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**APPENDICES**

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## APPENDIX I

### Validation of the HPLC Method

Analytical parameters validated were specificity, precision, accuracy, and linearity. The validation of an analytical method was the process by which performance characteristics of the method were established to meet the USP 27, 2004 requirements for the intended analytical applications.

#### 1. Specificity

The specificity was the ability to assess unequivocally the analyte in the presence of components in the matrix. Under the chromatographic condition used, the peak of triamcinolone acetonide must be completely separated from and not be interfered by the peak of other components in the sample. The internal standard technique was performed by determining the peak area ratio of triamcinolone acetonide to prednisolone base (internal standard). The peaks of triamcinolone acetonide, its internal standard, and all other components must be sharp and have appropriate resolution. The retention times of triamcinolone acetonide and prednisolone base were at 11.4 and 7.3 min, respectively. The chromatogram is shown in Figure 38.

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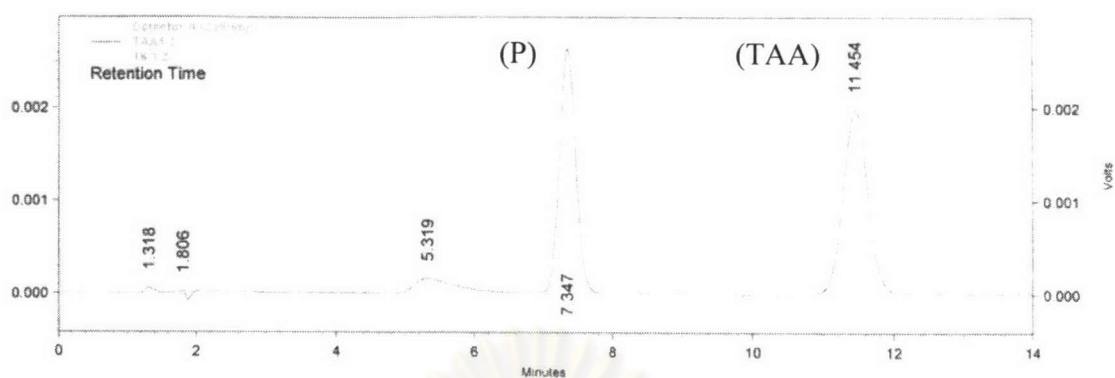


Figure 38 HPLC chromatogram of 1.0  $\mu\text{g/ml}$  prednisolone base (P) and 1.2  $\mu\text{g/ml}$  triamcinolone acetonide (TAA). Column: C 18 Inertsil ODS 5 micron, mobile phase: methanol:water = 60:40, detector: UV-visible (239 nm).

## 2. Precision

The precision of an analytical method was the degree of agreement among individual test results when the method was applied repeatedly to multiple samplings of a homogeneous sample. The precision of an analytical method was usually expressed as the standard deviation or relative standard deviation (coefficient of variation) of a series of measurements. The determination of precision of the analysis of triamcinolone acetonide by HPLC method was performed by analyzing the coefficient of variation of three sets of five standard solutions.

Tables 33 and 34 illustrate the data of within run precision and between run precision, respectively. The values of coefficient of variation of the within run and between run precisions were 0.23-0.78 % and 0.39-1.15 %, respectively. The coefficient of variation of an analytical method could generally be less than 2 % (USP 27, 2004). Since all the values were less than 2 %, the HPLC method could be used for quantitative analysis of triamcinolone acetonide in the range studied.

Table 33 Data of within run precision of triamcinolone acetonide analysis by HPLC method

Concentration ( $\mu\text{g/ml}$ )	Peak area ratio				
	Set No.1	Set No.2	Set No.3	Mean $\pm$ SD	%CV
0.70	0.5712	0.5747	0.5793	0.5751 $\pm$ 0.0041	0.71
1.10	0.8907	0.8789	0.8912	0.8869 $\pm$ 0.0070	0.78
1.50	1.1886	1.1905	1.1939	1.1910 $\pm$ 0.0027	0.23
1.90	1.4841	1.4903	1.4953	1.4899 $\pm$ 0.0056	0.38
2.30	1.8062	1.8238	1.8221	1.8174 $\pm$ 0.0097	0.53

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Table 29 Data of between run precision of triamcinolone acetonide analysis by HPLC method

Concentration (µg/ml)	Peak Area ratio											
	Day 1			Day 2			Day 3			Mean	SD	%CV
	Set No.1	Set No.2	Set No.3	Set No.1	Set No.2	Set No.3	Set No.1	Set No.2	Set No.3			
0.70	0.5543	0.5547	0.5593	0.5568	0.5572	0.5513	0.5690	0.5694	0.5634	0.5595	0.0065	1.15
1.10	0.8856	0.8989	0.8812	0.8818	0.8877	0.8879	0.8922	0.8884	0.8887	0.8880	0.0053	0.60
1.50	1.1922	1.1905	1.1939	1.1803	1.1890	1.1816	1.1849	1.1869	1.1895	1.1876	0.0046	0.39
1.90	1.5271	1.5203	1.5253	1.5273	1.5267	1.5224	1.4982	1.4936	1.4992	1.5156	0.0142	0.94
2.30	1.7634	1.7683	1.7628	1.7535	1.7412	1.7492	1.7624	1.7651	1.7673	1.7592	0.0092	0.52

