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APPENDICES

Appendix A

Calibration Curves

The absorbance concentration relationship of propranolol HCl in pH 1.5 buffer solution, at 318.7 nm., in pH 6.8 buffer solution, at 318.7 nm., and in methanol, at 289.1 nm. are presented in Table 27, 28, and 29, respectively. The calibration curves of propranolol HCl after regression analysis are illustrated in Figure 43, 44, and 45, respectively.

The relationship between the concentration of propranolol HCl and the peak area ratio of propranolol HCl to pindolol in water: acetonitrile (650:350) is presented in Table 30 and illustrated in Figure 46. The chromatograms are also illustrated.

Table 27 Absorbance Concentration Relationship of Propranolol HCl in pH 1.5 Buffer Solution, at 318.7 nm.

Concentration (μg/mL.)	Absorbance
0.00	0.000
26.88	0.171
53.76	0.335
80.64	0.501
107.52	0.661
134.40	0.823
161.28	0.989

Table 28 Absorbance Concentration Relationship of Propranolol HCl in pH 6.8 Buffer Solution, at 318.7 nm.

Concentration (μg/mL.)	Absorbance
0.00	0.000
25.10	0.165
50.20	0.321
75.30	0.481
100.40	0.636
125.50	0.795
150.60	0.948

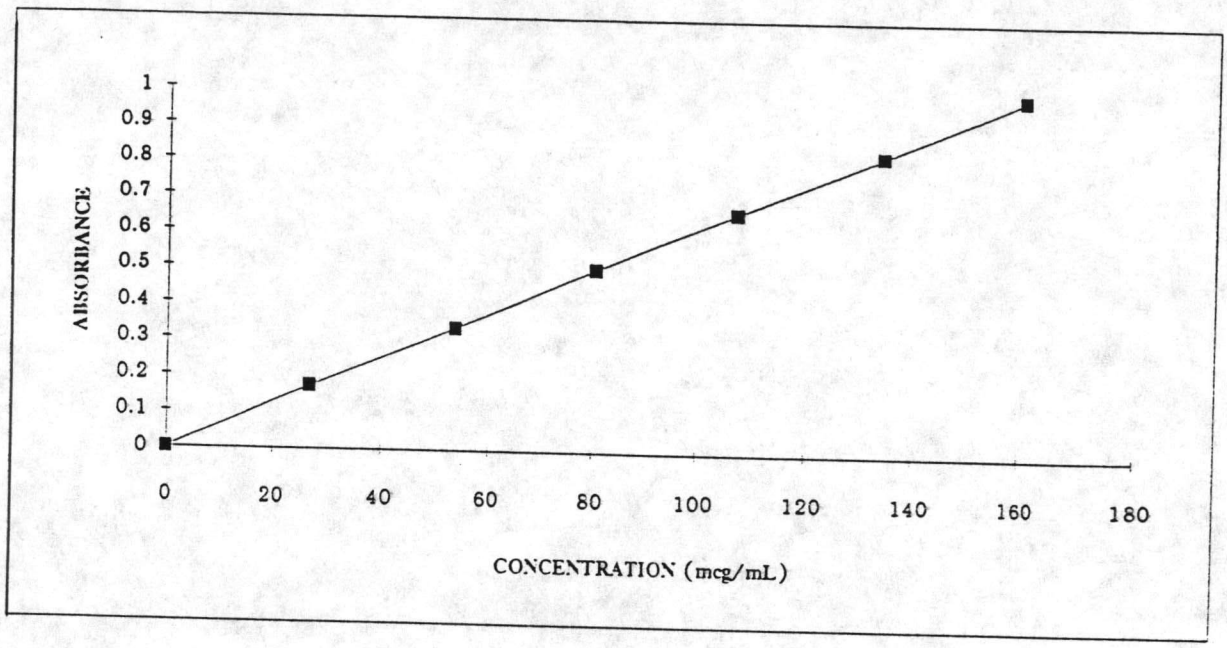

Figure 43 Absorbance concentration relationship of propranolol HCl in pH 1.5 buffer solution, at 318.7 nm

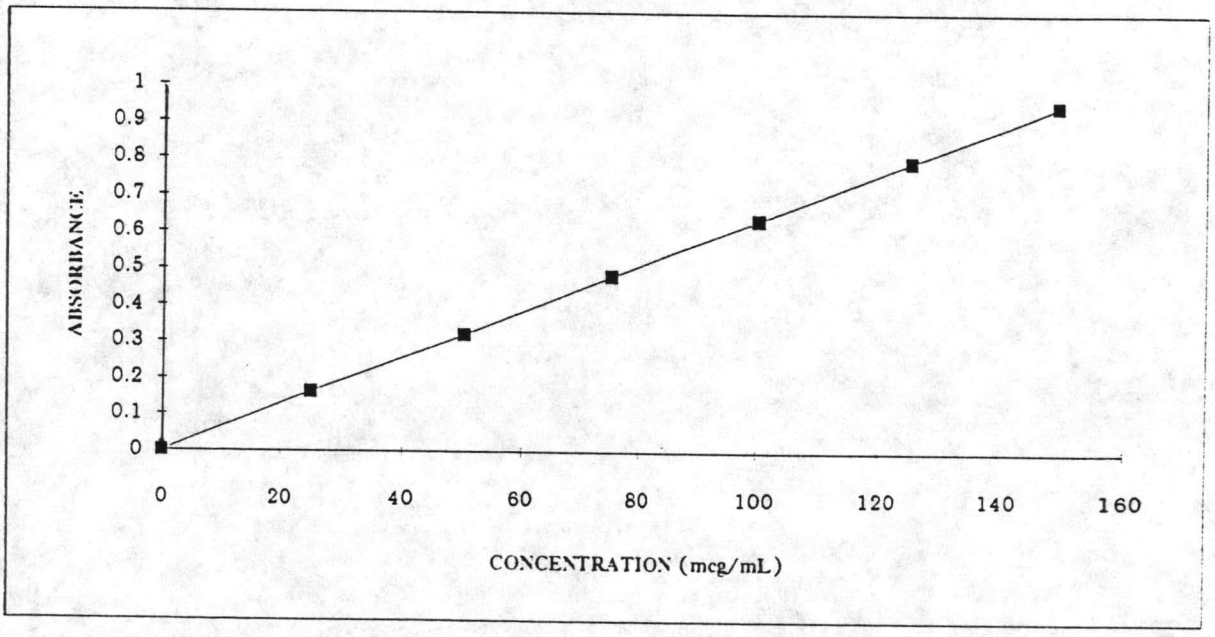

Figure 44 Absorbance concentration relationship of propranolol HCl in pH 6.8 buffer solution, at 318.7 nm

Table 29 Absorbance Concentration Relationship of Propranolol HCl in Methanol, at 289.1 nm.

Concentration (μg/mL.)	Absorbance
0.00	0.000
8.16	0.166
16.32	0.336
24.48	0.505
32.64	0.669
40.80	0.827

Table 30 Relationship between Concentration of Propranolol HCl and the Peak Area Ratio of Propranolol HCl to Pindolol in 650 : 350 Water : Acetonitrile

Concentration (μg/mL.)	Peak Area Ratio
0.00	0.000
5.20	2.219
10.41	4.253
15.62	6.438
20.82	8.888
26.02	10.971

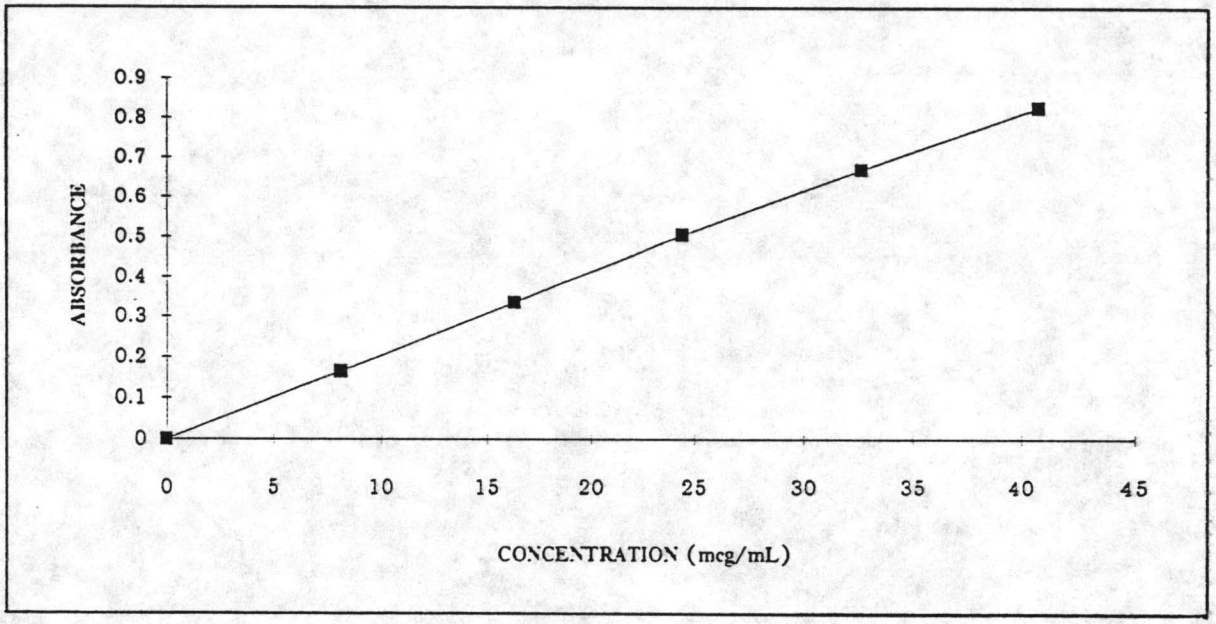

Figure 45 Absorbance concentration relationship of propranolol HCl in methanol, at 289.1 nm

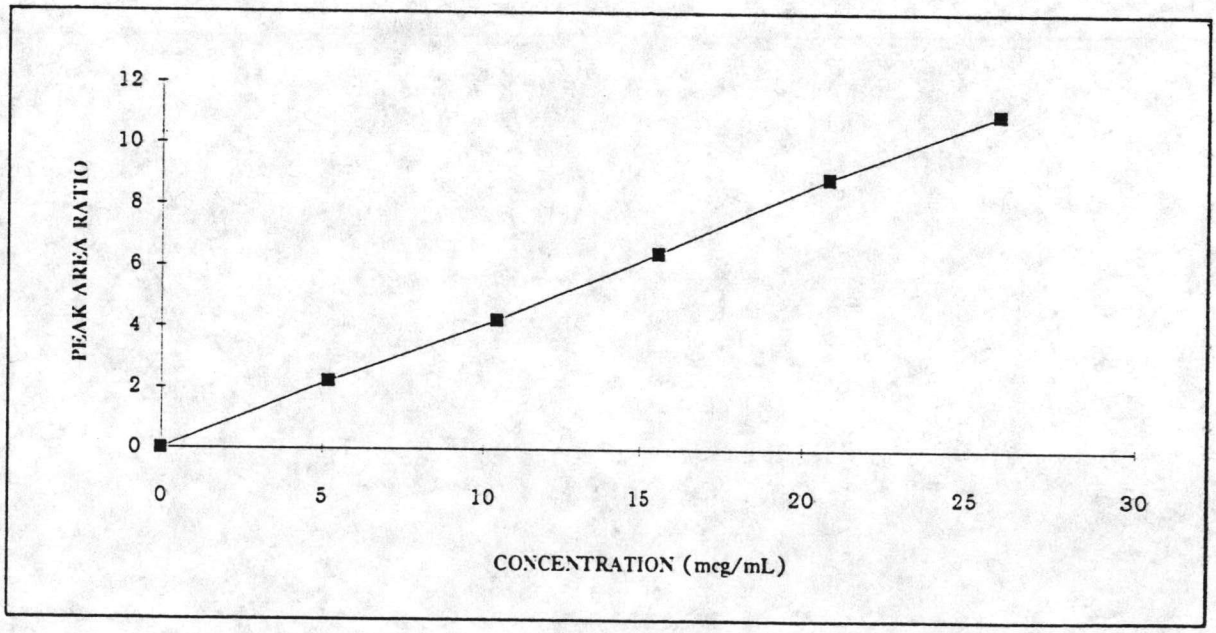

Figure 46 Relationship between concentration of propranolol HCl and the peak area ratio of propranolol HCl to pindolol in 650: 350 water:acetonitrile

