Last Word on Viewpoint: Precedence and autocracy in breathing control

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TO THE EDITOR: Here are two puzzling questions.

How to reconcile the existence of a rapid stimulus to breathe originating from the circulatory system, which we (3) and others have long tried to characterize (4), with the observation that breathing remains unchanged for tens of seconds or even minutes at the onset of a cardiac arrest (2), whether at rest or following a muscular exercise?

How the arterial carotid bodies (CB) could produce oscillations in tidal volume with a period of 45 s in response to out-of-phase oscillations in PaCO₂ (and blood flow), whereas complete abolition of carotid blood flow for 10 s—a potent stimulus of the carotid bodies—followed by a slow restoration of circulation for another 10 s have no effect on the period or the amplitude of these oscillations (2)? Even more challenging would be to reconcile these observations with the traditional model of periodic breathing in cardiac patients reviewed by Dr. Del Rio, Andrade, and Schultz in their comments (see Ref. 6), wherein the chemoreceptors-minute ventilation relationship has a high gain/slope (1).

Answering these questions certainly represents a thought-provoking endeavor. Theories are dictated and can be refuted by data; reconciling these apparently incompatible observations may require, as developed by Dr. Poon, new frames of reference in which these contradictions will hopefully vanish or at least will make some sense. Dr. Poon offers some interesting responses (5). We’ll need to find creative ways to translate these theories into testable and definitive experimental approaches. Not resisting the temptation of rejecting observations that do not fit with the theories we feel comfortable with may just prevent us from describing a more complete—and exciting—theory on how breathing is controlled. In addition, such “unifying” theory(ies) may have relevant physiological or clinical implications in situations we still do not fully comprehend, e.g., the mechanisms of PaCO₂ homeostasis. Like in the last verse of Dr. O’Halloran’s very nice poem (see Ref. 6), the fact that we are all “trying to work it out” is, I believe, excellent news, not only because such challenges represent the best antidote against moroseness—keeping alive our natural curiosity—but also because these questions disqualify those who have claimed, too soon, that respiratory physiology is an obsolete discipline.

DISCLOSURES

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REFERENCES


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