

Motherisk Drug Testing Newsletter for Children's Aid Societies

Vol. 2; No. 1 - DECEMBER 2006

Dear Colleagues:

We are very pleased to present our second Newsletter dedicated to you. You are our partners in important clinical and research work in protecting the health of high-risk children. This area is rapidly moving and we want to ensure you are optimally updated. All the best and season's greetings.

Dr. G. Koren, Director, The Motherisk Program

METHAMPHETAMINE USE DURING PREGNANCY AND PARENTING: THE SOCIAL SERVICES PERSPECTIVE

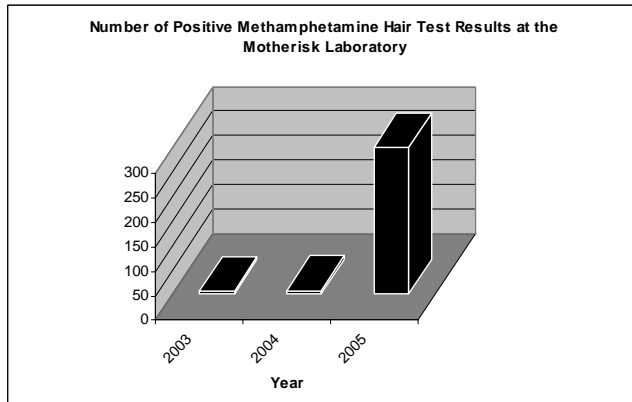
The Motherisk Hair Testing Database contains thousands of results obtained at the request of child protective services. As a result of this, we are able to offer a unique insight from the toxicological perspective and provide information to child welfare workers based on the characteristics of their own client population; consisting of parents and caregivers under suspicion of drug abuse.

Methamphetamine abuse has been gathering momentum worldwide during the past two decades, with an estimated half a million people using this drug weekly in the United States alone. Methamphetamine in the form of "crystal meth" is cheap and easy to produce in home laboratories, making it potentially easier to access than other substances of abuse. It has also been estimated that 5% of pregnancies are exposed to methamphetamine in North America. These data have directed us to turn our attention towards methamphetamine use in the context of child protection. It is very important to distinguish that a positive hair test for *methamphetamine* does not necessarily mean that the individual used *crystal* methamphetamine, just as a positive test for cocaine does not necessarily mean that an individual used *crack* cocaine.

Methamphetamine is a form of "speed" or "uppers." It is a very potent stimulant than can be taken as a pill, injected, snorted, or smoked in the very potent form of "crystal meth". Methamphetamine can also be present in tablets of "Ecstasy" (MDMA). As a general rule with all areas of clinical toxicology, we cannot necessarily determine the exact form in which a drug was taken, but we do know that the individual was exposed in some way.

Approximately 8% of individuals with positive drug tests in our database are positive for methamphetamine; moreover, approximately 85% of the individuals positive for methamphetamine are positive for at least one other drug of abuse, most commonly cocaine. Positivity for methamphetamine has increased sharply after 2005 and preliminary data from 2006 suggests that this trend has not stopped (see figure on page 2). We are pleased to announce that earlier this year the Motherisk Laboratory developed reference ranges for amphetamine and methamphetamine in adult hair (previously, only cocaine, opiates, and cannabis were available). These ranges are available on page 2 of this newsletter.

Find this Newsletter on-line at <http://www.motherisk.org/prof/casNewsletter.jsp>



REFERENCES

- Garcia-Bournissen *et al.* Methamphetamine detection in maternal and neonatal hair; Implications for fetal safety. Arch. Dis. Child. Fetal Neonatal Ed. Published online 31 Oct 2006.
- Roehr B. Half a million Americans use methamphetamine every week. BMJ 2005;331:476.
- Nordeste B. The potential expansion of methamphetamine production and distribution in Canada. 2005. chk web.

INTERPRETATION OF HAIR TEST RESULTS: AN UPDATE

We are often asked, “Can you tell based on a hair test how much drug an individual has used?” We cannot tell exactly what dose of a particular drug someone is using. It requires very detailed studies with controlled doses to develop this kind of detailed information and these kinds of “dose-response” studies are not available due to two main reasons:

1. Large numbers of documented cases with very accurate histories are extremely difficult to obtain in a substance-abusing population.
2. Clinical trials in which people are dosed with known amounts of drug and their hair is measured are, of course, ethically impossible, since many drugs of abuse are highly addictive and potentially toxic.