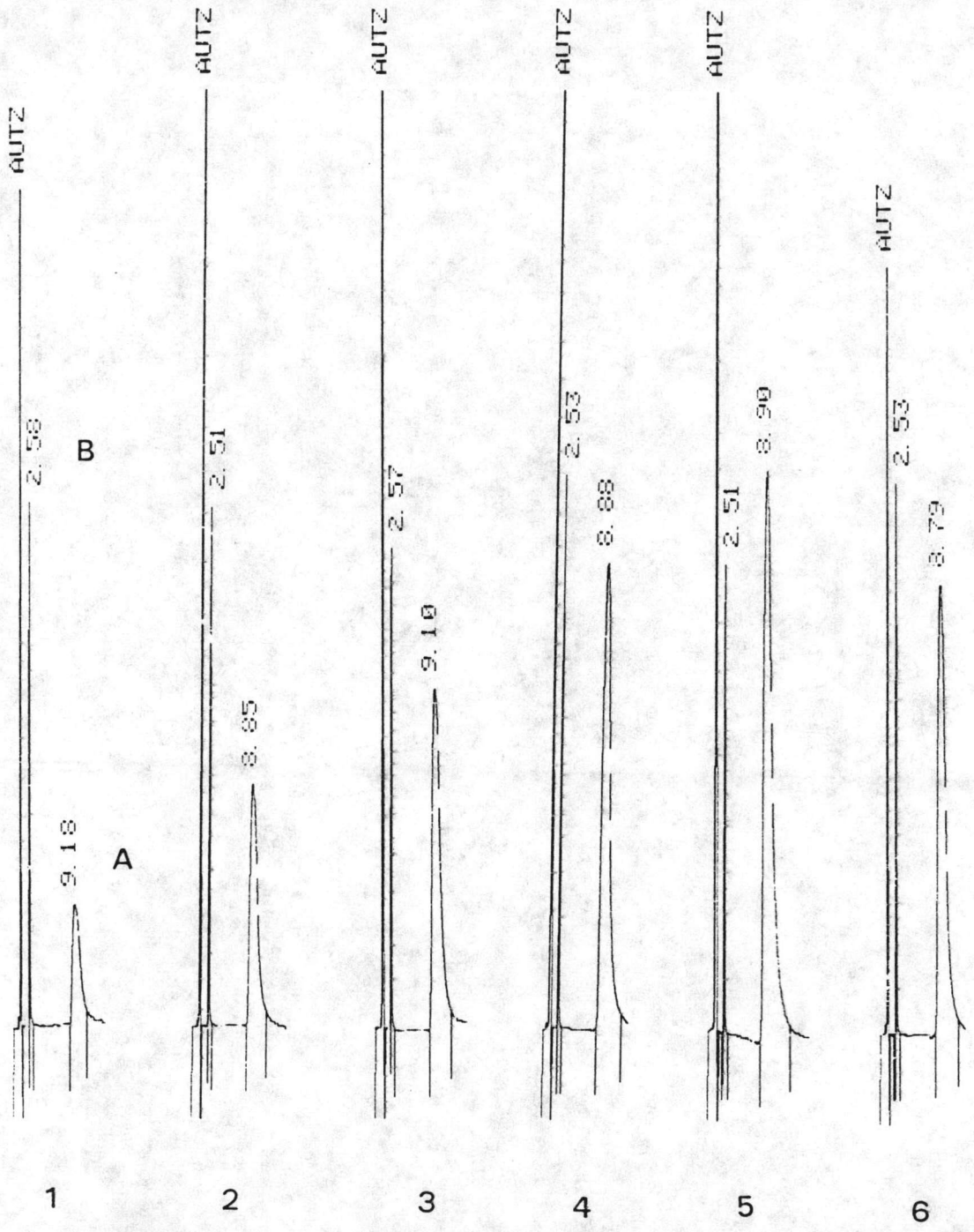

Figure 47 Typical chromatograms of propranolol HCl (A) and pindolol (B) as an internal standard, in calibration curve preparation (1-5) and samples preparation (6)

Appendix B

Rheological Properties of Film Coating Formulations Containing Water-soluble Film Formers

A large number of pharmaceutical products, for example, liquid dispersions of natural and synthetic gums, including the film coating formulations of both chitosan and cellulose derivatives in the present investigation, mostly exhibit pseudoplastic flow (Martin 1993). To compare between differrent pseudoplastic systems, the exponential formula,

$$F^N = n'.G \qquad (5)$$

has been used most frequently, in which F is defined as the shearing stress and G as the rate of shear. The exponent N rises as the flow becomes increasingly non-Newtonian. The term n' is a vicosity coefficient. Following rearrangement, equation (5) may be written in the logarithmic form:

$$\log G = N \log F - \log n' \qquad (6)$$

which is an equation for a straight line of slope N and intercept of log n' on the log G axis. These parameters could be obtained for different concentrations of a polymer in the solution. If a correlation between log n' and concentration could be established, the flow properties of a solution of any other concentration could be calculated.

Table 31 Relationship between the Rate of Shear and the Shearing Stress of 3% w/w Chitosan Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.537	0.441	9.352	0.418	9.528	0.400
19.760	0.763	19.760	0.812	19.770	0.815
29.650	1.102	29.690	1.102	29.600	1.140
39.720	1.505	39.720	1.540	39.720	1.551
49.710	1.766	49.660	1.862	49.750	1.975
59.430	2.111	59.520	2.210	59.430	2.366
69.500	2.633	69.550	2.709	69.550	2.856
79.710	2.970	79.710	3.074	79.710	3.347
89.780	3.576	89.740	3.541	89.820	3.753
99.500	3.776	99.590	3.721	99.590	3.953
109.700	4.304	109.700	4.173	109.700	4.393
119.700	4.666	119.800	4.712	119.700	4.971
129.900	5.324	129.500	5.214	129.900	5.336
139.500	5.919	139.600	5.646	139.600	5.884
149.800	6.052	149.800	5.948	149.800	6.322
159.900	6.682	159.900	6.339	159.900	6.679
170.000	6.992	169.700	6.809	169.700	7.140
179.700	7.462	179.700	7.557	179.700	7.871
189.800	7.888	189.900	7.943	189.900	8.300
199.900	8.500	199.700	8.439	199.900	8.555

Table 32 Relationship between the Rate of Shear and the Shearing Stress of 4% w/v Chitosan Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.532	0.780	9.528	0.940	9.523	1.021
19.740	1.699	19.780	1.836	19.740	1.798
29.650	2.479	29.560	2.769	29.560	2.729
39.720	3.297	39.720	3.538	39.720	3.703
49.660	4.324	49.710	4.683	49.750	4.852
59.470	5.304	59.470	5.678	59.520	5.980
69.550	6.319	69.550	6.447	69.550	6.966
79.710	7.479	79.710	7.575	79.710	8.134
89.820	8.471	89.740	8.509	89.820	9.300
99.590	9.059	99.500	9.779	99.590	10.500
109.700	9.886	109.700	10.760	109.700	11.280
119.800	10.990	119.700	11.810	119.800	12.280
129.500	11.680	129.900	12.660	129.500	13.090
139.600	12.490	139.500	13.570	139.600	14.220
149.800	13.460	149.700	14.940	149.800	15.490
159.900	14.280	159.900	15.820	159.900	16.510
169.700	15.180	169.700	16.700	169.800	17.570
179.700	16.390	179.900	17.520	180.000	18.300
189.900	17.250	189.900	18.590	189.900	19.340
199.900	18.010	199.900	19.600	199.900	20.530

Table 33 Relationship between the Rate of Shear and the Shearing Stress of 5% w/w Chitosan Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.545	1.702	9.541	1.833	9.541	1.856
19.770	3.257	19.780	3.431	19.760	3.706
29.650	4.782	29.650	5.049	29.560	5.600
39.720	6.850	39.720	7.122	39.720	7.987
49.750	8.598	49.710	8.865	49.710	9.953
59.520	10.450	59.470	10.730	59.520	12.040
69.550	12.420	69.550	12.710	69.590	14.310
79.710	14.030	79.710	14.460	79.710	16.110
89.780	15.850	89.820	16.450	89.690	17.980
99.630	17.630	99.810	18.440	99.720	19.920
109.700	19.460	109.800	20.360	109.700	22.040
119.700	21.050	119.800	21.950	119.700	23.810
129.700	23.110	129.900	24.160	129.700	26.010
139.800	24.740	139.500	25.780	139.800	27.980
150.000	26.240	149.700	27.550	149.600	29.640
159.700	28.390	159.800	29.640	159.600	31.840
169.700	29.960	169.800	31.320	169.700	33.670
179.700	31.700	179.800	33.030	179.700	35.760
189.800	33.260	189.800	34.650	189.800	37.500
199.800	35.180	199.800	36.770	199.800	39.610

Table 34 Relationship between the Rate of Shear and the Shearing Stress of 6% w/w Chitosan Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.550	3.059	9.559	3.799	9.537	3.610
19.790	6.113	19.790	7.360	19.780	7.647
29.650	9.057	29.560	11.100	29.690	11.440
39.720	12.640	39.590	15.310	39.770	15.440
49.750	15.670	49.750	18.910	49.790	18.820
59.520	18.730	59.780	22.620	59.470	22.330
69.500	22.070	69.500	26.590	69.460	26.330
79.660	24.910	79.570	30.070	79.660	30.010
89.690	28.070	89.560	33.730	89.690	33.780
99.720	31.350	99.630	37.610	99.770	36.830
109.800	34.480	109.700	41.320	109.700	40.570
119.800	37.440	119.700	44.800	119.800	44.080
129.800	40.890	129.700	48.890	129.800	47.620
139.800	43.670	139.700	52.140	139.500	51.360
150.000	46.460	149.800	55.560	149.600	54.660
159.700	49.940	159.900	59.330	159.700	58.170
169.700	52.750	169.900	62.760	169.700	61.740
179.700	55.740	180.000	66.580	179.700	65.480
189.700	58.520	189.900	70.030	189.800	69.140
199.800	61.860	199.900	73.600	199.800	72.500

Table 35 Relationship between the Rate of Shear and the Shearing Stress of 7% w/w Chitosan Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.532	6.073	9.532	6.577	9.541	6.754
19.780	12.190	19.780	12.910	19.800	13.840
29.690	18.120	29.650	19.980	29.690	20.790
39.720	24.820	39.630	26.710	39.680	27.780
49.750	30.330	49.710	33.200	49.750	33.900
59.780	36.190	59.690	39.900	59.690	40.570
69.770	42.720	69.680	46.540	69.720	47.590
79.570	47.990	79.790	52.900	79.530	53.820
89.560	53.740	89.820	59.160	89.600	60.320
99.630	59.770	99.500	65.370	99.500	66.320
109.600	65.510	109.500	71.570	109.600	72.790
119.600	71.170	119.600	77.690	119.600	79.020
129.600	77.170	129.600	84.160	129.700	85.400
139.700	82.360	139.600	89.900	139.800	91.520
149.900	87.640	149.800	95.790	149.900	97.500
159.900	93.380	159.900	102.200	159.900	103.600
169.900	98.690	169.800	108.000	169.900	109.600
180.000	104.400	180.000	114.300	180.000	115.800
190.000	109.800	189.900	119.700	189.900	122.000
199.700	115.100	199.900	125.600	200.000	127.700

Table 36 Relationship between the Rate of Shear and the Shearing Stress of 3% w/w Hydroxypropyl Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.554	0.267	9.576	0.160	9.532	0.133
19.770	0.447	19.760	0.342	19.750	0.334
29.650	0.624	29.650	0.531	29.600	0.493
39.810	0.795	39.720	0.676	39.680	0.719
49.880	0.974	49.750	0.858	49.750	0.885
59.520	1.143	59.430	1.070	59.470	1.116
69.680	1.360	69.590	1.351	69.550	1.435
79.790	1.551	79.710	1.557	79.660	1.670
89.520	1.769	89.820	1.798	89.740	1.928
99.630	1.963	99.590	1.963	99.500	2.082
109.800	2.242	109.700	2.247	109.700	2.419
119.500	2.329	119.800	2.366	119.700	2.508
129.600	2.613	129.900	2.691	129.800	2.920
139.700	2.813	139.600	2.987	139.600	3.222
149.900	2.885	149.900	2.999	149.700	3.257
159.700	3.268	159.900	3.306	159.900	3.579
169.800	3.494	169.700	3.579	170.000	3.787
179.900	3.738	179.700	4.031	179.700	4.309
190.000	4.005	189.900	4.356	189.800	4.550
199.800	4.260	199.600	4.666	199.900	4.872

Table 37 Relationship between the Rate of Shear and the Shearing Stress of 4% w/w Hydroxypropyl Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.589	0.284	9.598	0.403	9.532	0.374
19.760	0.783	19.770	0.873	19.760	0.882
29.690	1.279	29.650	1.305	29.690	1.401
39.770	1.636	39.720	1.920	39.720	1.725
49.710	2.320	49.750	2.233	49.750	2.430
59.470	2.810	59.470	2.711	59.520	2.929
69.550	3.138	69.550	3.474	69.550	3.184
79.710	3.938	79.710	3.851	79.710	3.860
89.780	4.335	89.820	4.553	89.780	4.289
99.680	4.915	99.630	4.982	99.590	4.982
109.700	5.385	109.700	5.626	109.700	5.455
119.700	6.177	119.800	5.939	119.800	6.258
129.900	6.481	129.500	6.905	129.900	6.566
139.500	6.972	139.600	7.470	139.600	7.006
149.800	7.868	149.800	7.673	149.800	8.033
159.900	8.245	159.900	8.436	159.900	8.468
169.800	8.761	169.800	8.999	169.700	9.019
179.700	9.338	179.700	9.744	179.700	9.407
189.900	9.895	189.900	10.260	189.900	10.080
199.900	10.370	199.900	10.900	199.900	10.650

Table 38 Relationship between the Rate of Shear and the Shearing Stress of 5% w/w Hydroxypropyl Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.585	0.908	9.523	1.000	9.541	1.000
19.760	1.763	19.760	1.955	19.760	2.134
29.650	2.627	29.690	2.903	29.650	3.088
39.720	3.813	39.720	4.312	39.720	4.289
49.750	4.649	49.750	5.278	49.750	5.333
59.520	5.739	59.520	6.461	59.520	6.618
69.550	7.024	69.590	7.847	69.550	8.317
79.710	7.911	79.710	8.842	79.710	9.225
89.820	9.152	89.820	10.220	89.820	10.370
99.630	10.420	99.630	11.490	99.590	11.150
109.700	11.580	109.700	12.770	109.700	12.380
119.800	12.310	119.800	13.580	119.800	13.560
129.600	13.600	129.900	15.100	129.900	14.900
139.700	14.760	139.600	16.180	139.600	16.210
149.800	15.530	149.700	17.140	149.800	17.140
159.600	16.930	159.700	18.470	159.900	18.410
169.700	17.860	169.800	19.490	169.900	19.570
179.700	18.650	179.800	20.440	180.000	21.230
189.800	19.720	189.900	21.550	189.900	22.390
199.800	21.080	199.900	23.030	199.700	23.550

