Lung damage in ventilated preterm infants differs with gestational age, early research shows

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Assisted ventilation is crucial to support very preterm babies, however the treatment often leads to chronic lung disease. While the survival of

preterm babies has increased over the past 30 years, rates of chronic lung disease have remained static.

Now a team of researchers has found the type of injury caused by ventilation depends on the gestational age of the lungs. The findings, published today in the journal *Scientific Reports*, suggest individualised respiratory support could reduce risks to infants.

In the animal study, researchers led by Dr. Prue Pereira-Fantini and A/Prof David Tingay of Murdoch Children's Research Institute in collaboration with researchers from the University of Melbourne and Royal Women's Hospital mapped protein changes in blood plasma following ventilation of lambs born at term, preterm (less than 32 weeks) and very preterm (less than 26 weeks).

Dr. Pereira-Fantini said that understanding what happened at a molecular level when lung injury begins is essential to developing ways to protect the lungs of preterm babies.

"This work is the first step in developing a broader understanding of how preterm lung injury develops and is necessary to the development of support strategies to reduce damage to the lungs of this very vulnerable population," she said.

One in eight Australian children is born preterm. Of those born at less than 32 weeks gestation, 93 per cent will require some form of respiratory support, leaving them at risk of permanent lung injury, asthma and reduced lung function. Previous animal studies have shown that a single dose of ventilation is enough to cause lung injury.

Dr. Pereira-Fantini said the different effects of ventilation depending on the gestational age had not been comprehensively explored and this was the first study to use proteomics to examine the link.

By examining blood samples taken within the first 60 minutes of life, the researchers found significant changes in coagulant and complement protein expression in the preterm models. Dr. Pereira-Fantini said the changes indicated potential for worsening lung injury and inhibiting the effectiveness of treatments options such as surfactant administration.

"This study demonstrates the need to develop respiratory support that is tailored to both the gestational age of the infant and their underlying disease," Dr. Pereira-Fantini said.

"If this work can be validated more broadly, it potentially offers a simple blood test to guide clinicians in providing preterm infants with the best and safest clinical care when their fragile lungs are most at risk."

In the study's next phase, researchers will examine the changes in the lungs of preterm human infants.

More information: Prue M. Pereira-Fantini et al. Plasma proteomics reveals gestational age-specific responses to mechanical ventilation and identifies the mechanistic pathways that initiate preterm lung injury, *Scientific Reports* (2018). DOI: 10.1038/s41598-018-30868-x

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