



## Meconium Screening for Fetal Alcohol Spectrum Disorder in Pregnancy

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### **Issue:**

Identifying prenatal exposure to alcohol is important for prevention and diagnosis, but information about maternal alcohol consumption is often difficult to obtain. It has been suggested that measuring the presence of fatty acid ethyl esters in meconium may be used as a “biomarker” to establish maternal problem drinking.

### **Background:**

Meconium is the product of the first bowel movements of the newborn. It is composed of wastes accumulated in the gastrointestinal tract during gestation and before milk consumed by mouth has entered the gastrointestinal tract. Fatty acid ethyl esters (FAEE) are found in the meconium and are the normal breakdown products of naturally occurring low levels of alcohols produced during fetal formation. FAEE begin to accumulate after the bowel is established at the end of the first trimester of pregnancy and become more plentiful in the last half of pregnancy. When liquor, wine or beer (all containing ethyl alcohol or “ethanol”) are consumed by the mother, the alcohol passes freely through the placenta and the fetus. Most of the alcohol will be metabolized by the mother, but some will also be metabolized by the fetus and both will produce extra levels of FAEE. Although normal metabolism produces very low levels of FAEE that are not related to maternal alcohol consumption, high amounts of FAEE are usually the result of maternal ethanol consumption. The cut-off level that differentiates naturally produced FAEE production from that related to maternal alcohol consumption is not known, so the meaning of intermediate amounts of FAEE are often uncertain. It is also not known how timing, frequency and patterns of drinking (binge versus daily) affect the amount and type of FAEE in the meconium.

It has been suggested that measurement of FAEE in meconium has the potential to be a biomarker for prenatal alcohol exposure and, thus, Fetal Alcohol Spectrum Disorder (FASD) and researchers have been studying this relationship since the late 1990s. (1-3) Despite the promise, there are some limitations. For example, testing meconium for FAEE is technically challenging. The material must be collected shortly after it is expressed and must be kept cold in storage and in shipping until analyzed. Not all laboratories have been able to demonstrate consistent results in analysis but, under optimum conditions, FAEE have been shown to be a reliable marker for both acute and chronic alcohol intake by the mother in the latter periods of pregnancy. (4-6) Some locations in Canada and Internationally offer meconium testing services.

The uses of meconium are indeed limited. When high levels of FAEE are found, the infant can be placed in an “at risk” category for FASD. The identification of “at risk” would allow for physical examinations and neuropsychological testing over time that could confirm FASD. However, it must be emphasized that **no** specific level of FAEE has been established that would actually confirm a diagnosis of FASD without subsequent testing of the child. A diagnosis within FASD is rarely made in infancy, even with maternal confirmation of alcohol use. The process of diagnosis often begins during early or middle childhood. The risk-relationship between the level of FAEE and FASD is not yet fully understood, but no level would ever be found that would guarantee that the child would have FASD. Further, because the meconium test is only applicable later in pregnancy, it will completely miss infants that should be identified as “at risk” for FASD who were only exposed to alcohol in the first trimester, when exposure is actually the most dangerous.

Meconium testing is different than nearly all other prenatal screening. In most cases, the prenatal test can detect a medical problem that is unknown to the parents. However, in the case of meconium testing, alcohol use is known to the mother. This issue has raised ethical concerns in the use of the test. (7) The difficulty rests with parental resistance to disclosing this information. One might reason that simply asking women (and men) about their alcohol use in pregnancy through a structured or unstructured interview would be simpler, cheaper, more honest and more likely, if done properly, to engage the family in a discussion of preparation for a potentially “at risk” infant for FASD. While this approach has been proposed and implemented in some places, there is no evidence yet as to the sensitivity or specificity in the interview outcomes.

Koren and his group have studied meconium testing as an anonymized method for screening selected populations for gestational alcohol exposure. They have recently reported that, in a study of voluntary testing of meconium for FAEE and long-term developmental follow-up of positive cases, the participation rate in the screening program was significantly lower than when testing was conducted anonymously, suggesting that the majority of mothers who consumed alcohol in pregnancy refused to participate. The investigators concluded that, despite the potential benefits of such screening programs, maternal unwillingness to consent, likely due to fear, embarrassment, and guilt, may limit the effectiveness of meconium testing for population-based open screening, highlighting the need for public education and social marketing efforts for such programs to be of benefit. (8)

Investigators in Prince Edward Island recently completed an anonymous, provincial, population-based study to determine the incidence of prenatal fetal alcohol exposure in PEI newborns. The study results show that at least 3.1% of PEI babies were exposed to frequent prenatal alcohol consumption after the first trimester of pregnancy, placing these children at risk for FASD. (9) Repeated sampling in the same areas over time could help determine if prevention programming was successful. (5,10) This is an attractive, albeit, expensive method for obtaining this information. However, women who are at risk for alcohol consumption during pregnancy and might be ready for treatment will not be found and the stigma associated with drinking in pregnancy that prevents a simple open discussion will not be diminished.

## Recommendations:

- A great deal more work needs to be done in delineating the relationship between FAEE and the risk of FASD as well as studying the utility, the ethics and the cost of meconium screening and directly comparing it to other approaches before it will be ready for widespread public health use.
- Implementation of a meconium screening program and the implications related to sensitivity and specificity, the stigma associated with alcohol use during pregnancy and the relationship between the health care provider and the pregnant woman must be carefully considered.

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