QUANTIFYING AGITATION CONDITIONS IN COMPENDIAL DISSOLUTION TESTS

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The rotating basket dissolution tests of the BP and USP present difficulties in precise standardisation of equipment geometry, agitation, vibration and sampling procedure. Interlaboratory variation might be reduced considerably if standard pellets with a reproducible dissolution profile were available (Hanson, 1977) for checking the operating conditions of the dissolution equipment.

We have used compressed pellets of potassium sorbate (PS), formulated as a co-precipitate with polyethylene glycol 6000 (PEG), to obtain comparative dissolution data in the BP and USP rotating basket apparatus. This formulation technique eliminated inter-pellet variation due to powder mixing, granulation and ill-defined disintegration behaviour of conventional tablets. The plane-faced 12.7 mm diameter pellets with a strength of 55 ± 5 N weighed 500 ± 25 mg and contained a nominal 10 mg PS. Dissolution tests were performed in de-aerated water using 5 replicate pellets, firstly with the pellet inside the rotating basket as in the compendial method and secondly with the pellet outside the rotating basket at the base of the flask. The basket was rotated at 100 ± 5 rpm. Samples of dissolution medium were removed at 2.5 minute intervals using the BP Addendum 1977 procedure and were analysed spectrophotometrically at 279 nm. Knowing the weight of each pellet, the amount of PS released was expressed as a percentage of the theoretical content.

Release of PS followed zero-order kinetics until about 50% had dissolved, enabling dissolution rates to be calculated from the initial rectilinear release profiles. The mean dissolution rate in the official BP test was 0.63 mg PS per minute. Table 1. shows the relative values for the other dissolution conditions.

Dissolution apparatus (and pellet location)	Relative dissolution rates (±95% confidence limits)
BP (in rotating basket)	1.00 ± 0.05
BP (outside the basket)	0.40 ± 0.04
USP (in rotating basket)	1.07 ± 0.11
USP (outside the basket)	0.28 ± 0.02

Table 1. Relative dissolution rates of PS-PEG pellets

The narrow confidence limits indicate that the pellets possessed reproducible release profiles and that agitation conditions in replicate tests were reproducible. For pellets inside the rotating basket, the different shape of the BP and USP flasks had no significant effect on the dissolution rate. Pellets placed at the base of the BP flask dissolved more rapidly than those similarly located in the USP flask, possibly because the convex base of the USP flask orders the angular rotation of the dissolution medium and reduces turbulence compared with the flat-bottomed BP flask. In both apparatus the agitation conditions were much less intense at the base of the flask than inside the basket, so the test tends to discriminate against tablets which disintegrate into granules just small enough to escape from the basket.

We conclude that calibration tests of the rotating basket equipment using non-disintegrating pellets should include an assessment of the agitation conditions outside the basket as well as those inside. As might be expected, the USP and BP flasks should not be considered interchangeable.

Hanson, W. A. (1977). Pharmaceutical Technology, 1 (9), 31-63.