

FETAL O₂ IS NOT DIRECTLY ASSOCIATED WITH REDUCED BIRTH WEIGHT AT HIGH ALTITUDE. O Kovalenko,¹ L Echalar,² W Tellez,² I Maldonado,² Z Li,¹ E Vargas,² N P Illsley,¹ S Zamudio.¹ ¹*Ob/Gyn & Women's Hlth, NJMS, Newark, NJ, USA;* ²*Instituto Boliviano Biología Altura, La Paz, Bolivia.*

Rationale: High altitude (HA) residence reduces birth weight, but the effect varies between populations. Native Andean women are protected relative to European migrants to HA. Reduction in O₂ availability is thought to cause decreased birth weight at HA, but this has not been tested with direct measures of fetal oxygenation. We asked whether maternal and fetal blood gases vary with ancestry at HA, and whether HA vs. low altitude (LA) neonates would have greater circulating markers of hypoxia (erythropoietin-EPO, transferrin-Tf).

Methods: Participants were healthy and delivered by cesarean without onset of labor prior to delivery. 30 natives of HA (NHA), 14 migrants of sea level ancestry living at HA (MHA) (3600-4000 m, Bolivia), and 40 natives of LA living at LA (400 m NLA) were studied. Maternal arterialized blood was obtained 1-8 days prior to delivery. Fetal umbilical venous (UV) blood was collected at delivery. EPO (mIU/ml) and Tf (µg/ml) were measured by ELISA.

Results: Birth weight (mean±SEM) was greatest in NLA (3437±72 g), intermediate in NHA (3283±68 g) and least in MHA (3004±106 g, p<.05). Maternal blood measures (PO₂, PCO₂, arterial O₂ saturation, O₂ content, Hb, Hct) were similar in NHA vs. MHA. PO₂, PCO₂ and SaO₂ were markedly higher, while O₂ content, Hb and Hct were markedly lower (p<.0001) in NLA than at HA. Only PCO₂ differed between ethnic groups, being lower in NHA than MHA (26.5±0.6 vs. 30.0±1.2 mmHg, p<.01). Fetal UV PO₂ and PCO₂ did not differ by altitude nor by ethnicity. However UV SO₂ and Hb were greater at HA, leading to greater UV O₂ content in NHA (6.3±0.3) and MHA (5.2±0.6) vs. NLA (3.8±0.4). EPO (24.9±2.4 LA, 27.7±1.9 HA) and Tf (3.1±0.1 LA, 3.2±0.1 HA) did not differ between altitudes or ethnicities. EPO and Tf were not related to blood gases or hematological parameters at LA. Among NHA, Tf was positively correlated with fetal Hb and Hct (r² = 0.38 p<.001, r² = 0.23, p<.05) and EPO was negatively associated with fetal Hb (r² = -0.22 p<.05). Among MHA, EPO was negatively associated with UV PO₂ (r² = -0.68, p<.01) SaO₂ (r² = -0.39, p<.05) and O₂ content (r² = -0.42, p<.05).

Conclusions: There is no evidence for reduced O₂ availability in the term HA fetus. The hypothesis that HA neonates would have greater circulating markers of hypoxia was not supported. Tf appears to be related to erythropoiesis in NHA, and suggests these fetuses both adapt to and are tolerant of hypoxia. The association of EPO with clear indicators of lowered O₂ among MHA suggests that these fetuses experience greater hypoxia or are more reactive to hypoxic insult than natives. Support: NSF-BCS 0309142, NIH HD 42737.