1597ΔC Polymorphism and Preterm Birth in African-American Mothers

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Introduction

Natural killer cells are of particular interest during pregnancy, as they account for 70% of all lymphocytes in the placenta. Thus, abnormalities in natural killer (NK) cells have been implicated in pre-term birth, the leading cause of infant mortality. A suggested causative factor is a deletion at nucleotide 1597 in the HLA-G gene, which codes for the HLA-G histocompatibility antigen. HLA-G is of interest as: it is a rare “non-classical” antigen predominantly produced by fetal cells, and HLA-G polymorphisms have been implicated in another pregnancy disorder: preeclampsia. The interaction between HLA-G antigen on trophoblasts and inhibitory killer-immunoglobulin like receptor (KIR) 2DL4 on natural killer cells produces an inhibitory effect on the natural killer cell.

Figure 1. Premature baby in Neonatal Intensive Care Unit

However, a deletion at nucleotide 1597 produces a frameshift mutation, rendering the HLA-G antigen unable to interact with KIR 2DL4. It is speculated that this failed interaction might cause the mother’s immune system to allow an increased natural killer cell response to the fetus, aborting the pregnancy. Here we examine the DNA from a large population of African-American mothers to determine if this association between HLA-G 1597ΔC is causative in pre-term birth. The African-American population is of particular interest as this demographic has a uniquely high incidence of preterm birth.

Materials & Methods

Samples are from African-American mothers who gave birth between Jan. 2000 and Apr. 2007 (California Very Preterm Birth Study): 343 controls, 78 preeclampsia, 330 pre-term (pre-term defined as birth at <34 weeks).

Maternal DNA was amplified using quantitative (“real-time”) PCR (qPCR), which can quantify target sequences of DNA. Each sample was run twice with primers positive (1597ΔC) and negative (HLA-G, or 1597) for the deletion. Peaks at approx. 88°C signified the deletion, and peaks at 77 °C (with absence of a positive peak) signified absence of the deletion.

Results

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Normal</th>
<th>Deletion Δ/C</th>
<th>Deletion Δ/Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>630</td>
<td>81</td>
<td>2</td>
</tr>
<tr>
<td>Frequency</td>
<td>88.36%</td>
<td>11.36%</td>
<td>0.28%</td>
</tr>
</tbody>
</table>

Conclusion

We are confirming the association between 1597ΔC and pre-term birth in this population, and a positive association would suggest that mothers possessing the deletion are at risk for delivering pre-term. As this is a double-blind study, we are unaware which genotypes correlate with pre-term birth. We are currently awaiting completion of the statistical analysis by the California Department of Health.

References

4. Loisel, Dagan A.; Billstrand, Christine; Murray, Kathleen; Patterson, Kristen; Chaiworapongsa, Tinnakorn; Romero, Roberto and Ober, Carol. "The Maternal HLA-G 1597DeltaC Null Mutation is Associated with Increased Risk of Pre-Eclampsia and Reduced HLA-G Expression During Pregnancy in African-American Women". Molecular Human Reproduction. 19.3 (2013):144-152.
5. Hunt, Joan S.; Petroff, Margaret G.; McIntire, Ramsey H., and Ober, Carole. "HLA-G and Immune Tolerance in Pregnancy". Federation of American Societies for Experimental Biology. 19.7 (2005);691-693.