### 3. Accuracy

The accuracy of an analytical method was the closeness of test results obtained to the true value. The accuracy could be established across its range. The determination of accuracy of analysis of triamcinolone acetonide by HPLC method was performed by analyzing the percentages of analytical recovery of three sets of five standard solutions. The percentages of analytical recovery of triamcinolone acetonide are shown in Table 35. The mean and %CV of the percentages of analytical recovery of all triamcinolone acetonide concentrations were 99.79 % and 0.58 %, respectively, indicating that this method could be used for analysis of triamcinolone acetonide in all concentrations studied with high accuracy. The mean of the percentage of analytical recovery could generally be 98-102 % (USP 27, 2004).

Table 35 The percentages of analytical recovery of triamcinolone acetonide analysis by HPLC method

Concentration ( $\mu\text{g/ml}$ )	Estimated concentration ( $\mu\text{g/ml}$ )				
	1	2	3	Mean $\pm$ SD	% Recovery
0.70	0.69	0.69	0.71	0.70 $\pm$ 0.01	100.00
1.10	1.10	1.09	1.09	1.09 $\pm$ 0.01	99.09
1.50	1.49	1.49	1.48	1.49 $\pm$ 0.00	99.33
1.90	1.92	1.90	1.91	1.91 $\pm$ 0.01	100.53
2.30	2.28	2.29	2.32	2.30 $\pm$ 0.02	100.00
Mean					99.79
SD					0.58
%CV					0.58



#### 4. Linearity

The linearity of an analytical method was the ability to elicit test results that were directly, or by a well-defined mathematical transformation, proportional to the concentration of analyte in samples within a given range. The linearity could be established across the range of the analytical procedures. It should be established initially by visual examination of a plot of signals as a function of analyte concentration. If there appeared to be a linear relationship, test results could be established by calculation of regression line by the method of least squares. The calibration curve data is shown in Table 36. A plot of triamcinolone acetonide concentrations versus the peak area ratios of triamcinolone acetonide to its internal standard (Figure 39) illustrated the linear correlation in the concentration range studied (0.70, 1.10, 1.50, 1.90, and 2.30  $\mu\text{g/ml}$ , respectively). The coefficient of determination ( $r^2$ ) of this line was 0.9999, and the corresponding equation was  $Y = 0.7728X + 0.0341$ . These results indicated that the HPLC method was acceptable for quantitative analysis of triamcinolone acetonide in the concentration range studied.



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Table 36 Data of calibration curve of triamcinolone acetonide analysis by HPLC method

Concentration ( $\mu\text{g/ml}$ )	Peak area ratio				
	Set No.1	Set No.2	Set No.3	Mean $\pm$ SD	%CV
0.70	0.5732	0.5712	0.5773	0.5739 $\pm$ 0.0031	0.54
1.10	0.8897	0.8868	0.8888	0.8885 $\pm$ 0.0015	0.17
1.50	1.1906	1.1935	1.1929	1.1923 $\pm$ 0.0015	0.13
1.90	1.4960	1.4953	1.4963	1.4959 $\pm$ 0.0005	0.03
2.30	1.8162	1.8183	1.8130	1.8158 $\pm$ 0.0027	0.15