Table 39 Relationship between the Rate of Shear and the Shearing Stress of 6% w/w Hydroxypropyl Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.611	1.859	9.537	2.053	9.532	2.134
19.780	3.709	19.770	3.944	19.770	4.005
29.690	5.420	29.650	5.881	29.650	6.009
39.720	7.807	39.770	8.459	39.720	8.662
49.750	9.518	49.710	10.310	49.660	10.590
59.520	11.630	59.520	12.510	59.520	12.890
69.550	14.200	69.550	15.220	69.550	15.510
79.710	15.990	79.840	17.200	79.790	17.520
89.600	18.180	89.870	19.660	89.870	20.040
99.500	20.360	99.630	21.890	99.550	22.420
109.500	22.620	109.600	24.240	109.500	24.710
119.700	24.330	119.600	26.100	119.600	26.770
129.700	26.820	129.600	28.650	129.600	29.230
139.700	28.880	139.600	30.860	139.600	31.440
149.900	30.510	149.800	32.710	149.800	33.490
159.900	32.910	159.900	35.320	159.800	36.050
169.900	34.770	169.900	37.350	170.000	38.130
180.000	37.060	180.000	39.500	180.000	40.220
190.000	39.000	189.900	41.640	189.900	42.310
199.600	41.010	199.700	43.820	199.900	44.890

Table 40 Relationship between the Rate of Shear and the Shearing Stress of 7% w/w Hydroxypropyl Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.541	3.532	9.541	3.642	9.559	3.637
19.770	6.583	19.780	7.285	19.770	7.528
29.650	10.540	29.690	11.480	29.650	11.520
39.770	14.240	39.720	15.080	39.720	15.160
49.880	18.070	49.790	19.310	49.880	19.490
59.520	21.490	59.520	23.030	59.520	23.170
69.550	24.970	69.550	26.390	69.550	26.740
79.660	28.420	79.660	30.650	79.620	31.000
89.690	31.960	89.690	34.250	89.690	34.680
99.770	36.050	99.770	38.050	99.720	38.310
109.800	39.500	109.800	41.730	109.800	42.050
119.900	42.890	119.800	45.820	119.800	46.310
129.900	46.430	129.900	49.040	129.900	49.650
139.500	49.590	139.500	52.750	139.600	53.560
149.600	53.480	150.000	57.130	149.800	57.390
159.700	56.780	159.700	60.150	159.800	60.930
169.700	60.460	169.800	64.090	169.800	64.870
179.800	63.540	179.700	67.920	179.900	69.080
189.800	67.080	189.800	71.770	190.000	72.910
199.800	70.470	199.800	75.080	199.900	76.360

Table 41 Relationship between the Rate of Shear and the Shearing Stress of 3% w/w Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.532	0.328	9.541	0.212	9.545	0.296
19.760	0.684	19.760	0.519	19.760	0.624
29.520	0.937	29.650	0.847	29.600	1.076
39.720	1.276	39.720	1.160	39.720	1.195
49.620	1.476	49.660	1.462	49.660	1.827
59.430	1.749	59.380	1.836	59.430	2.259
69.500	2.355	69.500	2.178	69.460	2.230
79.620	2.540	79.710	2.332	79.660	2.668
89.690	3.001	89.740	2.755	89.780	2.909
99.500	3.048	99.410	3.454	99.500	3.764
109.700	3.567	109.700	3.726	109.700	4.008
119.700	3.590	119.700	3.956	119.700	4.591
129.900	4.393	129.900	4.388	129.500	4.422
139.500	4.817	139.500	4.544	139.500	4.762
149.700	4.704	149.700	5.104	149.800	5.759
159.800	5.411	159.800	5.522	159.900	5.954
169.900	5.461	169.900	5.832	169.600	6.319
179.600	5.820	179.700	5.640	179.700	6.450
189.700	6.075	189.800	5.986	189.800	6.925
199.900	6.980	199.900	6.560	199.900	7.082

Table 42 Relationship between the Rate of Shear and the Shearing Stress of 4% w/w Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.545	0.740	9.545	0.928	9.532	0.887
19.760	1.630	19.760	1.720	19.780	1.450
29.650	2.575	29.600	2.685	29.650	2.210
39.630	2.990	39.720	3.358	39.720	3.260
49.620	4.333	49.710	4.663	49.660	3.776
59.430	5.168	59.470	5.669	59.470	4.634
69.500	5.429	69.500	5.994	69.500	5.849
79.620	6.771	79.620	7.108	79.710	6.281
89.740	7.233	89.740	7.757	89.780	7.430
99.550	8.294	99.460	9.425	99.630	8.685
109.600	8.857	109.700	10.150	109.700	9.550
119.700	10.340	119.600	11.320	119.800	9.831
129.500	10.350	129.900	11.890	129.500	10.990
139.600	11.120	139.600	12.330	139.500	11.870
149.800	12.660	149.800	13.940	149.800	12.480
159.900	13.040	159.900	14.620	159.900	13.550
169.700	13.730	169.600	15.390	169.700	14.340
179.600	14.720	179.700	15.670	179.700	14.470
189.800	15.600	189.900	16.500	189.800	15.250
199.900	15.770	199.900	17.370	199.900	16.600

Table 43 Relationship between the Rate of Shear and the Shearing Stress of 5% w/v Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.528	1.940	9.541	2.645	9.545	2.685
19.780	3.895	19.780	4.405	19.770	5.089
29.650	5.397	29.600	6.394	29.650	7.891
39.720	7.853	39.720	8.839	39.680	9.570
49.660	8.874	49.660	10.600	49.660	12.930
59.430	10.540	59.470	12.660	59.430	15.170
69.500	13.170	69.500	14.990	69.680	16.360
79.710	14.220	79.570	16.310	79.490	19.430
89.740	16.500	89.780	18.410	89.470	21.110
99.720	17.630	99.500	20.940	99.550	23.080
109.800	19.630	109.500	22.590	109.600	24.680
119.800	20.470	119.600	23.900	119.700	27.490
129.800	23.000	129.600	25.610	129.600	28.540
139.500	24.450	139.700	27.320	139.700	30.360
149.600	25.460	149.800	28.940	149.800	33.150
159.700	27.380	159.800	30.650	159.900	34.540
169.700	28.740	169.800	32.220	169.800	36.660
179.700	29.700	179.900	33.030	179.900	38.370
189.700	31.000	189.900	34.570	189.900	40.340
199.800	33.090	199.700	35.900	199.700	42.140

Table 44 Relationship between the Rate of Shear and the Shearing Stress of 6% w/w Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.554	6.215	9.550	8.410	9.537	7.453
19.780	12.410	19.770	16.110	19.760	12.200
29.650	16.530	29.650	21.840	29.690	18.070
39.720	21.920	39.590	27.200	39.720	22.420
49.710	24.880	49.530	31.380	49.710	27.870
59.690	28.800	59.600	35.990	59.780	32.130
69.680	33.610	69.550	41.530	69.720	35.440
79.490	36.220	79.750	45.330	79.490	39.820
89.470	40.050	89.740	49.560	89.470	43.560
99.500	43.150	99.770	53.100	99.630	47.850
109.600	46.830	109.800	57.360	109.700	51.330
119.700	49.130	119.600	60.750	119.700	55.240
129.600	53.390	129.500	65.190	129.600	57.850
139.600	56.290	139.500	68.580	139.700	61.570
149.900	58.350	149.600	71.600	149.800	65.970
159.800	61.940	159.700	75.950	159.900	68.500
169.900	64.500	169.800	79.080	169.800	72.350
179.900	67.710	179.700	82.390	179.900	74.910
189.900	70.300	189.800	85.400	190.000	78.590
199.900	73.540	199.800	89.260	199.700	81.320

Table 45 Relationship between the Rate of Shear and the Shearing Stress of 7% w/v Methylcellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.554	14.460	9.545	15.030	9.629	18.560
19.810	27.090	19.790	25.110	19.790	30.590
29.560	35.350	29.560	33.900	29.560	42.170
39.590	44.020	39.590	42.690	39.590	50.630
49.530	50.490	49.570	49.010	49.570	60.150
59.650	57.390	59.650	55.770	59.520	68.120
69.590	64.610	69.500	62.930	69.550	74.620
79.710	70.440	79.710	68.380	79.710	82.740
89.740	76.820	89.690	75.050	89.740	89.090
99.850	81.580	99.900	80.820	99.770	96.160
109.900	87.350	109.900	87.060	109.800	102.300
119.500	92.450	119.500	91.750	119.800	109.100
129.500	98.830	129.500	97.350	129.900	114.300
139.500	104.300	139.600	102.800	139.500	119.800
149.700	108.300	149.700	108.200	149.600	125.800
159.700	114.200	159.700	113.200	159.600	131.300
169.800	118.800	169.800	118.500	169.700	136.800
179.800	123.600	179.800	122.600	179.700	142.600
189.900	128.200	189.900	127.700	189.800	147.900
199.900	133.400	199.900	132.600	199.800	152.800

Table 46 Relationship between the Rate of Shear and the Shearing Stress of 3% w/w Hydroxypropyl Cellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.607	0.000	9.523	0.009	9.523	0.003
19.770	0.067	19.750	0.142	19.760	0.139
29.600	0.168	29.600	0.244	29.560	0.249
39.720	0.290	39.680	0.334	39.680	0.339
49.710	0.363	49.660	0.368	49.620	0.487
59.520	0.473	59.380	0.473	59.430	0.597
69.550	0.615	69.500	0.682	69.500	0.679
79.710	0.690	79.660	0.783	79.660	0.771
89.470	0.771	89.740	0.870	89.740	0.850
99.590	0.902	99.460	0.902	99.500	1.021
109.700	1.032	109.700	1.006	109.700	1.148
119.800	1.096	119.700	1.157	119.700	1.230
129.500	1.276	129.800	1.238	129.800	1.337
139.500	1.340	139.600	1.328	139.500	1.464
149.800	1.412	149.800	1.551	149.800	1.633
159.900	1.473	159.800	1.601	159.800	1.752
169.600	1.659	169.600	1.746	169.900	1.865
179.700	1.862	179.700	1.859	179.700	1.876
189.800	1.955	189.900	2.004	189.800	1.978
199.600	2.082	199.900	2.042	199.800	2.230

Table 47 Relationship between the Rate of Shear and the Shearing Stress of 4% w/w Hydroxypropyl Cellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.581	0.119	9.532	0.165	9.537	0.200
19.760	0.281	19.740	0.426	19.760	0.400
29.560	0.522	29.650	0.664	29.560	0.612
39.720	0.728	39.720	0.835	39.720	0.777
49.660	0.861	49.660	1.096	49.660	0.980
59.430	1.035	59.430	1.285	59.380	1.183
69.500	1.351	69.500	1.522	69.500	1.485
79.710	1.485	79.660	1.865	79.660	1.650
89.780	1.778	89.740	2.013	89.740	1.978
99.500	1.859	99.500	2.288	99.460	2.218
109.700	2.097	109.700	2.497	109.600	2.482
119.700	2.329	119.600	2.868	119.700	2.613
129.800	2.549	129.800	2.970	129.800	3.022
139.500	2.816	139.500	3.219	139.500	3.265
149.700	2.941	149.700	3.721	149.700	3.294
159.800	3.100	159.900	3.898	159.800	3.747
169.900	3.416	169.800	4.289	169.800	3.828
179.600	3.819	179.700	4.408	179.700	4.211
189.800	4.002	189.700	4.727	189.700	4.466
199.900	4.077	199.900	4.901	199.800	5.046

Table 48 Relationship between the Rate of Shear and the Shearing Stress of 5% w/v Hydroxypropyl Cellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.554	0.415	9.528	0.377	9.528	0.531
19.770	0.850	19.750	0.879	19.750	1.009
29.650	1.180	29.560	1.325	29.520	1.464
39.720	1.595	39.720	1.653	39.630	1.966
49.660	1.998	49.710	2.256	49.660	2.375
59.430	2.395	59.430	2.659	59.380	2.885
69.500	2.871	69.500	2.993	69.500	3.523
79.660	3.399	79.710	3.587	79.710	3.956
89.740	3.813	89.780	3.918	89.780	4.556
99.500	4.034	99.550	4.652	99.500	5.182
109.600	4.504	109.700	5.081	109.600	5.791
119.700	5.118	119.700	5.655	119.700	6.093
129.800	5.530	129.900	6.070	129.800	6.887
139.500	6.099	139.500	6.418	139.500	7.438
149.700	6.554	149.800	7.235	149.700	7.795
159.900	6.963	159.800	7.728	159.800	8.564
170.000	7.792	169.900	8.262	169.700	9.260
179.700	8.245	179.700	8.509	179.700	9.390
189.800	8.967	189.800	9.106	189.800	9.909
199.900	9.521	199.900	9.616	199.900	10.810

Table 49 Relationship between the Rate of Shear and the Shearing Stress of 6% w/w Hydroxypropyl Cellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.532	0.748	9.550	0.792	9.541	0.783
19.750	1.482	19.780	1.482	19.760	1.502
29.560	2.201	29.600	2.218	29.560	2.262
39.680	3.028	39.680	3.132	39.680	3.071
49.660	3.680	49.620	3.779	49.710	3.715
59.520	4.379	59.430	4.550	59.430	4.480
69.550	5.388	69.500	5.681	69.500	5.516
79.660	6.142	79.710	6.392	79.710	6.281
89.780	7.111	89.740	7.401	89.820	7.215
99.500	7.560	99.550	7.963	99.500	7.720
109.700	8.509	109.700	8.946	109.600	8.677
119.800	9.242	119.700	9.706	119.700	9.526
129.900	10.260	129.900	10.770	129.900	10.520
139.600	11.190	139.600	11.660	139.500	11.510
149.800	11.640	149.800	12.250	149.700	11.930
159.900	12.630	159.900	13.220	159.800	12.970
169.700	13.510	169.700	14.120	170.000	13.620
179.700	14.550	179.700	15.020	179.700	14.830
189.900	15.330	189.900	15.840	189.800	15.590
199.900	16.220	199.900	16.760	199.900	16.550

Table 50 Relationship between the Rate of Shear and the Shearing Stress of 7% w/v Hydroxypropyl Cellulose Film Coating Formulations.

