Application of Serological and DNA Methods for the Identification of Urine Specimen Donors

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ABSTRACT: Recent implementation of urine drug-screening policies in the workplace has resulted in an increase in the submission of substituted urine specimens. Donor verification of urine specimens often becomes necessary when the origin of a specimen is in question or when a positive drug test is contested. Methods reported for the identification of the urine donor include the analysis of blood group antigenic substances (ABH and Lewis systems), polymorphic proteins (group-specific component, haptoglobin, and orosomucoid), and deoxyribonucleic acid (DNA). Since the concentrations of the antigenic substances and polymorphic proteins in urine are typically low, most serological procedures adapt a concentration step enhancing the presence of these substances in the resulting residue by a factor ranging from 100 to 3,000. Conventional (and a two-dimensional) absorption-inhibition and electrophoresis procedures can then be applied to characterize the antigenic substances and polymorphic proteins. Recently developed DNA methodologies have also evolved to help characterize urine specimens and often provide more informative data than those derived from conventional serological approaches. As of this date, the unique nature of urine as the source of genetic markers has not yet been thoroughly explored and understood. Also, many related procedures and statistical data have yet to be empirically established. This state-of-the-art technology cannot yet "fingerprint" a urine specimen at this date. A limited number of investigations do indicate, however, that the combined use of serological and DNA approaches can provide valuable information helping to resolve the donorship issues that are frequently contested in drug urinalysis-related legal proceedings.

KEY WORDS: Deoxyribonucleic acid (DNA), DNA identification, DNA typing, forensic serology, genetic markers, human leukocyte antigen (HLA) DQ-α, immunology, urine.