While we cannot know the absolute dose someone has used or the exact pattern of an individual’s drug use is (i.e. daily, weekly, etc.), we *can* determine what their *average level of drug use is over a specific time period (≥ 1 month)*. By performing a *segmented analysis*, we can further determine *changes in the average level of drug use* and *verify abstinence* once an individual has stopped using for more than one month.

The following table allows us to assess an individual’s hair test results by comparing it to the distribution of positive test results for that particular drug. This is similar to the “bell-curve” concept; we are able to assess what percentile of exposure a person falls into based on the thousands of positive drug test results we have in our laboratory data base.

ADULT HAIR					
	COCAINE ng/mg (n = 1,532)	OPIATES ng/mg (n = 426)	CANNABIS ng/mg (n = 597)	AMPHETAMINE ng/mg (n = 97)	METHAMPHETAMINE ng/mg (n = 243)
<i>median</i>	2.38	0.65	0.33	0.60	1.03
VERY LOW (5 th percentile)	<0.23	<0.16	<0.11	<0.13	<0.16
LOW (5-25 th percentile)	0.23-0.71	0.16-0.33	0.11-0.18	0.13-0.30	0.16-0.37
MEDIUM (25 th -75 th percentile)	0.72-8.58	0.34-1.77	0.19-0.70	0.31-1.44	0.38-3.87
HIGH (75 th -95 th percentile)	8.59-39.47	1.78-8.22	0.71-2.86	1.45-9.72	3.88-24.51
VERY HIGH (95 th percentile)	>39.47	>8.22	>2.86	>9.72	>24.51

Frequently Asked Questions

Q. How do I book an appointment for a client to have a hair sample collected at the Hospital for Sick Children?

A. Hair test appointments are booked by telephone through a voice-mail system. To book a hair test appointment, call (416) 813-8572 and follow the voice-response instructions. All details involved in booking a hair test appointment are included in this voice message. Please note, we do not call back to book or confirm appointments. All hair test orders require a written requisition (faxed to 416-813-5189) listing the drugs to be tested, the length of time to be tested, the client's full name, date of birth, and contact information of the requesting party.

Q. If I live too far away to send a client to Toronto, how can I get a hair sample collected and sent to the Motherisk Laboratory?

A. The process of collecting a hair sample is actually quite simple and straightforward. In many jurisdictions, social services workers do the hair sampling themselves and mail the samples to Motherisk.

To get more information on how to collect and send hair samples, just fax us a request for our "Hair Collection Protocol" at (416) 813-5189, and we will fax you back detailed instructions.

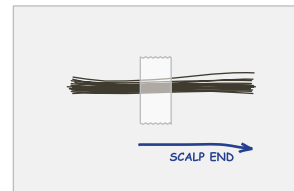
Many agencies prefer to use a third party collector to avoid any concerns from the client regarding bias. Motherisk deals with several third party collectors, to discuss options regarding setting up hair sample collection in your area, you can call the Motherisk Laboratory Manager, Joey Gareri, at (416) 813-5780.

Q. What if my client shaves his/her head, can I still have a hair test done?

A. Yes, in the absence of head hair, we are able to test body hair (e.g. armpit, beard, arm, leg, etc.). It is important to note however, that body hair analysis provides much less interpretative value than head hair due to more interindividual variability in rates of growth, shedding, and drug incorporation. Additionally, Motherisk's Reference Ranges are for scalp hair only and are not applicable to body hair. A body hair analysis *can* tell us if someone *has or has not used* a particular drug in "the recent past." Please note we do not collect body hair samples at the Hospital for Sick Children.

Q. What is a segment? When is it beneficial to request a segmented test? Is there a downside to a segmented hair analysis?

