

Illegal and Therapeutic Drug Concentrations in Hair Segments — A Timetable of Drug Exposure?

REFERENCE: Pragst F, Rothe M, Spiegel K, Sporkert F: Illegal and therapeutic drug concentrations in hair segments — A timetable of drug exposure? *Forensic Sci Rev* 10:81–112; 1998.

ABSTRACT. Literature data related to the merit of hair as a chronological diary of drug exposure, as examined by segmental analysis, are reviewed with emphases on the mechanisms of drug incorporation, physiology of hair growth, and findings resulting from research effort and routine analytical results. In a single anagen strand, a drug dose may be incorporated, within the hair follicle, to a drug-containing zone of approximately 2–5 mm width, which appears at the skin surface 1–5 days after drug exposure and moves regularly away following the strand's growth rate. This process is disturbed by deposition from sweat, sebum, and in rare cases environmental contamination, as well as by elimination during hair care or chemical treatment. In a hair tuft, the time resolution is seriously deteriorated by the presence of 5–15% (or even more) strands in the resting stage, by variability in the growth rate (up to 40%), and by inexact alignment of the strands. Interindividually, the generally accepted medium growth rate of 1.1 ± 0.2 cm/month is only a very rough approximation. When applying to retrospective elucidation of intoxications and control of illegal or therapeutic drug intake cases, correlations ranging from excellent agreement to enormous deviations have been reported. Satisfactory dose-concentration correlation could not be established in both intra- and interindividual studies. Therefore, the domain of routine hair analysis remains the retrospective qualitative detection of drug exposure. Improved time estimation is possible using anagen hair and careful determination of individual growth rate and its variation at the sites of sampling, careful sample handling, and analysis of sufficient segments.

KEY WORDS: Drugs in hair segments, hair analysis, retrospective detection of drug use, time resolution of hair analysis.
