2	89.8	89.3
#5	0.420	91.6	91.7	92.3	91.9
#6	0.429	93.5	93.6	94.2	93.8

Table 7B Dissolution of Prednisone in Open Dish at 25°C, Day 36

5 min	Abs	#1	#2	#3	%D
#1	0.1	32.4	32.2	32.9	32.5
#2	0.1	32.4	32.2	32.9	32.5
#3	0.2	35.7	35.5	36.2	35.8
Average					29.3
STDEV					6.39
#4	0.1	28.5	28.2	29.0	28.6
#5	0.1	17.4	17.1	17.8	17.4
#6	0.1	28.7	28.5	29.2	28.8
10 min	Abs	#1	#2	#3	%D
#1	0.3	59.9	59.8	60.5	60.1
#2	0.3	56.4	56.3	57.0	56.6
#3	0.3	61.0	60.9	61.6	61.1
Average					55.3
STDEV					6.60
#4	0.2	53.4	53.3	54.0	53.6
#5	0.2	42.9	42.7	43.4	43.0
#6	0.3	57.3	57.2	57.9	57.5
20 min	Abs	#1	#2	#3	%D
#1	0.4	85.7	85.8	86.4	86.0
#2	0.4	83.8	83.9	84.5	84.1
#3	0.4	84.7	84.7	85.4	84.9
Average					82.2
STDEV					5.87
#4	0.4	79.8	79.8	80.4	80.0
#5	0.3	71.0	71.0	71.6	71.2
#6	0.4	86.6	86.7	87.3	86.8
30 min	Abs	#1	#2	#3	%D
#1	0.4	92.7	92.8	93.4	92.9
#2	0.4	92.7	92.8	93.4	92.9
#3	0.4	91.8	91.9	92.5	92.1
Average					90.5
STDEV					4.61
#4	0.4	92.9	93.0	93.6	93.2
#5	0.4	81.1	81.1	81.7	81.3
#6	0.4	90.1	90.2	90.8	90.4

Table 8B Dissolution of Prednisone in Open Dish at 25°C, Day 42

5 min	Abs	#1	#2	#3	%D			
#1	0.132	28.9	28.7	29.4	29.0			
#2	0.135	29.6	29.3	30.0	29.7			
#3	0.104	22.8	22.5	23.3	22.9	Average	25.9	
#4	0.148	32.4	32.2	32.9	32.5	STDEV	5.44	
#5	0.080	17.6	17.3	18.0	17.6			
#6	0.109	23.9	23.6	24.4	24.0			
10 min	Abs	#1	#2	#3	%D			
#1	0.261	57.1	57.0	57.7	57.2			
#2	0.254	55.6	55.5	56.1	55.7			
#3	0.246	53.6	53.5	54.2	53.8	Average	54.0	
#4	0.288	62.9	62.8	63.5	63.1	STDEV	6.93	
#5	0.192	42.0	41.8	42.5	42.1			
#6	0.239	52.1	52.0	52.7	52.3			
20 min	Abs	#1	#2	#3	%D			
#1	0.365	79.5	79.6	80.2	79.8			
#2	0.359	78.3	78.3	78.9	78.5			
#3	0.342	74.6	74.7	75.3	74.9	Average	79.1	
#4	0.391	85.3	85.4	86.0	85.6	STDEV	4.56	
#5	0.335	73.1	73.2	73.8	73.4			
#6	0.376	82.1	82.2	82.8	82.3			
30 min	Abs	#1	#2	#3	%D			
#1	0.381	83.2	83.2	83.9	83.4			
#2	0.401	87.4	87.5	88.1	87.7			
#3	0.365	79.6	79.6	80.2	79.8	Average	85.6	
#4	0.419	91.4	91.5	92.1	91.7	STDEV	4.05	
#5	0.386	84.2	84.3	84.9	84.5			
#6	0.397	86.5	86.6	87.2	86.8			

Table 9B Dissolution of Prednisone in Open Dish at 30°C, Day 6

5 min	Abs	#1	#2	#3	%D
#1	0.148	32.4	32.2	31.8	32.5
#2	0.143	31.3	31.1	31.8	31.4
#3	0.159	34.8	34.6	35.3	34.9
#4	0.195	42.6	42.5	43.2	42.8
#5	0.152	33.3	33.1	33.8	33.4
#6	0.150	32.9	32.6	33.3	32.9
10 min	Abs	#1	#2	#3	%D
#1	0.293	64.0	63.9	64.6	64.2
#2	0.290	63.3	63.3	63.9	63.5
#3	0.313	68.3	68.3	68.9	68.5
#4	0.367	80.1	80.2	80.8	80.4
#5	0.293	64.0	63.9	64.6	64.2
#6	0.303	66.1	66.1	66.7	66.3
20 min	Abs	#1	#2	#3	%D
#1	0.371	81.0	81.1	81.7	81.3
#2	0.397	86.6	86.7	87.3	86.8
#3	0.400	87.2	87.3	87.9	87.5
#4	0.428	93.4	93.5	94.1	93.7
#5	0.413	90.0	90.1	90.7	90.3
#6	0.418	91.3	91.4	92.0	91.5
30 min	Abs	#1	#2	#3	%D
#1	0.414	90.3	90.5	91.1	90.6
#2	0.420	91.6	91.7	92.3	91.9
#3	0.403	87.8	87.9	88.5	88.1
#4	0.424	92.4	92.6	93.2	92.7
#5	0.420	91.6	91.7	92.3	91.9
#6	0.422	92.0	92.2	92.8	92.3

Average 34.6
STDEV 4.14

Average 67.8
STDEV 6.41

Average 88.5
STDEV 4.37

Average 91.3
STDEV 1.71

Table 10B Dissolution of Prednisone in Open Dish at 30°C, Day 12

5 min	Abs	#1	#2	#3	%D
#1	0.130	28.5	28.2	29.0	28.6
#2	0.167	36.6	36.3	37.0	36.6
#3	0.135	29.6	29.3	30.0	29.7
#4	0.171	37.4	37.2	37.9	37.5
#5	0.150	32.9	32.6	33.3	32.9
#6	0.201	44.0	43.8	44.5	44.1
10 min	Abs	#1	#2	#3	%D
#1	0.259	56.7	56.6	57.2	56.8
#2	0.305	66.6	66.5	67.2	66.8
#3	0.284	62.0	62.0	62.6	62.2
#4	0.306	66.8	66.7	67.4	67.0
#5	0.289	63.1	63.1	63.7	63.3
#6	0.332	72.4	72.4	73.0	72.6
20 min	Abs	#1	#2	#3	%D
#1	0.328	71.6	71.7	72.3	71.9
#2	0.402	87.6	87.7	88.4	87.9
#3	0.387	84.4	84.5	85.1	84.7
#4	0.413	90.0	90.1	90.7	90.3
#5	0.411	89.6	89.7	90.3	89.8
#6	0.412	89.8	89.9	90.5	90.1
30 min	Abs	#1	#2	#3	%D
#1	0.369	80.4	80.5	81.1	80.7
#2	0.414	90.3	90.5	91.1	90.6
#3	0.418	91.2	91.3	91.9	91.5
#4	0.418	91.2	91.3	91.9	91.5
#5	0.422	92.0	92.2	92.8	92.3
#6	0.414	90.3	90.5	91.1	90.6

Average 34.9
STDEV 5.75

Average 64.8
STDEV 5.33

Average 85.8
STDEV 7.13

Average 89.5
STDEV 4.39

Table 11B Dissolution of Prednisone in Open Dish at 30°C, Day 18

5 min	Abs	#1	#2	#3	%D		
#1	0.159	34.8	34.6	35.3	34.9		
#2	0.165	36.1	35.9	36.6	36.2		
#3	0.128	28.1	27.8	28.5	28.1	Average	33.1
#4	0.125	27.4	27.1	27.9	27.5	STDEV	4.57
#5	0.178	38.9	38.7	39.4	39.0		
#6	0.150	32.9	32.6	33.3	32.9		
10 min	Abs	#1	#2	#3	%D		
#1	0.245	53.4	53.3	54.0	53.6		
#2	0.315	68.7	68.7	69.3	68.9		
#3	0.224	48.9	48.8	49.4	49.0	Average	61.2
#4	0.312	68.1	68.0	68.7	68.3	STDEV	8.12
#5	0.286	62.5	62.4	63.1	62.7		
#6	0.295	64.4	64.4	65.0	64.6		
20 min	Abs	#1	#2	#3	%D		
#1	0.360	78.5	78.5	79.1	78.7		
#2	0.425	92.8	92.9	93.5	93.0		
#3	0.368	80.4	80.4	81.1	80.6	Average	86.7
#4	0.413	90.0	90.1	90.7	90.3	STDEV	5.71
#5	0.407	88.7	88.8	89.4	89.0		
#6	0.406	88.5	88.6	89.2	88.8		
30 min	Abs	#1	#2	#3	%D		
#1	0.388	84.6	84.7	85.3	84.9		
#2	0.437	95.2	95.3	95.9	95.5		
#3	0.411	89.7	89.8	90.4	90.0	Average	91.6
#4	0.429	93.5	93.6	94.2	93.8	STDEV	3.78
#5	0.428	93.3	93.4	94.0	93.6		
#6	0.420	91.6	91.7	92.3	91.9		

Table 12B Dissolution of Prednisone in Open Dish at 30°C, Day 24

5 min	Abs	#1	#2	#3	%D		
#1	0.166	36.3	36.1	36.8	36.4		
#2	0.191	41.8	41.6	42.3	41.9		
#3	0.134	29.4	29.1	29.8	29.4	Average	30.0
#4	0.171	37.4	37.2	37.9	37.5	STDEV	12.6
#5	0.029	6.5	6.1	6.9	6.5		
#6	0.128	28.1	27.8	28.5	28.1		
10 min	Abs	#1	#2	#3	%D		
#1	0.296	64.6	64.6	65.2	64.8		
#2	0.305	66.6	66.5	67.2	66.8		
#3	0.224	48.9	48.8	49.4	49.0	Average	59.4
#4	0.239	52.1	52.0	52.7	52.3	STDEV	7.12
#5	0.278	60.7	60.7	61.3	60.9		
#6	0.285	62.3	62.2	62.9	62.4		
20 min	Abs	#1	#2	#3	%D		
#1	0.396	86.4	86.5	87.1	86.6		
#2	0.408	88.9	89.0	89.6	89.2		
#3	0.349	76.1	76.2	76.8	76.4	Average	85.0
#4	0.395	86.1	86.2	86.9	86.4	STDEV	4.57
#5	0.400	87.2	87.3	87.9	87.5		
#6	0.383	83.6	83.7	84.3	83.8		
30 min	Abs	#1	#2	#3	%D		
#1	0.404	88.2	88.3	88.9	88.5		
#2	0.415	90.5	90.7	91.3	90.8		
#3	0.380	83.0	83.0	83.6	83.2	Average	89.1
#4	0.417	91.0	91.1	91.7	91.3	STDEV	3.02
#5	0.412	89.9	90.0	90.6	90.2		
#6	0.413	90.1	90.2	90.8	90.4		

Table 1.3B Dissolution of Prednisone in Open Dish at 30°C, Day 30

5 min	Abs	#1	#2	#3	%D	
#1	0.121	26.5	26.3	27.0	26.6	
#2	0.151	33.1	32.8	33.5	33.2	
#3	0.152	33.3	33.1	33.8	33.4	Average 33.2
#4	0.181	39.6	39.4	40.1	39.7	STDEV 4.63
#5	0.136	29.8	29.6	30.3	29.9	
#6	0.166	36.3	36.1	36.8	36.4	
10 min	Abs	#1	#2	#3	%D	
#1	0.229	50.0	49.8	50.5	50.1	
#2	0.276	60.3	60.2	60.9	60.5	
#3	0.275	60.1	60.0	60.7	60.3	Average 59.9
#4	0.310	67.6	67.6	68.3	67.8	STDEV 5.89
#5	0.264	57.7	57.6	58.3	57.9	
#6	0.288	62.9	62.8	63.5	63.1	
20 min	Abs	#1	#2	#3	%D	
#1	0.364	79.3	79.4	80.0	79.6	
#2	0.356	77.6	77.7	78.3	77.9	
#3	0.391	85.3	85.4	86.0	85.6	Average 82.8
#4	0.387	84.4	84.5	85.1	84.7	STDEV 3.49
#5	0.378	82.5	82.6	83.2	82.8	
#6	0.396	86.4	86.5	87.1	86.6	
30 min	Abs	#1	#2	#3	%D	
#1	0.377	82.3	82.4	83.0	82.6	
#2	0.361	78.7	78.8	79.4	79.0	
#3	0.421	91.8	91.9	92.5	92.1	Average 86.6
#4	0.386	84.2	84.3	84.9	84.5	STDEV 5.45
#5	0.407	88.9	89.0	89.6	89.1	
#6	0.422	92.0	92.2	92.8	92.3	

Table 14B Dissolution of Prednisone in Open Dish at 40°C, Day 6

5 min	Abs	#1	#2	#3	%D
#1	0.124	27.2	26.9	27.6	27.3
#2	0.151	33.1	32.8	33.5	33.2
#3	0.120	26.3	26.1	26.8	26.4
#4	0.166	36.3	36.1	36.8	36.4
#5	0.142	31.1	30.9	31.6	31.2
#6	0.194	42.4	42.3	42.9	42.5
10 min	Abs	#1	#2	#3	%D
#1	0.242	52.8	52.7	53.3	52.9
#2	0.309	67.4	67.4	68.0	67.6
#3	0.253	55.4	55.3	55.9	55.5
#4	0.314	68.5	68.5	69.1	68.7
#5	0.280	61.2	61.1	61.8	61.4
#6	0.334	72.8	72.8	73.5	73.0
20 min	Abs	#1	#2	#3	%D
#1	0.379	82.7	82.8	83.4	83.0
#2	0.415	90.4	90.5	91.1	90.7
#3	0.364	79.3	79.4	80.0	79.6
#4	0.410	89.3	89.5	90.1	89.6
#5	0.392	85.5	85.6	86.2	85.8
#6	0.419	91.5	91.6	92.2	91.8
30 min	Abs	#1	#2	#3	%D
#1	0.411	89.7	89.8	90.4	90.0
#2	0.422	92.0	92.2	92.8	92.3
#3	0.390	85.1	85.1	85.8	85.3
#4	0.439	95.8	96.0	96.6	96.1
#5	0.417	91.0	91.1	91.7	91.3
#6	0.426	92.9	93.0	93.6	93.2