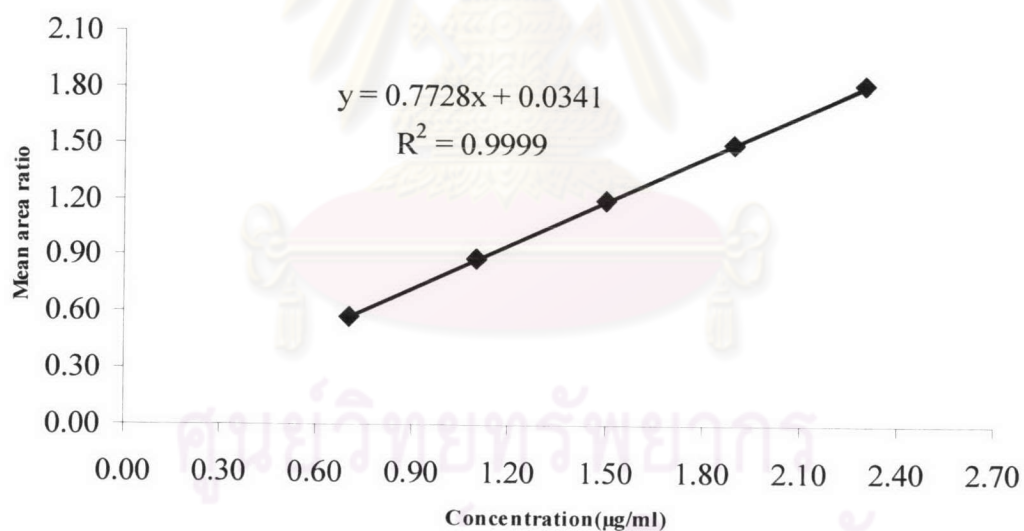


Figure 39 Calibration curve of triamcinolone acetonide analysis by HPLC method

## APPENDIX II

## Experimental Data

Table 37 The thickness of buccal mucoadhesive film No.1-8

	Film No.							
	1	2	3	4	5	6	7	8
1	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
2	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
3	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
4	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
5	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
6	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
7	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
8	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
9	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
10	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
11	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
12	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
13	0.060	0.055	0.045	0.050	0.050	0.070	0.045	0.050
14	0.050	0.060	0.045	0.050	0.055	0.070	0.045	0.050
15	0.055	0.050	0.045	0.050	0.055	0.065	0.045	0.050
16	0.055	0.065	0.045	0.050	0.055	0.065	0.045	0.055
17	0.055	0.055	0.045	0.050	0.055	0.070	0.050	0.055
18	0.060	0.050	0.050	0.055	0.060	0.070	0.050	0.055
19	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
20	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
21	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
22	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
23	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
24	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
25	0.060	0.055	0.050	0.050	0.055	0.070	0.050	0.055
26	0.050	0.055	0.050	0.060	0.050	0.065	0.050	0.055
27	0.050	0.055	0.045	0.060	0.050	0.060	0.050	0.055
28	0.055	0.050	0.045	0.060	0.050	0.065	0.050	0.060
29	0.055	0.050	0.045	0.065	0.050	0.065	0.050	0.050
30	0.050	0.060	0.040	0.065	0.050	0.065	0.050	0.065
mean(mm)	0.058	0.055	0.046	0.052	0.052	0.069	0.047	0.053
SD	0.004	0.003	0.003	0.005	0.003	0.003	0.003	0.004

Table 38 The thickness of buccal mucoadhesive film No.9-11, and 23-28

	Film No.									
	9	10	11	23	24	25	26	27	28	29
1	0.080	0.090	0.115	0.120	0.115	0.100	0.124	0.125	0.115	0.110
2	0.080	0.090	0.115	0.100	0.130	0.110	0.123	0.130	0.130	0.115
3	0.080	0.090	0.115	0.110	0.120	0.125	0.115	0.125	0.120	0.115
4	0.080	0.090	0.115	0.125	0.120	0.120	0.130	0.125	0.120	0.100
5	0.080	0.090	0.105	0.120	0.130	0.100	0.120	0.130	0.120	0.105
6	0.080	0.090	0.110	0.100	0.120	0.110	0.120	0.125	0.110	0.115
7	0.080	0.090	0.110	0.110	0.110	0.110	0.120	0.120	0.125	0.115
8	0.080	0.090	0.110	0.110	0.125	0.125	0.120	0.120	0.120	0.110
9	0.080	0.090	0.110	0.125	0.120	0.124	0.120	0.105	0.120	0.115
10	0.085	0.095	0.115	0.124	0.100	0.123	0.120	0.115	0.125	0.110
11	0.085	0.095	0.115	0.123	0.110	0.115	0.120	0.125	0.110	0.115
12	0.085	0.095	0.110	0.115	0.110	0.130	0.125	0.120	0.125	0.110
13	0.085	0.095	0.115	0.130	0.125	0.120	0.120	0.120	0.124	0.115
14	0.085	0.095	0.115	0.120	0.124	0.120	0.125	0.120	0.120	0.115
15	0.085	0.095	0.110	0.120	0.120	0.120	0.130	0.130	0.120	0.110
16	0.085	0.095	0.110	0.120	0.120	0.110	0.125	0.120	0.125	0.105
17	0.083	0.092	0.110	0.120	0.120	0.125	0.110	0.110	0.115	0.110
18	0.084	0.094	0.110	0.120	0.120	0.120	0.125	0.125	0.125	0.110
19	0.083	0.093	0.105	0.125	0.125	0.120	0.115	0.120	0.120	0.115
20	0.083	0.092	0.105	0.120	0.120	0.125	0.115	0.100	0.123	0.110
21	0.082	0.092	0.110	0.125	0.125	0.110	0.115	0.110	0.115	0.105
22	0.082	0.091	0.110	0.130	0.100	0.125	0.110	0.110	0.130	0.110
23	0.081	0.091	0.110	0.125	0.110	0.124	0.110	0.125	0.120	0.110
24	0.081	0.090	0.105	0.120	0.110	0.120	0.105	0.124	0.110	0.105
25	0.080	0.090	0.115	0.115	0.125	0.120	0.110	0.120	0.125	0.115
26	0.080	0.089	0.115	0.130	0.124	0.120	0.105	0.120	0.124	0.115
27	0.079	0.089	0.110	0.120	0.120	0.120	0.115	0.120	0.120	0.115
28	0.079	0.088	0.110	0.120	0.120	0.125	0.115	0.125	0.120	0.110
29	0.078	0.088	0.105	0.130	0.120	0.120	0.115	0.120	0.120	0.115
30	0.078	0.087	0.110	0.120	0.120	0.120	0.110	0.125	0.115	0.115
mean(mm)	0.082	0.091	0.111	0.120	0.119	0.119	0.118	0.120	0.120	0.111
SD	0.002	0.002	0.003	0.008	0.007	0.007	0.007	0.007	0.005	0.004

