Newborn Phosphatidylethanol Screening to Detect Fetal Alcohol Exposure in Uruguay

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Disclosure

- I am not discussing any commercial products or services
- I have no financial interests herein
- I am in compliance with HIPAA in this presentation
Objectives

- Identifying infants or children at risk for developing FASD often relies on confirmation of maternal drinking during pregnancy or detection of prenatal alcohol exposure in the newborn.

- Prenatal records can often lack information on alcohol use.

- In certain situations, maternal self-report can be unreliable due to recall bias or apprehension of stigmatization associated with drinking during pregnancy.

- Biomarkers of alcohol use and/or alcohol exposure can help in identifying at-risk mothers and also newborns who have been exposed to alcohol in utero.

- Phosphatidylethanol is a highly sensitive biomarker of alcohol use but the clinical utility of PEth as a screening test for prenatal alcohol exposure in newborns has not been examined.
Cultural patterns of drinking alcohol in Uruguay have changed in the last 30 years, from moderate consumption with meals to more risky patterns of heavy alcohol consumption.

Drinking during pregnancy is common in Uruguay, in part due to a lack of information given to pregnant women about possible alcohol-related risks from drinking during pregnancy.

National surveys do not assess alcohol consumption during pregnancy in Uruguay, although recent epidemiological studies have demonstrated that it is a significant problem.
Studies of Alcohol Use during Pregnancy

- In a 2005 study of 900 women surveyed from two public healthcare hospitals in Montevideo following delivery, 36.8% of the mothers reported alcohol consumption at some point during their pregnancy.

- A subsequent study in 2007 found very high rates of reported alcohol consumption (65.6%) in an urban population of young, incompletely educated women from low socioeconomic status delivering in the public healthcare hospitals in Montevideo.

- The incidence of prenatal alcohol exposure, as determined by fatty acid ethyl esters (FAEE) detection in meconium, was found to be 44%.

Study Rationale

- No study to date has examined neurocognitive profiles and facial dysmorphology in a cohort of infants with known alcohol exposure measured in mothers and newborns using a direct alcohol biomarker at birth.
Design
Within 48 Hours of Birth
- Hospital General de las Fuerzas Amadas in Montevideo, Uruguay
- Maternal Interview 696 mother/newborn pairs
- Mother and baby blood samples for PEth analysis

Six Months
- 41 infants enrolled in follow-up pilot study
- Dysmorphology Checklist
- Bayley Scales of Infant Development
- Vineland Adaptive Behavior

Nine months to One year
- Dysmorphology Checklist
- Bayley Scales of Infant Development
- Vineland Adaptive Behavior
Biomarker Results
Prevalence of PEth in all enrolled mothers

- 20% positive
- 20 - 1,524 ng/mL
- 78.9 ng/mL
Prevalence of PEth in all enrolled newborns

62.5% positive
20 - 2,862 ng/mL
99.1 ng/mL
Follow Up Study Results
Sample Characteristics in Follow Up Pilot Study (N=41)

**Age**
Range: 19-40 years
M = 27.96 (5.57)

**Education**
M = 10.95 (3.34)
Range = 3-21 years

**Race**
White = 46.3%
Black = 7.3%
Mixed = 41.5%
Native Uruguayan = 4.9%

**Marital Status**
Married = 36.6%
Unmarried, partnered = 56.1%
Single = 4.9%
Divorced/Separated = 2.4%
Substance Use During Pregnancy

7.3% at any point in pregnancy
4.9% last 30 days

0% cocaine or marijuana use
Alcohol Use During Pregnancy

**Self-Report**
- First Trimester = 25%
- Second Trimester = 4.9%
- Last Trimester = 9.8%
- Any point in pregnancy = 26.8%

**Maternal PEth**
- Positive = 29.3%
- Negative = 56.1%
- Missing = 14.6%

- Average PEth = 34.58 ng/mL
- Range = 8 - 128 ng/mL
## Maternal Risk Factors for Alcohol Consuming and Abstaining Women

<table>
<thead>
<tr>
<th>Difference in Risk Factors by Maternal PEth Result</th>
<th>Positive Maternal PEth M (SD)</th>
<th>Negative Maternal PEth M (SD)</th>
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<td>Age (years)</td>
<td>29.84 (5.20)</td>
<td>27.36 (5.94)</td>
<td>-1.12</td>
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<td>0.293</td>
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<td>Education (years)</td>
<td>11.67 (2.74)</td>
<td>10.95 (3.5)</td>
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<td>Gavidity</td>
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<td>Age at first drink (years)</td>
<td>14.78 (4.46)</td>
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<td>Heel PEth (ng/mL)</td>
<td>110.0 (92.56)</td>
<td>24.85 (11.62)</td>
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<td>Cord PEth (ng/mL)</td>
<td>79.67 (109.94)</td>
<td>37.93 (23.71)</td>
<td>-1.38</td>
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Birth Data

Gestational Age
M = 38.78 weeks

Assigned Sex at Birth
Female = 56.1%
Male = 43.9%

Apgar
1 min: M = 8.82 (0.61)
5 min: M = 9.92 (0.36)

Birth Weight
M = 3295.56g (579.89g)
Range = 1195-4330g

Birth Length
M = 48.84cm (2.18)
Range = 43-54cm

Head Circumference
M = 34.61cm (1.22)
Range = 32-37
# Infant Biomarker Results

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<th>Umbilical Cord Blood PEth</th>
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<td>Mean Positive PEth</td>
<td>54.9ng/mL</td>
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<td>Range</td>
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Infants Meeting FASD Criteria
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<th>Head PEth</th>
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<th>Self-Report</th>
<th>Height ≤ 10%</th>
<th>Weight ≤ 10%</th>
<th>Head Circumference ≤ 10%</th>
<th>PFL ≤ 10%</th>
<th>Other Significant Dysmorphology</th>
<th>Vermilion Code 4 or 5</th>
<th>Phallic Code 4 or 5</th>
<th>Bayley ≤ 25%</th>
<th>Cognitive</th>
<th>Language</th>
<th>Motor</th>
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<th>Daily Living Skills</th>
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24 infants met the criteria for any FASD diagnosis at either 6 months or 1 year.

At the first follow-up 17 children met the diagnostic criteria, with the most common diagnosis being ARND in 16 of the infants.

At the second follow-up there were 15 children that met criteria for an diagnosis with ARND again being the most common diagnosis in 12 of the children.

No child met the criteria for FAS at either time point.

Of the 24 children that met the criteria for an FASD diagnosis at either time point, only 2 children did not have confirmed alcohol exposure during pregnancy based on PEth at birth or maternal self-report.

The average PEth concentration at birth in newborns who met the criteria for an FASD diagnosis was 65.2 ng/ml.
Infants Not Meeting FASD Criteria
17 children did not meet the criteria for an FASD diagnosis at 6 months or 1 year time points.
Only 3 of the mothers had a positive PEth at the time of birth, compared to 11 of the mothers who had a child that did meet the criteria for an FASD.
The average PEth concentration at birth in newborns who did not meet the criteria for an FASD diagnosis was 37.5 ng/ml.
Discussion and Conclusions

- These findings suggest that the prevalence of alcohol consumption during pregnancy continues to be a serious public health problem in Uruguay.

- These findings also suggest that biomarker screening can assist in early infancy developmental and dysmorphology testing to screen for FASD.

- Early identification is key for early intervention, and newborn PEth screening could assist in identify prenatal alcohol exposure.
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