

## A REVIEW OF PUBLICATIONS IN HAIR TESTING: 2020-2023

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**Introduction and Aims:** Since its first use until now, the relevance of hair in the toxicological expertise has evolved, mainly due to its advantages over traditional samples. Despite the fact that it is one of the most used alternative specimens, hair still presents important challenges. The objective of this study was to perform a bibliographic review of scientific publications on toxicological applications of hair testing between the years 2020 and 2023.

**Materials & Methods:** The Scopus database was used for literature search, for papers published from 2020 to 2023 (10<sup>th</sup> April), and only articles written in English were considered. The search strings for terms included in the title, abstract or keywords were “hair testing” and “hair samples”. The papers were independently reviewed by four of the authors to determine their relevance in the context of this study.

**Results & Discussion:** Taking into consideration these criteria and search strings, 218 articles were found, from which 18 were excluded since animal hair specimens had been used. The papers were classified according to type (e.g. review, research paper), analytes, extraction and clean-up approaches. Each paper could be placed under more than one category, except review papers (32 articles). Concerning analytes, the highest number of papers involved drugs of abuse (175, from which 45 involving new psychoactive substances), drugs (44) and alcohol biomarkers (17). Other biomarkers included hormones, endocannabinoids, etc. (44 papers, 25 of which involved cortisol). Most studies involve protein precipitation and direct injection (91), and only 12 studies address the issues of cosmetic treatments or drug adulterants.

**Conclusions:** Hair testing is still mainly directed to the determination of drugs of abuse, and new psychoactive substances are still seldom included. Additionally, other applications are becoming more relevant, for instance the use of hair to determine biomarkers in some diseases.

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