Average	32.8
STDEV	6.04

Average	63.2
STDEV	7.93

Average	86.7
STDEV	4.81

Average	91.4
STDEV	3.61

Table 15B Dissolution of Prednisone in Open Dish at 40°C, Day 12

5 min	Abs	#1	#2	#3	%D
#1	0.139	30.5	30.2	30.9	30.5
#2	0.187	40.9	40.7	41.4	41.0
#3	0.120	26.3	26.1	26.8	26.4
#4	0.199	43.5	43.3	44.0	43.6
#5	0.133	29.2	28.9	29.6	29.2
#6	0.152	33.3	33.1	33.8	33.4
10 min	Abs	#1	#2	#3	%D
#1	0.261	57.1	57.0	57.7	57.2
#2	0.315	68.7	68.7	69.3	68.9
#3	0.250	54.7	54.6	55.3	54.9
#4	0.338	73.7	73.7	74.3	73.9
#5	0.253	55.4	55.3	55.9	55.5
#6	0.286	62.5	62.4	63.1	62.7
20 min	Abs	#1	#2	#3	%D
#1	0.353	77.0	77.0	77.6	77.2
#2	0.408	88.9	89.0	89.6	89.2
#3	0.400	87.2	87.3	87.9	87.5
#4	0.421	91.9	92.0	92.6	92.2
#5	0.384	83.8	83.9	84.5	84.1
#6	0.393	85.7	85.8	86.4	86.0
30 min	Abs	#1	#2	#3	%D
#1	0.392	85.5	85.6	86.2	85.7
#2	0.415	90.5	90.7	91.3	90.8
#3	0.419	91.4	91.5	92.1	91.7
#4	0.418	91.2	91.3	91.9	91.5
#5	0.399	87.0	87.1	87.7	87.2
#6	0.415	90.5	90.7	91.3	90.8

Average	34.0
STDEV	6.86

Average	62.2
STDEV	7.81

Average	86.0
STDEV	5.13

Average	89.6
STDEV	2.50

Table 16B Dissolution of Prednisone in Open Dish at 40°C, Day 18

5 min	Abs	#1	#2	#3	%D
#1	0.169	37.0	36.8	37.5	37.1
#2	0.188	41.1	40.9	41.6	41.2
#3	0.091	20.0	19.7	20.4	20.1
#4	0.149	32.6	32.4	33.1	32.7
#5	0.159	34.8	34.6	35.3	34.9
#6	0.128	28.1	27.8	28.5	28.1
10 min	Abs	#1	#2	#3	%D
#1	0.233	50.8	50.7	51.4	51.0
#2	0.236	51.5	51.4	52.0	51.6
#3	0.237	51.7	51.6	52.3	51.8
#4	0.311	67.9	67.8	68.5	68.1
#5	0.281	61.4	61.3	62.0	61.6
#6	0.291	63.5	63.5	64.2	63.7
20 min	Abs	#1	#2	#3	%D
#1	0.351	76.6	76.6	77.2	76.8
#2	0.362	78.9	78.9	79.6	79.1
#3	0.346	75.5	75.5	76.1	75.7
#4	0.412	89.8	89.9	90.5	90.1
#5	0.395	86.1	86.2	86.9	86.4
#6	0.404	88.1	88.2	88.8	88.3
30 min	Abs	#1	#2	#3	%D
#1	0.381	83.2	83.2	83.9	83.4
#2	0.387	84.4	84.5	85.1	84.7
#3	0.367	80.0	80.0	80.7	80.2
#4	0.420	91.6	91.7	92.3	91.9
#5	0.408	89.1	89.2	89.8	89.3
#6	0.417	91.0	91.1	91.7	91.3

Average	32.4
STDEV	7.44

Average	58.0
STDEV	7.41

Average	82.7
STDEV	6.26

Average	86.8
STDEV	4.71

Table 17B Dissolution of Prednisone in Open Dish at 40°C, Day 24

5 min	Abs	#1	#2	#3	%D
#1	0.145	31.8	31.5	32.2	31.8
#2	0.147	33.2	32.0	32.7	32.3
#3	0.116	25.5	25.2	25.9	25.5
#4	0.175	38.3	38.1	38.8	38.4
#5	0.159	34.8	34.6	35.3	34.9
#6	0.154	33.7	33.5	34.2	33.8
10 min	Abs	#1	#2	#3	%D
#1	0.269	58.8	58.7	59.4	59.0
#2	0.333	72.6	72.6	73.2	72.8
#3	0.279	61.0	60.9	61.6	61.1
#4	0.258	56.4	56.3	57.0	56.6
#5	0.261	57.1	57.0	57.7	57.2
#6	0.247	53.9	53.7	54.4	54.0
20 min	Abs	#1	#2	#3	%D
#1	0.353	77.0	77.0	77.6	77.2
#2	0.401	87.4	87.5	88.1	87.7
#3	0.400	87.2	87.3	87.9	87.5
#4	0.376	82.1	82.2	82.8	82.3
#5	0.373	81.5	81.5	82.1	81.7
#6	0.379	82.7	82.8	83.4	83.0
30 min	Abs	#1	#2	#3	%D
#1	0.399	87.0	87.1	87.7	87.2
#2	0.414	90.3	90.5	91.1	90.6
#3	0.422	92.0	92.2	92.8	92.3
#4	0.397	86.5	86.6	87.2	86.8
#5	0.395	86.1	86.2	86.8	86.4
#6	0.425	92.7	92.8	93.4	92.9

Average	32.8
STDEV	4.27

Average	60.1
STDEV	6.65

Average	83.2
STDEV	3.93

Average	89.4
STDEV	2.94

Table 18B Dissolution of Prednisone in Open Dish at 40°C, Day 30

5 min	Abs	#1	#2	#3	%D	
	#1	0.087	19.1	18.8	19.6	19.2
	#2	0.126	27.6	27.4	28.1	27.7
	#3	0.134	29.4	29.1	29.8	29.4
	#4	0.160	35.0	34.8	35.5	35.1
	#5	0.009	2.2	1.8	2.5	2.1
10 min	Abs	#1	#2	#3	%D	
	#1	0.204	44.6	44.4	45.1	44.7
	#2	0.239	52.1	52.0	52.7	52.3
	#3	0.248	54.1	54.0	54.6	54.2
	#4	0.285	62.3	62.2	62.9	62.4
	#5	0.211	46.1	45.9	46.6	46.2
20 min	Abs	#1	#2	#3	%D	
	#1	0.346	75.5	75.5	76.1	75.7
	#2	0.377	82.3	82.4	83.0	82.6
	#3	0.383	83.6	83.7	84.3	83.8
	#4	0.390	85.1	85.2	85.8	85.3
	#5	0.346	75.5	75.5	76.1	75.7
30 min	Abs	#1	#2	#3	%D	
	#1	0.406	88.5	88.6	89.2	88.8
	#2	0.392	85.5	85.6	86.2	85.7
	#3	0.417	91.0	91.1	91.7	91.3
	#4	0.414	90.3	90.5	91.1	90.6
	#5	0.409	89.3	89.4	90.0	89.6
	Abs	#1	#2	#3	%D	
	#1	0.392	85.5	85.6	86.2	85.7
	#2	0.417	91.0	91.1	91.7	91.3
	#3	0.414	90.3	90.5	91.1	90.6
	#4	0.409	89.3	89.4	90.0	89.6
	#5	0.392	85.5	85.6	86.2	85.7
	Abs	#1	#2	#3	%D	
	#1	0.434	94.6	94.7	95.3	94.9
	#2	0.434	94.6	94.7	95.3	94.9
	#3	0.434	94.6	94.7	95.3	94.9
	#4	0.434	94.6	94.7	95.3	94.9
	#5	0.434	94.6	94.7	95.3	94.9
Average	23.8					
	STDEV					
52.6	6.51					
	STDEV					
82.0	5.29					
	STDEV					
89.6	3.49					
	STDEV					

Table 19B Dissolution of Prednisone in Open Dish at 40°C, Day 36

5 min	Abs	#1	#2	#3	%D	
	#1	0.104	22.8	22.5	23.3	22.9
	#2	0.148	32.4	32.2	32.9	32.5
	#3	0.154	33.7	33.5	34.2	33.8
	#4	0.134	29.4	29.1	29.8	29.4
	#5	0.134	29.4	29.1	29.8	29.4
	#6	0.156	34.2	33.9	34.6	34.2
10 min	Abs	#1	#2	#3	%D	
	#1	0.219	47.8	47.7	48.4	48.0
	#2	0.286	62.5	62.4	63.1	62.7
	#3	0.263	57.5	57.4	58.1	57.7
	#4	0.259	56.7	56.6	57.2	56.8
	#5	0.254	55.6	55.5	56.1	55.7
	#6	0.255	55.8	55.7	56.4	56.0
20 min	Abs	#1	#2	#3	%D	
	#1	0.335	73.1	73.2	73.8	73.4
	#2	0.385	84.0	84.1	84.7	84.3
	#3	0.358	78.0	78.1	78.7	78.3
	#4	0.383	83.6	83.7	84.3	83.8
	#5	0.397	86.6	86.7	87.3	86.8
	#6	0.394	85.9	86.0	86.6	86.2
30 min	Abs	#1	#2	#3	%D	
	#1	0.365	79.6	79.6	80.2	79.8
	#2	0.404	88.0	88.1	88.7	88.3
	#3	0.369	80.4	80.5	81.1	80.7
	#4	0.418	91.2	91.3	91.9	91.5
	#5	0.410	89.5	89.6	90.2	89.8
	#6	0.399	87.0	87.1	87.7	87.4

Table 20B Dissolution of Prednisone in PVC at 25°C, Day 8

5 min	Abs	#1	#2	#3	%D
#1	0.143	31.3	31.1	31.8	31.4
#2	0.189	41.3	41.2	41.8	41.4
#3	0.162	35.5	35.2	35.9	35.6
Average	36.5				
STDEV	5.50				
#4	0.173	37.9	37.7	38.4	38.0
#5	0.134	29.4	29.1	29.8	29.4
#6	0.198	43.3	43.1	43.8	43.4
10 min	Abs	#1	#2	#3	%D
#1	0.287	62.7	62.6	63.3	62.9
#2	0.351	76.7	76.7	77.3	76.9
#3	0.320	69.8	69.8	70.4	70.0
Average	70.0				
STDEV	6.98				
#4	0.337	73.5	73.5	74.1	73.7
#5	0.275	60.1	60.0	60.7	60.3
#6	0.347	75.8	75.9	76.5	76.1
20 min	Abs	#1	#2	#3	%D
#1	0.417	90.8	91.0	91.6	91.1
#2	0.438	95.5	95.7	96.3	95.8
#3	0.418	91.3	91.4	92.0	91.5
#4	0.418	91.3	91.4	92.0	91.5
Average	91.7				
STDEV	2.67				
#5	0.400	87.2	87.3	87.9	87.5
#6	0.422	92.1	92.2	92.8	92.4
30 min	Abs	#1	#2	#3	%D
#1	0.431	93.9	94.1	94.7	94.2
#2	0.420	91.6	91.7	92.3	91.9
#3	0.421	91.8	91.9	92.5	92.1
Average	92.1				
STDEV	1.22				
#4	0.420	91.6	91.7	92.3	91.9
#5	0.413	90.1	90.2	90.8	90.4
#6	0.420	91.6	91.7	92.3	91.9

Table 21B Dissolution of Prednisone in PVC at 25°C, Day 14

5 min	Abs	#1	#2	#3	%D
#1	0.170	37.2	37.0	37.7	37.3
#2	0.186	40.7	40.5	41.2	40.8
#3	0.150	32.9	32.6	33.3	32.9
Average	41.3				
STDEV	6.57				
#4	0.213	46.6	46.4	47.1	46.7
#5	0.178	38.9	38.7	39.4	39.0
#6	0.233	50.9	50.8	51.5	51.1
10 min	Abs	#1	#2	#3	%D
#1	0.333	72.6	72.6	73.2	72.8
#2	0.348	76.0	76.1	76.7	76.3
#3	0.299	65.3	65.2	65.9	65.5
Average	72.5				
STDEV	5.99				
#4	0.365	79.7	79.8	80.4	79.9
#5	0.298	65.1	65.0	65.7	65.2
#6	0.344	75.0	75.0	75.6	75.2
20 min	Abs	#1	#2	#3	%D
#1	0.417	90.8	91.0	91.6	91.1
#2	0.425	92.8	92.9	93.5	93.0
#3	0.416	90.6	90.7	91.4	90.9
#4	0.446	97.2	97.4	98.0	97.5
Average	93.8				
STDEV	2.84				
#5	0.425	92.8	92.9	93.5	93.0
#6	0.443	96.6	96.8	97.3	96.9
30 min	Abs	#1	#2	#3	%D
#1	0.432	94.1	94.3	94.9	94.4
#2	0.435	94.8	94.9	95.5	95.1
#3	0.436	95.0	95.1	95.7	95.3
Average	95.2				
STDEV	1.03				
#4	0.441	96.2	96.4	97.0	96.5
#5	0.429	93.5	93.6	94.2	93.8
#6	0.439	95.8	96.0	96.6	96.1

Table 22B Dissolution of Prednisone in PVC at 25°C, Day 20

5 min	Abs	#1	#2	#3	%D
#1	0.175	38.3	38.1	38.8	38.4
#2	0.170	37.2	37.0	37.7	37.3
#3	0.165	36.1	35.9	36.6	36.2
#4	0.161	35.2	35.0	35.7	35.3
#5	0.140	30.7	30.4	31.1	30.7
#6	0.187	40.9	40.7	41.4	41.0
10 min	Abs	#1	#2	#3	%D
#1	0.318	69.4	69.3	70.0	69.6
#2	0.323	70.4	70.4	71.1	70.6
#3	0.299	65.3	65.2	65.9	65.5
#4	0.299	65.3	65.2	65.9	65.5
#5	0.299	65.3	65.2	65.9	65.5
#6	0.356	77.8	77.8	78.4	78.0
20 min	Abs	#1	#2	#3	%D
#1	0.414	90.2	90.3	90.9	90.5
#2	0.417	90.8	91.0	91.6	91.1
#3	0.389	84.9	85.0	85.6	85.1
#4	0.400	87.2	87.3	87.9	87.5
#5	0.393	85.7	85.8	86.4	86.0
#6	0.417	91.1	91.2	91.8	91.3
30 min	Abs	#1	#2	#3	%D
#1	0.423	92.2	92.4	93.0	92.5
#2	0.429	93.5	93.6	94.2	93.8
#3	0.396	86.3	86.4	87.0	86.6
#4	0.426	92.9	93.0	93.6	93.2
#5	0.405	88.4	88.5	89.2	88.7
#6	0.419	91.4	91.5	92.1	91.7
Average					
STDEV					