A. A "segment" is a cut section of hair of a specified length. For example, when we receive a lock of hair for analysis, it can be requested that only the most recent 3 months be tested for drug use. We would then cut the hair and test only the segment between 0 and 3 centimetres (cm)



from the scalp end (hair grows at approximately 1 cm per month). This is considered a segmented analysis of "1 segment of 3 months." Conversely, if one wants to look at changes in drug use patterns over the last 6 months, one could request "2 segments of 3 months" or "3 segments of 2 months, or for a very detailed analysis, "6 segments of 1 month". It is very important to consider when ordering a segmented analysis, that tests are billed *per drug, per segment*. If a segmented analysis is not requested, we will automatically test the entire length of hair we receive.

Eye on Research

The following is a sneak peek at some of the research currently underway in the Motherisk lab. Each research project is approved by the Hospital for Sick Children's research ethics board, and conducted according to strict research protocols. When it is complete, this study will be published in a peer-reviewed scientific journal where it will become one of over 300 Motherisk research articles published since 1985.

DETECTION OF FETAL ETHANOL EXPOSURE BY MECONIUM ANALYSIS OF FATTY ACID ETHYL ESTERS; THE FIRST CANADIAN POPULATION-BASED STUDY

Joey Gareri, Hazel Lynn, Maureen Handley, Chitra Rao, Gideon Koren

Challenges in identifying children exposed prenatally to ethanol result in an inability to diagnose Fetal Alcohol Spectrum Disorder (FASD) and a subsequent lack of adequate intervention for the majority of alcohol-affected individuals. Meconium fatty acid ethyl esters (FAEE), products of non-oxidative ethanol metabolism, have been established as a novel biomarker of fetal ethanol exposure. This study is the first application of this biomarker to a population-based sample in Canada to objectively determine the prevalence of fetal ethanol exposure in a general neonatal population.

Methods

Meconium specimens were anonymously collected from neonates born in the region of Grey Bruce, Ontario over a period of twelve months at five regional birthing hospitals. Meconium FAEE were analyzed by GC-FID with GC-MS confirmation. Meconium with a cumulative FAEE concentration of greater than 2.0 nmol/g are considered positive for significant prenatal ethanol exposure.

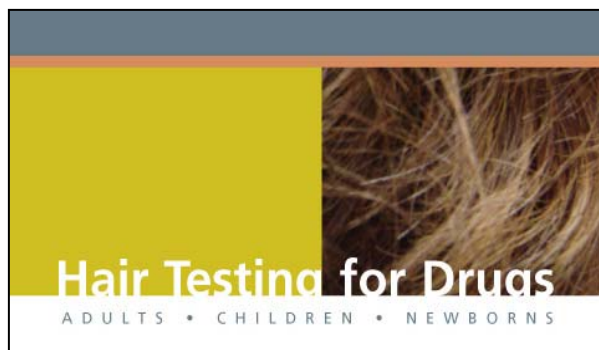
Results

Seventeen of 682 collected meconium specimens tested positive for significant

prenatal ethanol exposure. Meconium FAEE analysis detected 5-fold more ethanol-exposed pregnancies than standard post-partum questionnaires in this population, (2.5% vs 0.5%) ($P < 0.001$). The prevalence of ethanol-exposed pregnancies was consistent with CDC estimates of 'frequent' prenatal drinking and previously published estimates of Fetal Alcohol Spectrum Disorder disease prevalence in a general North American population.

Conclusion

Meconium FAEE analysis demonstrates a five-fold increase in sensitivity over currently employed methods of self report-based post-partum screening in Ontario for the detection of ethanol-exposed pregnancies in a clinical setting. According to the Canadian Community Health Survey, there are no significant differences in the rates of heavy drinking in females between the region of Grey Bruce (9.2%), the province of Ontario (11.4%), and all of Canada (11.6%). Due to this fact, the herein established 2.5% prevalence of prenatal ethanol exposure is potentially generalizable to the Canadian population as a whole, thus indicating that 10,000 Canadian neonates may be born each year at risk for FASD.



CALL 416-813-8572 TO:

Book a hair test appointment at Sick Kids
Get testing results
Get help interpreting results

General inquiries / new clients 416-813-5780
Fax 416-813-5189
E-mail hairtest@sickkids.ca