### APPENDIX III

#### Analytical Data

Table 39 Amount of triamcinolone acetonide containing in film No.29 at initial time

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.1182	14.28	100.48
2	1.1168	14.26	100.36
3	1.1147	14.24	100.18
Mean	1.1166	14.26	100.34
SD	0.0018	0.02	0.15
%CV	0.16	0.15	0.15

Calibration curve data

Concentration( $\mu\text{g/ml}$ )	Area ratio
0.60	0.4715
1.00	0.7512
1.40	1.0963
1.80	1.4191
2.20	1.7278
2.60	2.0742

$$y = 0.8047x - 0.0308; r^2 = 0.9993$$

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Table 40 Amount of triamcinolone acetonide containing in film No.29 stored at ambient condition (1<sup>st</sup> month)

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.1144	14.34	100.92
2	1.0998	14.16	99.63
3	1.1067	14.24	100.24
Mean	1.1070	14.25	100.26
SD	0.01	0.09	0.65
%CV	0.66	0.65	0.65

Calibration curve data

Concentration( $\mu\text{g}/\text{ml}$ )	Area ratio
0.60	0.4731
1.00	0.7520
1.40	1.0885
1.80	1.4099
2.20	1.6987
2.60	2.0483

$$y = 0.7884x - 0.0163; r^2 = 0.9992$$

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Table 41 Amount of triamcinolone acetonide containing in film No.29 stored at 40 °C and 75% RH (1<sup>st</sup> month)

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.1068	14.20	99.9
2	1.1066	14.19	99.87
3	1.0972	14.14	99.47
Mean	1.1052	14.17	99.75
SD	0.0026	0.03	0.24
%CV	0.23	0.24	0.24

Calibration curve data

Concentration( $\mu\text{g/ml}$ )	Area ratio
0.60	0.4773
1.00	0.7876
1.40	1.0943
1.80	1.4173
2.20	1.6855
2.60	2.0019

$$y = 0.76x + 0.028; r^2 = 0.9996$$

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Table 42 Amount of triamcinolone acetonide containing in film No.29 stored at ambient condition (2<sup>nd</sup> month)

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.1189	14.21	100
2	1.1185	14.2	99.96
3	1.1218	14.25	100.25
Mean	1.1197	14.22	100.07
SD	0.0018	0.02	0.16
%CV	0.16	0.16	0.16

Calibration curve data

Concentration( $\mu\text{g/ml}$ )	Area ratio
0.60	0.4737
1.00	0.7593
1.40	1.0921
1.80	1.4254
2.20	1.7079
2.60	2.0410

$$y = 0.7868x - 0.009; r^2 = 0.9994$$

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Table 43 Amount of triamcinolone acetonide containing in film No.29 stored at 40 °C and 75% RH (2<sup>nd</sup> month)

Sample	Area ratio	Triamcinolone acetonide(μg)	%LA
1	1.0963	14.15	99.61
2	1.0906	14.08	99.09
3	1.0783	13.93	98.00
Mean	1.0884	14.05	98.90
SD	0.0092	0.12	0.82
%CV	0.84	0.83	0.83

Calibration curve data

Concentration(μg/ml)	Area ratio
0.60	0.4677
1.00	0.7512
1.40	1.0814
1.80	1.4197
2.20	1.6915
2.60	2.0376

$$y = 0.7863x - 0.0166; r^2 = 0.9991$$

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Table 44 Amount of triamcinolone acetonide containing in film No.29 at ambient conditions (3<sup>rd</sup> month)

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.0932	14.16	99.64
2	1.0986	14.23	100.12
3	1.0895	14.11	99.30
mean	1.0937	14.17	99.69
SD	0.0046	0.06	0.41
%CV	0.42	0.41	0.41

Calibration curve data

Concentration( $\mu\text{g/ml}$ )	Area ratio
0.60	0.4662
1.00	0.7437
1.40	1.0813
1.80	1.4153
2.20	1.6932
2.60	2.0267

$$y = 0.7846x - 0.0177; r^2 = 0.9992$$

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Table 45 Amount of triamcinolone acetonide containing in film No.29 stored at 40 °C and 75% RH (3<sup>rd</sup> month)

Sample	Area ratio	Triamcinolone acetonide( $\mu\text{g}$ )	%LA
1	1.0776	13.92	100.00
2	1.0757	13.89	99.96
3	1.0819	13.97	100.25
Mean	1.0784	13.93	98.03
SD	0.0032	0.04	0.29
%CV	0.29	0.30	0.30

Calibration curve data

Concentration( $\mu\text{g/ml}$ )	Area ratio
0.60	0.4770
1.00	0.7573
1.40	1.0888
1.80	1.4083
2.20	1.6777
2.60	2.0215

$$y = 0.7717x + 0.0038; r^2 = 0.9992$$

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Table 46 The cumulative amount release of triamcinolone acetonide from film No.29

