MECONIUM TESTING FOR FATTY ACID ETHYL ESTERS: A 2011 STATUS REPORT

Stuart MacLeod[1], Gideon Koren[2]

[1]Department of Pediatrics, University of British Columbia; [2]The Motherisk Program, The Hospital for Sick Children, The University of Toronto

ABSTRACT

The Canadian Association of Pediatric Health Centres, working in partnership with the Public Health Agency of Canada has recently published a toolkit to guide screening for identification of risk of FAS/FASD. One of the tools highlighted is the testing of meconium for fatty acid ethyl esters to identify high risk pregnancies and to support associated prevention programs. This paper describes the conclusions of a workshop held in Prince Edward Island in September 2011 to discuss key issues surrounding the wider deployment of meconium testing for assessment of population risk for FAS/FASD.

Key Words: *Meconium, fetal alcohol spectrum disorder, fatty acid ethyl esters, screening*

Since 2008, the Canadian Association of Pediatric Health Centres (CAPHC) has been working closely with the Public Health Agency of Canada on the development of screening tools to support programs targeting prevention of FAS/FASD. In late 2010 this work culminated in publication of an FASD tool kit[1] which has attracted widespread interest among clinicians in Canada and internationally. One of the tools highlighted in the CAPHC-PHAC work is meconium screening for presence of fatty acid ethyl esters (FAEE). This tool, which has been well described in the literature, has been validated as useful for demonstration of maternal ethanol consumption during the second and third trimesters of pregnancy.[2] It has been already employed in important population screening studies in Canada.[3]

Background

The development of robust screening tools is critically important because FAS/FASD is the most common form of preventable cerebral injury in Canada and its medical, social and economic importance is beyond question.

In September 2011 CAPHC convened a workshop in Prince Edward Island, the site of a current meconium population study, to discuss the key issues surrounding more widespread deployment of this test. The workshop was broadcast across Canada as a webinar and those interested in the detailed presentations can now access these on the CAPHC Knowledge Exchange Network website (www.caphc.org). All of those attending the PEI workshop agreed that meconium testing and measuring of FAEEs provided important insights into prenatal ethanol exposure and therefore offered an important avenue for identification of children at risk for FAS/FASD. It was noted that meconium testing meets most of the utility criteria established by WHO for screening tests.[4] The key recommendations from the workshop fall into four categories:

1. deployment of universal vs. targeted population screening,
2. improved understanding of meconium test purposes and interpretation of results,
3. place of maternal advocacy: consideration of rights and roles in decision making,
4. costs and benefits of meconium testing.

Universal vs. Targeted Population Screening

It is recognized that universal application of a screening procedure such a meconium FAEE has some advantages over more targeted application. Universal screening avoids stigmatization of specific populations and provides a valuable research indicator concerning the incidence, prevalence, dose

effects and linkage among meconium FAEE concentration, ethanol consumption by pregnant women, and incidence of FAS/FASD.

Workshop participants felt strongly that universal screening would provide the evidence needed to garner support and resources for the expanded screening, assessment and treatment essential for recognition of FAS/FASD as a public health priority. There is remaining debate about the degree to which universal screening deserves support at this time and it is recognized that the level of endorsement will depend to some extent on the capabilities and capacity of the surrounding health care system. Universal screening should only be supported when appropriate follow up services are readily accessible for infants, mothers and families identified as being at risk.

Understanding of Test Purpose and Interpretation of Results

Meconium testing is a validated, objective test of fetal exposure to ethanol only during the second and third trimesters of pregnancy.[5] A negative result cannot be taken as ruling out significant ethanol exposure in the first trimester. It is recognized, however, that significant ethanol consumption in the latter two-thirds of pregnancy offers a strong suggestion of earlier consumption.

A positive test result should never be taken as translating directly to a diagnosis of FAS/FASD in the exposed infant. It has been shown that 40% of fetuses exposed to excessive maternal alcohol develop FASD.[5] The incidence of FAS/FASD is clearly influenced by other social and biological factors brought into play in the context of maternal ethanol consumption. These complex determinants require extensive further study. After a positive meconium FAEE test long term follow-up and monitoring will be required for more complete diagnosis and understanding of effects on development. The workshop participants emphasized that meconium testing results, while potentially indicative of maternal ethanol use, are not, in themselves, an indicator of child endangerment or compromised parenting capacity.

