# Intrapulmonary percussive ventilation superimposed on conventional ventilation: bench study of humidity and ventilator behaviour.

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**OBJECTIVE:** Intrapulmonary percussive ventilation (IPV) is a form of high-frequency ventilation that can be superimposed on spontaneous breathing or conventional ventilation. Drawbacks include difficulties achieving adequate airway humidification and an inability to monitor delivered volumes and pressures, which may vary with patient characteristics. The objectives of this study were to assess various humidification set-ups, to measure intrapulmonary pressures and volumes resulting from IPV superimposed on a conventional driving ventilator (DV) and to test several ventilators regarding their ability to accept added IPV.

**DESIGN:** Bench study in a test-lung set-up was used to measure humidification and the effects of adding IPV to a DV under various conditions of compliance, resistance, plateau and positive end-expiratory pressures. Then, five ventilators were tested in combination with IPV.

**MEASUREMENTS AND RESULTS:** Adequate humidification required a heated humidifier on the inspiratory line downstream of the IPV device. IPV increased end-inspiratory intrapulmonary pressures up to 10 $CmH_2O$, increased delivered volumes up to 237 ml and generated intrinsic PEEP from 1.7 to 4.3 $CmH_2O$ when no PEEP was set on the DV. Intrinsic PEEP was lower or absent when $P_{EE}P$ was set on the DV. With most tested ventilators, IPV prevented reliable flow monitoring. Autotriggering and missing cycles were common and the PEEP effect varied across DVs.

**CONCLUSION:** Achieving adequate humidification with IPV requires a specific set-up. Superimposing IPV on standard ventilation can increase intrapulmonary pressures and tidal volumes importantly and interfere with the triggering sensors of the ventilator. These factors must be taken into account before clinical use.

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