The Influence of Film Coatings on Performance of Hypromellose Matrices

ABSTRACT SUMMARY

The influence of four film coating systems on the performance of hypromellose sustained release (SR) matrices stored under different conditions up to 12 months storage has been investigated.

Keywords: hypromellose, film coating, stability.

INTRODUCTION

Hypromellose (HPMC) has been widely used in oral slow drug release matrix systems.[1] Formulation development is simple and reproducible release profiles are well documented. Majority of reported studies in the literature are based on uncoated matrices. Here, the influence of four film coating systems on the performance of hypromellose SR matrices, stored under different conditions up to 12 months, is investigated.

EXPERIMENTAL METHODS

A model formulation containing; 20% hypromellose (METHOCEL™, premium cellulose ethers, K4M, Dow Chemical Company), 30% drug, 49.25% microcrystalline cellulose (Avicel PH102, FMC), 0.5% fumed silica (Aerosil 200, Degussa AG) and 0.25% magnesium stearate (Peter Greven) was used. Chlorpheniramine maleate (CPM) and theophylline (TP) were used as model freely water-soluble and slightly water-soluble drugs, respectively.

All ingredients with the exception of magnesium stearate were blended in a Turbular mixer (Type T2A, Pleuger, Basel, Switzerland) for 10 minutes. Then magnesium stearate was added and mixed for an additional five minutes. Tablets (333mg) containing 100mg drug were directly compressed using an instrumented Piccola rotary 10 station tablet press with 9mm concave tooling at 10 kN and 30 rpm. Tablets were coated with four different film coating systems (Opadry® II, high performance film coating system, (33G), Opadry II (85F), Opadry® AMB, aqueous moisture barrier film coating system, Opaglos® 2, high gloss film coating system; Colorcon) to 4% w/w weight gain in a 38-cm side-vented pan (Labcoat II-X, O'Hara) using a Schlick spray gun.

Uncoated and coated tablets were stored in Securitainer polypropylene jars (Jaycare Ltd) at 25ºC/60%RH, 30ºC/60%RH and 40ºC/75%RH for up to twelve months.

Tablets were tested initially and after 1, 2, 3, 6 and 12 months storage. Drug release from the matrices was determined using a Caleva ST7 dissolution tester, USP apparatus II (paddle) and sinkers, in 37±1ºC water at 100rpm. Tablet mechanical strength was also measured.

RESULTS AND DISCUSSION

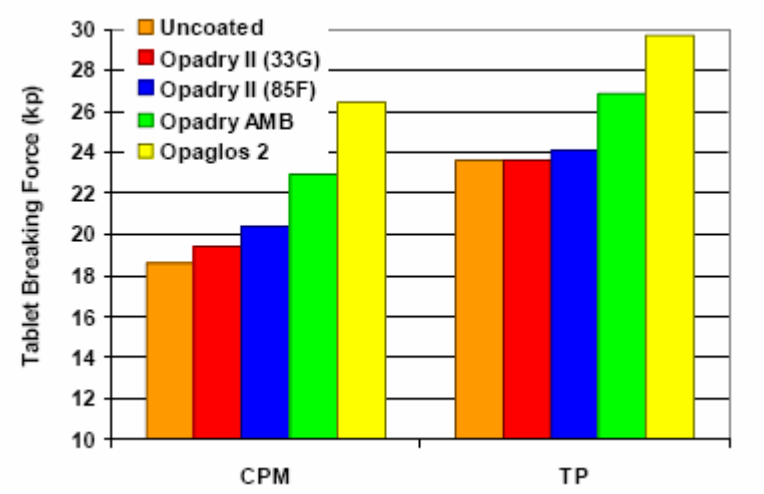
Table 1 shows properties of powder mixtures and uncoated tablets.

Table 1. Properties of Powder Mixtures and Uncoated Tablets

	CPM	TP
Powder Bulk Density (g/cm^3)	0.449 ± 0.001	0.423 ± 0.003
Powder Tapped Density (g/cm^3)	0.542 ± 0.002	0.526 ± 0.002
Compressibility Index	17	20
Tablet Weight (mg)	333 ± 3	333 ± 4
Tablet Diameter (mm)	9.24 ± 0.006	9.022 ± 0.005
Tablet Thickness (mm)	5.053 ± 0.018	4.939 ± 0.029
Tablet Breaking Force (kp)	18.6 ± 0.5	23.6 ± 1.3
Tablet Friability (%)	< 0.001	< 0.001

All coated and uncoated tablets had low weight variation and good mechanical strength initially and after 12 months storage. Application of film coatings generally resulted in an increase in tablet breaking force (Figure 1).

Figure 1. Tablet Breaking Force



Good stability results were produced at all storage conditions after 1, 2, 3, 6 and 12 months. No changes were observed in tablet appearance. No significant decrease in tablet mechanical strength was recorded. Drug release did not change after storage at all three storage conditions. Figures 2-5 show drug release profiles at 0 and 12 months time points. For both CPM and TP, there were no differences between drug release from coated or uncoated matrices. In addition, drug release from these matrices remained the same after 12 months stability at 40ºC/75%RH.