Test No.1		Test No.2		Test No.3	
Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)	Rate of Shear (1/S)	Shearing Stress (Pa)
9.594	1.224	9.589	1.380	9.581	1.464
19.740	2.500	19.780	2.665	19.780	2.822
29.650	3.552	29.650	3.932	29.650	4.364
39.720	4.826	39.720	5.379	39.720	5.742
49.710	6.041	49.710	6.676	49.660	7.436
59.430	7.288	59.470	8.033	59.430	8.880
69.500	8.706	69.500	9.628	69.500	10.470
79.710	10.040	79.710	11.060	79.710	12.210
89.740	11.410	89.820	12.520	89.820	13.720
99.550	12.290	99.630	13.600	99.550	14.980
109.700	13.600	109.700	15.040	109.700	16.540
119.700	14.950	119.700	16.470	119.600	18.180
129.900	16.290	129.500	18.010	129.600	19.720
139.800	17.490	139.500	19.400	139.600	21.170
149.900	18.850	149.600	20.470	149.700	22.740
159.900	19.950	159.800	22.130	159.800	24.160
169.900	21.290	169.800	23.320	169.800	25.720
179.600	22.820	179.900	25.030	179.900	27.490
189.700	23.980	189.900	26.300	189.900	28.970
199.700	25.430	199.900	27.720	199.600	30.540

Table 51 Viscosity Coefficient at Various Concentrations of Chitosan Film Coating Formulations.

	Concentration (% w/w)	Viscosity Coeficient
1	2.98	0.039
	3.00	0.039
	2.99	0.040
2	4.03	0.083
	4.03	0.093
	4.02	0.096
3	5.02	0.168
	5.03	0.177
	4.99	0.192
4	5.84	0.318
	6.04	0.398
	5.97	0.403
5	7.04	0.678
	7.03	0.727
	7.00	0.780

Table 52 Viscosity Coefficient at Various Concentrations of Hydroxypropyl Methylcellulose Film Coating Formulations.

	Concentration (% w/w)	Viscosity Coeficient
1	3.00 3.04 3.06	0.021 0.019 0.019
2	4.03 3.99 4.00	0.039 0.044 0.044
3	5.02 5.01 5.00	0.089 0.099 0.103
4	6.10 6.00 6.01	0.181 0.199 0.205
5	7.05 7.00 7.02	0.357 0.383 0.385

Table 53 Viscosity Coefficient at Various Concentrations of Methylcellulose Film Coating Formulations.

	Concentration (% w/w)	Viscosity Coeficient
1	3.04	0.032
	2.99	0.028
	3.20	0.033
2	4.01	0.081
	3.97	0.092
	3.93	0.080
3	4.99	0.215
	4.88	0.288
	5.06	0.320
4	6.06	1.153
	6.09	1.886
	6.00	1.256
5	7.02	4.948
	6.91	4.647
	7.02	7.319

Table 54 Viscosity Coefficient at Various Concentrations of Hydroxypropyl Cellulose Film Coating Formulations.

	Concentration (% w/w)	Viscosity Coeficient
1	3.02 3.00 3.02	0.011 0.011 0.011
2	4.04 4.01 3.97	0.018 0.022 0.021
3	5.01 5.06 5.05	0.041 0.042 0.051
4	6.02 6.05 5.99	0.075 0.076 0.076
5	7.04 6.99 7.01	0.123 0.137 0.146

Appendix C

Tablet Evaluations

The physical properties and the drug release characteristics of the propranolol HCl core tablets and the propranolol HCl coated tablets are presented.

Table 55 Properties of Propranolol HCl Core Tablets before Being Coated with Chitosan Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
CS 5	0.2682 0.2633	10.8	5.06	98.26	97.91
	0.2673 0.2732	10.0	7.09	99.34	99.05
	0.2642 0.2539	10.2	7.20	97.04	
	0.2737 0.2615	8.9	4.55	98.72	
	0.2651 0.2521	10.9	5.27	99.18	
	0.2650 0.2540	10.2	5.58	98.88	
	0.2580 0.2538	11.4		98.88	
	0.2497 0.2606	9.5		100.87	
	0.2667 0.2633	9.8		103.64	
	0.2557 0.2724	9.6		97.65	
CS 10	0.2775 0.2741	8.2	4.46	98.11	102.12
	0.2645 0.2785	10.2	8.25	96.42	100.24
	0.2708 0.2784	8.6	4.18	102.56	
	0.2647 0.2568	11.3	5.07	97.80	
	0.2834 0.2675	11.0	6.22	101.49	
	0.2808 0.2571	8.3	6.40	103.33	
	0.2810 0.2756	9.8		100.87	
	0.2636 0.2739	9.0		98.26	
	0.2700 0.2713	9.8		103.18	
	0.2628 0.2611	11.5		96.12	

Table 55 Properties of Propranolol HCl Core Tablets before Being Coated with Chitosan Film Coating Formulations (Cont.).

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	labeled Content (%)
CS 15	0.2556 0.2569	9.7	5.06	98.26	97.91
	0.2717 0.2540	10.8	7.09	99.34	99.05
	0.2636 0.2651	9.2	7.20	97.04	
	0.2611 0.2641	8.4	4.55	98.72	
	0.2607 0.2624	11.8	5.27	99.18	
	0.2683 0.2660	7.0	5.58	98.88	
	0.2619 0.2606	7.8		98.88	
	0.2678 0.2530	8.7		100.87	
	0.2626 0.2645	9.8		103.64	
	0.2629 0.2636	9.1		97.65	

Table 56 Properties of Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
HPMC 5	0.2743 0.2794	12.5	6.10	108.55	106.46
	0.2849 0.2710	10.8	7.17	107.32	106.04
	0.2841 0.2778	8.1	7.54	106.09	
	0.2838 0.2874	10.1	6.02	108.39	
	0.2824 0.2516	11.2	7.03	107.17	
	0.2794 0.2574	9.9	7.17	105.63	
	0.2684 0.2838	10.8		107.93	
	0.2861 0.2774	12.0		106.71	
	0.2852 0.2769	10.4		107.47	
	0.2831 0.2886	9.4		101.95	
HPMC 10	0.2772 0.2840	9.2	5.03	95.66	97.66
	0.2709 0.2570	9.8	7.11	99.65	94.11
	0.2624 0.2630	8.9	5.50	96.12	
	0.2859 0.2653	8.6	6.46	98.88	
	0.2599 0.2709	8.6	6.46	96.12	
	0.2631 0.2591	9.9	7.17	91.36	
	0.2787 0.2714	11.0		98.42	
	0.2706 0.2596	10.3		97.34	
	0.2736 0.2689	9.5		95.04	
	0.2575 0.2727	10.6		99.65	

Table 56 Properties of Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont.)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
HPMC 15	0.2686 0.2864	9.8	9.09	98.57	101.22
	0.2649 0.2649	12.2	10.04	99.95	100.67
	0.2658 0.2643	11.4	10.29	97.65	
	0.2689 0.2685	11.8	8.53	99.65	
	0.2896 0.2867	10.7	9.48	97.65	
	0.2647 0.2550	10.0	10.08	93.66	
	0.2802 0.2639	8.6		97.19	
	0.2877 0.2777	9.5		98.26	
	0.2689 0.2912	9.8		97.96	
	0.2630 0.2622	8.4		99.34	

Table 57 Properties of Propranolol HCl Core Tablets before Being Coated with Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
MC 5	0.2675 0.2611	15.0	3.25	100.41	100.39
	0.2654 0.2730	15.0	3.32	101.64	99.35
	0.2604 0.2706	12.6	4.39	89.98	
	0.2669 0.2719	10.3	6.04	97.65	
	0.2772 0.2691	10.0	4.01	99.95	
	0.2654 0.2615	10.6	4.40	94.43	
	0.2849 0.2891	10.2		98.11	
	0.2661 0.2787	8.6		95.66	
	0.2628 0.2570	9.3		102.41	
	0.2593 0.2691	10.4		98.88	
MC 10	0.2568 0.2613	8.8	4.46	98.11	102.12
	0.2701 0.2600	11.1	8.25	96.42	100.24
	0.2721 0.2757	11.3	4.18	102.56	
	0.2643 0.2523	10.2	5.07	97.80	
	0.2627 0.2720	10.8	6.22	101.49	
	0.2699 0.2710	10.9	6.40	103.33	
	0.2789 0.2661	10.8		100.87	
	0.2720 0.2633	11.5		98.26	
	0.2868 0.2662	7.9		103.18	
	0.2601 0.2745	7.6		96.12	

Table 57 Properties of Propranolol HCl Core Tablets before Being Coated with Methylcellulose Film Coating Formulations. (Cont.)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
MC 15	0.2572 0.2763	9.8	4.46	98.11	102.12
	0.2834 0.2714	10.5	8.25	96.42	100.24
	0.2602 0.2698	11.9	4.18	102.56	
	0.2736 0.2614	9.0	5.07	97.80	
	0.2568 0.2622	9.8	6.22	101.49	
	0.2706 0.2705	9.0	6.40	103.33	
	0.2639 0.2705	10.6		100.87	
	0.2595 0.2583	11.0		98.26	
	0.2634 0.2614	10.8		103.18	
	0.2763 0.2702	11.8		96.12	

Table 58 Properties of Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Cellulose Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
HPC 5	0.2818 0.2800	10.4	6.10	108.55	106.46
	0.2853 0.2733	11.0	7.17	107.32	106.04
	0.2822 0.2764	8.9	7.54	106.09	
	0.2745 0.2777	11.4	6.02	108.39	
	0.2708 0.2897	11.1	7.03	107.17	
	0.2623 0.2880	11.0	7.17	105.63	
	0.2804 0.2806	10.0		107.93	
	0.2872 0.2739	13.0		106.71	
	0.2753 0.2836	9.9		107.47	
	0.2820 0.2832	11.6		101.95	
HPC 10	0.2561 0.2580	9.4	5.06	98.26	97.91
	0.2641 0.2533	9.5	7.09	99.34	99.05
	0.2686 0.2595	8.2	7.20	97.04	
	0.2568 0.2646	10.2	4.55	98.72	
	0.2589 0.2653	9.7	5.27	99.18	
	0.2646 0.2537	10.8	5.58	98.88	
	0.2658 0.2605	7.8		98.88	
	0.2566 0.2610	8.4		100.87	
	0.2542 0.2549	9.4		103.64	
	0.2695 0.2664	8.0		97.65	

Table 58 Properties of Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Cellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
HPC 15	0.2687 0.2607	11.6	8.09	104.56	101.80
	0.2703 0.2725	10.8	7.55	99.03	104.78
	0.2688 0.2744	11.9	8.21	103.18	
	0.2806 0.2722	11.1	8.31	100.26	
	0.2751 0.2745	11.5	8.48	98.42	
	0.2723 0.2707	12.0	7.56	104.56	
	0.2724 0.2660	11.6		100.87	
	0.2661 0.2732	11.9		99.80	
	0.2799 0.2728	11.7		101.33	
	0.2741 0.2746	10.7		102.26	

Table 59 Properties of Propranolol HCl Core Tablets before Being Coated with Chitin Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
CT 5	0.2701 0.2783	12.7	9.04	99.65 97.50	98.37
	0.2708 0.2659	9.1	10.07	100.87 99.34	97.08
	0.2718 0.2602	10.6	10.24	97.50 102.10	
	0.2753 0.2615	8.9	10.16	98.72 99.95	
	0.2769 0.2651	10.1	10.42	101.64 102.26	
	0.2741 0.2664		10.59		
CT 10	0.2736 0.2718	12.5	9.04	99.65 97.50	98.37
	0.2744 0.2710	8.6	10.07	100.87 99.34	97.08
	0.2757 0.2687	11.9	10.24	97.50 102.10	
	0.2803 0.2779	11.4	10.16	98.72 99.95	
	0.2659 0.2701	11.4	10.42	101.64 102.26	
	0.2725 0.2711		10.59		

Table 60 Properties of Propranolol HCl Core Tablets before Being Coated with Ethylcellulose Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	labeled Content (%)
EC 3	0.2762 0.2783	9.1	3.25	100.41	100.39
	0.2594 0.2624	8.6	3.32	101.64	99.35
	0.2479 0.2533	8.3	4.39	89.98	
	0.2543 0.2630	12.0	6.04	97.65	
	0.2587 0.2650	8.7	4.01	99.95	
	0.2751 0.2727	10.5	4.40	94.43	
	0.2786 0.2625	10.2		98.11	
	0.2573 0.2641	11.4		95.66	
	0.2714 0.2768	8.6		102.41	
	0.2543 0.2480	8.5		98.88	
EC 5	0.2610 0.2727	14.4	4.42	96.72	97.84
	0.2605 0.2733	13.6	7.16	98.88	100.74
	0.2702 0.2683	14.0	6.31	101.33	
	0.2575 0.2609	9.4	5.15	95.35	
	0.2604 0.2585	10.1	6.02	99.18	
	0.2751 0.2715	12.5	6.14	101.79	
	0.2643 0.2678	10.4		98.11	
	0.2665 0.2643	10.4		100.26	
	0.2748 0.2731	11.9		100.26	
	0.2653 0.2689	14.8		96.58	

