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Short Communication

Advances in Drugs of Abuse Testing Methodology

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DESCRIPTION

Drug testing is used worldwide in a large scale with clinical and forensic applications. Urine, the primary specimen used for this, is connected with difficulties due to the risk of adulteration and the need for collecting samples under supervision, which violates the right to privacy for the individual. One reason for using urine as a primary specimen originates from the immunochemical screening technology that made large scale drug testing possible. A limitation of the immunochemical screening methods is that positive results must be confirmed by mass spectrometry methods before being considered reliable. However, the more recent advent of modern combined liquid chromatography and mass spectrometry did not only lead to better methods for confirmatory analysis but has also made it possible to use it already for screening, but also for using other specimens not suitable for the high-volume immunochemical based screening assays [1,2]. Thereby it is possible for the field of drug testing to become even more powerful by the possibility to rapidly report reliable results and to cover the larger panels of drugs.

Blood is the prime specimen in toxicological and health investigations in general, but its use is limited because of the need of professional health workers and safe facilities to collect venous blood samples. Therefore, the possibility to use dried capillary blood as Dried Blood Spots (DBS) collected by a finger prick has been proposed as a substitute and more available specimen which also provides the additional advantage to be stable, safe, and easy to transport [3]. However, one limitation with traditional application of DBS has been the lack of knowing the exact amount of blood collected which has hindered measurement of concentrations with precision [4]. This problem was solved with the advent of volumetric DBS which can produce a DBS with exactly known volume [5].

In the recent study by Guterstam and co-workers these developments were put together demonstrating the possibility to design a multipanel drug testing mass spectrometry method suitable for both urine and volumetric DBS [6]. For urine the potential is to deliver reliable results with a short reporting time, and for DBS to enable the use of the prime and often preferred toxicology specimen. The use of a volumetric DBS device to collect specimen will enable precise quantifications and more use of blood as a toxicology specimen with potential not only to monitor drug intake but also excessive unhealthy drinking using the alcohol biomarker phosphatidylethanol (PE^{th}) [7].

The urine method comprised of 37 drugs or drug metabolites that for some immunoassays are not available. The reporting limits were set to match those used in immunochemical screening. The method was designed in a 96-well format to allow automation and to achieve short (24 h) turn-around times, which has been proven by the routine application in the laboratory of three of the co-authors. The clinical application demonstrated that the method performs well for at clinical application for patients in a methadone maintenance program. The feature of being able to report cannabis metabolite concentrations was highly valued. Normally the clinics are served with rapid screening results with a limited panel of drugs covered. A method with larger coverage and reliable results were highly rated.

The DBS method comprised of 35 drugs or drug metabolites. The reporting limits were at 1 ng/mL for most of the compounds. This lower limit as compared with urine led to a high degree of agreement regarding detected substances in the DBS specimen when using urine as the reference. The collection of finger blood was well accepted by a majority of the patients.

CONCLUSION

It was demonstrated that mass spectrometry methods can be designed to offer an alternative to immunoassay screening and offer significant advantages. The use of capillary blood from a finger prick in combination with a volumetric DBS device, as alternative to venous blood, offer greater availability in combination with a specimen more in focus for toxicological

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investigation, and a specimen that is less intrusive on privacy, safer and easy to transport. In addition, the long-term alcohol marker PEth can also be determined in capillary blood from the finger making the concept even more valuable

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