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Title: Sphingosine 1-Phosphate (S1P) Rescues an Endotoxin (LPS) Model of Canine Lung Injury

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Purpose: Acute lung injury (ALI) is characterized by high permeability pulmonary edema. We previously demonstrated that S1P pretreatment prevents pulmonary vascular permeability in LPS-injured rodents and canines. We hypothesized that intravenous S1P administered subsequent to injury induction would reduce regional pulmonary vascular permeability in LPS-injured dogs. **Methods:** Three male beagles (12-15 kg) were anesthetized and mechanically ventilated (MV). All dogs received LPS (2 mg/kg in 0.9 NS) instilled intrabronchially via fiberoptic bronchoscope and intravenous S1P (85 mg/kg) one hour later. Supportive care including MV (Vt=17cc/kg, PEEP=5 cm H₂O, FiO₂=30%), fluid resuscitation, and hemodynamic monitoring was provided for six hours. ALI was quantified by shunt formation, bronchoalveolar lavage (BAL) protein concentration. CT quantification of regional lung water content was performed in one dog after six hours. Results were compared with LPS injured control dogs (n=12) from previously reported set of experiments.

Results: Each dog remained hemodynamically stable throughout the experiment and exhibited, as previously reported, rapid increases shunt following LPS instillation. In control dogs not receiving S1P, the shunt fraction continued to rise over time. Canines receiving S1P exhibited reduced shunt at 5h compared to LPS injured animals (19.3±7.9% vs. 37.6±3.9%, mean±SEM, p=0.08) and reduced BAL protein compared to LPS controls at 3h and 5h (p<0.01). CT-estimated lung water content was reduced in the S1P-rescued dog compared to LPS controls (31.5% vs. 48.6% respectively) and was similar to normal canine lung historical controls (33%).

Conclusions: S1P administered after established LPS-induced ALI attenuates regional edema formation. These results suggest that vascular barrier protection/restoration by S1P may shorten the duration of MV and therefore morbidity associated with ALI in critically ill patients.

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