Table 60 Properties of Propranolol HCl Core Tablets before Being Coated with Ethylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	labeled Content (%)
EC 10	0.2620 0.2534	13.9	9.09	98.57	101.22
	0.2884 0.2565	7.6	10.04	99.95	100.67
	0.2579 0.2722	10.7	10.29	97.65	
	0.2638 0.2638	14.0	8.53	99.65	
	0.2557 0.2729	10.3	9.48	97.65	
	0.2744 0.2659	9.8	10.08	93.66	
	0.2534 0.2688	11.3		97.19	
	0.2624 0.2538	14.0		98.26	
	0.2536 0.2529	12.4		97.96	
	0.2532 0.2655	12.7		99.34	

Table 61 Properties of Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
EH 4060	0.2613 0.2714	9.7	8.41	97.80	103.25
	0.2667 0.2690	10.8	8.51	101.33	104.53
	0.2668 0.2675	9.9	10.06	105.17	
	0.2652 0.2574	12.0	8.29	99.49	
	0.2572 0.2666	8.4	8.34	95.50	
	0.2814 0.2622	10.4	9.45	100.26	
	0.2636 0.2592	9.7		97.19	
	0.2570 0.2854	10.1		105.78	
	0.2700 0.2691	10.6		96.27	
	0.2705 0.2677	11.5		99.65	
EH 5050	0.2613 0.2584	10.2	6.30	97.19	101.49
	0.2657 0.2723	12.1	8.22	102.87	100.70
	0.2640 0.2572	11.5	9.12	97.34	
	0.2608 0.2685	9.6	6.53	100.87	
	0.2649 0.2517	10.6	8.24	98.57	
	0.2598 0.2625	8.3	9.02	100.26	
	0.2552 0.2656	12.0		99.80	
	0.2689 0.2531	11.3		98.26	
	0.2663 0.2601	10.4		99.65	
	0.2687 0.2639	10.9		100.72	

Table 61 Properties of Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
EH 6040	0.2662 0.2546	12.2	8.09	104.56	101.80
	0.2590 0.2609	10.9	7.55	99.03	104.78
	0.2666 0.2621	11.1	8.21	103.18	
	0.2535 0.2650	12.1	8.31	100.26	
	0.2613 0.2730	10.1	8.48	98.42	
	0.2632 0.2654	11.9	7.56	104.56	
	0.2576 0.2536	12.2		100.87	
	0.2584 0.2623	10.8		99.80	
	0.2676 0.2666	10.1		101.33	
	0.2512 0.2592	9.4		102.26	
EH 8020	0.2829 0.2765	10.6	9.30	103.18	95.25
	0.2774 0.2754	8.2	10.34	101.18	101.13
	0.2668 0.2729	10.6	11.02	103.33	
	0.2843 0.2781	12.7	11.36	103.48	
	0.2761 0.2702	9.7	12.01	102.10	
	0.3736 0.2714	12.7	11.04	99.34	
	0.2794 0.2735	11.2		101.95	
	0.2778 0.2778	12.5		104.25	
	0.2774 0.2774	11.1		102.72	
	0.2727 0.2718	11.6		103.94	

Table 61 Properties of Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
EH 8218	0.2755 0.2741	11.0	9.04	99.65	98.37
	0.2693 0.2740	11.1	10.07	100.87	97.08
	0.2766 0.2693	10.6	10.24	97.50	
	0.2730 0.2724	12.2	10.16	98.72	
	0.2718 0.2771	11.6	10.42	101.64	
	0.2741 0.2680	11.5	10.59	97.50	
	0.2805 0.2644	11.3		99.34	
	0.2712 0.2719	10.0		102.10	
	0.2663 0.2734	9.6		99.95	
	0.2724 0.2665	8.6		102.26	
EH 8515	0.2775 0.2758	8.2	6.27	103.79	103.51
	0.2862 0.2853	9.3	7.51	106.24	106.07
	0.2854 0.2781	10.1	8.36	102.41	
	0.2880 0.2866	11.7	8.33	107.01	
	0.2863 0.2807	10.1	8.41	100.87	
	0.2760 0.2870	12.7	9.01	99.18	
	0.2930 0.2792	10.3		102.87	
	0.2911 0.2828	13.3		108.70	
	0.2855 0.2824	8.9		105.17	
	0.2804 0.2751	10.3		104.40	

Table 61 Properties of Propranolol HCl Core Tablets before Being Coated with Conbination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)	Hardness (kp.)	Disintegration Time (min.sec)	Uniformity of Dosage Units (%)	Labeled Content (%)
EH 8713	0.2847 0.2845	11.0	6.27	103.79	103.51
	0.2831 0.2779	10.3	7.51	106.24	106.07
	0.2914 0.2713	12.9	8.36	102.41	
	0.2694 0.2797	14.2	8.33	107.01	
	0.2734 0.2795	11.4	8.41	100.87	
	0.2837 0.2829	9.0	9.01	99.18	
	0.2822 0.2821	13.3		102.87	
	0.2859 0.2816	8.5		108.70	
	0.2755 0.2905	12.3		105.17	
	0.2710 0.2841	11.9		104.40	
EH 9010	0.2877 0.2770	12.6	8.41	97.80	103.25
	0.2869 0.2836	9.4	8.51	101.33	104.53
	0.2860 0.2818	14.4	10.06	105.17	
	0.2757 0.2875	12.3	8.29	99.49	
	0.2806 0.2658	12.7	8.34	95.50	
	0.2800 0.2706	10.6	9.45	100.26	
	0.2773 0.2718	10.6		97.19	
	0.2758 0.2686	14.0		105.78	
	0.2613 0.2895	13.4		96.27	
	0.2811 0.2875	12.4		99.65	

Table 62 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Chitosan Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CS 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	34.871	36.345	35.240	35.485	(0.626)
	0.10	60.669	66.019	65.092	63.927	(2.334)
	0.15	85.873	88.858	89.583	88.105	(1.606)
	0.20	97.767	97.822	99.657	98.415	(0.878)
	0.25	100.700	99.096	101.125	100.307	(0.874)
	0.30	100.514	98.533	100.573	99.873	(0.948)
CS 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	27.319	28.424	26.398	27.380	(0.828)
	0.10	62.469	62.476	59.885	61.610	(1.220)
	0.15	86.025	86.216	84.348	85.530	(0.839)
	0.20	96.263	95.349	97.340	96.317	(0.814)
	0.25	98.266	98.821	99.349	98.812	(0.442)
	0.30	98.988	99.361	99.893	99.414	(0.371)

Table 62 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Chitosan Film Coating Formulations (Cont..) .

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CS 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	34.871	36.345	35.240	35.485	(0.626)
	0.10	60.669	66.019	65.092	63.927	(2.334)
	0.15	85.873	88.858	89.583	88.105	(1.606)
	0.20	97.767	97.822	99.657	98.415	(0.878)
	0.25	100.700	99.096	101.125	100.307	(0.874)
	0.30	100.514	98.533	100.573	99.873	(0.948)

* Standard Deviation.

Table 63 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPMC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	27.687	31.187	32.293	30.389	(1.963)
	0.10	52.156	56.412	55.682	54.750	(1.858)
	0.15	74.734	79.382	78.094	77.403	(1.959)
	0.20	92.093	98.056	98.972	96.374	(3.050)
	0.25	103.284	103.017	104.490	103.597	(0.641)
	0.30	105.139	103.949	104.878	104.655	(0.511)
HPMC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	37.082	45.003	43.529	41.871	(3.440)
	0.10	75.786	75.093	74.901	75.260	(0.380)
	0.15	93.890	91.351	93.184	92.808	(1.070)
	0.20	95.881	94.986	96.645	95.837	(0.678)
	0.25	95.671	95.323	99.807	95.934	(0.634)
	0.30	95.825	95.291	96.783	95.966	(0.617)

Table 63 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPMC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	26.582	25.845	25.477	25.968	(0.459)
	0.10	58.229	57.304	55.275	56.936	(1.234)
	0.15	80.287	80.646	78.607	79.847	(0.889)
	0.20	94.546	94.355	93.593	94.165	(0.412)
	0.25	98.750	98.926	99.266	98.981	(0.214)
	0.30	99.291	99.099	100.178	99.523	(0.470)

* Standard Deviation.

Table 64 Cumulative Percent Amount of Drug Released from Propranolol HCl Core Tablets before Being Coated with Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
MC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	25.477	30.819	25.845	27.380	(2.436)
	0.10	63.196	67.094	62.830	64.373	(1.930)
	0.15	88.230	89.202	86.019	87.817	(1.332)
	0.20	95.164	95.773	94.783	95.240	(0.408)
	0.25	94.766	95.562	95.120	95.149	(0.326)
	0.30	95.469	96.085	95.272	95.609	(0.346)
MC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	27.319	28.424	26.398	27.380	(0.828)
	0.10	62.469	62.476	59.885	61.610	(1.220)
	0.15	86.025	86.216	84.348	85.530	(0.839)
	0.20	96.263	95.349	97.340	96.317	(0.814)
	0.25	98.266	98.821	99.349	98.812	(0.442)
	0.30	98.988	99.361	99.893	99.414	(0.371)

Table 64 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Methylcellulose Film Coating Formulations (Cont..).

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
MC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	27.319	28.424	26.398	27.380	(0.828)
	0.10	62.469	62.476	59.885	61.610	(1.220)
	0.15	86.025	86.216	84.348	85.530	(0.839)
	0.20	96.263	95.349	97.340	96.317	(0.814)
	0.25	98.266	98.821	99.349	98.812	(0.442)
	0.30	98.988	99.361	99.893	99.414	(0.371)

* Standard Deviation.

Table 65 Cumulative Percent Amount of the Drug Released from Propranlol HCl Core Tablets before Being Coated with Hydroxypropyl Cellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	27.687	31.187	32.293	30.389	(1.963)
	0.10	52.156	56.412	55.682	54.750	(1.858)
	0.15	74.734	79.382	78.094	77.403	(1.959)
	0.20	92.093	98.056	98.972	96.374	(3.050)
	0.25	103.284	103.017	104.490	103.597	(0.641)
	0.30	105.139	103.949	104.878	104.655	(0.511)
HPC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	34.871	36.345	35.240	35.485	(0.626)
	0.10	60.669	66.019	65.092	63.927	(2.334)
	0.15	85.873	88.858	89.583	88.105	(1.606)
	0.20	97.767	97.822	99.657	98.415	(0.878)
	0.25	100.700	99.096	101.125	100.307	(0.874)
	0.30	100.514	98.533	100.573	99.873	(0.948)

Table 65 Cumulative Percent Amount of the Drug Released from Propranlol HCl Core Tablets before Being Coated with Hydroxypropyl Cellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	37.266	35.977	39.108	37.450	(1.285)
	0.10	68.419	65.281	68.982	67.561	(1.628)
	0.15	90.166	87.194	89.995	89.118	(1.362)
	0.20	99.874	97.991	98.412	98.759	(0.807)
	0.25	100.607	98.898	99.137	99.547	(0.756)
	0.30	100.972	99.438	99.494	99.968	(0.710)

* Standard Deviation.

Table 66 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Chitin Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CT 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	21.793	22.714	31.003	25.170	(4.142)
	0.10	38.124	38.313	43.517	39.985	(2.499)
	0.15	56.019	57.867	61.625	58.504	(2.332)
	0.20	73.090	74.765	77.070	74.975	(1.632)
	0.25	85.650	87.886	89.836	87.791	(1.710)
	0.30	93.857	97.395	96.223	95.825	(1.472)
	0.35	98.422	99.585	97.301	98.436	(0.932)
	0.40	98.589	99.758	97.645	98.664	(0.864)
CT 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	21.793	22.714	31.003	25.170	(4.142)
	0.10	38.124	38.313	43.517	39.985	(2.499)
	0.15	56.019	57.867	61.625	58.504	(2.332)
	0.20	73.090	74.765	77.070	74.975	(1.632)
	0.25	85.650	87.886	89.836	87.791	(1.710)
	0.30	93.857	97.395	96.223	95.825	(1.472)
	0.35	98.422	99.585	97.301	98.436	(0.932)
	0.40	98.589	99.758	97.645	98.664	(0.864)

Table 67 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Ethylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EC 3	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	25.477	30.819	25.845	27.380	(2.436)
	0.10	63.196	67.094	62.830	64.373	(1.930)
	0.15	88.230	89.202	86.019	87.817	(1.332)
	0.20	95.164	95.773	94.783	95.240	(0.408)
	0.25	94.766	95.562	95.120	95.149	(0.326)
	0.30	95.469	96.085	95.272	95.609	(0.346)
EC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	34.319	35.424	34.687	34.810	(0.459)
	0.10	67.850	66.751	67.115	67.239	(0.457)
	0.15	92.357	94.751	90.697	92.602	(1.664)
	0.20	96.551	97.669	97.460	97.227	(0.485)
	0.25	99.107	100.785	99.838	99.910	(0.687)
	0.30	98.728	100.414	99.831	99.658	(0.699)

Table 67 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Ethylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	26.582	25.845	25.477	25.968	(0.459)
	0.10	58.229	57.304	55.275	56.936	(1.234)
	0.15	80.287	80.646	78.607	79.847	(0.889)
	0.20	94.546	94.355	93.593	94.165	(0.412)
	0.25	98.750	98.926	99.266	98.981	(0.214)
	0.30	99.291	99.099	100.178	99.523	(0.470)

* Standard Deviation.

