Correspondence

Controlling Relative Humidity

To the Editor:—Dr. Loew, Dr. Klein, and Professor Chalon describe a technique for achieving a precise 60 per cent relative humidity (ANESTHESIOLOGY 36:181–184, 1972). They claim that this level was adequate to prevent cytologic changes in the tracheobronchial mucosa, and confirmation of this statement would provide the first standard for minimal supplementary humidification of the fresh gases.

As gas enters the airway, its temperature rises, and the same water content now represents a lower relative humidity. At their range of room temperatures, an exact 60 per cent saturation represents an absolute humidity of 11.5 to 14.6 mg/l, and moisture content of this order can be supplied by much simpler apparatus.

They predict that humidification of fresh gases supplied to anesthetic systems will become mandatory. But the patient's expiration shares some of the airway with inspiration, and moisture exchange occurs, increasing the inspiratory water content above that of the fresh gases. So information about optimum tracheal conditions, and the concentrations of inspired gases necessary to maintain them, is still needed.

C. A. SARA, F.F.A.R.A.C.S.
C. A. SHANKS, F.F.A.R.A.C.S.
Department of Anaesthetics
Royal Prince Alfred Hospital
Missenden Road
Camperdown, N.S.W. 2050
Australia

(Accepted for publication May 16, 1972.)

To the Editor:—The vaporizer was constructed in order to administer anesthetic gases with *precisely* 60 per cent relative humidity at room temperature (22–26 C) to a group of patients being studied for cytomorphologic changes in the ciliated cells obtained by bronchial lavage during general endotracheal anesthesia. Other groups included patients inhaling dry anesthetic gases and gases saturated with water vapor at body temperature (37 C).

We agree wholeheartedly about what happens to gases once they flow past the inhalation segment of the nonrebreathing valve. If 60 per cent humidity at room temperature represents an absolute humidity of 11.5 to 14.6 mg/l, then by the time the gases have been warmed to body temperature they will have a water content represented by only 25–33 per cent saturation, since at 37 C saturated gases will hold 44 mg/l of water vapor. It is also true that exhaled gases will lose some of their moisture owing to decreases in temperature once they reach the portion of the endotracheal tube that protrudes from the mouth and the nonrebreathing valve. Some of the water of condensation will, at later stages, gradually increase the humidity of inspired gases not already fully humidified.

We are not concerned, at present, with what the humidity of the gases we administer becomes when they reach the tracheobronchial tree. We have found in our cytologic studies [1] that patients who breathed dry gases through an endotracheal tube connected to a nonrebreathing valve yielded bronchial washings that contained ciliated columnar epithelial cells with significant cytomorphologic changes when anesthesia lasted more than an hour. Patients placed on a humidified nonrebreathing system delivering gases with a 60 per cent relative humidity at room temperature, or placed on the system described by Weeks and Broman [2] and receiving gases saturated with water vapor at body temperature, did not develop significant cytologic changes at the end of three hours. What we know is that inhaled gases that contain 11.5 mg/l or more of water vapor are safe by our standards. We therefore believe that, in time, it will become mandatory to control closely the inspired humidity