Table 23B Dissolution of Prednisone in PVC at 25°C, Day 26

5 min	Abs	#1	#2	#3	%D
#1	0.127	27.9	27.6	28.3	27.9
#2	0.200	43.7	43.6	44.3	43.9
#3	0.143	31.3	31.1	31.8	31.4
#4	0.187	40.9	40.7	41.4	41.0
#5	0.111	24.4	24.1	24.8	24.4
#6	0.167	36.6	36.3	37.0	36.6
10 min	Abs	#1	#2	#3	%D
#1	0.232	50.6	50.5	51.2	50.8
#2	0.346	75.4	75.4	76.1	75.6
#3	0.279	61.0	60.9	61.6	61.1
#4	0.317	69.1	69.1	69.8	69.4
#5	0.245	53.4	53.3	54.0	53.6
#6	0.304	66.3	66.3	67.0	66.5
20 min	Abs	#1	#2	#3	%D
#1	0.339	74.0	74.0	74.6	74.2
#2	0.408	88.9	89.0	89.6	89.2
#3	0.376	82.1	82.2	82.8	82.3
#4	0.408	88.9	89.0	89.6	89.2
#5	0.359	78.3	78.3	78.9	78.5
#6	0.407	88.7	88.8	89.4	89.0
30 min	Abs	#1	#2	#3	%D
#1	0.384	83.8	83.9	84.5	84.1
#2	0.414	90.3	90.5	91.1	90.6
#3	0.425	92.7	92.8	93.4	92.9
#4	0.418	91.2	91.3	91.9	91.5
#5	0.408	89.1	89.2	89.8	89.3
#6	0.431	93.9	94.1	94.7	94.2
Average					
STDEV					

Table 26B Dissolution of Prednisone in PVC at 25°C, Day 44

5 min	Abs	#1	#2	#3	%D
#1	0.130	28.5	28.2	29.0	28.6
#2	0.147	32.2	32.0	32.7	32.3
#3	0.148	32.4	32.2	32.9	32.5
#4	0.146	32.0	31.7	32.5	32.1
#5	0.154	33.7	33.5	34.2	33.8
#6	0.153	33.5	33.3	34.0	33.6
10 min	Abs	#1	#2	#3	%D
#1	0.263	57.5	57.4	58.1	57.7
#2	0.307	67.0	67.0	67.6	67.2
#3	0.263	57.5	57.4	58.1	57.7
#4	0.269	58.8	58.7	59.4	59.0
#5	0.267	58.4	58.3	59.0	58.5
#6	0.263	57.5	57.4	58.1	57.7
20 min	Abs	#1	#2	#3	%D
#1	0.378	82.5	82.6	83.2	82.8
#2	0.400	87.2	87.3	87.9	87.5
#3	0.388	84.7	84.7	85.4	84.9
#4	0.387	84.4	84.5	85.1	84.7
#5	0.393	85.7	85.8	86.4	86.0
#6	0.381	83.2	83.2	83.9	83.4
30 min	Abs	#1	#2	#3	%D
#1	0.401	87.4	87.5	88.1	87.7
#2	0.407	88.9	89.0	89.6	89.1
#3	0.423	92.2	92.4	93.0	92.5
#4	0.406	88.6	88.8	89.4	88.9
#5	0.424	92.4	92.6	93.2	92.7
#6	0.425	92.7	92.8	93.4	92.9

Average	32.1
STDEV	1.89

Average	59.6
STDEV	3.75

Average	84.9
STDEV	1.71

Average	90.7
STDEV	2.34

Table 27B Dissolution of Prednisone in PVC at 25°C, Day 50

5 min	Abs	#1	#2	#3	%D
#1	0.146	32.0	31.7	32.5	32.1
#2	0.150	32.9	32.6	33.3	32.9
#3	0.142	31.1	30.9	31.6	31.2
#4	0.157	34.4	34.2	34.9	34.5
#5	0.141	30.9	30.6	31.4	31.0
#6	0.172	37.6	37.4	38.1	37.7
10 min	Abs	#1	#2	#3	%D
#1	0.263	57.5	57.4	58.1	57.7
#2	0.270	59.0	58.9	59.6	59.2
#3	0.276	60.3	60.2	60.9	60.5
#4	0.294	64.2	64.1	64.8	64.4
#5	0.275	60.1	60.0	60.7	60.3
#6	0.326	71.1	71.1	71.7	71.3
20 min	Abs	#1	#2	#3	%D
#1	0.374	81.7	81.7	82.4	81.9
#2	0.387	84.4	84.5	85.1	84.7
#3	0.383	83.6	83.7	84.3	83.8
#4	0.405	88.3	88.4	89.0	88.6
#5	0.410	89.3	89.5	90.1	89.6
#6	0.430	93.8	94.0	94.6	94.1
30 min	Abs	#1	#2	#3	%D
#1	0.390	85.1	85.1	85.8	85.3
#2	0.398	86.7	86.8	87.5	87.0
#3	0.388	84.6	84.7	85.3	84.9
#4	0.415	90.5	90.7	91.3	90.8
#5	0.411	89.7	89.8	90.4	90.0
#6	0.431	93.9	94.1	94.7	94.2

Average	33.2
STDEV	2.55

Average	62.2
STDEV	4.97

Average	87.1
STDEV	4.49

Average	88.7
STDEV	3.61

Table 288B Dissolution of Prednisone in PVC at 25°C, Day 56

5 min	Abs	#1	#2	#3	%D
#1	0.143	31.3	31.1	31.8	31.4
#2	0.170	37.2	37.0	37.7	37.3
#3	0.163	35.7	35.5	36.2	35.8
#4	0.191	41.8	41.6	42.3	41.9
#5	0.118	25.9	25.6	26.3	25.9
#6	0.173	37.9	37.7	38.4	38.0
10 min	Abs	#1	#2	#3	%D
#1	0.261	57.1	57.0	57.7	57.2
#2	0.306	66.8	66.7	67.4	67.0
#3	0.284	62.0	62.0	62.6	62.2
#4	0.317	69.1	69.1	69.8	69.4
#5	0.250	54.7	54.6	55.3	54.9
#6	0.303	66.1	66.1	66.7	66.3
20 min	Abs	#1	#2	#3	%D
#1	0.382	83.4	83.5	84.1	83.6
#2	0.397	86.6	86.7	87.3	86.8
#3	0.398	86.8	86.9	87.5	87.1
#4	0.401	87.4	87.5	88.1	87.7
#5	0.386	84.2	84.3	84.9	84.5
#6	0.425	92.8	92.9	93.5	93.0
30 min	Abs	#1	#2	#3	%D
#1	0.389	84.8	84.9	85.5	85.1
#2	0.403	87.8	87.9	88.5	88.1
#3	0.409	89.3	89.4	90.0	89.6
#4	0.411	89.7	89.8	90.4	90.0
#5	0.388	84.6	84.7	85.3	84.9
#6	0.433	94.3	94.5	95.1	94.6

Average	35.0
STDEV	5.60

Average	62.8
STDEV	5.78

Average	87.1
STDEV	3.31

Average	88.7
STDEV	3.62

Table 298B Dissolution of Prednisone in PVC at 25°C, Day 62

5 min	Abs	#1	#2	#3	%D
#1	0.131	28.7	28.5	29.2	28.8
#2	0.185	40.5	40.3	41.0	40.6
#3	0.146	32.0	31.7	32.5	32.1
#4	0.172	37.6	37.4	38.1	37.7
#5	0.117	25.7	25.4	26.1	25.7
#6	0.162	35.5	35.2	35.9	35.6
10 min	Abs	#1	#2	#3	%D
#1	0.274	59.9	59.8	60.5	60.1
#2	0.312	68.1	68.0	68.7	68.3
#3	0.260	56.9	56.8	57.4	57.0
#4	0.299	65.3	65.2	65.9	65.5
#5	0.249	54.5	54.4	55.1	54.7
#6	0.279	61.0	60.9	61.6	61.1
20 min	Abs	#1	#2	#3	%D
#1	0.364	79.3	79.4	80.0	79.6
#2	0.410	89.3	89.5	90.1	89.6
#3	0.383	83.6	83.7	84.3	83.8
#4	0.417	90.8	91.0	91.6	91.1
#5	0.382	83.4	83.5	84.1	83.6
#6	0.392	85.5	85.6	86.2	85.8
30 min	Abs	#1	#2	#3	%D
#1	0.364	79.4	79.4	80.0	79.6
#2	0.429	93.5	93.6	94.2	93.8
#3	0.409	89.3	89.4	90.0	89.6
#4	0.428	93.3	93.4	94.0	93.6
#5	0.398	86.7	86.8	87.5	87.0
#6	0.408	89.1	89.2	89.8	89.3

Average	33.4
STDEV	5.60

Average	61.1
STDEV	5.09

Average	85.6
STDEV	4.24

Average	88.8
STDEV	5.22

Table 30B Dissolution of Prednisone in PVC at 30°C, Day 7

5 min	Abs	#1	#2	#3	%D
#1	0.190	41.6	41.4	42.1	41.7
#2	0.217	47.4	47.3	48.0	47.6
#3	0.146	32.0	31.7	32.5	32.1
#4	0.205	44.8	44.7	45.3	44.9
#5	0.180	39.4	39.2	39.9	39.5
#6	0.212	46.3	46.2	46.9	46.5
10 min	Abs	#1	#2	#3	%D
#1	0.343	74.7	74.8	75.4	75.0
#2	0.356	77.8	77.8	78.4	78.0
#3	0.284	62.0	62.0	62.6	62.2
#4	0.372	81.2	81.3	81.9	81.5
#5	0.338	73.7	73.7	74.3	73.9
#6	0.373	81.4	81.5	82.1	81.7
20 min	Abs	#1	#2	#3	%D
#1	0.419	91.5	91.6	92.2	91.8
#2	0.419	91.5	91.6	92.2	91.8
#3	0.390	85.1	85.2	85.8	85.3
#4	0.426	93.0	93.1	93.7	93.3
#5	0.426	93.0	93.1	93.7	93.3
#6	0.429	93.6	93.7	94.3	93.9
30 min	Abs	#1	#2	#3	%D
#1	0.423	92.2	92.4	93.0	92.5
#2	0.422	92.0	92.2	92.8	92.3
#3	0.408	89.1	89.2	89.8	89.3
#4	0.423	92.2	92.4	93.0	92.5
#5	0.430	93.7	93.9	94.5	94.0
#6	0.427	93.1	93.2	93.8	93.4

Average	42.0
STDEV	5.74

Average	75.4
STDEV	7.20

Average	91.5
STDEV	3.16

Average	92.3
STDEV	1.60

Table 31B Dissolution of Prednisone in PVC at 30°C, Day 13

5 min	Abs	#1	#2	#3	%D
#1	0.161	35.2	35.0	35.7	35.3
#2	0.210	45.9	45.8	46.4	46.0
#3	0.144	31.5	31.3	32.0	31.6
#4	0.158	34.6	34.4	35.1	34.7
#5	0.191	41.8	41.6	42.3	41.9
#6	0.166	36.3	36.1	36.8	36.4
10 min	Abs	#1	#2	#3	%D
#1	0.338	73.7	73.7	74.3	73.9
#2	0.366	79.9	80.0	80.6	80.2
#3	0.311	67.9	67.8	68.5	68.1
#4	0.311	67.9	67.8	68.5	68.1
#5	0.337	73.5	73.5	74.1	73.7
#6	0.316	68.9	68.9	69.6	69.1
20 min	Abs	#1	#2	#3	%D
#1	0.420	91.7	91.8	92.4	92.0
#2	0.432	94.3	94.4	95.0	94.5
#3	0.418	91.3	91.4	92.0	91.5
#4	0.425	92.8	92.9	93.5	93.0
#5	0.417	90.8	91.0	91.6	91.1
#6	0.422	92.1	92.2	92.8	92.4
30 min	Abs	#1	#2	#3	%D
#1	0.424	92.4	92.6	93.2	92.7
#2	0.429	93.5	93.6	94.2	93.8
#3	0.421	91.8	91.9	92.5	92.1
#4	0.429	93.5	93.6	94.2	93.8
#5	0.423	92.2	92.4	93.0	92.5
#6	0.425	92.7	92.8	93.4	92.9

Average	37.7
STDEV	5.30

Average	72.2
STDEV	4.74

Average	92.4
STDEV	1.23

Average	93.0
STDEV	0.69

Table 32B Dissolution of Prednisone in PVC at 30°C, Day 19

5 min	Abs	#1	#2	#3	%D
#1	0.128	28.1	27.8	28.5	28.1
#2	0.166	36.3	36.1	36.8	36.4
#3	0.185	40.5	40.3	41.0	40.6
#4	0.150	32.9	32.6	33.3	32.9
#5	0.156	34.2	33.9	34.6	34.2
#6	0.136	29.8	29.6	30.3	29.9
10 min	Abs	#1	#2	#3	%D
#1	0.266	58.2	58.1	58.7	58.3
#2	0.308	67.2	67.2	67.8	67.4
#3	0.309	67.4	67.4	68.0	67.6
#4	0.317	69.1	69.1	69.8	69.4
#5	0.316	68.9	68.9	69.6	69.1
#6	0.262	57.3	57.2	57.9	57.5
20 min	Abs	#1	#2	#3	%D
#1	0.384	83.8	83.9	84.5	84.1
#2	0.414	90.2	90.3	90.9	90.5
#3	0.409	89.1	89.2	89.9	89.4
#4	0.414	90.2	90.3	90.9	90.5
#5	0.408	88.9	89.0	89.6	89.2
#6	0.385	84.0	84.1	84.7	84.3
30 min	Abs	#1	#2	#3	%D
#1	0.411	89.7	89.8	90.4	90.0
#2	0.413	90.1	90.2	90.8	90.4
#3	0.414	90.3	90.5	91.1	90.6
#4	0.426	92.9	93.0	93.6	93.2
#5	0.420	91.6	91.7	92.3	91.9
#6	0.418	91.2	91.3	91.9	91.5