Figure 2. CPM Release at "0" Time Point

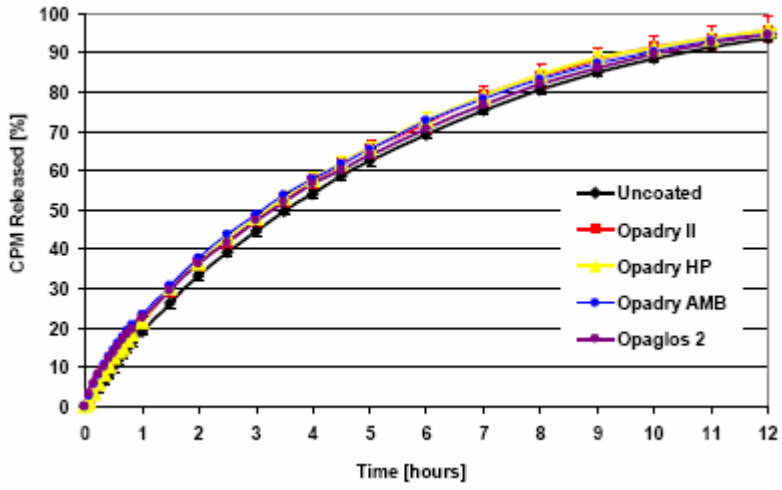


Figure 3. CPM Release after 12 months Storage at 40ºC/75%RH

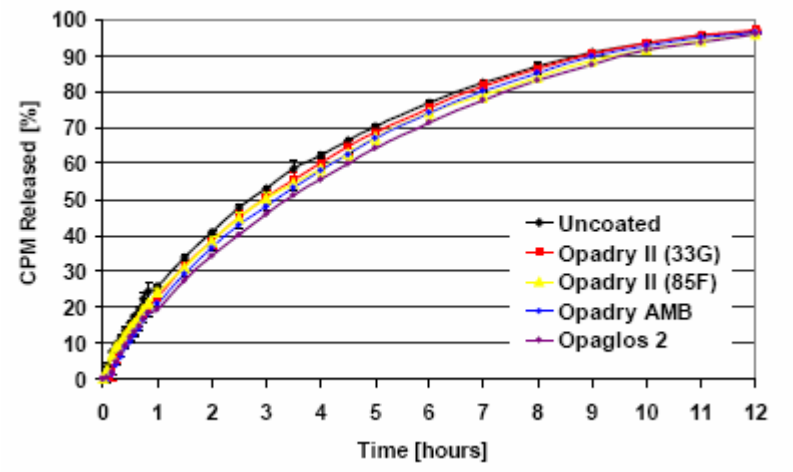


Figure 4. Theophylline Release at "0" Time Point

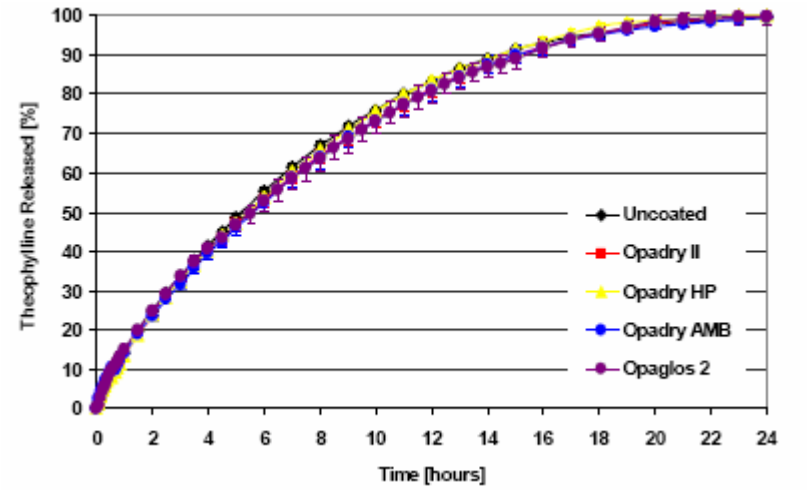
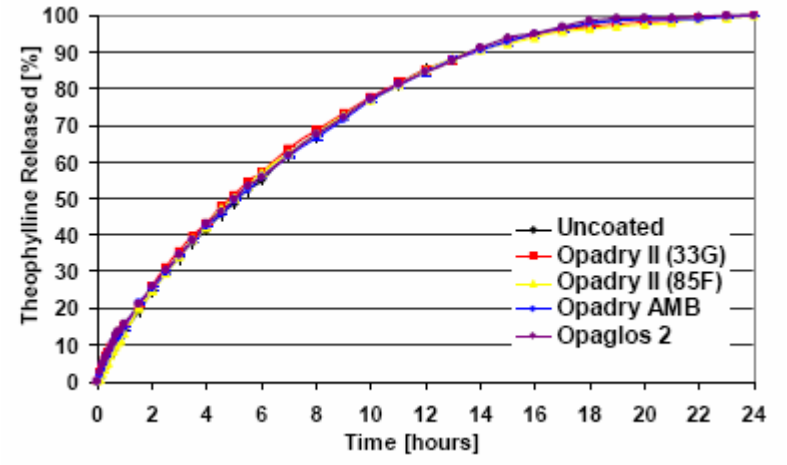


Figure 5. Theophylline Release after 12 months Storage at 40ºC/75%RH



CONCLUSIONS

The model chlorpheniramine maleate and theophylline formulations, with HPMC as the rate controlling polymer, show extended release characteristics with excellent reproducibility after 12 months storage at 25ºC/60%RH, 30ºC/60%RH and 40ºC/75%RH. The four film coating systems used in this study did not influence drug release profiles initially and during 12 months storage under different conditions.

REFERENCES

1. Rajabi-Siahboomi, A.R. & Jordan M.P. European Pharm. Rev., 5, 4, 21-23 (2000).

Reprint of poster presented at CRS – July 2003. Authors: Marina Levina, Peter Wan, Martin Jordan and Ali R. Rajabi-Siahboomi.

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