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Development of Modified Release Pellets via Dry Powder Coating

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Dry powder coating is a relatively new technique to coat substrates without the use of any organic solvent or water. The film forming polymer is applied as a powder to the cores to be coated leading to reduced process times [1]. Additionally, excipients like plasticizers, preferably in liquid form, are often needed to soften the polymer in order to get a functional film. A curing step is sometimes necessary to achieve film formation depending on the characteristics of the polymer used. One critical parameter in dry powder coating is the coating efficiency which describes how much of the applied coating material actually adheres to the cores. Therefore, another main task of the excipients used is to enhance the adhesion of polymer powder. The aim of this work was to evaluate excipients, like plasticizers and polymers, regarding their suitability for dry powder coating.

Dry powder coating was performed in a rotary fluid bed (GPCG1.1, Glatt, Binzen, Germany). Polymer powder and liquid were fed simultaneously via a three-way nozzle to the fluid bed. Coating efficiency was calculated by dividing the mass of adherent coating material by the mass of applied coating material. Theophylline pellets were used as cores and ethylcellulose, hydroxypropyl-methylcellulose acetate succinate (HPMCAS) or Eudragit RS[®] as coating polymer. Various liquids were characterized with respect to several properties, like viscosity, spreading behavior and droplet size. Coated pellets were investigated via dissolution testing and scanning electron microscopy before and after curing steps to evaluate whether film formation was achieved.

The spreading behavior of the liquids seems to be one key factor affecting the coating efficiency. It can be investigated by measuring contact angles of liquids on the polymer or predicted by calculating surface energies. However, there are still other parameters impacting the coating efficiency of the process like viscosity of the liquid, which influences on the one hand the kinetic of spreading as well as the droplet size generated by the spraying nozzle. The film forming properties of the polymers used were very different. Using ethylcellulose a curing step was required to obtain dense films whereas Eudragit RS[®] formed films without any curing.

- [1] Kablitz CD, Harder K, Urbanetz NA. Dry coating in a rotary fluid bed. Eur J Pharm Sci. 2006; 27 (2006) 212–219. doi:10.1016/j.ejps.2005.10.001