Average	33.7
STDEV	4.50

Average	64.9
STDEV	5.48

Average	88.0
STDEV	3.00

Average	91.3
STDEV	1.17

Table 33B Dissolution of Prednisone in PVC at 30°C, Day 25

5 min	Abs	#1	#2	#3	%D
#1	0.151	33.1	32.8	33.5	33.2
#2	0.201	44.0	43.8	44.5	44.1
#3	0.149	32.6	32.4	33.1	32.7
#4	0.176	38.5	38.3	39.0	38.6
#5	0.176	38.5	38.3	39.0	38.6
#6	0.142	31.1	30.9	31.6	31.2
10 min	Abs	#1	#2	#3	%D
#1	0.258	56.4	56.3	57.0	56.6
#2	0.346	75.4	75.4	76.1	75.6
#3	0.308	67.2	67.2	67.8	67.4
#4	0.322	70.2	70.2	70.9	70.4
#5	0.325	70.9	70.9	71.5	71.1
#6	0.262	57.3	57.2	57.9	57.5
20 min	Abs	#1	#2	#3	%D
#1	0.377	82.3	82.4	83.0	82.6
#2	0.422	92.1	92.2	92.8	92.4
#3	0.413	90.0	90.1	90.7	90.3
#4	0.407	88.7	88.8	89.4	89.0
#5	0.407	88.7	88.8	89.4	89.0
#6	0.368	80.2	80.2	80.9	80.4
30 min	Abs	#1	#2	#3	%D
#1	0.380	83.0	83.0	83.6	83.2
#2	0.422	92.0	92.2	92.8	92.3
#3	0.412	89.9	90.0	90.6	90.2
#4	0.405	88.4	88.5	89.2	88.7
#5	0.407	88.9	89.0	89.6	89.1
#6	0.404	88.0	88.1	88.7	88.3

Average	36.4
STDEV	4.90

Average	66.4
STDEV	7.75

Average	87.3
STDEV	4.70

Average	88.6
STDEV	3.03

Table 34B Dissolution of Prednisone in PVC at 30°C, Day 31

5 min	Abs	#1	#2	#3	%D
#1	0.140	30.7	30.4	31.1	30.7
#2	0.164	35.9	35.7	36.4	36.0
#3	0.130	28.5	28.2	29.0	28.6
#4	0.186	40.7	40.5	41.2	40.8
#5	0.158	34.6	34.4	35.1	34.7
#6	0.192	42.0	41.8	42.5	42.1
10 min	Abs	#1	#2	#3	%D
#1	0.280	61.2	61.1	61.8	61.4
#2	0.287	62.7	62.6	63.3	62.9
#3	0.251	54.9	54.8	55.5	55.1
#4	0.307	67.0	67.0	67.6	67.2
#5	0.288	62.9	62.8	63.5	63.1
#6	0.331	72.2	72.2	72.8	72.4
20 min	Abs	#1	#2	#3	%D
#1	0.395	86.1	86.2	86.9	86.4
#2	0.409	89.1	89.2	89.9	89.4
#3	0.357	77.8	77.9	78.5	78.1
#4	0.407	88.7	88.8	89.4	89.0
#5	0.401	87.4	87.5	88.1	87.7
#6	0.404	88.1	88.2	88.8	88.3
30 min	Abs	#1	#2	#3	%D
#1	0.411	89.7	89.8	90.4	90.0
#2	0.421	91.8	91.9	92.5	92.1
#3	0.425	92.7	92.8	93.4	92.9
#4	0.413	90.1	90.2	90.8	90.4
#5	0.427	93.1	93.2	93.8	93.4
#6	0.418	91.2	91.3	91.9	91.5
Average 35.5					
STDEV 5.35					
Average 63.7					
STDEV 5.80					
Average 86.5					
STDEV 4.26					
Average 91.7					
STDEV 1.36					

Table 35B Dissolution of Prednisone in PVC at 30°C, Day 37

5 min	Abs	#1	#2	#3	%D
#1	0.118	25.9	25.6	26.3	25.9
#2	0.153	33.5	33.3	34.0	33.6
#3	0.139	30.5	30.2	30.9	30.5
#4	0.190	41.6	41.4	42.1	41.7
#5	0.128	28.1	27.8	28.5	28.1
#6	0.200	43.7	43.6	44.3	43.9
10 min	Abs	#1	#2	#3	%D
#1	0.247	53.9	53.7	54.4	54.0
#2	0.287	62.7	62.6	63.3	62.9
#3	0.263	57.5	57.4	58.1	57.7
#4	0.309	67.4	67.4	68.0	67.6
#5	0.247	53.9	53.7	54.4	54.0
#6	0.343	74.7	74.8	75.4	75.0
20 min	Abs	#1	#2	#3	%D
#1	0.396	86.4	86.5	87.1	86.6
#2	0.406	88.5	88.6	89.2	88.8
#3	0.365	79.5	79.6	80.2	79.8
#4	0.410	89.3	89.5	90.1	89.6
#5	0.374	81.7	81.7	82.4	81.9
#6	0.420	91.7	91.8	92.4	92.0
30 min	Abs	#1	#2	#3	%D
#1	0.418	91.2	91.3	91.9	91.5
#2	0.414	90.3	90.5	91.1	90.6
#3	0.378	82.5	82.6	83.2	82.8
#4	0.413	90.1	90.2	90.8	90.4
#5	0.396	86.3	86.4	87.0	86.6
#6	0.420	91.6	91.7	92.3	91.9
Average 34.0					
STDEV 7.31					
Average 61.9					
STDEV 8.33					
Average 86.4					
STDEV 4.71					
Average 89.0					
STDEV 3.56					

Table 36B Dissolution of Prednisone in PVC at 30°C, Day 43

5 min	Abs	#1	#2	#3	%D	
#1	0.126	27.6	27.4	28.1	27.7	
#2	0.161	35.2	35.0	35.7	35.3	
#3	0.101	22.2	21.9	22.6	22.2	Average 29.7
#4	0.163	35.7	35.5	36.2	35.8	STDEV 6.67
#5	0.099	21.8	21.5	22.2	21.8	
#6	0.161	35.2	35.0	35.7	35.3	
10 min	Abs	#1	#2	#3	%D	
#1	0.258	56.4	56.3	57.0	56.6	
#2	0.292	63.8	63.7	64.4	63.9	
#3	0.248	54.1	54.0	54.6	54.2	Average 58.5
#4	0.293	64.0	63.9	64.6	64.2	STDEV 6.30
#5	0.223	48.7	48.5	49.2	48.8	
#6	0.288	62.9	62.8	63.5	63.1	
20 min	Abs	#1	#2	#3	%D	
#1	0.355	77.4	77.4	78.1	77.6	
#2	0.394	85.9	86.0	86.6	86.2	
#3	0.358	78.0	78.1	78.7	78.3	Average 81.5
#4	0.380	83.0	83.0	83.6	83.2	STDEV 5.81
#5	0.338	73.8	73.8	74.4	74.0	
#6	0.409	89.1	89.2	89.9	89.4	
30 min	Abs	#1	#2	#3	%D	
#1	0.384	83.8	83.9	84.5	84.1	
#2	0.400	87.2	87.3	87.9	87.4	
#3	0.396	86.3	86.4	87.0	86.6	Average 87.7
#4	0.420	91.6	91.7	92.3	91.9	STDEV 3.85
#5	0.382	83.4	83.4	84.1	83.6	
#6	0.424	92.4	92.6	93.2	92.7	

Table 37B Dissolution of Prednisone in PVC at 30°C, Day 49

5 min	Abs	#1	#2	#3	%D	
#1	0.082	18.1	17.7	18.5	18.1	
#2	0.148	32.4	32.2	32.9	32.5	
#3	0.135	29.6	29.3	30.0	29.7	Average 30.3
#4	0.183	40.0	39.8	40.5	40.1	STDEV 7.09
#5	0.140	30.7	30.4	31.1	30.7	
#6	0.140	30.7	30.4	31.1	30.7	
10 min	Abs	#1	#2	#3	%D	
#1	0.197	43.1	42.9	43.6	43.2	
#2	0.297	64.8	64.8	65.5	65.0	
#3	0.268	58.6	58.5	59.2	58.8	Average 59.6
#4	0.308	67.2	67.2	67.8	67.4	STDEV 8.97
#5	0.261	57.1	57.0	57.7	57.2	
#6	0.300	65.5	65.4	66.1	65.7	
20 min	Abs	#1	#2	#3	%D	
#1	0.329	71.9	71.9	72.5	72.1	
#2	0.400	87.2	87.3	87.9	87.5	
#3	0.376	82.1	82.2	82.8	82.3	Average 86.0
#4	0.418	91.3	91.4	92.0	91.5	STDEV 7.69
#5	0.422	92.1	92.2	92.8	92.4	
#6	0.411	89.6	89.7	90.3	89.8	
30 min	Abs	#1	#2	#3	%D	
#1	0.365	79.6	79.6	80.2	79.8	
#2	0.425	92.7	92.8	93.4	92.9	
#3	0.400	87.2	87.3	87.9	87.4	Average 89.3
#4	0.417	91.0	91.1	91.7	91.3	STDEV 5.12
#5	0.427	93.1	93.2	93.8	93.4	
#6	0.417	91.0	91.1	91.7	91.3	

Table 368B Dissolution of Prednisone in PVC at 40°C, Day 6

5 min							
Abs	#1	#2	#3	%D			
#1	0.139	30.5	30.2	30.9	30.5	Average	38.5
#2	0.212	46.3	46.2	46.9	46.5		
#3	0.164	35.9	35.7	36.4	36.0		
#4	0.162	35.5	35.2	35.9	35.6		
#5	0.192	42.0	41.8	42.5	42.1		
#6	0.184	40.3	40.1	40.8	40.4		
10 min							
Abs	#1	#2	#3	%D			
#1	0.281	61.4	61.3	62.0	61.6	Average	71.9
#2	0.390	85.1	85.2	85.8	85.3		
#3	0.348	76.0	76.1	76.7	76.3		
#4	0.315	68.7	68.7	69.3	68.9		
#5	0.317	69.1	69.1	69.8	69.4		
#6	0.320	69.8	69.8	70.4	70.0		
20 min							
Abs	#1	#2	#3	%D			
#1	0.392	85.5	85.6	86.2	85.8	Average	90.3
#2	0.422	92.1	92.2	92.8	92.4		
#3	0.440	96.0	96.1	96.7	96.3		
#4	0.393	85.7	85.8	86.4	86.0		
#5	0.408	88.9	89.0	89.6	89.2		
#6	0.421	91.9	92.0	92.6	92.2		
30 min							
Abs	#1	#2	#3	%D			
#1	0.420	91.6	91.7	92.3	91.9	Average	91.2
#2	0.419	91.4	91.5	92.1	91.7		
#3	0.421	91.8	91.9	92.5	92.1		
#4	0.401	87.4	87.5	88.1	87.7		
#5	0.419	91.4	91.5	92.1	91.7		
#6	0.421	91.8	91.9	92.5	92.1		
						STDEV	1.74

Table 398B Dissolution of Prednisone in PVC at 40°C, Day 12

5 min	Abs	#1	#2	#3	%D		
#1	0.159	34.8	34.6	35.3	34.9	Average	42.8
#2	0.210	45.9	45.8	46.4	46.0		
#3	0.146	32.0	31.7	32.5	32.1		
#4	0.160	35.0	34.8	35.5	35.1		
#5	0.350	76.4	76.4	77.0	76.6		
#6	0.146	32.0	31.7	32.5	32.1		
10 min	Abs	#1	#2	#3	%D		
#1	0.321	70.0	70.0	70.6	70.2	Average	67.8
#2	0.356	77.8	77.8	78.4	78.0		
#3	0.290	63.3	63.3	63.9	63.5		
#4	0.339	73.9	73.9	74.5	74.1		
#5	0.274	59.9	59.8	60.5	60.1		
#6	0.278	60.7	60.7	61.3	60.9		
20 min	Abs	#1	#2	#3	%D		
#1	0.412	89.8	89.9	90.5	90.1	Average	89.1
#2	0.424	92.5	92.7	93.3	92.8		
#3	0.403	87.9	88.0	88.6	88.1		
#4	0.419	91.5	91.6	92.2	91.8		
#5	0.392	85.5	85.6	86.2	85.8		
#6	0.392	85.5	85.6	86.2	85.8		
30 min	Abs	#1	#2	#3	%D		
#1	0.421	91.8	91.9	92.5	92.1	Average	91.7
#2	0.419	91.4	91.5	92.1	91.7		
#3	0.423	92.2	92.4	93.0	92.5		
#4	0.416	90.8	90.9	91.5	91.0		
#5	0.421	91.8	91.9	92.5	92.1		
#6	0.416	90.8	90.9	91.5	91.0		
						STDEV	

Table 40B Dissolution of Prednisone in PVC at 40°C, Day 18

5 min	Abs	#1	#2	#3	%D
#1	0.146	32.0	31.7	32.5	32.1
#2	0.158	34.6	34.4	35.1	34.7
#3	0.117	25.7	25.4	26.1	25.7
#4	0.164	35.9	35.7	36.4	36.0
#5	0.134	29.4	29.1	29.8	29.4
#6	0.110	24.2	23.9	24.6	24.2
10 min	Abs	#1	#2	#3	%D
#1	0.303	66.1	66.1	66.7	66.3
#2	0.339	73.9	73.9	74.5	74.1
#3	0.286	62.5	62.4	63.1	62.7
#4	0.329	71.7	71.7	72.4	71.9
#5	0.297	64.8	64.8	65.5	65.0
#6	0.258	56.4	56.3	57.0	56.6
20 min	Abs	#1	#2	#3	%D
#1	0.412	89.8	89.9	90.5	90.1
#2	0.431	94.0	94.2	94.8	94.3
#3	0.409	89.1	89.2	89.9	89.4
#4	0.421	91.9	92.0	92.6	92.2
#5	0.407	88.7	88.8	89.4	89.0
#6	0.363	79.1	79.2	79.8	79.4
30 min	Abs	#1	#2	#3	%D
#1	0.421	91.8	91.9	92.5	92.1
#2	0.426	92.9	93.0	93.6	93.2
#3	0.422	92.0	92.2	92.8	92.3
#4	0.426	92.9	93.0	93.6	93.2
#5	0.425	92.7	92.8	93.4	92.9
#6	0.392	85.5	85.6	86.2	85.7

Average	30.3
STDEV	4.76

Average	66.1
STDEV	6.35

Average	89.1
STDEV	5.16

Average	91.6
STDEV	2.89

Table 41B Dissolution of Prednisone in PVC at 40°C, Day 24

5 min	Abs	#1	#2	#3	%D
#1	0.115	25.2	25.0	25.7	25.3
#2	0.140	30.7	30.4	31.1	30.7
#3	0.140	30.7	30.4	31.1	30.7
#4	0.155	33.9	33.7	34.4	34.0
#5	0.130	28.5	28.2	29.0	28.6
#6	0.146	32.0	31.7	32.5	32.1
10 min	Abs	#1	#2	#3	%D
#1	0.264	57.7	57.6	58.3	57.9
#2	0.298	65.1	65.0	65.7	65.2
#3	0.351	76.7	76.7	77.3	76.9
#4	0.260	56.9	56.8	57.4	57.0
#5	0.249	54.5	54.4	55.1	54.7
#6	0.280	61.2	61.1	61.8	61.4
20 min	Abs	#1	#2	#3	%D
#1	0.398	86.8	86.9	87.5	87.1
#2	0.397	86.6	86.7	87.3	86.8
#3	0.349	76.1	76.2	76.8	76.4
#4	0.361	78.7	78.7	79.4	78.9
#5	0.390	85.1	85.2	85.8	85.3
#6	0.414	90.2	90.3	90.9	90.5
30 min	Abs	#1	#2	#3	%D
#1	0.425	92.7	92.8	93.4	92.9
#2	0.402	87.6	87.7	88.3	87.9
#3	0.397	86.5	86.6	87.2	86.8
#4	0.418	91.2	91.3	91.9	91.5
#5	0.404	88.0	88.1	88.7	88.3
#6	0.415	90.5	90.7	91.3	90.8