Table 68 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 4060	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	23.267	25.477	23.635	24.126	(0.967)
	0.10	38.501	45.328	38.871	40.900	(3.135)
	0.15	59.529	63.631	56.770	59.977	(2.819)
	0.20	76.436	78.350	74.582	76.456	(1.538)
	0.25	88.646	89.097	88.808	88.850	(0.187)
	0.30	96.132	95.296	97.953	96.460	(1.109)
	0.35	100.341	98.579	100.883	99.934	(0.984)
	0.40	101.071	99.299	100.880	100.417	(0.794)
EH 5050	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	23.819	25.477	28.977	26.091	(2.150)
	0.10	39.977	38.513	39.453	39.314	(0.606)
	0.15	61.014	56.962	56.618	58.198	(1.996)
	0.20	78.297	86.196	74.062	79.518	(5.028)
	0.25	91.254	94.040	86.627	90.640	(3.057)
	0.30	97.097	96.214	94.838	96.050	(0.930)
	0.35	97.443	96.371	97.935	97.250	(0.653)
	0.40	97.604	101.130	98.468	99.067	(1.501)

Table 68 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 6040	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	37.266	35.977	39.108	37.450	(1.285)
	0.10	68.419	65.281	68.982	67.561	(1.628)
	0.15	90.166	87.194	89.995	89.118	(1.362)
	0.20	99.874	97.991	98.412	98.759	(0.807)
	0.25	100.607	98.898	99.137	99.547	(0.756)
	0.30	100.972	99.438	99.494	99.968	(0.710)
EH 8020	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	22.346	24.372	24.556	23.758	(1.001)
	0.10	34.075	34.823	34.824	34.574	(0.353)
	0.15	47.526	49.567	50.674	49.256	(1.304)
	0.20	60.866	64.946	65.505	63.772	(2.068)
	0.25	74.280	79.855	80.602	78.246	(2.821)
	0.30	86.108	91.714	92.833	90.218	(2.942)
	0.35	100.394	98.847	98.315	99.185	(0.882)
	0.40	102.232	100.122	99.403	100.586	(1.201)

Table 68 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 8218	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	21.793	22.714	31.003	25.170	(4.142)
	0.10	38.124	38.313	43.517	39.985	(2.499)
	0.15	56.019	57.867	61.625	58.504	(2.332)
	0.20	73.090	74.765	77.070	74.975	(1.632)
	0.25	85.650	87.886	89.836	87.791	(1.710)
	0.30	93.857	97.395	96.223	95.825	(1.472)
	0.35	98.422	99.585	97.301	98.436	(0.932)
	0.40	98.589	99.758	97.645	98.664	(0.864)
EH 8515	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	24.924	27.135	23.267	25.109	(1.584)
	0.10	44.404	46.443	38.869	43.239	(3.200)
	0.15	64.728	64.752	57.320	62.267	(3.498)
	0.20	82.953	80.030	74.583	79.189	(3.468)
	0.25	95.936	93.180	89.546	92.887	(2.617)
	0.30	102.173	101.428	99.800	101.134	(0.991)
	0.35	102.731	105.850	104.214	104.265	(1.274)
	0.40	102.920	106.978	105.334	105.077	(1.667)

Table 68 Cumulative Percent Amount of the Drug Released from Propranolol HCl Core Tablets before Being Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 8713	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	24.924	27.135	23.267	25.109	(1.584)
	0.10	44.404	46.443	38.869	43.239	(3.200)
	0.15	64.728	64.752	57.320	62.267	(3.498)
	0.20	82.953	80.030	74.583	79.189	(3.468)
	0.25	95.936	93.180	89.546	92.887	(2.617)
	0.30	102.173	101.428	99.800	101.134	(0.991)
	0.35	102.731	105.850	104.214	104.265	(1.274)
	0.40	102.920	106.978	105.334	105.077	(1.667)
EH 9010	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.05	23.267	25.477	23.635	24.126	(0.967)
	0.10	38.501	45.328	38.871	40.900	(3.135)
	0.15	59.529	63.631	56.770	59.977	(2.819)
	0.20	76.436	78.350	74.582	76.456	(1.538)
	0.25	88.646	89.097	88.808	88.850	(0.187)
	0.30	96.132	95.296	97.953	96.460	(1.109)
	0.35	100.341	98.579	100.883	99.934	(0.984)
	0.40	101.071	99.299	100.880	100.417	(0.794)

Table 69 Properties of Propranolol HCl Tablets Coated with Chitosan Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
CS 5	0.2760	0.2775	14.0	8.28
	0.2845	0.2762	10.5	9.21
	0.2761	0.2716	15.9	9.27
	0.2735	0.2719	16.1	9.57
	0.2797	0.2812	10.8	8.23
	0.2798	0.2803	13.6	10.23
	0.2610	0.2824	11.6	
	0.2776	0.2828	11.5	
	0.2774	0.2789	15.0	
	0.2904	0.2868	13.8	
CS 10	0.2994	0.2955	13.3	9.37
	0.3116	0.2934	12.5	8.26
	0.3037	0.2997	17.7	10.07
	0.2943	0.3067	17.0	10.17
	0.3031	0.2993	17.3	10.25
	0.2886	0.3104	15.0	10.40
	0.2972	0.2922	17.8	
	0.2937	0.2987	15.3	
	0.2981	0.3052	18.0	
	0.3058	0.2962	16.0	

Table 69 Properties of Propranolol HCl Tablets Coated with Chitosan Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
CS 15	0.3079	0.3028	17.6	11.05
	0.3068	0.3120	> 20	9.59
	0.2996	0.3020	> 20	10.23
	0.2879	0.2937	> 20	9.12
	0.3155	0.2989	19.6	10.15
	0.3178	0.3007	> 20	11.27
	0.3011	0.3023	> 20	
	0.2946	0.2974	19.9	
	0.2831	0.2965	> 20	
	0.3093	0.2997	11.6	

Table 70 Properties of Propranolol HCl Tablets Coated with Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
HPMC 5	0.2907	0.3007	> 20	8.35
	0.2910	0.2910	> 20	11.19
	0.2951	0.2867	> 20	10.29
	0.3028	0.3046	> 20	9.39
	0.2919	0.2972	> 20	8.52
	0.2886	0.2964	> 20	9.02
	0.2907	0.2960	> 20	
	0.2897	0.2933	> 20	
	0.2838	0.2814	19.8	
	0.2966	0.2926	> 20	
HPMC 10	0.2980	0.3006	> 20	14.34
	0.2881	0.2956	> 20	13.56
	0.2951	0.2992	> 20	13.37
	0.2854	0.3026	> 20	14.38
	0.2919	0.2974	> 20	14.37
	0.2846	0.0373	> 20	12.47
	0.2957	0.2847	> 20	
	0.2937	0.2967	> 20	
	0.2959	0.3034	> 20	
	0.3127	0.2965	> 20	

Table 70 Properties of Propranolol HCl Tablets Coated with Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
HPMC 15	0.3055	0.3128	> 20	22.37
	0.3150	0.3247	> 20	21.57
	0.3007	0.3005	> 20	19.00
	0.3171	0.3155	> 20	22.51
	0.3163	0.3172	> 20	20.44
	0.2991	0.3003	> 20	21.45
	0.3073	0.3125	> 20	
	0.3028	0.3239	> 20	
	0.3134	0.3222	> 20	
	0.3069	0.3241	> 20	

Table 71 Properties of Propranolol HCl Tablets Coated with Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
MC 5	0.2823	0.2856	> 20	8.29
	0.2983	0.2740	> 20	12.19
	0.2751	0.2914	> 20	10.38
	0.2801	0.2826	> 20	11.52
	0.2817	0.2704	> 20	8.12
	0.2789	0.2831	> 20	11.48
	0.2945	0.2730	> 20	
	0.2806	0.2785	> 20	
	0.2893	0.2820	> 20	
	0.2783	0.2773	> 20	
MC 10	0.2926	0.2968	> 20	15.59
	0.2933	0.2823	> 20	12.43
	0.3003	0.2890	> 20	17.06
	0.2848	0.2973	> 20	15.47
	0.2913	0.2906	> 20	17.32
	0.2970	0.2935	> 20	13.23
	0.2858	0.2915	> 20	
	0.2844	0.3032	> 20	
	0.2985	0.2915	> 20	
	0.2877	0.2865	> 20	

Table 71 Properties of Propranolol HCl Tablets Coated with Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
MC 15	0.3075	0.3188	> 20	17.14
	0.2963	0.3021	> 20	17.31
	0.3093	0.2979	> 20	16.47
	0.3134	0.2968	> 20	21.26
	0.3092	0.3066	> 20	21.30
	0.3048	0.3159	> 20	20.17
	0.3070	0.3009	> 20	
	0.2953	0.3187	> 20	
	0.2982	0.3053	> 20	
	0.2951	0.3085	> 20	

Table 72 Properties of Propranolol HCl Tablets Coated with Hydroxypropyl Cellulose Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
HPC 5	0.2984	0.3054	13.0	8.48
	0.2818	0.2905	19.7	13.09
	0.2961	0.2970	16.2	9.16
	0.2967	0.2985	18.5	13.57
	0.2929	0.2864	14.2	10.27
	0.2923	0.2906	13.0	12.23
	0.2996	0.2970	18.3	
	0.2947	0.2860	16.4	
	0.2909	0.2966	13.4	
	0.2905	0.2984	14.8	
HPC 10	0.2842	0.2701	19.4	15.10
	0.2873	0.2949	> 20	13.55
	0.2733	0.2941	> 20	17.23
	0.2773	0.2984	> 20	11.52
	0.2829	0.2927	> 20	12.47
	0.2884	0.2854	> 20	13.05
	0.2885	0.2889	19.0	
	0.2838	0.2838	19.6	
	0.2794	0.2773	17.5	
	0.2700	0.2854	> 20	

Table 72 Properties of Propranolol HCl Tablets Coated with Hydroxypropyl Cellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
HPC 15	0.3119	0.3111	> 20	23.33
	0.3166	0.3166	> 20	23.56
	0.3180	0.3160	> 20	22.48
	0.3174	0.3170	> 20	23.20
	0.3111	0.3174	> 20	19.47
	0.3102	0.3164	> 20	19.57
	0.3094	0.3157	> 20	
	0.3111	0.3094	> 20	
	0.3111	0.3168	> 20	
	0.3081	0.3141	> 20	

Table 73 Properties of Propranolol HCl Tablets Coated with Chitin Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
CT 5	0.2831	0.2902	18.4	8.53
	0.2837	0.2910	18.3	9.01
	0.2834	0.2765	18.6	9.06
	0.2893	0.2777	> 20	
	0.2913	0.2891	> 20	
	0.2929	0.2745		
CT 10	0.3055	0.3112	> 20	17.13
	0.3148	0.3084	> 20	14.13
	0.2967	0.3107	> 20	12.22
	0.3052	0.2929	> 20	
	0.2990	0.2968	> 20	
	0.2981	0.2941		

Table 74 Properties of Propranolol HCl Tablets Coated with Ethylcellulose Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EC 3	0.2652	0.2780	19.1	37.50
	0.2639	0.2655	17.2	40.26
	0.2820	0.2835	17.1	38.30
	0.2680	0.2815	13.2	38.58
	0.2636	0.2765	> 20	41.32
	0.2721	0.2781	11.3	28.03
	0.2717	0.2724	19.2	
	0.2815	0.2718	12.2	
	0.2654	0.2645	8.1	
	0.2641	0.2690	18.9	
EC 5	0.2766	0.2827	> 20	> 2 hr.
	0.2752	0.2871	17.9	> 2 hr.
	0.2947	0.2769	17.5	> 2 hr.
	0.2817	0.2827	16.6	> 2 hr.
	0.2765	0.2707	16.4	> 2 hr.
	0.2823	0.2831	15.7	
	0.2851	0.2862	16.1	1 hr. 35.07
	0.2757	0.2775	> 20	
	0.2739	0.2815	14.6	
	0.2811	0.2732	14.2	

Table 74 Properties of Propranolol HCl Tablets Coated with Ethylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EC 10	0.2864	0.2961	14.3	> 2 hr.
	0.2933	0.2909	15.0	> 2 hr.
	0.2850	0.2933	13.5	> 2 hr.
	0.2904	0.2869	16.6	> 2 hr.
	0.2929	0.2949	14.7	> 2 hr.
	0.2883	0.2916	11.0	> 2 hr.
	0.2887	0.2894	15.8	
	0.2954	0.2848	11.9	
	0.2889	0.2881	10.9	
	0.2979	0.2900	13.8	

Table 75 Properties of Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EH 4060	0.2930	0.2735	> 20	12.25
	0.3035	0.2733	> 20	12.35
	0.2788	0.2757	> 20	12.35
	0.2686	0.2771	> 20	11.27
	0.2969	0.2718	> 20	12.33
	0.2724	0.3080	> 20	13.25
	0.2804	0.2792	> 20	
	0.2792	0.2965	> 20	
	0.2757	0.2753	> 20	
	0.2763	0.2813	> 20	
EH 5050	0.2703	0.2705	18.8	11.17
	0.2774	0.2714	17.6	10.41
	0.2734	0.2683	15.0	9.09
	0.2692	0.2753	15.8	11.01
	0.2747	0.2693	16.9	9.48
	0.2720	0.2739	15.7	9.49
	0.2787	0.2763	16.8	
	0.2696	0.2779	17.2	
	0.2759	0.2795	> 20	
	0.2760	0.2715	> 20	

