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**The Effect on Systemic and Pulmonary Circulations in the Resuscitation of Asphyxiated Newborn Piglets with 21%, 50% or 100% Oxygen**

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**BACKGROUND:** Neonatal asphyxia can lead to complications such as shock and persistent pulmonary hypertension (PHT). A hypoxia-reoxygenation process may be created in the resuscitation of asphyxiated newborns and indeed, may contribute to further complications. Resuscitation with room air has been suggested to be as effective as 100% oxygen, but limited information is available in the graded reoxygenation of asphyxiated newborns.

**OBJECTIVE:** To examine the cardiovascular effects of resuscitation with 21, 50 or 100% oxygen in asphyxiated newborn piglets.

**DESIGN/METHODS:** Thirty-two piglets (1-3 days, 1.5-2.1 kg) were instrumented for continuous monitoring of cardiac output, systemic, pulmonary arterial and central venous pressures. Following stabilization, hypoxia was induced by decreasing the inspired oxygen concentration to 10-15% for 2 hr. Piglets were randomized to receive reoxygenation for 1 hr with 21, 50, or 100% oxygen (n=8 each), followed by 3 hr at 21% oxygen. Control piglets (n=8) were ventilated at 21% oxygen without hypoxia-reoxygenation.

**RESULTS:** After 2 hr of severe hypoxemia, piglets were acidotic (vs. controls,  $p < 0.001$ , ANOVA). Cardiac index and stroke volume decreased to 38-46% and 46-55% of controls (145 mL/min/kg and 0.80 mL/kg respectively,  $p < 0.001$ ), but heart rate did not change significantly. While systemic arterial pressure and vascular resistance decreased during hypoxia, PHT developed with increased vascular resistance. During the first 30 min of reoxygenation with 21% but not 50 or 100% oxygen, cardiac index was higher and systemic vascular resistance was lower than controls ( $p < 0.05$ ). All experimental groups had similar improvement in stroke volume. There was an oxygen-dependent recovery of hypoxia-induced PHT, which resolved in the order: 100%=50%, 21%. By 1 hr after reoxygenation, these hemodynamic measurements were comparable to controls. Pulmonary vascular resistance recovered immediately to control values in all groups upon reoxygenation.

**CONCLUSIONS:** Resuscitation with 21-100% oxygen results in a graded resolution of pulmonary hypertension but equivalent immediate pulmonary vasodilatation. Cardiovascular recovery is equally effective in the resuscitation of asphyxiated newborn piglets with 21 or 50 or 100% oxygen although cardiac index during early reoxygenation was improved with 21% oxygen.