Average	30.2
STDEV	3.01

Average	62.2
STDEV	8.11

Average	84.2
STDEV	5.39

Average	89.7
STDEV	2.39

Table 42B Dissolution of Prednisone in PVC at 40°C, Day 30

5 min	Abs	#1	#2	#3	%D
#1	0.109	23.9	23.6	24.4	24.0
#2	0.164	35.9	35.7	36.4	36.0
#3	0.087	19.1	18.8	19.6	19.2
#4	0.167	36.6	36.3	37.0	36.6
#5	0.149	32.6	32.4	33.1	32.7
#6	0.166	36.3	36.1	36.8	36.4
10 min	Abs	#1	#2	#3	%D
#1	0.248	54.3	54.2	54.8	54.4
#2	0.294	64.2	64.1	64.8	64.4
#3	0.194	42.4	42.3	43.0	42.5
#4	0.283	61.8	61.8	62.4	62.0
#5	0.280	61.2	61.1	61.8	61.4
#6	0.301	65.7	65.7	66.3	65.9
20 min	Abs	#1	#2	#3	%D
#1	0.365	79.5	79.6	80.2	79.8
#2	0.402	87.6	87.7	88.4	87.9
#3	0.354	77.2	77.2	77.9	77.4
#4	0.390	85.1	85.2	85.8	85.3
#5	0.381	83.2	83.2	83.9	83.4
#6	0.399	87.0	87.1	87.7	87.3
30 min	Abs	#1	#2	#3	%D
#1	0.408	89.1	89.2	89.8	89.3
#2	0.422	92.0	92.2	92.8	92.3
#3	0.388	84.6	84.7	85.3	84.9
#4	0.392	85.5	85.6	86.2	85.7
#5	0.414	90.3	90.5	91.1	90.6
#6	0.418	91.2	91.3	91.9	91.5

Average	30.8
STDEV	7.46

Average	58.4
STDEV	8.72

Average	83.5
STDEV	4.19

Average	89.1
STDEV	3.07

Table 43B Dissolution of Prednisone in PVC at 40°C, Day 36

5 min	Abs	#1	#2	#3	%D
#1	0.120	26.3	26.1	26.8	26.4
#2	0.130	28.5	28.2	29.0	28.6
#3	0.145	31.8	31.5	32.2	31.8
#4	0.152	33.3	33.1	33.8	33.4
#5	0.132	28.9	28.7	29.4	29.0
#6	0.165	36.1	35.9	36.6	36.2
10 min	Abs	#1	#2	#3	%D
#1	0.225	49.1	49.0	49.7	49.2
#2	0.250	54.7	54.6	55.3	54.9
#3	0.272	59.5	59.4	60.0	59.6
#4	0.272	59.5	59.4	60.0	59.6
#5	0.263	57.5	57.4	58.1	57.7
#6	0.309	67.4	67.4	68.0	67.6
20 min	Abs	#1	#2	#3	%D
#1	0.362	78.9	78.9	79.6	79.1
#2	0.361	78.7	78.7	79.4	78.9
#3	0.382	83.4	83.5	84.1	83.6
#4	0.368	80.4	80.4	81.1	80.6
#5	0.383	83.6	83.7	84.3	83.8
#6	0.412	89.8	89.9	90.5	90.1
30 min	Abs	#1	#2	#3	%D
#1	0.391	85.3	85.4	86.0	85.5
#2	0.396	86.3	86.4	87.0	86.6
#3	0.402	87.6	87.7	88.3	87.9
#4	0.379	82.7	82.8	83.4	83.0
#5	0.398	86.7	86.8	87.5	87.0
#6	0.407	88.9	89.0	89.6	89.1

Average	30.9
STDEV	3.59

Average	58.1
STDEV	6.07

Average	82.7
STDEV	4.18

Average	86.5
STDEV	2.11

Table 44B Dissolution of Prednisone in PVC at 40°C, Day 42

5 min	Abs	#1	#2	#3	%D
#1	0.132	28.9	28.7	29.4	29.0
#2	0.150	32.9	32.6	33.3	32.9
#3	0.099	21.8	21.5	22.2	21.8
#4	0.138	30.2	30.0	30.7	30.3
#5	0.136	29.8	29.6	30.3	29.9
#6	0.140	30.7	30.4	31.1	30.7
10 min	Abs	#1	#2	#3	%D
#1	0.237	51.7	51.6	52.3	51.8
#2	0.281	61.4	61.3	62.0	61.6
#3	0.205	44.8	44.6	45.3	44.9
#4	0.256	56.0	55.9	56.6	56.2
#5	0.268	58.6	58.5	59.2	58.8
#6	0.273	59.7	59.6	60.3	59.8
20 min	Abs	#1	#2	#3	%D
#1	0.316	68.9	68.9	69.5	69.1
#2	0.388	84.7	84.7	85.4	84.9
#3	0.310	67.6	67.6	68.2	67.8
#4	0.357	77.8	77.9	78.5	78.1
#5	0.368	80.4	80.4	81.1	80.6
#6	0.377	82.3	82.4	83.0	82.6
30 min	Abs	#1	#2	#3	%D
#1	0.350	76.4	76.4	77.1	76.6
#2	0.410	89.5	89.6	90.2	89.8
#3	0.328	71.6	71.6	72.2	71.8
#4	0.374	81.7	81.7	82.4	81.9
#5	0.389	84.8	84.9	85.5	85.1
#6	0.411	89.7	89.8	90.4	90.0

Average	29.1
STDEV	3.82

Average	55.5
STDEV	6.20

Average	77.2
STDEV	7.14

Average	82.5
STDEV	7.29

Table 45B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 10

5 min	Abs	#1	#2	#3	%D
#1	0.162	35.5	35.2	35.9	35.6
#2	0.219	47.9	47.7	48.4	48.0
#3	0.122	26.8	26.5	27.2	26.8
#4	0.220	48.1	47.9	48.6	48.2
#5	0.166	36.3	36.1	36.8	36.4
#6	0.236	51.6	51.4	52.1	51.7
10 min	Abs	#1	#2	#3	%D
#1	0.325	70.9	70.9	71.5	71.1
#2	0.374	81.6	81.7	82.3	81.9
#3	0.264	57.7	57.6	58.3	57.9
#4	0.400	87.2	87.3	88.0	87.5
#5	0.320	69.8	69.8	70.4	70.0
#6	0.404	88.1	88.2	88.8	88.4
20 min	Abs	#1	#2	#3	%D
#1	0.415	90.4	90.5	91.1	90.7
#2	0.438	95.5	95.7	96.3	95.8
#3	0.373	81.5	81.5	82.1	81.7
#4	0.435	94.9	95.0	95.6	95.2
#5	0.435	94.9	95.0	95.6	95.2
#6	0.433	94.5	94.6	95.2	94.8
30 min	Abs	#1	#2	#3	%D
#1	0.422	92.0	92.2	92.8	92.3
#2	0.429	93.5	93.6	94.2	93.8
#3	0.404	88.2	88.3	88.9	88.5
#4	0.431	93.9	94.1	94.7	94.2
#5	0.412	89.9	90.0	90.6	90.2
#6	0.427	93.1	93.2	93.8	93.4
Average 92.1					
STDEV 2.26					

Table 46B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 20

5 min	Abs	#1	#2	#3	%D
#1	0.124	27.2	26.9	27.6	27.3
#2	0.154	33.7	33.5	34.2	33.8
#3	0.181	39.6	39.4	40.1	39.7
#4	0.225	49.2	49.0	49.7	49.3
#5	0.176	38.5	38.3	39.0	38.6
#6	0.196	42.9	42.7	43.4	43.0
10 min	Abs	#1	#2	#3	%D
#1	0.267	58.4	58.3	59.0	58.5
#2	0.288	62.9	62.8	63.5	63.1
#3	0.337	73.5	73.5	74.1	73.7
#4	0.366	79.9	80.0	80.6	80.2
#5	0.315	68.7	68.7	69.3	68.9
#6	0.358	78.2	78.2	78.9	78.4
20 min	Abs	#1	#2	#3	%D
#1	0.371	81.0	81.1	81.7	81.3
#2	0.381	83.2	83.2	83.9	83.4
#3	0.409	89.1	89.2	89.9	89.4
#4	0.407	88.7	88.8	89.4	89.0
#5	0.411	89.6	89.7	90.3	89.8
#6	0.423	92.3	92.5	93.1	92.6
30 min	Abs	#1	#2	#3	%D
#1	0.404	88.2	88.3	88.9	88.5
#2	0.413	90.1	90.2	90.8	90.4
#3	0.409	89.3	89.4	90.0	89.6
#4	0.423	92.2	92.4	93.0	92.5
#5	0.436	95.0	95.1	95.7	95.3
#6	0.426	92.9	93.1	93.6	93.2
Average 91.6					
STDEV 2.53					

Table 47B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 30

5 min	Abs	#1	#2	#3	%D
#1	0.152	33.3	33.1	33.8	33.4
#2	0.229	50.0	49.9	50.6	50.2
#3	0.163	35.7	35.5	36.2	35.8
#4	0.214	46.8	46.6	47.3	46.9
#5	0.156	34.2	33.9	34.6	34.2
#6	0.168	36.8	36.6	37.3	36.9
10 min	Abs	#1	#2	#3	%D
#1	0.269	58.8	58.7	59.4	59.0
#2	0.364	79.5	79.5	80.2	79.7
#3	0.297	64.8	64.8	65.5	65.0
#4	0.366	79.9	80.0	80.6	80.2
#5	0.292	63.8	63.7	64.4	63.9
#6	0.309	67.4	67.4	68.0	67.6
20 min	Abs	#1	#2	#3	%D
#1	0.390	85.1	85.2	85.8	85.3
#2	0.429	93.6	93.7	94.3	93.9
#3	0.398	86.8	86.9	87.5	87.1
#4	0.429	93.6	93.7	94.3	93.9
#5	0.407	88.7	88.8	89.4	89.0
#6	0.409	89.1	89.2	89.9	89.4
30 min	Abs	#1	#2	#3	%D
#1	0.404	88.2	88.3	88.9	88.5
#2	0.427	93.1	93.2	93.8	93.4
#3	0.404	88.2	88.3	88.9	88.5
#4	0.424	92.4	92.6	93.2	92.7
#5	0.430	93.7	93.9	94.5	94.0
#6	0.407	88.9	89.0	89.6	89.1

Average	39.6
STDEV	7.14

Average	69.2
STDEV	8.75

Average	89.8
STDEV	3.52

Average	91.0
STDEV	2.59

Table 48B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 40

5 min	Abs	#1	#2	#3	%D
#1	0.137	30.0	29.8	30.5	30.1
#2	0.154	33.7	33.5	34.2	33.8
#3	0.174	38.1	37.9	38.6	38.2
#4	0.240	52.4	52.3	53.0	52.6
#5	0.185	40.5	40.3	41.0	40.6
#6	0.156	34.2	33.9	34.6	34.2
10 min	Abs	#1	#2	#3	%D
#1	0.259	56.7	56.6	57.2	56.8
#2	0.284	62.0	62.0	62.6	62.2
#3	0.300	65.5	65.4	66.1	65.7
#4	0.369	80.6	80.6	81.2	80.8
#5	0.331	72.2	72.2	72.8	72.4
#6	0.304	66.3	66.3	67.0	66.5
20 min	Abs	#1	#2	#3	%D
#1	0.404	88.1	88.2	88.8	88.3
#2	0.401	87.4	87.5	88.1	87.7
#3	0.408	88.9	89.0	89.6	89.2
#4	0.432	94.3	94.4	95.0	94.5
#5	0.428	93.4	93.5	94.1	93.7
#6	0.415	90.4	90.5	91.1	90.7
30 min	Abs	#1	#2	#3	%D
#1	0.427	93.1	93.2	93.8	93.4
#2	0.421	91.8	91.9	92.5	92.1
#3	0.411	89.7	89.8	90.4	90.0
#4	0.433	94.3	94.5	95.1	94.6
#5	0.428	93.3	93.4	94.0	93.6
#6	0.415	90.5	90.7	91.3	90.8

Average	38.2
STDEV	7.91

Average	67.4
STDEV	8.33

Average	90.7
STDEV	2.85

Average	92.4
STDEV	1.78

Table 49B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 50

5 min	Abs	#1	#2	#3	%D
#1	0.160	35.0	34.8	35.5	35.1
#2	0.175	38.3	38.1	38.8	38.4
#3	0.175	38.3	38.1	38.8	38.4
#4	0.152	33.3	33.1	33.8	33.4
#5	0.147	32.2	32.0	32.7	32.3
#6	0.136	29.8	29.6	30.3	29.9
10 min	Abs	#1	#2	#3	%D
#1	0.311	67.9	67.8	68.5	68.1
#2	0.314	68.5	68.5	69.1	68.7
#3	0.310	67.6	67.6	68.3	67.8
#4	0.276	60.3	60.2	60.9	60.5
#5	0.285	62.3	62.2	62.9	62.4
#6	0.270	59.0	58.9	59.6	59.2
20 min	Abs	#1	#2	#3	%D
#1	0.409	89.1	89.2	89.9	89.4
#2	0.386	84.2	84.3	84.9	84.5
#3	0.416	90.6	90.7	91.4	90.9
#4	0.356	77.6	77.7	78.3	77.9
#5	0.407	88.7	88.8	89.4	89.0
#6	0.395	86.1	86.2	86.9	86.4
30 min	Abs	#1	#2	#3	%D
#1	0.429	93.5	93.6	94.2	93.8
#2	0.437	95.4	95.5	96.1	95.7
#3	0.430	93.7	93.9	94.5	94.0
#4	0.417	91.0	91.1	91.7	91.3
#5	0.427	93.1	93.2	93.8	93.4
#6	0.413	90.1	90.2	90.8	90.4