Time	Cumulative amount release ( $\mu\text{g}/\text{cm}^2$ )					Mean	SD
	Sample1	Sample2	Sample3	Sample4	Sample5		
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	2.09	2.02	2.00	2.07	2.04	2.04	0.03
20	3.41	3.28	3.32	3.36	3.31	3.33	0.05
30	4.22	4.11	4.09	4.17	4.20	4.16	0.06
45	4.91	4.72	4.88	4.93	4.81	4.85	0.09
60	6.00	6.07	5.95	6.04	6.02	6.02	0.05
120	10.89	11.03	10.98	10.94	10.95	10.96	0.05
180	14.10	14.17	14.07	14.04	14.09	14.09	0.05

## Calibration curve data

Concentration( $\mu\text{g}/\text{ml}$ )	Area ratio
0.60	0.4937
1.00	0.7721
1.40	1.1152
1.80	1.4531
2.20	1.7304
2.60	2.0708

$$y = 0.7927x + 0.0042; r^2 = 0.9991$$

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Table 47 The cumulative amount release of triamcinolone acetonide from Kenalog® in orabase

Time	Cumulative amount release ( $\mu\text{g}/\text{cm}^2$ )					Mean	SD
	Sample1	Sample2	Sample3	Sample4	Sample5		
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.96	0.91	0.83	0.81	0.88	0.88	0.06
20	1.27	1.19	1.37	1.32	1.23	1.28	0.07
30	1.84	1.89	1.79	1.72	1.77	1.80	0.06
45	3.11	3.03	3.08	3.06	3.15	3.09	0.05
60	4.32	4.22	4.21	4.29	3.98	4.20	0.13
120	6.08	6.05	6.02	6.17	6.12	6.09	0.06
180	9.44	9.41	9.36	9.32	9.20	9.35	0.09
240	12.07	11.91	12.05	11.94	12.03	12.00	0.07
300	12.65	12.60	12.78	12.75	12.69	12.69	0.07
360	13.73	13.68	13.54	13.66	13.57	13.64	0.08
420	13.73	13.68	13.54	13.66	13.57	13.64	0.08
480	13.73	13.68	13.54	13.66	13.57	13.64	0.08

Calibration curve data

Concentration( $\mu\text{g}/\text{ml}$ )	Area ratio
0.60	0.4879
1.00	0.7684
1.40	1.1128
1.80	1.4469
2.20	1.7279
2.60	2.0684

$$y = 0.7939x - 0.0016; r^2 = 0.9992$$

## APPENDIX IV

## Statistical Analysis Data

Table 48 t-test for the effect of mucin in artificial saliva on force of mucoadhesion

Film No.	Mean force of mucoadhesion (N)		Sig	p-value
	Artificial saliva without mucin	Artificial saliva with mucin		
1	0.0359	0.0403	0.1883	0.0500
2	0.0340	0.0394	0.0140	0.0500
3	0.0373	0.0428	0.0030	0.0500
4	0.0402	0.0462	0.0474	0.0500
5	0.0239	0.0318	0.0183	0.0500
6	0.0480	0.0726	0.0000	0.0500
7	0.0330	0.0342	0.6400	0.0500
8	0.0451	0.0511	0.0081	0.0500

Table 49 t-test for the effect of mucin in artificial saliva on work of adhesion

Film No.	Mean work of adhesion (mJ)		Sig	p-value
	Artificial saliva without mucin	Artificial saliva with mucin		
1	0.0439	0.0549	0.0016	0.0500
2	0.0439	0.0479	0.0006	0.0500
3	0.0441	0.0578	0.0000	0.0500
4	0.0556	0.0659	0.0046	0.0500
5	0.0330	0.0445	0.0037	0.0500
6	0.0660	0.0711	0.0451	0.0500
7	0.0438	0.0457	0.3249	0.0500
8	0.0568	0.0697	0.0001	0.0500

Table 50 t-test for the effect of triamcinolone acetonide in PG film on force and work of adhesion

	Artificial saliva		p-value
	without mucin	mucin	
	Sig	Sig	
Force of mucoadhesion	0.0000	0.0020	0.0500
Work of adhesion	0.0015	0.0000	0.0500

Table 51 LSD test of the force of mucoadhesion of film No.1-8 in artificial saliva without mucin

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0450 *	5	1	0.0000 *
	3	0.0460 *		2	0.0003 *
	4	0.0370 *		3	0.0000 *
	5	0.0000 *		4	0.0000 *
	6	0.0000 *		6	0.0000 *
	7	0.0400 *		7	0.0009 *
	8	0.0008 *		8	0.0000 *
	2	1		0.0450 *	6
3		0.0380 *	2	0.0000 *	
4		0.0175 *	3	0.0002 *	
5		0.0003 *	4	0.0036 *	
6		0.0000 *	5	0.0000 *	
7		0.0470 *	7	0.0000 *	
8		0.0001 *	8	0.0490 *	
3		1	0.0460 *	7	
	2	0.0380 *	2		0.0470 *
	4	0.0490 *	3		0.0390 *
	5	0.0000 *	4		0.0069 *
	6	0.0002 *	5		0.0009 *
	7	0.0390 *	6		0.0000 *
	8	0.0038 *	8		0.0000 *
	4	1	0.0370 *		8
2		0.0175 *	2	0.0001 *	
3		0.0490 *	3	0.0038 *	
5		0.0000 *	4	0.0490 *	
6		0.0036 *	5	0.0000 *	
7		0.0069 *	6	0.0490 *	
8		0.0490 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.

