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ANALYSIS OF DRUGS AND ENDOGENOUS SUBSTANCES IN HUMAN HAIR FOR ASSESSING INDIVIDUAL PAST HISTORY OF DRUG THERAPY AND PROGRESS OF DISEASE STATE

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Hair analysis is now of growing interest in the fields of clinical pharmacology and toxicology as well as forensic science. It is because we have so far shown that hair serves just like a "tape-recorder" which serially stores all informations on the substances taken by a subject along its length. The drug concentration in hair well correlates with the dose both between and within subjects, for example, in the case of antipsychotic drugs such as haloperidol and chlorpromazine[1,2]. In the assumption of hair growth rate of 1 cm/month the axial cm-by-cm distribution of drug content along the hair shaft approximately corresponds to the month-by-month dosage history, when a single hair is sectioned into 1-cm lengths successively from the scalp end and the drug content in each 1-cm length of hair is measured.

However, the growth rate of scalp hair, in other words "tape-speed", varies not only among subjects but also within a subject, and the absence of information on the growth rate of any single hair may deteriorate the potential usefulness of hair analysis. For the solution of this problem we have tried to find such drugs that could be detected from a single hair even after a short exposure to them in order to use them as time marker in hair. Finally, it has been found that antimicrobial fluoroquinolones are, in general, suitable for time marker in hair[3,4]. Fluoroquinolones including ofloxacin, one of the most widely used fluoroquinolone derivatives, can be detected from a 2-mm length of hair even after an exposure to their usual daily dose for only one day. In addition, they may be used in patients with bacterial infections, independently of their original diseases, or even in otherwise healthy subjects with only minor upper-respiratory or urogenital infections. A single hair sampled from a male patient, who had been treated by changing the doses of haloperidol several times and in whom ofloxacin had been administered for a few days only at the beginning of haloperidol therapy, was analyzed for both substances. When the past history of his haloperidol dosage was illustrated on a time scale matched to the growth rate of this hair strand estimated by detecting the hair length which contained ofloxacin, the axial distribution of haloperidol content along the hair shaft well corresponded to hishaloperidol dosage history[5]. Thus, it has been shown that scalp hair is a useful specimen quite suitable

for quantitative analysis of individual past drug therapy and patient compliance.

The hair analysis is useful to provide us not only with the informations on drug therapy but also with those on the progress of disease state and its modification by medical interventions. We unconsciously consume caffeine contained in beverages such as coffee, tea and cola every day. The content of caffeine in hair is increased in the patients with hepatic cirrhosis in correspondence to the decreased hepatic capacity of metabolizing caffeine[6]. Smoking is a preventable risk factor of ischemic diseases and lung cancer. Hair analysis of nicotine gives us the informations on individual smoking behavior or degree of passive smoking[7]. Now we are concentrating on the determination of degree of hair protein glycation to evaluate the progess of diabetes mellitus and its modification by drug therapy. For this purpose we have already established a sensitive and reproducible analytical method of furosine, which is a degradation product of furctose-lysine subsequent to acid hydrolysis of hair protein.

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