Average	34.6
STDEV	3.41

Average	64.5
STDEV	4.24

Average	86.3
STDEV	4.75

Average	93.1
STDEV	1.94

Table 50B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 60

5 min	Abs	#1	#2	#3	%D
#1	0.131	28.7	28.5	29.2	28.8
#2	0.155	33.9	33.7	34.4	34.0
#3	0.125	27.4	27.1	27.9	27.5
#4	0.238	52.0	51.9	52.6	52.1
#5	0.177	38.7	38.5	39.2	38.8
#6	0.155	33.9	33.7	34.4	34.0
10 min	Abs	#1	#2	#3	%D
#1	0.261	57.1	57.0	57.7	57.2
#2	0.284	62.0	62.0	62.6	62.2
#3	0.288	62.9	62.8	63.5	63.1
#4	0.377	82.3	82.4	83.0	82.5
#5	0.318	69.4	69.3	70.0	69.6
#6	0.297	64.8	64.8	65.5	65.0
20 min	Abs	#1	#2	#3	%D
#1	0.378	82.5	82.6	83.2	82.8
#2	0.413	90.0	90.1	90.7	90.3
#3	0.406	88.5	88.6	89.2	88.8
#4	0.433	94.5	94.6	95.2	94.8
#5	0.401	87.4	87.5	88.1	87.7
#6	0.400	87.2	87.3	87.9	87.5
30 min	Abs	#1	#2	#3	%D
#1	0.397	86.5	86.6	87.2	86.8
#2	0.419	91.4	91.5	92.1	91.7
#3	0.410	89.5	89.6	90.2	89.8
#4	0.435	94.8	94.9	95.5	95.1
#5	0.416	90.8	90.9	91.5	91.0
#6	0.418	91.2	91.3	91.9	91.5

Average	35.9
STDEV	8.96

Average	66.6
STDEV	8.77

Average	88.6
STDEV	3.92

Average	91.0
STDEV	2.69

Table 51B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 65

5 min	Abs	#1	#2	#3	%D
#1	0.142	31.1	30.9	31.6	31.2
#2	0.195	42.6	42.5	43.2	42.8
#3	0.157	34.4	34.2	34.9	34.5
#4	0.168	36.8	36.6	37.3	36.9
#5	0.148	32.4	32.2	32.9	32.5
#6	0.175	38.3	38.1	38.8	38.4
10 min	Abs	#1	#2	#3	%D
#1	0.240	52.3	52.2	52.9	52.5
#2	0.337	73.5	73.5	74.1	73.7
#3	0.274	59.9	59.8	60.5	60.1
#4	0.296	64.6	64.6	65.2	64.8
#5	0.298	65.1	65.0	65.7	65.2
#6	0.327	71.3	71.3	71.9	71.5
20 min	Abs	#1	#2	#3	%D
#1	0.341	74.4	74.4	75.1	74.6
#2	0.402	87.6	87.7	88.4	87.9
#3	0.382	83.4	83.5	84.1	83.6
#4	0.421	91.9	92.0	92.6	92.2
#5	0.402	87.6	87.7	88.4	87.9
#6	0.422	92.1	92.2	92.8	92.4
30 min	Abs	#1	#2	#3	%D
#1	0.366	79.8	79.8	80.5	80.0
#2	0.406	88.6	88.8	89.4	88.9
#3	0.402	87.6	87.7	88.3	87.9
#4	0.425	92.7	92.8	93.4	92.9
#5	0.427	93.1	93.2	93.8	93.4
#6	0.433	94.3	94.5	95.1	94.6

Average	36.0
STDEV	4.24

Average	64.6
STDEV	7.72

Average	86.4
STDEV	6.63

Average	89.6
STDEV	5.40

Table 52B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 71

5 min	Abs	#1	#2	#3	%D
#1	0.142	31.1	30.9	31.6	31.2
#2	0.143	31.3	31.1	31.8	31.4
#3	0.155	33.9	33.7	34.4	34.0
#4	0.149	32.6	32.4	33.1	32.7
#5	0.139	30.5	30.2	30.9	30.5
#6	0.171	37.4	37.2	37.9	37.5
10 min	Abs	#1	#2	#3	%D
#1	0.252	55.1	55.0	55.7	55.3
#2	0.244	53.2	53.1	53.8	53.4
#3	0.268	58.6	58.5	59.2	58.8
#4	0.316	68.9	68.9	69.6	69.1
#5	0.262	57.3	57.2	57.9	57.5
#6	0.308	67.2	67.2	67.8	67.4
20 min	Abs	#1	#2	#3	%D
#1	0.369	80.6	80.7	81.3	80.9
#2	0.379	82.7	82.8	83.4	83.0
#3	0.374	81.7	81.7	82.4	81.9
#4	0.385	84.0	84.1	84.7	84.3
#5	0.381	83.2	83.2	83.9	83.4
#6	0.403	87.9	88.0	88.6	88.1
30 min	Abs	#1	#2	#3	%D
#1	0.395	86.1	86.2	86.8	86.4
#2	0.403	87.8	87.9	88.5	88.1
#3	0.402	87.6	87.7	88.3	87.9
#4	0.401	87.4	87.5	88.1	87.7
#5	0.407	88.9	89.0	89.6	89.1
#6	0.422	92.0	92.2	92.8	92.3

Average	32.9
STDEV	2.58

Average	60.2
STDEV	6.51

Average	83.6
STDEV	2.52

Average	88.6
STDEV	2.03

Table 53B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 77

5 min	Abs	#1	#2	#3	%D	
	#1	0.138	30.2	30.0	30.7	30.3
	#2	0.161	35.2	35.0	35.7	35.3
	#3	0.161	35.2	35.0	35.7	35.3
	#4	0.178	38.9	38.7	39.4	39.0
	#5	0.174	38.1	37.9	38.6	38.2
	#6	0.122	26.8	26.5	27.2	26.8
10 min	Abs	#1	#2	#3	%D	
	#1	0.247	53.9	53.7	54.4	54.0
	#2	0.273	59.7	59.6	60.3	59.8
	#3	0.295	64.4	64.4	65.0	64.6
	#4	0.303	66.1	66.1	66.7	66.3
	#5	0.297	64.8	64.8	65.5	65.0
	#6	0.246	53.6	53.5	54.2	53.8
20 min	Abs	#1	#2	#3	%D	
	#1	0.354	77.2	77.2	77.9	77.4
	#2	0.385	84.0	84.1	84.7	84.3
	#3	0.367	80.0	80.0	80.6	80.2
	#4	0.403	87.9	88.0	88.6	88.1
	#5	0.396	86.4	86.5	87.1	86.6
	#6	0.351	76.6	76.6	77.2	76.8
30 min	Abs	#1	#2	#3	%D	
	#1	0.390	85.1	85.1	85.8	85.3
	#2	0.398	86.7	86.8	87.5	87.0
	#3	0.379	82.7	82.8	83.4	83.0
	#4	0.420	91.6	91.7	92.3	91.9
	#5	0.407	88.9	89.0	89.6	89.1
	#6	0.388	84.6	84.7	85.3	84.9
Average					86.9	
STDEV					3.21	

Table 54B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 83

5 min	Abs	#1	#2	#3	%D	Average	
						33.6	3.69
#1	0.2	39.2	39.0	39.7	39.3		
#2	0.2	33.3	33.1	33.8	33.4		
#3	0.2	32.9	32.6	33.3	32.9		
#4	0.2	35.7	35.5	36.2	35.8		
#5	0.1	31.8	31.5	32.2	31.8		
#6	0.1	28.3	28.0	28.7	28.3		
10 min	Abs	#1	#2	#3	%D	Average	
#1	0.3	67.6	67.6	68.3	67.8		
#2	0.3	59.5	59.4	60.0	59.6		
#3	0.3	61.8	61.8	62.4	62.0		
#4	0.3	59.9	59.8	60.5	60.1		
#5	0.3	56.4	56.3	57.0	56.6		
#6	0.2	43.1	42.9	43.6	43.2		
20 min	Abs	#1	#2	#3	%D	Average	
#1	0.4	87.9	88.0	88.6	88.1		
#2	0.4	80.2	80.2	80.9	80.4		
#3	0.4	83.0	83.0	83.6	83.2		
#4	0.3	74.6	74.7	75.3	74.9		
#5	0.4	83.2	83.2	83.9	83.4		
#6	0.3	72.7	72.7	73.4	72.9		
30 min	Abs	#1	#2	#3	%D	Average	
#1	0.4	89.9	90.0	90.6	90.2		
#2	0.4	85.1	85.1	85.8	85.3		
#3	0.4	84.6	84.7	85.3	84.9		
#4	0.4	82.3	82.4	83.0	82.6		
#5	0.4	87.2	87.3	87.9	87.4		
#6	0.4	81.5	81.5	82.2	81.7		
Average						85.4	
SD						3.13	

Table 55B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 89

5 min	Abs	#1	#2	#3	%D		
#1	0.1	28.1	27.8	28.5	28.1		
#2	0.2	41.3	41.2	41.8	41.4		
#3	0.2	37.2	37.0	37.7	37.3	Average	36.6
#4	0.2	37.2	37.0	37.7	37.3	SD	6.88
#5	0.1	29.4	29.1	29.8	29.4		
#6	0.2	45.9	45.8	46.4	46.0		
10 min	Abs	#1	#2	#3	%D		
#1	0.2	53.6	53.5	54.2	53.8		
#2	0.3	72.2	72.2	72.8	72.4		
#3	0.3	65.9	65.9	66.5	66.1	Average	66.5
#4	0.3	66.8	66.7	67.4	67.0	SD	9.87
#5	0.3	58.2	58.1	58.7	58.3		
#6	0.4	81.2	81.3	81.9	81.5		
20 min	Abs	#1	#2	#3	%D		
#1	0.4	82.7	82.8	83.4	83.0		
#2	0.4	91.9	92.0	92.6	92.2		
#3	0.4	86.8	86.9	87.5	87.1	Average	88.2
#4	0.4	88.7	88.8	89.4	89.0	SD	3.73
#5	0.4	85.3	85.4	86.0	85.6		
#6	0.4	92.1	92.2	92.8	92.4		
30 min	Abs	#1	#2	#3	%D		
#1	0.4	84.8	84.9	85.5	85.1		
#2	0.4	91.2	91.3	91.9	91.5		
#3	0.4	87.8	87.9	88.5	88.1	Average	89.0
#4	0.4	88.6	88.8	89.4	88.9	SD	2.69
#5	0.4	87.4	87.5	88.1	87.7		
#6	0.4	92.2	92.4	93.0	92.5		

Table 56B Dissolution of Prednisone in PVC/Aclar at 25°C, Day 95

5 min	Abs	#1	#2	#3	%D		
#1	0.2	36.8	36.6	37.3	36.9		
#2	0.2	34.6	34.4	35.1	34.7		
#3	0.2	35.9	35.7	36.4	36.0	Average	33.0
#4	0.2	32.9	32.6	33.3	32.9	SD	3.5
#5	0.1	29.6	29.3	30.0	29.7		
#6	0.1	28.1	27.8	28.5	28.1		
10 min	Abs	#1	#2	#3	%D		
#1	0.3	66.1	66.1	66.7	66.3		
#2	0.3	62.9	62.8	63.5	63.1		
#3	0.3	66.3	66.3	67.0	66.5	Average	64.6
#4	0.4	78.0	78.0	78.6	78.2	SD	8.1
#5	0.3	55.4	55.3	55.9	55.5		
#6	0.3	57.5	57.4	58.1	57.7		
20 min	Abs	#1	#2	#3	%D		
#1	0.4	86.8	86.9	87.5	87.1		
#2	0.4	88.3	88.4	89.0	88.6		
#3	0.4	88.5	88.6	89.2	88.8	Average	84.1
#4	0.4	78.7	78.7	79.4	78.9	SD	4.5
#5	0.4	81.2	81.3	81.9	81.5		
#6	0.4	79.5	79.6	80.2	79.8		
30 min	Abs	#1	#2	#3	%D		
#1	0.4	91.6	91.7	92.3	91.9		
#2	0.4	89.3	89.4	90.0	89.6		
#3	0.4	89.5	89.6	90.2	89.8	Average	85.9
#4	0.4	79.4	79.4	80.0	79.6	SD	5.1
#5	0.4	82.7	82.8	83.4	83.0		
#6	0.4	81.5	81.5	82.2	81.7		

Table 57/B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 5

5 min	Abs	#1	#2	#3	%D	
#1	0.198	43.3	43.1	43.8	43.4	
#2	0.248	54.2	54.1	54.7	54.3	
#3	0.129	28.3	28.0	28.7	28.3	Average 44.2
#4	0.249	54.4	54.3	55.0	54.5	STDDEV 11.9
#5	0.143	31.3	31.1	31.8	31.4	
#6	0.242	52.9	52.8	53.4	53.0	
10 min	Abs	#1	#2	#3	%D	
#1	0.331	72.2	72.2	72.8	72.4	
#2	0.380	82.9	83.0	83.6	83.2	
#3	0.265	57.9	57.9	58.5	58.1	Average 75.7
#4	0.384	83.8	83.9	84.5	84.1	STDDEV 11.8
#5	0.308	67.2	67.2	67.8	67.4	
#6	0.408	89.0	89.1	89.7	89.2	
20 min	Abs	#1	#2	#3	%D	
#1	0.404	88.1	88.2	88.8	88.3	
#2	0.433	94.5	94.6	95.2	94.8	
#3	0.393	85.7	85.8	86.4	86.0	Average 90.7
#4	0.433	94.5	94.6	95.2	94.8	STDDEV 4.05
#5	0.397	86.6	86.7	87.3	86.8	
#6	0.426	93.0	93.1	93.7	93.3	
30 min	Abs	#1	#2	#3	%D	
#1	0.421	91.8	91.9	92.5	92.1	
#2	0.429	93.5	93.6	94.2	93.8	
#3	0.423	92.2	92.4	93.0	92.5	Average 92.6
#4	0.429	93.5	93.6	94.2	93.8	STDDEV 1.06
#5	0.416	90.8	90.9	91.5	91.0	
#6	0.422	92.0	92.2	92.8	92.3	