Table 52 LSD test of the force of mucoadhesion of film No.1-8 in artificial saliva with mucin

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0490 *	5	1	0.0000 *
	3	0.0430 *		2	0.0001 *
	4	0.0012 *		3	0.0000 *
	5	0.0000 *		4	0.0000 *
	6	0.0000 *		6	0.0000 *
	7	0.0010 *		7	0.0380 *
	8	0.0000 *		8	0.0000 *
	2	1		0.0490 *	6
3		0.0490 *	2	0.0000 *	
4		0.0003 *	3	0.0000 *	
5		0.0001 *	4	0.0000 *	
6		0.0000 *	5	0.0000 *	
7		0.0036 *	7	0.0000 *	
8		0.0000 *	8	0.0000 *	
3		1	0.0430 *	7	
	2	0.0490 *	2		0.0036 *
	4	0.0489 *	3		0.0000 *
	5	0.0000 *	4		0.0000 *
	6	0.0000 *	5		0.0380 *
	7	0.0000 *	6		0.0000 *
	8	0.0000 *	8		0.0000 *
	4	1	0.0012 *		8
2		0.0003 *	2	0.0000 *	
3		0.0489 *	3	0.0000 *	
5		0.0000 *	4	0.0055 *	
6		0.0000 *	5	0.0000 *	
7		0.0000 *	6	0.0000 *	
8		0.0055 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.



Table 53 LSD test of the work of adhesion of film No.1-8 in artificial saliva without mucin

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0470 *	5	1	0.0000 *
	3	0.0490 *		2	0.0000 *
	4	0.0000 *		3	0.0000 *
	5	0.0000 *		4	0.0000 *
	6	0.0000 *		6	0.0000 *
	7	0.0490 *		7	0.0000 *
	8	0.0000 *		8	0.0000 *
	2	1		0.0470 *	6
3		0.0370 *	2	0.0000 *	
4		0.0000 *	3	0.0000 *	
5		0.0000 *	4	0.0001 *	
6		0.0000 *	5	0.0000 *	
7		0.0450 *	7	0.0000 *	
8		0.0000 *	8	0.0003 *	
3		1	0.0490 *	7	
	2	0.0370 *	2		0.0450 *
	4	0.0000 *	3		0.0390 *
	5	0.0000 *	4		0.0000 *
	6	0.0000 *	5		0.0000 *
	7	0.0390 *	6		0.0000 *
	8	0.0000 *	8		0.0000 *
	4	1	0.0000 *		8
2		0.0000 *	2	0.0000 *	
3		0.0000 *	3	0.0000 *	
5		0.0000 *	4	0.0360 *	
6		0.0001 *	5	0.0000 *	
7		0.0000 *	6	0.0003 *	
8		0.0360 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.

Table 54 LSD test of the work of adhesion of film No.1-8 in artificial saliva with mucin

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0001 *	5	1	0.0000 *
	3	0.0460 *		2	0.0353 *
	4	0.0000 *		3	0.0000 *
	5	0.0000 *		4	0.0000 *
	6	0.0000 *		6	0.0000 *
	7	0.0000 *		7	0.0450 *
	8	0.0000 *		8	0.0000 *
	2	1		0.0001 *	6
3		0.0000 *	2	0.0000 *	
4		0.0000 *	3	0.0000 *	
5		0.0353 *	4	0.0018 *	
6		0.0000 *	5	0.0000 *	
7		0.0390 *	7	0.0000 *	
8		0.0000 *	8	0.0370 *	
3		1	0.0460 *	7	
	2	0.0000 *	2		0.0390 *
	4	0.0000 *	3		0.0000 *
	5	0.0000 *	4		0.0000 *
	6	0.0000 *	5		0.0450 *
	7	0.0000 *	6		0.0000 *
	8	0.0000 *	8		0.0000 *
	4	1	0.0000 *		8
2		0.0000 *	2	0.0000 *	
3		0.0000 *	3	0.0000 *	
5		0.0000 *	4	0.0179 *	
6		0.0018 *	5	0.0000 *	
7		0.0000 *	6	0.0370 *	
8		0.0179 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.