Maternal Advocacy, Rights and Decision Making

A comprehensive meconium FAEE testing and screening program should also include an advocacy component designed to protect maternal rights and to ensure respect for the maternal/child unit. Testing should be embedded within a system of family centred care that considers and respects the needs of both mother and child.

The issues surrounding consideration of maternal rights are complex and call out for interprofessional, multidisciplinary consideration. Workshop attendees were strongly of the opinion that opportunities should be sought to bring together medical and legal representatives to discuss ethical-legal considerations surrounding meconium FAEE testing. Such considerations should focus on the need to protect infants and ensure the rights of mothers. Caution is necessary in acting on the basis of positive meconium FAEE testing. Negotiation, education and mediation should be the first course of action when mothers, children and families at risk are identified. Best efforts should always be made to avoid, wherever possible, progression to legal action. The important legal issues surrounding the place of meconium testing in Canada were discussed by Professor Bernard Dickens and his observations have recently been published.[6]

Costs and Benefit

There are good estimates available of the cost of FAS/FASD to the health care system in Canada.[7] These costs, estimated at over $5 billion annually, warrant urgent consideration of potentially mitigating interventions including identification of high risk situations and institution of effective prevention strategies. There are initial cost benefit studies already completed addressing the incremental benefit potentially available through more widely available meconium FAEE testing.[8]

It is hoped that systematic review and more complete cost benefit analysis will support provincial ministries of health in making decisions about future fiscal support to make meconium testing available. It is a certainty that more universal meconium testing will result in a reduced average cost per test and will alter those cost benefit analyses already available.

Workshop attendees felt that the Canadian Agency for Drugs and Technologies in Health should be asked to work with provincial health technology assessment agencies to perform a Canadian analysis addressing the cost benefit of

meconium FAEE testing. Such analysis should also examine the impact of widespread deployment of other validated screening tests of antenatal exposure.

CONCLUSION

There is considerable pan-Canadian enthusiasm for wider application of population screening using meconium FAEE testing. CAPHC and the Public Health Agency of Canada welcome further participation in this discussion of a leading Canadian public health issue. Readers are encouraged to view the symposium as podcast by CAPHC.[9] The Public Health Agency of Canada is committed to working with a range of Canadian partner organizations to continue exploration of effective measures to reduce the burden of illness associated with FAS/FASD.

Corresponding Author: smacleod@cw.bc.ca

REFERENCES
[Note: all URL accessed 07 October, 2011]

1. Canadian Association of Pediatric Health Centres Knowledge Exchange Network. May 6, 2010. http://ken.caphc.org/xwiki/bin/view/FASDScreeningToolkit/National+Screening+Tool+Kit+for+Children+and+Youth+Identified+and+Potentially+Affected+by+FASD
2. Hutson JR, Rao C, Fulga N, Aleksa K, Koren G. An improved method for rapidly quantifying fatty acid ethyl esters in meconium suitable for prenatal alcohol screening. Alcohol 2011;45:193-9.
3. Gareri J, Lynn H, Handley M, Rao C, Koren G. Prevalence of fetal ethanol exposure in a regional population-based sample by meconium analysis of fatty acid ethyl esters. Ther Drug Monit. 2008;30(2):239-45.
4. World Health Organization. Principles and practice of screening for disease. Wilson JMG, Jungner G. Public Health Papers No. 34, Geneva 1968. http://whqlibdoc.who.int/php/WHO_PHP_34.pdf
5. Koren G, Hutson J, Gareri J. Novel methods for the detection of drug and alcohol exposure during pregnancy: implications for maternal and child health. Clin Pharmacol Ther 2008 Apr;83(4):631-4.
6. Dickens B. Legal and ethical considerations in meconium testing for fetal alcohol exposure. J Pop Ther Clin Pharmacol 2011;18:e471-4.
7. Stade B, Ali A, Bennett D, Campbell D, Johnston M, Lens C, Tran S, Koren G. The burden of prenatal exposure to alcohol: revised measurement of cost. Can J Clin Pharmacol 2009;16(1):e91-102
8. Zelner I, Koren G. Universal or targeted screening for fetal alcohol exposure: a cost-effectiveness analysis. Ther Drug Monit. 2009;31(2):170-2
9. Canadian Association of Pediatric Health Centres Knowledge Exchange Network. FASD screening tool kit webinar series. May 4, 2011. http://ken.caphc.org/xwiki/bin/view/FASDScreeningToolkit/Fetal+Alcohol+Spectrum+Disorder+-+Introduction+to+Screening