2 *Henderson, Y.* Adventures in Respiration. Modes of Asphyxiation and Methods of Resuscitation. Williams & Wilkins: Baltimore, 1938.

REPLY

I would like to thank Dr. Parsloe for correcting my error. My source attributed this quotation to the British physiologist Samson Wright[1] who was known to use it frequently in his teaching and as the title of an essay project he assigned to medical students.[2] While Dr. Wright may have popularized this quotation, it is clear that F. Miescher was the original author.

As Dr. Parsloe's references indicate, the concept that CO_2 protects the oxygen supply arose from consideration of its physiological role in helping to regulate several fundamental processes required for oxygenation – including alveolar ventilation, cardiac output, regional circulation, and the oxygen saturation and desaturation of haemoglobin. It seemed to me that this concept is at least equally apt when applied to the monitoring role that CO_2 can play in indicating disturbances of oxygenation during anaesthesia. This capability of CO_2 can be readily appreciated by considering the series of metabolic, circulatory, ventilatory and equipment processes involved in both oxygen and CO_2 transport in anaesthetized patients, together with the manner in which CO_2 is commonly monitored (Figure).

Carbon dioxide is typically monitored by capnography at the airway opening – this being a distal or downstream site in the CO_2 transport chain. (In a somewhat analogous way, oxygen is monitored by oximetry at the level of the microvasculature – a relatively distal point in its conveyance chain.) Since the continuous delivery of CO_2 to the airway is completely dependent upon the moment to moment function of each component of the transport system upstream, the nature and size of the CO_2 signal at the airway opening responds rapidly to any disturbance of ventilation, circulation and/or metabolism that alters the transfer of CO_2 upstream. In addition, the airway CO_2 signal reacts to any reversal of CO_2 flow caused by rebreathing malfunctions of anaesthetic equipment. Since the delivery of oxygen to the tissues utilizes the same transport system (in reverse), the disturbances that alter CO_2 transfer or flow and the resulting airway CO_2 signal can also act to impair oxygenation. In fact, these disturbances constitute the most important causes of tissue hypoxia during anaesthesia.[3] By alerting the clinician about these problems, the airway CO_2 signal is ultimately protecting the oxygen supply.

Thus, in the context of anaesthesia, carbon dioxide can act to safeguard oxygenation in two related but different ways: (1) by helping to regulate the physiologic processes required for delivery of oxygen to the tissues (as it does elsewhere) and (2) by providing a signal which acts as a sensitive early warning indicator of disturbances of these oxygenating processes.[3] For anaesthetists, the quotation of Miescher is doubly pertinent!

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REFERENCES
1 *Campbell, EJM.* Not Always on the Level. University Press, Cambridge 1988; 87.
2 *Campbell, EJM.* Personal communication.
3 *Knill, RL.* Practical CO_2 monitoring in anaesthesia. Can J Anaesth 1993; 40: Pt. 2, R40–R45.

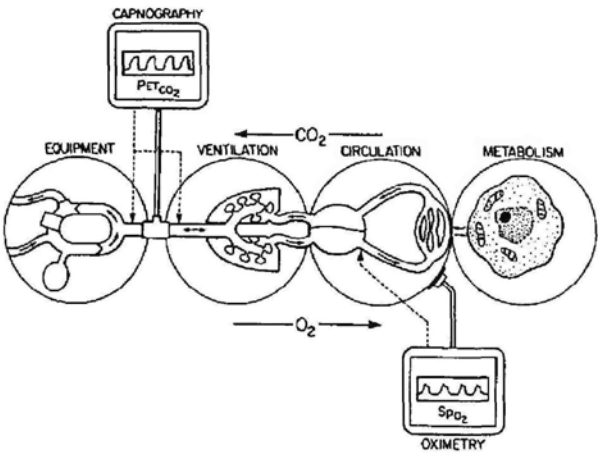
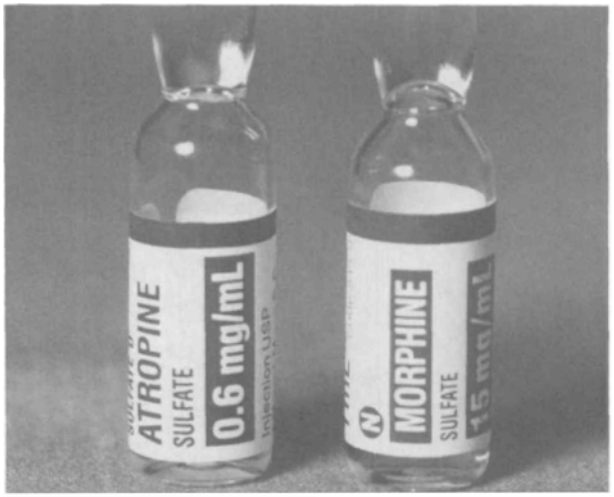


FIGURE A depiction of the corporate system required for carbon dioxide and oxygen transport during anaesthesia, together with the sites at which CO_2 and O_2 transfer are monitored.

