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Development and evaluation of a multiple-plate fraction collector for sample processing: Application to radioprofiling in drug metabolism studies

Anthony Barros Jr. [a,*], Van T. Ly[a], Theodore J. Chando[a], Qian Ruan[a], Scott L. Donenfeld[b], David P. Holub[b], Lisa J. Christopher[a]
[a] Department of Biotransformation, Bristol-Myers Squibb, Route 206 and Province Line Road, Princeton, NJ 08543, USA
[b] LEAP Technologies, P.O. Box 969, Carrboro, NC 27510, USA

a b s t r a c t

Microplate scintillation counters are utilized routinely in drug metabolism laboratories for the off-line radioanalysis of fractions collected during HPLC radioprofiling. In this process, the current fraction collection technology is limited by the number of plates that can be used per injection as well as the potential for sample loss due to dripping or spraying as the fraction collector head moves from well to well or between plates. More importantly, sample throughput is limited in the conventional process, since the collection plates must be manually exchanged after each injection. The Collect PAL, an innovative multiple-plate fraction collector, was developed to address these deficiencies and improve overall sample throughput. It employs a zero-loss design and has sub-ambient temperature control. Operation of the system is completely controlled with software and up to 24 (96- or 384-well) fraction collection plates can be loaded in a completely automated run. The system may also be configured for collection into various-sized tubes or vials. At flow rates of 0.5 or 1.0 mL/min and at collection times of 10 or 15 s, the system precisely delivered 83-_L fractions (within 4.1% CV) and 250-_L fractions (within 1.4% CV), respectively, of three different mobile phases into 12mm×32mmvials. Similarly, at a flow rate of 1 mL/min and 10 s collection times, the system precisely dispensed mobile phase containing a [^{14}C]-radiolabeled compound across an entire 96-well plate (% CV was within 5.3%). Triplicate analyses of metabolism test samples containing [^{14}C]buspirone and its metabolites, derived from three different matrices (plasma, urine and bile), indicated that the Collect PAL produced radioprofiles that were reproducible and comparable to the current technology; the % CV for 9 selected peaks in the radioprofiles generated with the Collect PAL were within 9.3%. Radioprofiles generated by collecting into 96- and 384-well plates were qualitatively comparable; however, the peak resolution was greater in the profiles that were collected in 384-well plates due to the collection of a larger number of fractions per minute. In conclusion, this new and innovative fraction collector generated radioprofile results that were comparable to current technology and should provide a major improvement in capacity and throughput for radioprofiling studies.

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