

Pharmaceutical analysis nearer the sampling point; use of simple, rapid on-site immunoassays for cleaning validation, health and safety, and environmental release applications

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Much effort has been made to develop analytical methods suitable for use "nearer to the patient/user". The objective has been to adapt methods to render them sufficiently mobile, simple and robust that they can be performed at the patient's home or hospital bedside. This ideally should be undertaken accurately by relatively unskilled operators such as the users themselves. This approach has been successfully applied to home tests for blood glucose monitoring (using biosensors) and for pregnancy and kerbside tests for drugs of abuse. The tests for pregnancy and drugs of abuse use a form of lateral diffusion immunoassay. This is a reagentless system in which analyte interacts with immunological reagents on a pad as the pad is wetted by the sample. The wetting process leads to migration of sample and reagents in a manner analogous to that in paper chromatography and results in the development (or non-development) of coloured spots or bands on the pad's surface.

We have investigated the use of similar immunological reagents for analysis of key analytes within the pharmaceutical production plant. The areas which lend themselves to immediate on-site analysis following sampling include;

1. Cleaning validation
2. Monitoring of air and aqueous discharges from the factory into the local environment, and
3. Monitoring the air within the factory for release of analyte to demonstrate process containment and possible worker exposure, the latter for health and safety purposes.

Current practice is to take samples; swabs for 1, aqueous discharge samples for 2 and filter samples following air sampling for 2 and 3, which are then taken to a dedicated laboratory where the analyte is extracted and analysis performed. Results are often obtained days or weeks following sampling.

In order to demonstrate the potential of simplified immunoassay methods to these areas we have developed indirect competitive enzyme-linked immunosorbent assays (ELISAs) for some cephalosporin antibiotics (Rowell et al 1997) and ethinyl estradiol. These are performed directly on the surface of cellulose nitrate filters retained within samplers commonly used by industrial hygienists for air sampling. The resulting assays can be performed on-site with results obtained within minutes of air sampling or applying swab extracts or samples of aqueous discharges (both 50 μ l). The assay detects low nanogramme quantities of these analytes. The end point is either a semi-quantitative visual one or a fully quantitative one following scanning of the surface of the filter with an optical scanner when the intensities of the coloured spots can be compared with those of standards. The method is also suitable for the simultaneous analysis of 12 or more analytes per sample.

Reference

Rowell, F. J., Miao, Z-F., Reeve, R. N., Cumming, R. H. (1997) Direct on-filter immunoassay of some β -lactam antibiotics for rapid analysis of drug captured from the workplace atmosphere. *Analyst*, 122:1505-1508