Table 75 Properties of Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EH 6040	0.2680	0.2806	19.6	14.37
	0.2715	0.2642	18.5	11.53
	0.2751	0.2740	17.4	13.53
	0.2772	0.2757	18.1	12.40
	0.2804	0.2819	18.7	14.13
	0.2819	0.2808	19.2	12.05
	0.2743	0.2705	19.9	
	0.2765	0.2796	> 20	
	0.2811	0.2836	> 20	
	0.2874	0.2798	> 20	
EH 8020	0.2840	0.2856	18.2	15.47
	0.2850	0.2947	18.8	16.35
	0.2927	0.2905	18.0	17.35
	0.2910	0.2886	> 20	15.40
	0.2882	0.2865	> 20	16.08
	0.2904	0.2841	18.9	16.25
	0.2870	0.2838	19.2	
	0.2908	0.2935	19.0	
	0.2856	0.2846	> 20	
	0.2906	0.2860	> 20	

Table 75 Properties of Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EH 8218	0.2888	0.2789	19.7	22.10
	0.2798	0.2847	19.9	18.43
	0.2846	0.2887	19.5	20.33
	0.2846	0.2843	> 20	21.52
	0.2863	0.2900	> 20	21.38
	0.2861	0.2853	16.8	19.51
	0.2846	0.2786	17.9	
	0.2803	0.2865	17.0	
	0.2811	0.2801	> 20	
	0.2829	0.2882	> 20	
EH 8515	0.2864	0.3004	> 20	21.50
	0.3022	0.3053	> 20	23.27
	0.3111	0.2940	> 20	26.06
	0.3046	0.3023	> 20	26.01
	0.2976	0.2998	> 20	26.00
	0.2922	0.2960	18.1	24.05
	0.2976	0.2963	17.9	
	0.3073	0.2889	> 20	
	0.2947	0.2981	> 20	
	0.3028	0.2931	> 20	

Table 75 Properties of Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Weight (gm.)		Hardness (kp.)	Disintegration Time (min.sec)
EH 8713	0.2960	0.2813	> 20	29.45
	0.2983	0.2840	> 20	30.29
	0.2881	0.2808	> 20	32.27
	0.2886	0.2960	> 20	23.50
	0.2917	0.3067	> 20	28.51
	0.2997	0.2885	19.8	31.17
	0.3032	0.3010	19.9	
	0.2902	0.3011	> 20	
	0.3022	0.2862	> 20	
	0.2957	0.3021	> 20	
EH 9010	0.2942	0.2969	19.5	57.25
	0.2818	0.3023	19.1	38.02
	0.3012	0.2975	> 20	38.44
	0.2918	0.2792	> 20	42.55
	0.2776	0.2810	> 20	46.50
	0.2935	0.2919	19.1	50.46
	0.2935	0.2947	17.9	
	0.2942	0.2931	> 20	
	0.2889	0.2861	> 20	
	0.2930	0.3073	> 20	

Table 76 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Chitosan Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CS 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	85.159	87.922	90.869	87.983	(2.332)
	0.40	99.816	101.305	100.031	100.384	(0.657)
	1.00	99.631	100.759	99.848	100.079	(0.489)
	1.30	99.626	100.024	99.475	99.708	(0.232)
CS 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	84.790	82.764	80.922	82.825	(1.580)
	0.40	100.182	100.723	98.687	99.864	(0.861)
	1.00	100.736	101.280	99.417	100.478	(0.782)
	1.30	101.106	101.837	99.964	100.969	(0.771)
CS 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	89.948	84.422	85.711	86.694	(2.361)
	0.40	103.342	103.127	102.213	102.894	(0.489)
	1.00	102.992	103.882	102.226	103.033	(0.677)
	1.30	103.006	104.085	101.867	102.986	(0.906)

* Standard Deviation.

Table 77 Cumulative Percent Amount of the Drug Released fron Propranolol HCl Tablets Coated with Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPMC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	31.187	37.450	35.977	34.871	(2.674)
	0.40	99.884	98.261	100.648	99.598	(0.995)
	1.00	107.990	106.174	106.916	107.027	(0.745)
	1.30	108.402	106.944	107.690	107.679	(0.595)
HPMC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.820	8.162	10.925	7.302	(3.364)
	0.40	82.780	87.046	84.299	84.708	(1.765)
	1.00	92.450	95.266	93.977	93.898	(1.151)
	1.30	92.961	95.792	95.048	94.600	(1.198)
HPMC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	0.241	0.978	4.662	1.960	(1.934)
	0.40	33.215	32.114	33.239	32.856	(0.525)
	1.00	93.818	93.263	91.816	92.966	(0.844)
	1.30	98.943	100.596	98.220	99.253	(0.994)

* Standard Deviation.

Table 78 Cumulative PercentAmount of the Drug Released from Propranolol HCl Tablets Coated with Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
MC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	18.846	29.714	28.977	25.846	(4.959)
	0.40	46.581	50.141	74.268	56.997	(12.299)
	1.00	84.785	65.155	95.863	81.934	(12.698)
	1.30	99.438	80.988	98.234	92.887	(8.428)
MC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	23.635	6.873	35.424	21.977	(11.715)
	0.40	92.658	76.724	93.461	87.614	(7.708)
	1.00	100.540	100.175	103.741	101.485	(1.602)
	1.30	101.095	102.203	103.209	102.169	(0.863)
MC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.636	4.294	0.978	2.636	(1.354)
	0.40	87.752	60.684	75.217	74.551	(11.060)
	1.00	101.871	98.966	99.213	100.017	(1.315)
	1.30	102.987	104.119	101.236	102.781	(1.186)

* Standard Deviation.

Table 79 Cumulative PercentAmount of the Drug Released from Propranolol HCl Tablets Coated with Hydroxypropyl Cellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
HPC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	35.424	35.056	31.003	33.828	(2.003)
	0.40	98.618	98.800	95.831	97.750	(1.359)
	1.00	106.902	106.164	107.230	106.765	(0.446)
	1.30	107.307	106.749	108.374	107.477	(0.674)
HPC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	20.872	20.135	32.661	24.556	(5.739)
	0.40	88.775	87.113	88.656	88.181	(0.757)
	1.00	98.109	97.727	96.884	97.573	(0.512)
	1.30	98.282	98.267	97.418	97.989	(0.404)
HPC 15	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	7.794	6.136	14.241	9.390	(3.496)
	0.40	46.151	47.615	42.503	45.423	(2.150)
	1.00	95.958	95.220	93.026	94.735	(1.245)
	1.30	101.647	100.905	99.620	100.724	(0.837)

* Standard Deviation

Table 80 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Chitin Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CT 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	15.714	14.977	38.924	23.205	(11.119)
	0.40	22.617	23.534	60.323	35.491	(17.563)
	1.00	27.532	30.296	78.525	45.451	(23.414)
	1.30	42.051	39.120	88.353	56.508	(22.550)
	2.00	73.603	62.084	97.720	77.802	(14.848)
	3.00	87.733	78.492	89.900	85.375	(4.947)
	4.00	91.743	86.225	89.729	89.232	(2.280)
	5.00	92.732	87.916	90.094	90.247	(1.969)
	6.00	93.010	88.183	89.925	90.373	(1.996)
	8.00	92.750	88.451	90.828	90.676	(1.758)
	10.00	92.488	88.719	90.662	90.623	(1.539)

* Standard Deviation.

Table 80 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Chitin Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
CT 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	11.109	22.714	19.767	17.863	(4.925)
	0.40	18.539	29.840	21.903	23.427	(4.738)
	1.00	25.089	41.057	29.945	32.030	(6.684)
	1.30	33.332	51.783	41.714	42.276	(7.543)
	2.00	45.204	66.517	72.193	61.305	(11.618)
	3.00	56.899	71.788	85.959	71.549	(11.865)
	4.00	70.269	78.160	89.245	79.225	(7.783)
	5.00	79.597	82.420	89.865	83.961	(4.331)
	6.00	83.967	85.809	90.486	86.754	(2.744)
	8.00	88.001	89.216	91.468	89.562	(1.436)
	10.00	89.731	91.746	92.990	91.489	(1.343)
	12.00	91.469	91.963	93.445	92.292	(0.840)
	14.00	90.710	92.537	93.732	92.326	(1.243)
	18.00	91.018	92.041	92.211	91.757	(0.527)
	24.00	91.018	92.435	92.837	92.097	(0.780)

* Standard Deviation.

Table 81 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Ethylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EC 3	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	0.425	5.030	5.767	3.741	(2.364)
	0.40	0.428	1.006	1.010	0.815	(0.273)
	1.00	0.983	1.011	1.016	1.003	(0.015)
	1.30	2.093	1.569	2.495	2.052	(0.379)
	2.00	3.589	2.528	9.357	5.158	(3.001)
	3.00	6.280	4.501	21.919	10.900	(7.825)
	4.00	10.776	7.201	34.371	17.449	(12.054)
	5.00	15.655	10.989	44.387	23.677	(14.768)
	6.00	21.276	15.335	52.311	29.641	(16.213)
	8.00	31.579	24.356	64.214	40.050	(17.339)
	10.00	53.926	33.069	74.928	53.974	(17.089)
	12.00	67.988	41.115	83.017	64.040	(17.333)
	14.00	77.295	48.667	88.644	71.535	(16.821)
	18.00	87.547	59.838	94.658	80.681	(15.021)
	24.00	95.527	73.753	98.734	89.338	(11.098)

* Standard Deviation.

Table 81 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Ethylcellulose Film Coating formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EC 5	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	4.392	2.928	3.660	3.660	(0.598)
	0.40	1.305	1.114	2.399	1.606	(0.566)
	1.00	0.946	0.937	0.949	0.944	(0.005)
	1.30	0.952	0.942	0.588	0.827	(0.169)
	2.00	2.018	2.186	1.298	1.834	(0.385)
	3.00	1.668	1.838	0.947	1.484	(0.386)
	4.00	1.495	1.665	0.771	1.310	(0.388)
	5.00	1.498	1.669	0.950	1.372	(0.307)
	6.00	1.678	2.028	0.952	1.553	(0.448)
	8.00	1.860	2.034	1.487	1.794	(0.228)
	10.00	2.220	2.573	1.874	2.222	(0.285)
	12.00	2.760	2.938	2.565	2.754	(0.152)
	14.00	3.303	3.659	3.820	3.594	(0.216)
	18.00	4.382	4.740	5.615	4.912	(0.518)
	24.00	5.823	6.538	9.907	7.423	(1.781)

* Standard Deviation.

Table 81 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Ethylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EC 10	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.379	4.209	3.843	3.477	(0.791)
	0.40	0.928	1.304	1.668	1.300	(0.302)
	1.00	0.933	0.945	0.762	0.880	(0.084)
	1.30	0.755	0.768	0.767	0.763	(0.006)
	2.00	2.888	3.611	3.787	3.429	(0.389)
	3.00	2.011	3.271	8.780	4.687	(2.939)
	4.00	1.485	2.396	4.559	2.813	(1.289)
	5.00	1.489	1.872	4.403	2.588	(1.293)
	6.00	1.671	1.700	2.645	2.005	(0.452)
	8.00	1.853	1.883	2.477	2.071	(0.287)
	10.00	2.214	1.889	2.309	2.137	(0.180)
	12.00	2.222	2.428	3.027	2.559	(0.341)
	14.00	2.230	2.615	3.217	2.687	(0.406)
	18.00	3.482	4.046	4.474	4.001	(0.406)
	24.00	4.030	4.419	5.382	4.610	(0.568)

* Standard Deviation.

Table 82 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations.

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 4060	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	28.913	26.168	24.522	26.534	(1.811)
	0.40	91.659	76.638	82.302	83.533	(6.194)
	1.00	102.781	98.290	100.875	100.649	(1.840)
	1.30	104.080	100.480	102.530	102.363	(1.474)
EH 5050	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	26.900	33.671	35.867	32.146	(3.816)
	0.40	86.158	76.863	86.391	83.137	(4.438)
	1.00	100.177	97.967	99.862	99.335	(0.976)
	1.30	101.279	99.789	100.779	100.616	(0.619)
EH 6040	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	21.777	26.900	15.372	21.350	(4.716)
	0.40	79.175	86.158	75.114	80.149	(4.561)
	1.00	96.999	97.432	95.843	96.758	(0.671)
	1.30	98.084	98.519	98.386	98.330	(0.182)

* Standard Deviation.

Table 82 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 8020	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	5.856	2.928	2.928	3.904	(1.380)
	0.40	3.143	4.591	4.591	4.108	(0.683)
	1.00	6.821	8.094	7.362	7.426	(0.522)
	1.30	11.982	12.530	11.977	12.163	(0.260)
	2.00	23.533	24.258	31.880	26.557	(3.776)
	3.00	35.147	49.912	65.753	50.271	(12.497)
	4.00	63.353	70.378	85.954	73.228	(9.444)
	5.00	82.473	83.314	95.070	86.952	(5.750)
	6.00	86.772	88.502	99.259	91.511	(5.524)
	8.00	90.914	94.961	100.981	95.619	(4.136)
	10.00	94.011	95.411	101.465	96.962	(3.235)
	12.00	95.523	100.837	103.549	99.970	(3.334)
	14.00	96.864	102.025	103.688	100.859	(2.905)
	18.00	98.210	103.218	104.535	101.988	(2.725)
	24.00	100.626	104.592	105.917	103.712	(2.248)

* Standard Deviation.

