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SPECIAL ARTICLE

Toxicology screening in paediatrics☆

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Abstract The prevalence of acute or chronic exposure to substances of abuse in paediatric patients, from the neonatal period to adolescence, is not well established as most cases go unnoticed. Regardless of clinical cases of acute poisoning leading to visits to emergency room, the exposure is usually detected by a questionnaire to the parents or children.

In the last few years, new validated analytical methodologies have been developed in order to detect parent drugs and their metabolites in different biological matrices. These biological matrices have different time windows for detection of the exposure: acute (i.e., urine, blood, oral fluid), and chronic (i.e., hair, meconium or teeth).

The aim of this paper was to review the scenarios where the use of biological matrices is indicated for the detection of acute or chronic exposure to substances of abuse.

PALABRAS CLAVE
Pediatría;
Drogas de abuso;
Exposición pasiva;
Intoxicación;
Cribado toxicológico;
Matrices biológicas alternativas

Utilidad del cribado toxicológico en pediatría

Resumen La prevalencia de la exposición aguda o crónica a sustancias de abuso en pediatría, desde la época neonatal hasta la adolescencia, no está bien establecida porque la mayoría de los casos pasan inadvertidos. Independientemente de los casos clínicos de intoxicaciones agudas que generan visitas a servicios de urgencias, las herramientas para la detección de la exposición que se han empleado clásicamente se reducen al cuestionario a los padres o los niños.

En los últimos años se han desarrollado metodologías analíticas validadas que permiten detectar la presencia de las sustancias madre y sus metabolitos en distintas matrices biológicas.

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Estas matrices biológicas ofrecen distintas ventanas de detección de la exposición: agudas (orina, sangre o saliva, entre otras) y crónicas (pelo, meconio o dientes, por ejemplo).

El objetivo de este manuscrito es revisar las situaciones en las que está indicada la utilización de las diferentes matrices biológicas para la detección de la exposición aguda o crónica a sustancias de abuso.

The consumption of drugs of abuse in the general population has remained stable for most substances in the last decade. In Spain, cocaine is now the most frequently consumed drug after cannabis in the population aged 15–64 years, and is the most frequently consumed illegal stimulant.[1] Although the prevalence of cocaine use in Europe has been decreasing after peaking at 3% in 2007, in the past decade there has been an increase in the use of cannabis and cocaine in Spain of up to 7.1% and 8.8%, respectively.[2–4]

A previous study conducted on newborns by our research group found an overall prevalence of prenatal exposure to drugs of abuse of 10%.[5] Another study conducted on the patients that visited the paediatric emergency department in our hospital and that used hair as an alternative matrix found that 23.3% of children aged 1–5 years and 13.5% of children aged 10–14 years are chronically exposed to drugs of abuse in their immediate environment.[2,6,7]

The documented cases demonstrate that acute intoxication with drugs of abuse in children is often the first clinical evidence of chronic repeated exposure.[6,8] Newborns, infants and young children can be passively exposed to such substances, for instance by inhaling the smoke produced by their consumption or by hand-to-mouth behaviours leading to ingestion of traces of drugs present in the residence of an active user. They may also be passively exposed through the placenta, breastfeeding, or the saliva or sweat of the user, and there is always the possibility of intentional administration by the adult. However, there is a dearth of published evidence on the subject of chronic exposure to drugs of abuse after the neonatal period. This possibility has already been documented in several published clinical cases.[5,6,8,9]

Diagnosis

Acute intoxications give rise to highly diverse clinical manifestations, often of a neurologic nature. Doses that are usually harmless to adults may lead to severe conditions in children, especially when different substances are consumed simultaneously. On the other hand, chronic intoxications due to continued exposure to drugs of abuse rarely produce specific symptoms, and are usually discovered by toxicological analysis of biological matrices.[6]

Aside from clinical cases of acute intoxications that result in emergency department visits, the means that have been traditionally used for detecting exposure have been limited to taking a history from the parents or the child. Questionnaires continue to be the most commonly used tool for identifying prenatal and postnatal exposure to drugs of abuse, but there is evidence that diagnosis of drug intake by means of questionnaires is not reliable and has a low diagnostic yield, as drug use tends to be underreported or not reported at all.[8,10]

There is no consensus-based standardised toxicology screen for implementation in paediatric emergency departments. Each laboratory has some of the various commercial rapid detection tests available, with the inherent differences in the substances they may detect and the cut-off points that define positive results. The most frequently used methods have urine as the biological matrix and involve semiquantitative detection by enzyme immunoassay. The tests available in hospitals can usually detect the presence of cannabis, cocaine, amphetamines, opioids, methadone, benzodiazepines, barbiturates and tricyclic antidepressants.[9] Except for very specific cases, such as the habitual use of cannabis or long half-life benzodiazepines, urine tests will only be able to detect substances that have been actively or passively consumed in the hours or days immediately preceding sample collection.

In recent years, analytical methods have been developed and validated that allow the objective detection of parent drugs and their metabolites (biomarkers) in different biological matrices, and thus a definitive diagnosis, which provides the foundation for the appropriate treatment and followup of newborns and children passively exposed to drugs of abuse. These biological matrices have different time windows for detection of drug exposure: acute (for example, urine, blood or saliva) and chronic (hair or meconium).

Traditionally, the biological matrices most frequently used for toxicology screening have been blood and urine, in which recent consumption can be detected[11]:

1. The detection window for drug testing of blood is very short, between zero and 1 h after consumption or exposure, although it can extend to up to 24 h for some substances. The chief limitation is that the procedure for sample collection is invasive.
2. The detection window for drugs of abuse in urine is somewhat longer, ranging from half to five hours from intake or exposure, although it can extend to 24–48 h for cannabis, or even one week.

The alternative or nonconventional biological matrices (hair, meconium, sweat, saliva) used for detection of drugs of abuse offer advantages compared to traditional matrices: the collection method is usually noninvasive, and some have very broad retrospective detection windows, for example, the past two trimesters in the case of meconium, while each