Table 58/B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 10

5 min	Abs	#1	#2	#3	%D	
#1	0.177	38.7	38.5	39.2	38.8	
#2	0.187	40.9	40.7	41.4	41.0	
#3	0.170	37.2	37.0	37.7	37.3	Average 39.0
#4	0.206	45.0	44.9	45.6	45.2	STDDEV 3.92
#5	0.152	33.3	33.1	33.8	33.4	
#6	0.175	38.3	38.1	38.8	38.4	
10 min	Abs	#1	#2	#3	%D	
#1	0.342	74.5	74.6	75.2	74.8	
#2	0.328	71.5	71.5	72.2	71.7	
#3	0.328	71.5	71.5	72.2	71.7	Average 70.6
#4	0.369	80.6	80.6	81.2	80.8	STDDEV 7.26
#5	0.277	60.5	60.5	61.1	60.7	
#6	0.293	64.0	63.9	64.6	64.2	
20 min	Abs	#1	#2	#3	%D	
#1	0.417	90.8	91.0	91.6	91.1	
#2	0.405	88.3	88.4	89.0	88.6	
#3	0.416	90.6	90.7	91.4	90.9	Average 89.1
#4	0.432	94.3	94.4	95.0	94.5	STDDEV 4.15
#5	0.377	82.3	82.4	83.0	82.6	
#6	0.396	86.4	86.5	87.1	86.6	
30 min	Abs	#1	#2	#3	%D	
#1	0.419	91.4	91.5	92.1	91.7	
#2	0.411	89.7	89.8	90.4	90.0	
#3	0.418	91.2	91.3	91.9	91.5	Average 91.6
#4	0.429	93.5	93.6	94.2	93.8	STDDEV 1.32
#5	0.421	91.8	91.9	92.5	92.1	
#6	0.414	90.3	90.5	91.1	90.6	

Table 59B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 15

5 min	Abs	#1	#2	#3	%D
#1	0.184	40.3	40.1	40.8	40.4
#2	0.220	48.1	47.9	48.6	48.2
#3	0.117	25.7	25.4	26.1	25.7
#4	0.172	37.6	37.4	38.1	37.7
#5	0.179	39.2	39.0	39.7	39.3
#6	0.166	36.3	36.1	36.8	36.4
10 min	Abs	#1	#2	#3	%D
#1	0.323	70.4	70.4	71.1	70.6
#2	0.365	79.7	79.8	80.4	79.9
#3	0.283	61.8	61.8	62.4	62.0
#4	0.360	78.6	78.7	79.3	78.9
#5	0.347	75.6	75.6	76.3	75.8
#6	0.349	76.3	76.3	76.9	76.5
20 min	Abs	#1	#2	#3	%D
#1	0.412	89.8	89.9	90.5	90.1
#2	0.423	92.3	92.5	93.1	92.6
#3	0.401	87.4	87.5	88.1	87.7
#4	0.426	93.0	93.1	93.7	93.3
#5	0.429	93.6	93.7	94.3	93.9
#6	0.441	96.2	96.3	96.9	96.5
30 min	Abs	#1	#2	#3	%D
#1	0.425	92.7	92.8	93.4	92.9
#2	0.426	92.9	93.0	93.6	93.2
#3	0.433	94.3	94.5	95.1	94.6
#4	0.438	95.6	95.8	96.4	95.9
#5	0.435	94.8	94.9	95.5	95.1
#6	0.439	95.8	96.0	96.6	96.1

Average	38.0
STDEV	7.28

Average	74.0
STDEV	6.69

Average	92.3
STDEV	3.07

Average	94.6
STDEV	1.35

Table 60B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 20

5 min	Abs	#1	#2	#3	%D
#1	0.164	35.9	35.7	36.4	36.0
#2	0.182	39.8	39.6	40.3	39.9
#3	0.106	23.3	23.0	23.7	23.3
#4	0.174	38.1	37.9	38.6	38.2
#5	0.210	45.9	45.8	46.4	46.0
#6	0.185	40.5	40.3	41.0	40.6
10 min	Abs	#1	#2	#3	%D
#1	0.307	67.0	67.0	67.6	67.2
#2	0.337	73.5	73.5	74.1	73.7
#3	0.231	50.4	50.3	51.0	50.5
#4	0.297	64.8	64.8	65.5	65.0
#5	0.345	75.2	75.2	75.8	75.4
#6	0.309	67.4	67.4	68.0	67.6
20 min	Abs	#1	#2	#3	%D
#1	0.407	88.7	88.8	89.4	89.0
#2	0.432	94.3	94.4	95.0	94.5
#3	0.364	79.3	79.4	80.0	79.6
#4	0.428	93.4	93.5	94.1	93.7
#5	0.438	95.5	95.7	96.3	95.8
#6	0.409	89.1	89.2	89.9	89.4
30 min	Abs	#1	#2	#3	%D
#1	0.430	93.7	93.9	94.5	94.0
#2	0.430	93.7	93.9	94.5	94.0
#3	0.412	89.9	90.0	90.6	90.2
#4	0.443	96.7	96.8	97.4	97.0
#5	0.440	96.0	96.2	96.8	96.3
#6	0.433	94.3	94.5	95.1	94.6

Average	37.3
STDEV	7.64

Average	66.6
STDEV	8.82

Average	90.3
STDEV	5.96

Average	94.4
STDEV	2.38

Table 63B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 37

5 min	Abs	#1	#2	#3	%D
#1	0.158	34.6	34.4	35.1	34.7
#2	0.157	34.4	34.2	34.9	34.5
#3	0.118	25.9	25.6	26.3	25.9
#4	0.180	39.4	39.2	39.9	39.5
#5	0.157	34.4	34.2	34.9	34.5
#6	0.182	39.8	39.6	40.3	39.9
10 min	Abs	#1	#2	#3	%D
#1	0.305	66.6	66.5	67.2	66.8
#2	0.277	60.5	60.5	61.1	60.7
#3	0.263	57.5	57.4	58.1	57.7
#4	0.323	70.4	70.4	71.1	70.6
#5	0.292	63.8	63.7	64.4	63.9
#6	0.330	71.9	72.0	72.6	72.2
20 min	Abs	#1	#2	#3	%D
#1	0.408	88.9	89.0	89.6	89.2
#2	0.381	83.2	83.2	83.9	83.4
#3	0.381	83.2	83.2	83.9	83.4
#4	0.409	89.1	89.2	89.9	89.4
#5	0.403	87.9	88.0	88.6	88.1
#6	0.414	90.2	90.3	90.9	90.5
30 min	Abs	#1	#2	#3	%D
#1	0.410	89.5	89.6	90.2	89.8
#2	0.381	83.2	83.2	83.9	83.4
#3	0.396	86.3	86.4	87.0	86.6
#4	0.396	86.3	86.4	87.0	86.6
#5	0.409	89.3	89.4	90.0	89.6
#6	0.417	91.0	91.1	91.7	91.3
Average 34.8					
STDEV 5.04					
Average 65.3					
STDEV 5.64					
Average 87.3					
STDEV 3.13					
Average 87.9					
STDEV 2.86					

Table 64B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 43

5 min	Abs	#1	#2	#3	%D
#1	0.124	27.2	26.9	27.6	27.3
#2	0.178	38.9	38.7	39.4	39.0
#3	0.145	31.8	31.5	32.2	31.8
#4	0.166	36.3	36.1	36.8	36.4
#5	0.113	24.8	24.5	25.2	24.9
#6	0.141	30.9	30.6	31.4	31.0
10 min	Abs	#1	#2	#3	%D
#1	0.241	52.6	52.4	53.1	52.7
#2	0.314	68.5	68.5	69.1	68.7
#3	0.267	58.4	58.3	59.0	58.5
#4	0.282	61.6	61.5	62.2	61.8
#5	0.240	52.3	52.2	52.9	52.5
#6	0.272	59.5	59.4	60.0	59.6
20 min	Abs	#1	#2	#3	%D
#1	0.371	81.0	81.1	81.7	81.3
#2	0.396	86.4	86.5	87.1	86.6
#3	0.379	82.7	82.8	83.4	83.0
#4	0.372	81.2	81.3	81.9	81.5
#5	0.362	78.9	78.9	79.6	79.1
#6	0.382	83.4	83.5	84.1	83.6
30 min	Abs	#1	#2	#3	%D
#1	0.382	83.4	83.4	84.1	83.6
#2	0.397	86.5	86.6	87.2	86.8
#3	0.397	86.5	86.6	87.2	86.8
#4	0.384	83.8	83.9	84.5	84.1
#5	0.397	86.5	86.6	87.2	86.8
#6	0.419	91.4	91.5	92.1	91.7
Average 31.7					
STDEV 5.36					
Average 59.0					
STDEV 6.07					
Average 82.5					
STDEV 2.54					
Average 86.6					
STDEV 2.87					

Table 65B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 49

5 min	Abs	#1	#2	#3	%D
#1	0.123	27.0	26.7	27.4	27.0
#2	0.187	40.9	40.7	41.4	41.0
#3	0.154	33.7	33.5	34.2	33.8
#4	0.154	33.7	33.5	34.2	33.8
#5	0.177	38.7	38.5	39.2	38.8
#6	0.192	42.0	41.8	42.5	42.1
10 min	Abs	#1	#2	#3	%D
#1	0.236	51.5	51.4	52.0	51.6
#2	0.299	65.3	65.2	65.9	65.5
#3	0.381	83.1	83.2	83.8	83.4
#4	0.278	60.7	60.7	61.3	60.9
#5	0.327	71.3	71.3	71.9	71.5
#6	0.330	71.9	72.0	72.6	72.2
20 min	Abs	#1	#2	#3	%D
#1	0.352	76.8	76.8	77.4	77.0
#2	0.405	88.3	88.4	89.0	88.6
#3	0.393	85.7	85.8	86.4	86.0
#4	0.393	85.7	85.8	86.4	86.0
#5	0.406	88.5	88.6	89.2	88.8
#6	0.421	91.9	92.0	92.6	92.2
30 min	Abs	#1	#2	#3	%D
#1	0.389	84.8	84.9	85.5	85.1
#2	0.412	89.9	90.0	90.6	90.2
#3	0.427	93.1	93.2	93.8	93.4
#4	0.404	88.0	88.1	88.7	88.3
#5	0.404	88.0	88.1	88.7	88.3
#6	0.420	91.6	91.7	92.3	91.9
Average 36.1					
STDEV 5.66					
Average 67.5					
STDEV 10.9					
Average 86.4					
STDEV 5.15					
Average 89.5					
STDEV 2.95					

Table 66B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 55

5 min	Abs	#1	#2	#3	%D
#1	0.089	19.6	19.3	20.0	19.6
#2	0.136	29.8	29.6	30.3	29.9
#3	0.138	30.2	30.0	30.7	30.3
#4	0.185	40.5	40.3	41.0	40.6
#5	0.112	24.6	24.3	25.0	24.6
#6	0.164	35.9	35.7	36.4	36.0
10 min	Abs	#1	#2	#3	%D
#1	0.202	44.2	44.0	44.7	44.3
#2	0.241	52.6	52.4	53.1	52.7
#3	0.242	52.8	52.7	53.3	52.9
#4	0.307	67.0	67.0	67.6	67.2
#5	0.236	51.5	51.4	52.0	51.6
#6	0.294	64.2	64.1	64.8	64.4
20 min	Abs	#1	#2	#3	%D
#1	0.334	72.9	72.9	73.6	73.1
#2	0.367	80.0	80.0	80.6	80.2
#3	0.350	76.3	76.4	77.0	76.6
#4	0.409	89.1	89.2	89.9	89.4
#5	0.377	82.3	82.4	83.0	82.6
#6	0.397	86.6	86.7	87.3	86.8
30 min	Abs	#1	#2	#3	%D
#1	0.367	80.0	80.0	80.7	80.2
#2	0.404	88.2	88.3	88.9	88.5
#3	0.378	82.5	82.6	83.2	82.8
#4	0.417	91.0	91.1	91.7	91.3
#5	0.417	91.0	91.1	91.7	91.3
#6	0.412	89.9	90.0	90.6	90.2
Average 30.2					
STDEV 7.54					
Average 55.5					
STDEV 8.61					
Average 81.5					
STDEV 6.13					
Average 87.4					
STDEV 4.72					

Table 67B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 61

5 min	Abs	#1	#2	#3	%D
#1	0.125	27.4	27.1	27.9	27.5
#2	0.151	33.1	32.8	33.5	33.2
#3	0.143	31.3	31.1	31.8	31.4
#4	0.173	37.9	37.7	38.4	38.0
#5	0.124	27.2	26.9	27.6	27.3
#6	0.143	31.3	31.1	31.8	31.4
10 min	Abs	#1	#2	#3	%D
#1	0.248	54.3	54.2	54.8	54.4
#2	0.281	61.4	61.3	62.0	61.6
#3	0.262	57.3	57.2	57.9	57.5
#4	0.304	66.3	66.3	67.0	66.5
#5	0.238	51.9	51.8	52.5	52.1
#6	0.281	61.4	61.3	62.0	61.6
20 min	Abs	#1	#2	#3	%D
#1	0.373	81.5	81.5	82.1	81.7
#2	0.395	86.1	86.2	86.9	86.4
#3	0.380	83.0	83.0	83.6	83.2
#4	0.411	89.6	89.7	90.3	89.8
#5	0.346	75.5	75.5	76.1	75.7
#6	0.396	86.4	86.5	87.1	86.6
30 min	Abs	#1	#2	#3	%D
#1	0.378	82.5	82.6	83.2	82.8
#2	0.406	88.6	88.8	89.4	88.9
#3	0.398	86.7	86.8	87.5	87.0
#4	0.419	91.4	91.5	92.1	91.7
#5	0.413	90.1	90.2	90.8	90.4
#6	0.419	91.4	91.5	92.1	91.7
					Average 88.7
					STDEV 3.42

Table 68B Dissolution of Prednisone in PVC/Aclar at 30°C, Day 67

5 min	Abs	#1	#2	#3	%D
#1	0.126	27.6	27.4	28.1	27.7
#2	0.142	31.1	30.9	31.6	31.2
#3	0.134	29.4	29.1	29.8	29.4
#4	0.178	38.9	38.7	39.4	39.0
#5	0.181	39.6	39.4	40.1	39.7
#6	0.096	21.1	20.8	21.5	21.1
10 min	Abs	#1	#2	#3	%D
#1	0.262	57.3	57.2	57.9	57.5
#2	0.272	59.5	59.4	60.0	59.6
#3	0.265	57.9	57.9	58.5	58.1
#4	0.337	73.5	73.5	74.1	73.7
#5	0.331	72.2	72.2	72.8	72.4
#6	0.206	45.0	44.9	45.5	45.1
20 min	Abs	#1	#2	#3	%D
#1	0.399	87.0	87.1	87.7	87.3
#2	0.393	85.7	85.8	86.4	86.0
#3	0.386	84.2	84.3	84.9	84.5
#4	0.411	89.6	89.7	90.3	89.8
#5	0.410	89.3	89.5	90.1	89.6
#6	0.294	64.2	64.1	64.8	64.4
30 min	Abs	#1	#2	#3	%D
#1	0.404	88.2	88.3	88.9	88.5
#2	0.403	87.8	87.9	88.5	88.1
#3	0.396	86.3	86.4	87.0	86.6
#4	0.411	89.7	89.8	90.4	90.0
#5	0.408	89.1	89.2	89.8	89.3
#6	0.355	77.5	77.5	78.1	77.7
					Average 86.7
					STDEV 4.56