Table 82 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Conbination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 8515	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.379	3.477	2.562	2.806	(0.480)
	0.40	2.758	2.215	2.210	2.394	(0.257)
	1.00	4.420	3.325	3.869	3.871	(0.447)
	1.30	7.373	5.540	6.636	6.516	(0.753)
	2.00	11.638	9.627	10.723	10.663	(0.822)
	3.00	15.926	13.737	15.188	14.950	(0.909)
	4.00	22.193	20.179	21.455	21.276	(0.832)
	5.00	30.805	28.079	29.889	29.591	(1.133)
	6.00	38.397	35.845	38.191	37.478	(1.158)
	8.00	53.140	50.405	52.759	52.101	(1.210)
	10.00	71.161	65.579	68.473	68.404	(2.279)
	12.00	87.327	76.926	83.384	82.546	(4.287)
	14.00	95.940	85.314	96.776	92.677	(5.217)
	18.00	101.577	95.167	104.732	100.492	(3.980)
	24.00	104.577	102.052	106.510	104.380	(1.825)

* Standard Deviation.

Table 82 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Conbination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 8713	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.562	3.294	1.098	2.318	(0.913)
	0.40	1.478	2.031	1.287	1.599	(0.315)
	1.00	2.218	2.774	2.209	2.400	(0.264)
	1.30	3.511	4.620	3.502	3.878	(0.525)
	2.00	8.843	8.707	7.056	8.202	(0.812)
	3.00	9.228	10.151	9.031	9.470	(0.488)
	4.00	13.879	14.091	14.748	14.239	(0.370)
	5.00	21.045	19.474	21.030	20.516	(0.737)
	6.00	27.894	25.954	28.767	27.538	(1.176)
	8.00	42.422	38.688	42.767	41.292	(1.847)
	10.00	57.385	51.314	57.200	55.300	(2.819)
	12.00	68.699	64.010	69.756	67.488	(2.497)
	14.00	78.297	77.308	80.071	78.559	(1.143)
	18.00	89.723	95.654	91.684	92.354	(2.467)
	24.00	99.433	103.792	100.339	101.188	(1.878)

* Standard Deviation.

Table 82 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Combination of Ethylcellulose and Hydroxypropyl Methylcellulose Film Coating Formulations. (Cont..)

Formulations	Time (hr.min)	Cumulative % Drug Released				
		1	2	3	Mean (SD)*	
EH 9010	0.00	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.562	3.660	3.660	3.294	(0.518)
	0.40	0.746	0.935	0.569	0.750	(0.149)
	1.00	0.750	0.391	0.389	0.510	(0.170)
	1.30	0.754	0.393	0.391	0.513	(0.171)
	2.00	3.775	2.348	1.991	2.705	(0.771)
	3.00	3.081	2.004	1.644	2.243	(0.611)
	4.00	3.805	2.012	2.540	2.786	(0.752)
	5.00	4.888	2.554	2.196	3.213	(1.194)
	6.00	6.332	3.277	2.384	3.998	(1.690)
	8.00	12.582	4.004	4.527	7.038	(3.926)
	10.00	18.867	8.111	8.814	11.931	(4.913)
	12.00	26.786	15.972	15.969	19.576	(5.098)
	14.00	36.525	24.410	26.717	29.217	(5.252)
	18.00	53.603	45.866	49.963	49.811	(3.160)
	24.00	77.172	72.594	74.581	74.782	(1.874)

* Standard Deviation.

Table 83 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Film Coating Formulation EH 8218 in Comparison with the Commercial Preparation.

	Time (hr.min)	Cumulative % Drug Released							
		1	2	3	4	5	6	Mean	(SD)*
EH 8218	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.196	2.562	5.856	4.758	6.405	3.660	4.240	(1.576)
	0.40	2.025	2.393	2.960	2.405	2.781	2.399	2.494	(0.302)
	1.00	3.866	3.870	4.258	4.066	3.528	2.596	3.697	(0.540)
	1.30	12.671	7.186	8.307	8.663	6.292	4.074	7.866	(2.622)
	2.00	27.954	23.179	28.920	32.297	10.557	8.694	21.934	(9.117)
	3.00	44.565	40.860	46.094	48.421	13.779	11.741	34.243	(15.367)
	4.00	59.313	62.193	69.582	63.568	20.396	19.602	49.109	(20.811)
	5.00	84.449	73.514	84.492	70.624	28.825	26.618	61.420	(24.383)
	6.00	92.486	78.678	89.532	77.007	36.591	34.206	68.083	(23.759)
	8.00	96.656	84.934	96.552	86.799	50.441	50.009	77.565	(19.831)
	10.00	97.115	85.358	97.034	91.846	64.544	65.544	83.574	(13.683)
	12.00	100.062	96.267	100.359	94.608	74.282	75.656	90.206	(10.967)
	14.00	100.890	98.882	100.501	96.317	79.452	94.528	95.095	(7.345)
	18.00	101.187	101.332	100.997	97.855	85.182	97.333	97.314	(5.660)
	24.00	103.083	101.837	102.736	100.465	93.963	100.151	100.373	(3.061)

* Standard Deviation

Table 83 Cumulative Percent Amount of the Drug Released from Propranolol HCl Tablets Coated with Film Coating Formulation EH 8218 in Comparison with the Commercial Preparation. (Cont..)

	Time (hr.min)	Cumulative % Drug Released							
		1	2	3	4	5	6	Mean	(SD)*
Commercial Preparation	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	(0.000)
	0.20	2.636	2.820	4.294	4.294	3.188	4.478	3.618	(0.757)
	0.40	5.966	5.230	8.738	8.370	6.890	8.739	7.322	(1.385)
	1.00	9.683	8.022	13.208	13.021	10.612	13.025	11.262	(1.975)
	1.30	14.710	11.935	19.175	18.619	16.197	18.070	16.451	(2.524)
	2.00	20.499	16.650	26.216	25.840	22.344	23.859	22.568	(3.292)
	3.00	27.509	23.475	33.949	33.573	30.787	30.332	29.938	(3.602)
	4.00	35.094	30.338	42.260	41.170	39.276	37.377	37.586	(4.007)
	5.00	41.289	36.164	48.828	48.093	46.381	43.388	44.024	(4.375)
	6.00	46.445	41.307	54.717	53.980	51.915	48.537	49.484	(4.664)
	8.00	53.955	48.804	62.784	61.867	60.341	56.039	57.298	(4.918)
	10.00	60.431	55.625	69.642	68.903	67.381	62.867	64.142	(5.022)
	12.00	65.333	60.874	74.212	73.471	74.101	67.942	69.322	(5.052)
	14.00	69.366	64.898	77.732	77.527	77.279	71.792	73.099	(4.855)
	18.00	74.671	71.089	83.058	82.677	83.157	77.809	78.744	(4.648)
	24.00	82.331	79.281	89.308	90.000	91.391	84.930	86.207	(4.387)

* Standard Deviation

Appendix D

Cast Film Evaluations

The tensile properties and moisture sorption ability of various cast films are presented.

Table 84 Tensile Properties of Chitosan Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.131	0.132	0.131	0.131	0.135
2	0.129	0.128	0.131	0.132	0.139
3	0.125	0.125	0.130	0.132	0.132
4	0.125	0.129	0.131	0.135	0.132
5	0.129	0.131	0.131	0.135	0.132
Mean Thickness (mm.)	0.128	0.129	0.131	0.133	0.134
Maximum Load (kg.)	0.2980	0.3313	0.4005	0.2231	0.2556
Ultimate Tensile Strength (kg./mm.^{2})	0.466	0.514	0.612	0.335	0.381
Elongation (%)	35.0	40.0	35.0	15.0	25.0

Table 85 Tensile Properties of Chitosan with 20%* Polyethylene Glycol 400 Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.128	0.121	0.129	0.129	0.125
2	0.125	0.121	0.128	0.125	0.125
3	0.122	0.122	0.125	0.125	0.125
4	0.122	0.125	0.125	0.122	0.125
5	0.122	0.128	0.125	0.125	0.125
Mean Thickness (mm.)	0.124	0.123	0.126	0.125	0.125
Maximum Load (kg.)	0.1917	0.1638	0.1646	0.2354	0.1179
Ultimate Tensile Strength (kg./mm.^{2})	0.310	0.265	0.260	0.376	0.189
Elongation (%)	65.0	60.0	40.0	60.0	55.0

* w/w of the polymer weight.

Table 86 Tensile Properties of Chitosan with 1%* Colloidal Silicon Dioxide Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.170	0.170	0.165	0.172	0.172
2	0.172	0.175	0.168	0.175	0.175
3	0.172	0.175	0.175	0.178	0.175
4	0.175	0.175	0.171	0.175	0.172
5	0.172	0.172	0.168	0.172	0.172
Mean Thickness (mm.)	0.172	0.173	0.169	0.174	0.173
Maximum Load (kg.)	0.6260	0.4875	0.5133	0.6328	0.6314
Ultimate Tensile Strength (kg./mm.^{2})	0.727	0.562	0.606	0.726	0.729
Elongation (%)	35.0	55.0	45.0	40.0	55.0

* % w/w of the polymer weight.

Table 87 Tensile Properties of Chitosan with 20%* Polyethylene Glycol 400 and 1%* Colloidal Silicon Dioxide Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.200	0.188	0.190	0.200	0.195
2	0.188	0.185	0.185	0.192	0.191
3	0.180	0.185	0.182	0.185	0.189
4	0.180	0.182	0.182	0.185	0.185
5	0.189	0.192	0.182	0.185	0.185
Mean Thickness (mm.)	0.187	0.186	0.184	0.189	0.189
Maximum load (kg.)	1.183	0.5817	0.6427	0.1337	0.6268
Ultimate Tensile Strength (kg./mm.^{2})	1.263	0.624	0.698	0.141	0.663
Elongation (%)	130.0	110.0	110.0	60.0	95.0

* % w/w of the polymer weight.

Table 88 Tensile Properties of Hydroxypropyl Methylcellulose Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.092	0.109	0.105	0.111	0.089
2	0.095	0.104	0.102	0.105	0.096
3	0.092	0.101	0.101	0.102	0.098
4	0.095	0.099	0.100	0.102	0.100
5	0.098	0.098	0.101	0.108	0.099
Mean Thickness (mm.)	0.094	0.102	0.102	0.106	0.096
Maximum load (kg.)	2.954	3.301	3.328	3.533	2.519
Ultimate Tensile Strength (kg./mm.^{2})	6.258	6.460	6.538	6.691	5.226
Elongation (%)	5.0	15.0	15.0	20.0	10.0

Table 89 Tensile Properties of Methylcellulose Cast Films.

Properties		Test No.				
		1	2	3	4	5
Thickness (mm.)	1	0.099	0.092	0.092	0.091	0.095
	2	0.098	0.095	0.090	0.091	0.100
	3	0.092	0.095	0.092	0.090	0.100
	4	0.098	0.095	0.091	0.099	0.099
	5	0.100	0.101	0.098	0.099	0.102
Mean Thickness (mm.)		0.097	0.096	0.093	0.094	0.099
Maximum Load (kg.)		2.631	2.706	2.544	2.761	2.530
Ultimate Tensile Strength (kg./mm.^{2})		5.402	5.661	5.495	5.874	5.101
Elongation (%)		5.0	15.0	10.0	10.0	10.0

Table 90 Tensile Properties of Hydroxypropyl Cellulose Cast Films.

Properties	Test No.				
	1	2	3	4	5
Thickness (mm.) 1	0.096	0.101	0.100	0.100	0.101
2	0.098	0.101	0.099	0.100	0.100
3	0.100	0.101	0.099	0.100	0.100
4	0.100	0.101	0.099	0.100	0.099
5	0.100	0.102	0.100	0.102	0.100
Mean Thickness (mm.)	0.099	0.101	0.099	0.100	0.100
Maximum Load (kg.)	0.2773	0.3560	0.3141	0.3286	0.3812
Ultimate Tensile Strength (kg./mm.^{2})	0.561	0.705	0.632	0.655	0.762
Elongation (%)	10.0	10.0	5.0	15.0	10.0

Table 91 Tensile Properties of Film Coating Formulations EH 5050 Cast Films.

Properties		Test No.				
		1	2	3	4	5
Thickness (mm.)	1	0.121	0.119	0.105	0.105	0.100
	2	0.121	0.105	0.105	0.104	0.103
	3	0.122	0.103	0.103	0.100	0.104
	4	0.119	0.100	0.104	0.105	0.107
	5	0.121	0.121	0.104	0.103	0.107
Mean Thickness (mm.)		0.121	0.110	0.104	0.103	0.104
Maximum load (kg.)		0.5299	0.5401	0.4682	0.4668	0.5689
Ultimate Tensile Strength (kg./mm.^{2})		0.877	0.986	0.899	0.903	1.092
Elongation (%)		5.0	5.0	5.0	5.0	5.0

Table 92 Moisture Sorption of Various Cast Films.

Cast Films	% Increased Weight (SD)***			
	0 day	15 days	30 days	60 days
CS	0	7.74 (0.26)	6.94 (0.15)	6.64 (0.22)
CS + 20%* PEG 400	0	8.25 (3.26)	7.03 (3.16)	7.04 (3.24)
CS + 1 % CSD **	0	5.71 (0.08)	5.61 (0.18)	5.05 (0.16)
CS + 20% PEG 400	0	12.00 (0.42)	11.94 (0.79)	11.51 (0.68)
and 1% CSD **	0			
HPMC	0	6.07 (0.33)	7.73 (0.21)	6.41 (0.05)
MC	0	3.85 (0.17)	6.12 (0.15)	3.53 (0.33)
HPC	0	3.60 (0.13)	3.55 (0.12)	3.30 (0.07)
EH 5050	0	3.44 (0.38)	3.11 (0.30)	2.94 (0.37)

* % w/w of the polymer weight

** Colloidal Silicon Dioxide

*** Standard Deviation

Biography

Mr. Chirasak Kusonwiriyawong was born on July 19, 1969, in Bangkok. He received his degree, Bechalor of Science in Pharmacy, in 1991 from Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, Thailand.