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Below are short overviews of the articles that appeared in this issue of VOLUME:

President's Report (Alan Crockett)

In Alan's final report as President he reminds us that the origin of our Society was May 1979 when several people met at the Thoracic Society of Australia (now the TSANZ) ASM in Surfers Paradise. Following this and with the financial support of Hewlett-Packard (at that time they manufactured lung function equipment) a meeting took place in Sydney in February 1980. Fifty-eight people attended and the guest speakers were Senator Peter Baume and Dr David Pengelly from McMaster University. These meetings were the precursors of our Society, which was formed in February 1981 and formally registered under the Association Incorporation Act in 1982.

In his report, Alan commented that the "functioning" of the Society required large numbers of dedicated volunteers and provided the following gem (author unknown):

> "A lot of volunteers are like wheelbarrows.
> No good unless pushed:
> Some are like trailers, have to be pulled.
> Some are like kites, if you don't keep a string on them they fly away.
> Some are like footballs, you can't tell which way they will bounce.
> And then, some are like a good watch ……
> Open faced, pure gold, quietly busy, and full of good works."

Notice from the Editor

Readers were informed that an agreement had been entered into for reciprocal publishing rights between VOLUME and the Canadian Society of Pulmonary and Cardiovascular Technologists. The arrangement was identical to that already established with Analyser, the official journal of the National Society of Cardiopulmonary Technology, USA.

Pulmonary Capillary Blood Volume (Gayle E. Theobald-Johnson)

This excellent article describes the theoretical background and practical details underlying the measurement of pulmonary capillary blood volume (Vc) based on the measurement of DLCO at two or more oxygen concentrations (Roughton and Forster, 1957). Gayle also included Vc data on healthy people and patients with a wide variety of lung disorders including asthma, COPD, obstructive sleep apnoea, pulmonary emboli and interstitial lung disease.

In brief, the method is based on the familiar relationship:

$1/DLCO = 1/DM + 1/\theta \times Vc$

Here, 1/DM is the resistance to CO diffusion offered by the alveolar-capillary membrane; $1/\theta \times Vc$ is the resistance offered by the blood which includes the resistance associated with the rate of uptake of CO by Hb. Due to competition between CO and O_2 for the binding sites on the Hb molecule, the rate of uptake of CO

by Hb (i.e. θ) and hence DLCO, decreases as the blood oxygen tension increases. Because θ can be computed for any known value of pulmonary capillary PO_2 it is possible to solve the above linear equation for Vc by measuring DLCO at two (or more) known oxygen concentrations.

The Vc data reported by Gayle are most instructive (age, height, gender of subjects were not given):

	n	**Mean (ml)**	**Range (ml)**
Normal	3	87.7	65 - 103
Asthma	11	97.6	62 - 134
COPD	4	35	23 - 49
Obstructive sleep apnoea	10	95.5	42 – 136
Vasculitis	1	36	-
"Honeycomb lung"	1	33	-
Non-Hodgkins lymphoma	1	42	-
Bronchiectasis	1	77	-
α_1 antitrypsin deficiency	1	38	-
Histiocytosis X	1	34	-

(Considering that there are 6 – 12 billion pulmonary capillaries (ie 20 to 40 capillaries per alveoli) I have always been amazed that in total they only contain about 70 ml of blood, at rest. This is particularly amazing when you consider that this volume is spread over a surface area approaching that of a singles tennis court (see note below). Imagine walking onto a tennis court with a small glass of red wine (i.e. 70 ml), tipping it onto the court and then sweeping it evenly over the entire surface. How thin a layer of blood is that? Yes, extremely thin. In fact, thinner than the thickness of the average RBC! The only way the RBC can pass through such a thin 'sheet' of blood is to deform and squeeze through, and interestingly when they move through the capillaries, the 'skin' of the RBC rolls like the track of an army tank. This rolling and squeezing facilitates the uptake of oxygen because in so doing so the Hb molecules are continuously mixed ensuring that "each" molecule is presented close to the alveolar-capillary membrane. This minimises the mean physical diffusion distance between the gas in the alveoli and Hb molecules.*

It is interesting to note that the heart's stroke volume is almost exactly equal to Vc both at rest and on exercise. Has anyone studied this? It does seem reasonable that the volume of blood ejected with each beat of the heart, whether at rest or on exercise, would be sufficient to push almost enough blood into the pulmonary capillaries to effectively displace all the blood that was delivered by the previous beat – at least I think it does because diffusion is so rapid that the blood really doesn't need to hang around. But is this true during strenuous exercise when transit time is rather short? Perhaps the concept of 'transit time', at least in this content, is rather meaningless. Any comments?

** Coincidentally, Jeff Pretto phoned me a couple of weeks ago to discuss the surface area of the lung. He was querying whether the well known "tennis court" was indeed correct. We concluded that although convenient, a tennis court area was probably an overestimation (at least in an average sized person), as the lung has been reported to have a surface area of only 70 – 140 m^2 compared with 195 m^2 for a singles tennis court.* ***Does anyone know who first equated the lung's surface area to that of a tennis court?*** *DPJ)*

Adult Transcutaneous Oxygen Measurement: Theory and Practice (Kevin K. Tremper)

This authorative review article was reprinted from the journal Analyser. The article reviews the principles and application of a relatively new method for monitoring the oxygen tension at the surface of an enclosed patch of heated skin tissue. The method uses a Clark polarographic oxygen electrode applied directly on the heated skin and provides a practical method for continuously monitoring skin oxygen tension (i.e. $PtcO_2$) which relates to arterial PO_2, particularly in infants for which the method was first developed in 1972. Dr Tremper reviews the physical and physiological properties of the skin in relation to oxygen transport, reports results of animal studies and the state of the art of transcutaneous oxygen monitoring in adult patients. This article is well worth reading, even 22-years later!

Mouth-Piece

Two letters were published, one from Alan Crockett and the other from Dr Charles Castle. Alan's letter alerts readers to a Canadian report that included several references to lung function laboratories. Dr Castle's letter describes a case (45-year old smoker) that illustrates some important points that are of interest to respiratory "technologists" dealing with patients referred by general practitioners. Included with his letter was an interesting and informative diagram describing the natural history of disease. In his final paragraph Dr Castle states:

> "There is a lack of understanding among family doctors regarding the information a respiratory function laboratory can provide in the 1980's. Perhaps a respiratory technologist could write a review for the Medical Journal of Australia or the Australian Family Physician. Both of these are widely read by general practitioners."

(It is important for each one of us, and the Society as a whole, to positively promote an understanding of our profession whenever the opportunity arises. Perhaps we should actively seek to communicate and educate the general public and press. We should let everyone know we are here … do we need a public relations officer, or a general public information page on our website? DPJ)

Please contact me if you are interested in a copy of this or any other issue of VOLUME.

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