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Table 55 Analysis of variance comparing the tensile strength of film No.1-8

Source	Sum of Squares	df	Mean Square	F	Sig.	p-value
Between Groups	1453.645	7	207.664	52.987	0.0000	0.05
Within Groups	125.413	32	3.919			
Total	1579.058	39				

Table 56 LSD of the tensile strength of film No.1-8

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0360 *	5	1	0.0380 *
	3	0.0000 *		2	0.0460 *
	4	0.0490 *		3	0.0000 *
	5	0.0380 *		4	0.0021 *
	6	0.0000 *		6	0.0000 *
	7	0.0000 *		7	0.0000 *
	8	0.0380 *		8	0.0200 *
	2	1		0.0360 *	6
3		0.0000 *	2	0.0000 *	
4		0.0064 *	3	0.0000 *	
5		0.0460 *	4	0.0000 *	
6		0.0000 *	5	0.0000 *	
7		0.0000 *	7	0.0210 *	
8		0.0480 *	8	0.0000 *	
3		1	0.0000 *	7	
	2	0.0000 *	2		0.0000 *
	4	0.0000 *	3		0.0000 *
	5	0.0000 *	4		0.0000 *
	6	0.0000 *	5		0.0000 *
	7	0.0000 *	6		0.0210 *
	8	0.0000 *	8		0.0000 *
	4	1	0.0490 *		8
2		0.0064 *	2	0.0480 *	
3		0.0000 *	3	0.0000 *	
5		0.0021 *	4	0.0470 *	
6		0.0000 *	5	0.0200 *	
7		0.0000 *	6	0.0000 *	
8		0.0470 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.

Table 57 Analysis of variance comparing the % elongation of film No.1-8

Source	Sum of Squares	df	Mean Square	F	Sig.	p-value
Between Groups	6661.597	7	951.657	267.625	0.0000	0.05
Within Groups	113.790	32	3.556			
Total	6775.387	39				

Table 58 LSD of the % elongation of film No.1-8

Film No.	Film No.	Sig.	Film No.	Film No.	Sig.
1	2	0.0000 *	5	1	0.0000 *
	3	0.0000 *		2	0.0000 *
	4	0.0000 *		3	0.0000 *
	5	0.0000 *		4	0.0000 *
	6	0.0000 *		6	0.0470 *
	7	0.0000 *		7	0.0000 *
	8	0.0006 *		8	0.0000 *
	2	1		0.0000 *	6
3		0.0000 *	2	0.0000 *	
4		0.0000 *	3	0.0000 *	
5		0.0000 *	4	0.0000 *	
6		0.0000 *	5	0.0470 *	
7		0.0002 *	7	0.0000 *	
8		0.0490 *	8	0.0000 *	
3		1	0.0000 *	7	
	2	0.0000 *	2		0.0002 *
	4	0.0011 *	3		0.0000 *
	5	0.0000 *	4		0.0029 *
	6	0.0000 *	5		0.0000 *
	7	0.0000 *	6		0.0000 *
	8	0.0000 *	8		0.0000 *
	4	1	0.0000 *		8
2		0.0000 *	2	0.0490 *	
3		0.0011 *	3	0.0000 *	
5		0.0000 *	4	0.0000 *	
6		0.0000 *	5	0.0000 *	
7		0.0029 *	6	0.0000 *	
8		0.0000 *	7	0.0000 *	

\* The mean difference is significant at the 0.05 level.

Table 59 Analysis of variance comparing the curing rate in subject group No.1-4

Source	Sum of Squares	df	Mean Square	F	Sig.	p-value
Between Groups	1.134	3	0.378	47.498	0.0000	0.05
Within Groups	0.541	68	0.0079			
Total	1.675	71				

Table 60 LSD of the curing rate in subject group No.1-4

Group No.	Group No.	Sig.
1	2	0.0000 *
	3	0.0000 *
	4	0.0000 *
2	1	0.0000 *
	3	0.0600
	4	0.1400
3	1	0.0000 *
	2	0.0600
	4	0.5770
4	1	0.0000 *
	2	0.1400
	3	0.5770

\* The mean difference is significant at the 0.05 level.

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Table 61 Analysis of variance comparing the time periods for ulcer disappearance of subject group No.1-4

Source	Sum of Squares	df	Mean Square	F	Sig.	p-value
Between Groups	30.278	3	10.093	10.451	0.0000	0.05
Within Groups	65.667	68	0.966			
Total	95.944	71				

Table 62 LSD test of the time periods for ulcer disappearance of subject group No.1-4

Group No.	Group No.	Sig.
1	2	0.0050 *
	3	0.0000 *
	4	0.0000 *
2	1	0.0050 *
	3	0.046 *
	4	0.0660
3	1	0.0000 *
	2	0.0460 *
	4	0.8660
4	1	0.0000 *
	2	0.0660
	3	0.8660

\* The mean difference is significant at the 0.05 level.

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Table 63 Analysis of variance comparing the the *in vivo* residence time of subject group No.1-4

Source	Sum of Squares	df	Mean Square	F	Sig.	p-value
Between Groups	235.148	2	117.574	2.969	0.0600	0.05
Within Groups	2019.667	51	39.601			
Total	2254.815	53				

Table 64 LSD of the the *in vivo* residence time of subject group No.1-4

Group No.	Group No.	Sig.	
2	3	0.2389	NS
	4	0.0510	NS
3	2	0.2389	NS
	4	0.2189	NS
4	2	0.0510	NS
	3	0.2189	NS

NS = The mean difference is non-significant at the 0.05 level.

