B. EXPERIMENTAL STUDIES AND MECHANICS

HIGH FREQUENCY VENTILATION: AN EXPERIMENTAL COMPARISON OF HPPV AND HFJV

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Most of the currently used high frequency ventilation (HFV) systems are of open character (1,2). HFV creates a demand for tidal volumes delivered in a short time and with high inspiratory flow (1-5). Systems with insignificant compression volume can fulfill such requirements (3,6). Presently, three modes of open systems are being used for HFV: a. Insufflation catheter, or double-lumen tube, b. pneumatic valve, and c. jet injector nozzle (1). This study evaluates these modalities in healthy dogs and in a lung model (Figure 1).

METHODS AND PROCEDURES

Seven mongrel dogs (mean BW 22.4 kg) were anesthetized with thiopental, and intubated with a double-lumen endotracheal tube (Hi-Lo Jet, National Catheter Corporation, Div. Mallinckrodt, Argyle, NY) with an inspiratory:expiratory lumen [IL:EL] ratio of 1:10. The dogs were ventilated to normocarbia (PaCO₂ 40.1±0.9 mmHg) with a Bronchovent® (Siemens-Elema AB, Solna, S-17195 Sweden; Siemens-Elema Ventilator Systems, Elk Grove Village IL 60007) or a fluidic ventilator (7; FV; Medical Kit, Corning) at a frequency (f) of 60/min, with inspiratory time (t%) 22% of the ventilatory cycle. Both ventilators were used (Figure 1) with the pneumatic valve (PV), the jet injector nozzle.
(JIN) or the insufflation line (insufflation catheter [IC]) of the double-lumen tracheal tube.

![Diagram of experimental design](image)

**FIGURE 1.** Experimental design of the studies in the lung model using the IL:EL 1:10 double-lumen tracheal tube with PV, JIN and IC, and ventilator settings as in the seven anesthetized dogs.

Figure 1 shows the experimental design, using a lung model (static compliance 72 ml/cm H₂O). A rigid 12 mm internal diameter plastic tube, which simulated the trachea, was intubated with the double-lumen tracheal tube as in the dogs. Ventilation was delivered by the Bronchovent® or the FV in the same way as in the dog experiments. Gas velocity was measured using a linear pneumotachograph (Model 3800, Hans Rudolph, Inc., Kansas City, MO) located between the trachea and the model lung. For every HFV modality, gas velocities and integrated tidal volumes were recorded on a pressurized ink recorder (Gould 2200S, Gould Inc., Cleveland, OH). The results were calculated from the recordings and combined with gasometric values obtained in the dog experiments.