Table 69B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 3

5 min	Abs	#1	#2	#3	%D
#1	0.202	44.2	44.0	44.7	44.3
#2	0.214	46.8	46.6	47.3	46.9
#3	0.222	48.5	48.4	49.1	48.7
#4	0.203	44.4	44.2	44.9	44.5
#5	0.218	47.7	47.5	48.2	47.8
#6	0.209	45.7	45.5	46.2	45.8
10 min	Abs	#1	#2	#3	%D
#1	0.312	68.1	68.0	68.7	68.3
#2	0.329	71.7	71.7	72.4	71.9
#3	0.319	69.6	69.6	70.2	69.8
#4	0.329	71.7	71.7	72.4	71.9
#5	0.320	69.8	69.8	70.4	70.0
#6	0.324	70.7	70.7	71.3	70.9
20 min	Abs	#1	#2	#3	%D
#1	0.389	84.9	85.0	85.6	85.1
#2	0.411	89.6	89.7	90.3	89.8
#3	0.383	83.6	83.7	84.3	83.8
#4	0.383	83.6	83.7	84.3	83.8
#5	0.398	86.8	86.9	87.5	87.1
#6	0.397	86.6	86.7	87.3	86.8
30 min	Abs	#1	#2	#3	%D
#1	0.405	88.4	88.5	89.2	88.7
#2	0.417	91.0	91.1	91.7	91.3
#3	0.419	91.4	91.5	92.1	91.7
#4	0.416	90.8	90.9	91.5	91.0
#5	0.410	89.5	89.6	90.2	89.8
#6	0.424	92.4	92.6	93.2	92.7
Average 46.3					
STDEV 1.77					
Average 70.5					
STDEV 1.42					
Average 86.1					
STDEV 2.30					
Average 90.9					
STDEV 1.43					

Table 70B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 6

5 min	Abs	#1	#2	#3	%D
#1	0.190	41.6	41.4	42.1	41.7
#2	0.201	44.0	43.8	44.5	44.1
#3	0.165	36.1	35.9	36.6	36.2
#4	0.153	33.5	33.3	34.0	33.6
#5	0.122	26.8	26.5	27.2	26.8
#6	0.136	29.8	29.6	30.3	29.9
10 min	Abs	#1	#2	#3	%D
#1	0.313	68.3	68.3	68.9	68.5
#2	0.355	77.5	77.6	78.2	77.8
#3	0.309	67.4	67.4	68.0	67.6
#4	0.297	64.8	64.8	65.5	65.0
#5	0.313	68.3	68.3	68.9	68.5
#6	0.358	78.2	78.2	78.9	78.4
20 min	Abs	#1	#2	#3	%D
#1	0.388	84.7	84.7	85.4	84.9
#2	0.415	90.4	90.5	91.1	90.7
#3	0.402	87.6	87.7	88.4	87.9
#4	0.379	82.7	82.8	83.4	83.0
#5	0.402	87.6	87.7	88.4	87.9
#6	0.427	93.2	93.3	93.9	93.5
30 min	Abs	#1	#2	#3	%D
#1	0.407	88.9	89.0	89.6	89.1
#2	0.414	90.3	90.5	91.1	90.6
#3	0.427	93.1	93.2	93.8	93.4
#4	0.405	88.4	88.5	89.2	88.7
#5	0.410	89.5	89.6	90.2	89.8
#6	0.424	92.4	92.6	93.2	92.7
Average 35.4					
STDEV 6.67					
Average 71.0					
STDEV 5.67					
Average 88.0					
STDEV 3.79					
Average 90.7					
STDEV 1.93					

Table 71B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 9

5 min	Abs	#1	#2	#3	%D
#1	0.130	28.5	28.2	29.0	28.6
#2	0.179	39.2	39.0	39.7	39.3
#3	0.143	31.3	31.1	31.8	31.4
#4	0.165	36.1	35.9	36.6	36.2
#5	0.129	28.3	28.0	28.7	28.3
#6	0.199	43.5	43.3	44.0	43.6
10 min	Abs	#1	#2	#3	%D
#1	0.278	60.7	60.7	61.3	60.9
#2	0.311	67.9	67.8	68.5	68.1
#3	0.281	61.4	61.3	62.0	61.6
#4	0.309	67.4	67.4	68.0	67.6
#5	0.276	60.3	60.2	60.9	60.5
#6	0.373	81.4	81.5	82.1	81.7
20 min	Abs	#1	#2	#3	%D
#1	0.382	83.4	83.5	84.1	83.6
#2	0.394	85.9	86.0	86.6	86.2
#3	0.392	85.5	85.6	86.2	85.8
#4	0.412	89.8	89.9	90.5	90.1
#5	0.387	84.4	84.5	85.1	84.7
#6	0.428	93.4	93.5	94.1	93.7
30 min	Abs	#1	#2	#3	%D
#1	0.409	89.3	89.4	90.0	89.6
#2	0.411	89.7	89.8	90.4	90.0
#3	0.407	88.9	89.0	89.6	89.1
#4	0.418	91.2	91.3	91.9	91.5
#5	0.412	89.9	90.0	90.6	90.2
#6	0.424	92.4	92.6	93.2	92.7
Average 34.6					
STDEV 6.19					
Average 66.7					
STDEV 8.06					
Average 87.3					
STDEV 3.80					
Average 90.5					
STDEV 1.34					

Table 72B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 14

5 min	Abs	#1	#2	#3	%D
#1	0.156	34.2	33.9	34.6	34.2
#2	0.199	43.5	43.3	44.0	43.6
#3	0.129	28.3	28.0	28.7	28.3
#4	0.139	30.5	30.2	30.9	30.5
#5	0.168	36.8	36.6	37.3	36.9
#6	0.139	30.5	30.2	30.9	30.5
10 min	Abs	#1	#2	#3	%D
#1	0.306	66.8	66.7	67.4	67.0
#2	0.376	82.1	82.1	82.8	82.3
#3	0.306	66.8	66.7	67.4	67.0
#4	0.286	62.5	62.4	63.1	62.7
#5	0.334	72.8	72.8	73.5	73.0
#6	0.290	63.3	63.3	63.9	63.5
20 min	Abs	#1	#2	#3	%D
#1	0.396	86.4	86.5	87.1	86.6
#2	0.432	94.3	94.4	95.0	94.5
#3	0.398	86.8	86.9	87.5	87.1
#4	0.384	83.8	83.9	84.5	84.1
#5	0.420	91.7	91.8	92.4	92.0
#6	0.389	84.9	85.0	85.6	85.1
30 min	Abs	#1	#2	#3	%D
#1	0.421	91.8	91.9	92.5	92.1
#2	0.433	94.3	94.5	95.1	94.6
#3	0.406	88.6	88.8	89.4	88.9
#4	0.411	89.7	89.8	90.4	90.0
#5	0.425	92.7	92.8	93.4	92.9
#6	0.408	89.1	89.2	89.8	89.3
Average 34.0					
STDEV 5.60					
Average 69.2					
STDEV 7.37					
Average 88.2					
STDEV 4.12					
Average 91.3					
STDEV 2.27					

Table 73B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 20

5 min	Abs	#1	#2	#3	%D
#1	0.140	30.7	30.4	31.1	30.7
#2	0.167	36.6	36.3	37.0	36.6
#3	0.171	37.4	37.2	37.9	37.5
#4	0.197	43.1	42.9	43.6	43.2
#5	0.118	25.9	25.6	26.3	25.9
#6	0.200	43.7	43.6	44.3	43.9
10 min	Abs	#1	#2	#3	%D
#1	0.294	64.2	64.1	64.8	64.4
#2	0.318	69.4	69.3	70.0	69.6
#3	0.306	66.8	66.7	67.4	67.0
#4	0.327	71.3	71.3	71.9	71.5
#5	0.265	57.9	57.9	58.5	58.1
#6	0.357	78.0	78.0	78.6	78.2
20 min	Abs	#1	#2	#3	%D
#1	0.396	86.4	86.5	87.1	86.6
#2	0.398	86.8	86.9	87.5	87.1
#3	0.396	86.4	86.5	87.1	86.6
#4	0.405	88.3	88.4	89.0	88.6
#5	0.381	83.2	83.2	83.9	83.4
#6	0.414	90.2	90.3	90.9	90.5
30 min	Abs	#1	#2	#3	%D
#1	0.405	88.4	88.5	89.2	88.7
#2	0.424	92.4	92.6	93.2	92.7
#3	0.404	88.0	88.1	88.7	88.3
#4	0.405	88.4	88.5	89.2	88.7
#5	0.416	90.8	90.9	91.5	91.0
#6	0.408	89.1	89.2	89.8	89.3
Average					89.8
STDEV					1.73

Table 74B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 26

5 min	Abs	#1	#2	#3	%D
#1	0.161	35.2	35.0	35.7	35.3
#2	0.192	42.0	41.8	42.5	42.1
#3	0.160	35.0	34.8	35.5	35.1
#4	0.140	30.7	30.4	31.1	30.7
#5	0.144	31.5	31.3	32.0	31.6
#6	0.167	36.6	36.3	37.0	36.6
10 min	Abs	#1	#2	#3	%D
#1	0.307	67.0	67.0	67.6	67.2
#2	0.328	71.5	71.5	72.2	71.7
#3	0.296	64.6	64.6	65.2	64.8
#4	0.277	60.5	60.5	61.1	60.7
#5	0.314	68.5	68.5	69.1	68.7
#6	0.311	67.9	67.8	68.5	68.1
20 min	Abs	#1	#2	#3	%D
#1	0.397	86.6	86.7	87.3	86.8
#2	0.391	85.3	85.4	86.0	85.6
#3	0.395	86.1	86.2	86.9	86.4
#4	0.375	81.9	81.9	82.6	82.1
#5	0.407	88.7	88.8	89.4	89.0
#6	0.410	89.3	89.5	90.1	89.6
30 min	Abs	#1	#2	#3	%D
#1	0.408	89.1	89.2	89.8	89.3
#2	0.407	88.9	89.0	89.6	89.1
#3	0.415	90.5	90.7	91.3	90.8
#4	0.388	84.6	84.7	85.3	84.9
#5	0.414	90.3	90.5	91.1	90.6
#6	0.422	92.0	92.2	92.8	92.3
Average					89.5
STDEV					2.54

Table 77B Dissolution of Prednisone in PVC/Aclar at 40°C, Day 44

5 min	Abs	#1	#2	#3	%D			
#1	0.140	30.7	30.4	31.1	30.7			
#2	0.149	32.6	32.4	33.1	32.7			
#3	0.133	29.2	28.9	29.6	29.2	Average	31.5	
#4	0.157	34.4	34.2	34.9	34.5	STDEV	5.04	
#5	0.107	23.5	23.2	23.9	23.5			
#6	0.175	38.3	38.1	38.8	38.4			
10 min	Abs	#1	#2	#3	%D			
#1	0.244	53.2	53.1	53.8	53.4			
#2	0.282	61.6	61.5	62.2	61.8			
#3	0.245	53.4	53.3	54.0	53.6	Average	57.9	
#4	0.264	57.7	57.6	58.3	57.9	STDEV	6.71	
#5	0.236	51.5	51.4	52.0	51.6			
#6	0.317	69.1	69.1	69.8	69.4			
20 min	Abs	#1	#2	#3	%D			
#1	0.343	74.8	74.9	75.5	75.1			
#2	0.404	88.1	88.2	88.8	88.3			
#3	0.362	78.9	78.9	79.6	79.1	Average	83.7	
#4	0.403	87.9	88.0	88.6	88.1	STDEV	5.87	
#5	0.374	81.7	81.7	82.4	81.9			
#6	0.409	89.1	89.2	89.9	89.4			
30 min	Abs	#1	#2	#3	%D			
#1	0.357	77.9	77.9	78.6	78.1			
#2	0.416	90.8	90.9	91.5	91.0			
#3	0.413	90.1	90.2	90.8	90.4	Average	88.1	
#4	0.413	90.1	90.2	90.8	90.4	STDEV	4.94	
#5	0.408	89.1	89.2	89.8	89.3			
#6	0.408	89.1	89.2	89.8	89.3			

APPENDIX C

Calculation

Initial Moisture Content (*IMC*) of Prednisone

Average Initial Moisture Content in Wet Basis Determined by Karl Fischer with Homogenizer is 5.17 g of water/100 g of wet product

$$\text{Moisture Content in Dry Basis} = \frac{\text{Moisture Content in Wet Basis}}{1 - \text{Moisture Content in Wet Basis}}$$

$$= \frac{0.0517}{1 - 0.0517}$$

$$= 0.0545 \text{ g of water/g of dry product}$$

$$= 5.45 \text{ g of water/100 g of dry product}$$

$$= 5.45\%(\text{Dry Basis})$$

Product Dry Weight (*W_D*) Calculation

Average Weight of Prednisone Tablet = 0.0988 g.

$$W_D = \frac{W_I}{1 + IMC}$$

Where, *W_D* = Product Dry Weight, g

W_I = Product Wet Weight, g

IMC = Initial Moisture Content of Prednisone in Dry Basis, g of water/g of dry product

$$W_D = \frac{0.0988}{1 + 0.0545} = 0.0937 \text{ g}$$

Shelf Life Calculation

From equation (3),
$$t = \frac{W_D \beta}{P' p_s} \ln \left[\frac{Aw_0 - Aw_{t=0}}{Aw_0 - Aw_{t=t}} \right]$$

$$P' = \frac{WVTR}{\Delta p} \text{ and } \Delta Aw = \frac{\Delta p}{p_s}$$

$$P' = \frac{WVTR}{\Delta Aw \cdot p_s}$$

$$t = \frac{W_D \beta \cdot \Delta Aw}{WVTR} \ln \left[\frac{Aw_0 - Aw_{t=0}}{Aw_0 - Aw_{t=t}} \right]$$

Time to reach equilibrium moisture content of Prednisone packaged in PVC/0.6

mil Aclar at 25°C, $t_{Aclar,25}$

$$W_D = 0.0937 \text{ g (from calculation above)}$$

$$\beta = 0.0127 \text{ (from figure)}$$

$$\Delta Aw = Aw_{outside} - Aw_{inside} = 0.75 - 0 = 0.75$$

$$WVTR = 5.5515E-05 \text{ g/day.cavity}$$

$$Aw_o = 0.75$$

$$Aw_{t=0} = 0.19 \text{ (from equation in figure)}$$

$$Aw_{t=t} = 0.74 \text{ (critical point in figure)}$$

$$t_{Aclar,25} = \frac{(0.0937)(0.0127)(0.75)}{(5.5515E-05)} \ln \left[\frac{0.75 - 0.19}{0.75 - 0.74} \right]$$

$$t_{Aclar,25} = 64.7 \text{ days}$$

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