Subject	Group1		Group2		Group3		Group4	
	Initial size (mm)	Time periods for ulcer disappearance (day)	Initial size (mm)	Time periods for ulcer disappearance (day)	Initial size (mm)	Time periods for ulcer disappearance (day)	Initial size (mm)	Time periods for ulcer disappearance (day)
1	3.5	7	3.5	5	5.5	6	3.5	5
2	4.5	7	3.0	4	2.0	3	5.0	7
3	2.0	7	5.0	7	1.0	4	4.0	5
4	3.0	7	4.5	7	3.0	4	4.0	5
5	2.5	6	2.5	3	3.5	4	4.0	5
6	2.0	7	4.0	7	3.0	6	2.0	4
7	2.0	4	3.5	5	3.0	5	3.0	5
8	2.0	5	3.5	5	2.0	3	4.0	5
9	2.5	7	5.0	7	5.0	6	4.0	5
10	2.5	7	3.5	6	4.0	6	3.0	4
11	2.5	7	3.5	5	4.0	6	4.0	7
12	2.5	6	2.5	5	4.0	6	3.0	4
13	3.0	7	4.5	7	3.5	5	3.5	5
14	2.5	7	3.0	5	3.5	5	3.0	5
15	2.5	6	3.5	6	3.0	4	3.5	5
16	3.0	7	4.0	6	4.0	5	3.5	5
17	2.5	7	3.0	5	3.5	5	3.0	4
18	2.5	6	3.5	5	3.5	5	3.5	4

## APPENDIX V

### Pre-test Basic Information of Subjects

Table 65 The age range of 72 subjects

Age	Number of subjects
15-20	10
21-25	40
26-35	12
36-45	10

Table 66 The frequency of incident in 72 subjects

Frequency of incident	Number of subjects
Weekly	8
2-3 week/incident	12
Monthly	18
2-3 month/incident	25
2-3 incidents/year	2
Once a year	1
Unpredictable	6

Table 67 The etiology of aphthous stomatitis in 72 subjects

Etiology	Number of subjects
Sleeplessness	17
Stress	35
Menstruation	10
No cause	10

Table 68 The treatment of aphthous stomatitis in 72 subjects

Treatment	Number of subjects
None of treatment	14
Herbal medicine	8
Mounthwash	5
Kenalog <sup>®</sup> orabase	20
Trinolone <sup>®</sup>	16
Sore Mounth Gel	7
Antibiotic drug	2



## APPENDIX VI

## The Questionnaire of Sensory Analysis test

แบบสอบถามการใช้แผ่นฟิล์มปิดเยื่อเมือกช่องปากจากเจลเปลือกทุเรียน

ชื่อ _____	นามสกุล _____
อายุ _____ ปี	
ที่อยู่ _____	
เบอร์โทรศัพท์ที่ติดต่อได้สะดวก _____	
วันที่เริ่มการทดลอง _____	วันที่สิ้นสุดการทดลอง _____

ได้รับผลิตภัณฑ์หมายเลข \_\_\_\_\_

## ส่วนที่ 1

เพศ  ชาย  หญิง

เคยเป็นแผลร้อนในในปากหรือไม่  เคย  ไม่เคย

ทุกสัปดาห์

2-3 สัปดาห์ต่อครั้ง

เดือนละครั้ง

2-3 เดือนต่อครั้ง

ปีละ 2-3 ครั้ง

ทุกปี

ไม่แน่นอน

ท่านคิดว่าสาเหตุของการเป็นแผลในปากคือ

พักผ่อนไม่เพียงพอ

เครียด

มีประจำเดือน

ไม่ทราบสาเหตุ

## วิธีการรักษาที่เคยใช้

- ปล่อยให้หายเอง                       ใช้ผลิตภัณฑ์สมุนไพรม                       ใช้น้ำยาบ้วนปาก  
 ใช้ผลิตภัณฑ์เจล                       ใช้ Kenalog® in orabase                       ใช้ไตรโนโลน®  
 ใช้น้ำยาแก้อักเสบ

## ส่วนที่ 2 ประเมินผลิตภัณฑ์

คำถาม	ความพอใจในผลิตภัณฑ์			
	0 ไม่มี	1 น้อย	2 ปานกลาง	3 มาก
ความพอใจในรสชาติ				
ความสะดวกในการใช้ผลิตภัณฑ์				
ความรู้สึกระคายเคืองหรือรำคาญเมื่อใช้ผลิตภัณฑ์ในช่องปาก				
ความพึงพอใจในผลิตภัณฑ์ภายหลังการใช้				

หากมีผลิตภัณฑ์รูปแบบนี้ในท้องตลาดจะซื้อหรือไม่     ซื้อ                       ไม่ซื้อ

ข้อเสนอแนะเพิ่มเติม \_\_\_\_\_

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## VITA

Miss Radaduen Tinmanee was born on February 2, 1981 in Bangkok, Thailand. She completed her BSc in pharmacy from the Faculty of Pharmacy, Silpakorn University in 2003. She took a master's degree in pharmacy at Chulalongkorn University since 2003.



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