Safety hazard – Sabex drug labels

To the Editor:

We would like to bring to your attention a safety hazard of which we have just become aware. Our institution recently changed suppliers of morphine and atropine to Sabex. They distribute both drugs in one mg glass vials. Unfortunately, Sabex markets both products with almost identical labels. The Figure illustrates some of the similarity. The label colours of both drugs have similar shades



FIGURE

of red on a white background. Although Sabex has modified the atropine label by removing the stripe, in our opinion, these ampules could still be easily confused with each other.

Medication error is an important cause of patient morbidity. All practical precautions must be taken to label clearly vials and syringes for quick and consistent differentiation.

It is disturbing that a single manufacturer would offer two medications which are visually so similar.

Charles Boldt MD
J.E. Renwick MD, FRCPC
Department of Anaesthesia
University Hospital
Vancouver, B.C.

REPLY

In response to the letter of Drs. Charles Boldt and J.E. Renwick, Sabex is in total agreement with their statement that since medication error is an important cause of patient morbidity, all practical precautions must be taken to clearly label vials and syringes for quick and consistent differentiation. We are also of the opinion that with the number of products that a health care professional must use, he/she cannot rely on glass colour or colour of label for product differentiation. To eliminate medication error, there can be no substitute for reading the label. In that respect, we believe that our very legibly labelled product assists in the reduction of medication errors (Figure).

As a Canadian owned manufacturer of pharmaceutical products, Sabex has the ability to make changes to labels or packaging on very short notice. We are known to be very cooperative and have in the past made several changes after being advised by our clients of a potential risk, and it is our intention to continue to offer this unique service.

Suzanne Levesque B. Pharm
Director, Scientific Affairs
Sabex Inc.
Boucherville, Quebec, Canada.

FIGURE

Unintentional left main bronchus intubation

To the Editor:

We would like to draw the readers' attention to the possibility of unintentional left main bronchus intubation in a patient with tracheal stenosis. A 50-yr-old obese woman was scheduled for subtotal thyroidectomy for a huge goitre. The clinical examination revealed no respiratory distress or inspiratory stridor, although on the chest *x*-ray, the trachea looked deviated to the right.

An awake intubation under topical anaesthesia was performed after which the patient was anaesthetized with N_2O/O_2, fentanyl, isoflurane and vecuronium. The endotracheal tube was secured in place and normal and equal breath sounds were heard bilaterally. Throughout surgery the arterial oxyhaemoglobin saturation (SpO_2) remained >97% with FiO_2 0.4 and the peak inspiratory pressures (PIP) were <30 cm H_2O. By the end of surgery, the SpO_2 gradually decreased to 94–95% and the PIP increased to 40 cm H_2O. Decreased breath sounds were noticed at the apex of the right lung. A chest *x*-ray taken at the end of surgery surprisingly revealed the tip of the ETT in the left main bronchus. The right lung received some ventilation through the "Murphy's Eye," but the right upper lobe was atelectatic (Figure). The tube was withdrawn 3 cm and the trachea remained intubated for

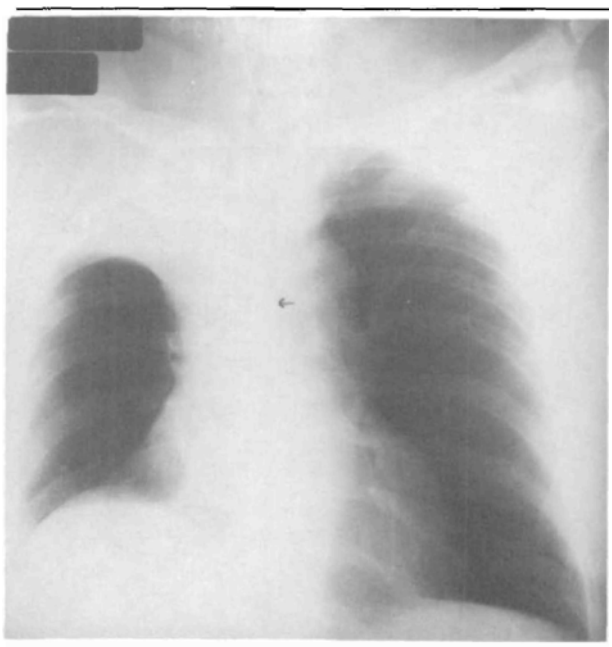


FIGURE Note curved outline of EIT and pressure of tip in left main bronchus.