to be generated inside the coated particle that will influence the rate at which the drug will be pushed out through pores or a preformed aperture in the membrane.

Dialysis

Dialytic effects describe conditions where water-filled channels are formed in a microporous membrane (often created by the imperfections common to many applied film coatings) through which drug in solution can pass. The key factors influencing drug release by this mechanism include the length and tortuosity of these channels, as well as the solubility of the drug in water.

Erosion

Some coatings are designed to erode gradually with time, thereby releasing the drug contained within the pellet in a controlled manner. Examples of these types of coating are usually those that consist of natural materials such as shellac (the solubility of which in water increases with increasing pH) or waxes and fats that become soft enough to facilitate erosion as the coated multiparticulates are subjected to intense agitation as they pass through the gastrointestinal tract.

Processes for coating multiparticulates

Traditionally, multiparticulates were coated using pan-coating processes, often employing techniques very similar to those used in sugar coating. As coating processes evolved, spray application techniques became more prevalent and today, fluidized-bed processes are preferred because of their ability to:

- enable discrete coatings to be applied to small particles while minimizing the risk of agglomeration
- ensure that coatings are uniformly deposited on the surface of each multiparticulate in the batch.

All the polymeric film-coating procedures described above can be used for the coating of multiparticulates. The fluidized bed is used in preference to the perforated pan. Another coating technique that is finding favour for the coating of modified-release pellets is hot-melt coating.

Hot-melt coating

Hot-melt coatings are usually applied to multiparticulates in order to mask taste and modify drug release. They consist of waxy materials (such as beeswax, synthetic spermaceti and other synthetic mono/diglycerides) that have melting points in the range of 55–65 °C and exhibit melt viscosities that are typically less than 100 mPa s (in order to allow the formation of smooth coatings on the surfaces of particles). Hot-melt coatings are preferably applied to multiparticulates using fluidized-bed coating processes, as described by Kennedy & Niebergall (1996).

References

Alvarez-Fuentes, J., Fernandez-Arevalo, M., Gonzalez-Rodriguez, M.L., Cirri, M., Mura, P. (2004) Development of enteric-coated timed-release matrix tablets for colon targeting. *Journal of Drug Targeting*, **12**, 607–612.

Chang, R-K. (1990) A comparison of rheological and enteric properties among organic solutions, ammonium salt aqueous solutions, and latex systems of some enteric polymers. *Pharmaceutical Technology*, **14**, 62–70.

Chopra, S.K. (2003) Procise: drug delivery systems based on geometric configuration. In: Rathbone, M.J., Hadgraft, J., Roberts, M.S. (eds) *Modified-Release Drug Delivery Technology (Drugs and the Pharmaceutical Sciences)*. Marcel Dekker, New York.

Dittgen, M., Durrani, M., Lehmann, K. (1997) Acrylic polymers: a review of pharmaceutical applications. *S.T.P. Pharma Sciences*, **7**, 403–437.

Gunsel, W.C., Dusel, R.G. (1990) Compression-coated and layer tablets. In: Lieberman, H.A., Lachman, L., Schwartz, J.B. (eds) Pharmaceutical Dosage Forms: Tablets, vol. 1, 2nd edn. Marcel Dekker, New York.

Hogan, J.E. (1982) Aqueous versus organic solvent film coating. *International Journal of Pharmaceutical Technology and Product Manufacture*, **3**, 17–20.

Jordan, M.P., Easterbrook, M.G., Hogan, J.E. (1995) Investigations into the moisture barrier properties of polyvinyl alcohol (PVA) tablet film coatings. *Proceedings of 1st World Meeting, APGI.APV*, Budapest, May 9–11.

Jozwiakowski, M.J., Jones, D.M., Franz, R.M. (1990) Characterization of a holt-melt fluid bed coating process for fine granules. *Pharmaceutical Research*, **7**, 1119–1126.

Kennedy, J.P., Niebergall, P.J. (1996) Development and optimization of a solid dispersion hot-melt fluid bed coating method. *Pharmaceutical Development and Technology*, **1**(1), 51–62.

Macleod, G.S., Fell, J.T. (2002) Comparison of atomization conditions between different spray guns used in pharmaceutical film coating. *Pharmaceutical Technology Europe*, November Issue.