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## Surfactant and Partial Liquid Ventilation Effects on Oxygenation and Histology in Paraquat-induced Rat Lung Injury

### ABSTRACT

**Background.** Partial liquid ventilation (PLV) has been studied to treat respiratory distress syndrome associated with surfactant deficiency and/or dysfunction. However, the interactions between PLV and an exogenous surfactant revealed variable results.

**Aim.** To evaluate the effects of a surfactant and PLV with FC-77 on gas exchange and lung histology and to investigate the interaction of the surfactant and FC-77 in a rat model of paraquat-induced lung injury.

**Methods.** Three days after intraperitoneal injection of paraquat (35 mg/kg), 33 male Sprague-Dawley rats were randomly assigned to 1 of 4 treatment groups and ventilated for 2 h: surfactant (Survanta, 50 mg/kg); PLV; surfactant + PLV (surfactant followed by PLV at 30 min of ventilation); and no treatment.

**Results.** Oxygen tension in arterial blood (PaO<sub>2</sub>) increased significantly relative to the no-treatment group during the first 30 min of ventilation in the surfactant, PLV, and surfactant + PLV groups. PaO<sub>2</sub> deteriorated 30 min and 60 min after the administration of FC-77 in the PLV and surfactant + PLV groups, respectively. Deflation pressure-volume curves showed that the measured lung volumes at pressures of 10 to 25 cmH<sub>2</sub>O for the surfactant and surfactant + PLV groups were significantly higher than those of the no-treatment group. The histological appearance of the lungs was better in the surfactant, PLV, and surfactant + PLV groups than in the no-treatment group.

**Conclusions.** Surfactant therapy improved gas exchange and lung histology; by contrast PLV with FC-77 improved oxygenation only transiently in a rat model of paraquat-induced lung injury ventilated for 2 h. PLV with FC-77 did not further improve the effects of the exogenous surfactant on gas exchange and lung histology. (N. Taipei J. Med. 2003;5:48-55)

### Key Words

Acute lung injury

Paraquat

Partial liquid ventilation

Perfluorocarbon

Surfactant

### INTRODUCTION

Paraquat dichloride (1,1'-dimethyl-4,4'-bipyridium dichloride; methyl viologen) is an effective and

widely used herbicide that causes acute respiratory distress syndrome (ARDS).<sup>1</sup> Intentional and accidental ingestion of commercial liquid formulations of paraquat has caused a large number of human fatali-

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