Antenatal Betamethasone Preserves Lung Structure and Function and Prevents Pulmonary Hypertension in Chorioamnionitis-Induced Bronchopulmonary Dysplasia

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Background

• Bronchopulmonary dysplasia (BPD), the chronic lung disease of preterm birth, is characterized by arrested lung development, abnormal lung function, and increased risk for pulmonary hypertension (PH).

• Antenatal steroids improve many complications of prematurity, however, their role in attenuating BPD are complicated by CA, antenatal steroids improve lung function, and reduce PH in a rat model.

• Timed pregnant Sprague-Dawley rats were used in our studies.

Methods: Experimental Model of Chorioamnionitis

• All animal procedures and protocols approved by the Animal Care and Use Committee at the University of Colorado Health Sciences Center.

• Clinical studies have shown strong associations of antenatal stress from chorioamnionitis (CA) with risk for BPD.

• Antenatal betamethasone (BETA) administration will help preserve lung growth and prevent PH in the setting of imminent preterm delivery has not yet been identified.

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We hypothesize that antenatal betamethasone (BETA) administration will help preserve lung growth and function and reduce PH in a rat model of CA-induced BPD.

Study Questions

1) Does maternal administration of antenatal betamethasone improve lung structure and function in rat pups in a CA-induced model of BPD?

2) Does maternal administration of antenatal betamethasone prevent right ventricular hypertrophy (RVH) in rat pups in a CA-induced model of BPD?

Results

• In comparison with controls, intra-amiotic ETX impaired lung growth, increased lung resistance, reduced compliance, and increased RVH at DOL14.

• Maternal BETA treatment of ETX-exposed fetal rats preserved distal lung structure and function and prevented RVH in infant rats:
  • reduced total lung resistance by 15.3% (p<0.05)
  • improved compliance by 9.5% (p<0.05)
  • preserved lung complexity as measured by alveolar growth as determined by radial alveolar counts (RAC; p<0.05)
  • increased vessel density and improved RVH by 42.3% (p<0.05).

• Antenatal betamethasone administration preserves lung structure, improves lung function, and prevents RVH in this rat model of CA-induced BPD.

Conclusion

• We speculate that in the subgroup of pregnancies at risk for premature birth that are complicated by CA, antenatal steroids can reduce the risk for BPD.