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We have been asked to review the test results and conclusions in two reports prepared by MotherRisk testing laboratory. The reports are dated the 24th of October, 2011 and May 3rd, 2012, and are the conclusions of tests performed on Yvonne Marchand, using hair samples from her scalp.

They test for, in each case, a 90 day average level of use of alcoholic beverages, and a 180 day average level of use of marijuana. The 0-6 cm samples cover 180 days, and 0-3 cm samples cover 90 days.

In our forensic reviews, we normally focus on the critical protocols and procedures of laboratory scientific testing, before even considering the validity of results, but while this is an important matter, it is not a criminal case, and we have not been engaged on that basis.

Nevertheless, a review of the result and conclusions sheet raises certain concerns.

In the matter of the cannabinoid tests, a result of 0.2ng/mg is marginally positive, and might indicate the smoking of marijuana once or twice at random intervals, once a week or so. This is described as low level recreational use.

The more disturbing result is the alcohol tests done on FAEE-fatty acid ethyl esters used as markers to extrapolate the level of alcohol ingestion.

The first issue of concern is the interpretation chart supplied and used by MotherRisk. It states that less than 0.49 ng/mg is "no evidence of excessive alcohol consumption (up to 20g of alcohol per day; ~2 drinks)." Once the level of consumption reaches 50 ng/mg, there is an abrupt change in category to various levels of alcohol abuse. There is no transitional change, which seems irrational.

Further concerns arise from the statement that 20g of alcohol represents 2 drinks. A standard drink is a bottle of beer (341 mL or 12 oz in Canada), or a 200 mL glass of wine. Assuming the average beer is 5% alcohol by volume, and the average wine is 13% alcohol by volume, 20 grams of alcohol is equivalent to about 1.5 bottles of beer or 1 glass of wine. (The specific gravity of ethyl alcohol is 0.789 g/mL). This means that someone who drinks more than either one and a half bottles of beer a day, or one glass of wine a day, would be classified as an abuser of alcohol.

Quantitative clinically precise levels usually relate directly to the levels of product ingested, in this case ethyl alcohol, so we assume a person with a level of 0.40 ng/mg has ingested twice the amount of one with a level of 0.20ng/mg. No other basis of calculation is provided. Using the MotherRisk chart, Ms. Marchand's test would indicate the following:

The report dated October 24, 2011 indicates a reading of 12.0 ng/mg, which is over 24 times the level that is described as "2 drinks per day." This would imply that Ms. Marchand had, on average, 48 drinks each day during the 90 days before sample collection (from about July 28, 2011 to September 28, 2011). If this was the case, we highly doubt performing this test or the following one in 2012 would be possible, as Ms. Marchand would not have survived that level of ethyl alcohol ingestion over a 90 day period.

The second test, dated May 3, 2012, indicates a reading of 2.509 ng/mg, which would equate to about 10 drinks per day over the 90 day period leading up to the date of sample collection.

Ms. Marchand has indicated that she holds a responsible administrative position, is a highly regarded employee, and rarely misses a day's work while functioning at a level of executive decision making and interacting with staff. She would be, if she made it to work, be displaying obvious symptoms of intoxication, and would be barely, if at all, able to function.

There are two other important factors that should be considered.

The proviso on the form marked "Interpretation of Alcohol Hair Analysis" is of concern. It states that "it is recommended to avoid use of any hair-care product containing ethanol (often listed as "Alcohol", "Denatured Alcohol", "Ethyl Alcohol") for three months prior to alcohol hair analysis." If the client is handed this sheet at the time of the sampling, the notice is three months too late, and the test may be seriously compromised. We suspect that this proviso is rarely explained to clients, if ever.

The sheet goes on to state that "it is not advisable to use the results of the hair testing for alcohol markers in isolation from other evidence pertaining to alcohol consumption to determine recent drinking behaviours."

While we do not know if such evidence exists, the work habits of Ms. Marchand may contradict the alcohol abuse implied by these reports.

Further, Ms. Marchand has indicated that she suffers from a chronic vaginal yeast infection, which is very common among women. It is an established fact that *Candida albicans* (yeast) infection can cause a significant increase in blood alcohol levels, and affect any testing. Put simply, vaginal yeast ferments blood sugar, similar to the process when making wine.

These are our initial observations, which we hope will be of assistance.

Yours Truly,

A handwritten signature in black ink, appearing to read 'H. Tenenbaum', with a long horizontal flourish extending to the right.

Harvey Tenenbaum, PhD