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A Novel Immunoassay for Quantitative Drug Abuse Screening in Serum

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1. Introduction

The intake of illicit drugs represents an international health and social issue. Besides the individual health problems great costs are caused for the government and the healthcare system. Alone in Germany public expenditures in the context of drug abuse account for over 6 bill. € (Mostardt et al., 2010) each year. The major part is spent on the public safety sector, e.g. courts or police, and a minor part is spent on the healthcare system, for e.g. emergency departments. In both sectors reliable detection systems are needed. Current standard procedures include ELISA (Enzyme-linked Immunosorbent Assay) for urine analysis (Beck et al., 2014) and gas chromatography coupled with mass-spectrometry (GC-MS) for blood analysis. Both methods are characterized by their specific advantages and disadvantages (Castaneto et al., 2015; Marsden et al., 2014). ELISA depicts an easy protocol with quite inexpensive equipment, but often suffers from unspecific binding due to the application of antibodies (Baker, 2015) and is mostly restricted to qualitative analysis. GC-MS is well-known for its specificity and sensitivity, but require expensive devices and elaborate sample preparation (Mercolini et al., 2013).

In the following a new assay was developed which combines the characteristics of both standard procedures, i.e. an easy and inexpensive protocol with a specific and sensitive quantitative detection. Therefore, an ELISA based assay was established which detects a drug specifically even in the presence of various drugs or antibodies. To forward multiplexing, increase the through-put and decrease the consumption of reagents a microarray assay for the detection of MDMA in serum was set-up.

This article describes a quantitative immunoassay in serum with the ability to perform multiplex measurements. As examples the drugs MDMA, methadone and benzoylecgonine