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

In Brief – Paramagnetism and Oxygen Analysis (PD Rochford and DP Johns)

Oxygen analysers utilising the physical property of paramagnetism are well known to physiologists for their exceptional sensitivity, linearity, and reliability as well as their comparatively low price. For these reasons paramagnetic oxygen analysers have been used extensively in clinical and research respiratory laboratories following it's development by Linus Pauling and colleagues immediately after the second World War (J. Amer. Chem. Soc. 68, 795-798, 1946). However, the property of paramagetism was first described almost 100 years earlier by Michael Faraday.

This article provides a short review of the atomic basis of paramagetism and how it was cleverly applied by Pauling et al to measure the oxygen concentration of gas mixtures (from the displacement of a nitrogen filled dumb-bell to null balanced instruments). Although rapid response paramagnetic oxygen analysers have been developed, the vast majority of instruments based on this principle have had a slow response time making them unsuitable for following breath-by-breath changes in oxygen concentration - a requirement that has become desirable in more recent years.

(Those who have used these instruments will be aware that these analysers directly measure the partial pressure of oxygen in the gas mixture rather than the percentage of oxygen present. That is, the reported oxygen concentration will be inaccurate if the gas mixture within the analysis cell is compressed or rarefied. Therefore, precautions need to be taken to ensure that the gas mixture is analysed at ambient pressure, unless exact corrections for this are applied. For this reason it was not uncommon for the analysis to be undertaken on static gas samples because under conditions of zero flow one can be certain that the pressure within the sensor is ambient. It may be instructive for our younger members to consider why this type of analyser is sensitive to partial pressure rather than the percent concentration of oxygen in the mixture? Incidentally, it is fortunate that respiratory gases such as nitrogen and carbon dioxide are not paramagnetic, thus rendering the analysis of respired gas very specific to oxygen. However, other gases do possess the property of paramagnetism, such as nitrogen dioxide and nitric oxide, and will interfere with the oxygen measurement if present in sufficient quantities. DPJ).

Abstracts Presented at the 1984 ASRT Symposium (Flinders Medical Centre, Adelaide, SA - 5-6 May)

1. Simmul R. Sleep Study Monitoring Equipment.
2. Johns DP, Rochford PD, Streeton JA. Evaluation of six molecular sieve oxygen concentrators.
3. Thornton AT. North American guidelines for the establishment of sleep study laboratories.
4. Shaw JC, Dent AC, Zimmerman PV. The relative sensitivities of histamine, methacholine and nebulised distilled water as bronchoprovocation agents for the diagnosis of asthma.
5. Imberger H, Johns DP. The measurement of the frequency response of spirometers.

6. Homan S, Baldock P, Eckert B, Leckie W. Procedures for estimating FEV1.
7. Berghouse R, Castle W, Silver D, Simmul R. Computerisation of a respiratory investigation unit.
8. Roget JA. An evaluation of the Cybermedic CMV spirometry system.
9. Crockett AJ. Standards of practice for the respiratory technologists.

Bronchodilator Effects of Salbutamol Powder Administered via Rotahaler and of Terbutaline Aerosol Administered via Misthaler (Susan J Towers, Elizabeth Sharota, Sylvia J Simpson and Craig M. Mellis)

This well written and conducted double-blind randomised study was conducted to compare two new methods of administering inhaled bronchodilators to children (n=25, aged 4-15 years, mean 9 years, 12 girls) who have difficulty with the use of their standard metered dose inhalers. The study showed that the administration of sabutamol via a Rotahaler and that of terbutaline via a Misthaler both resulted in effective bronchodilation in children with stable moderate to severe asthma. The authors concluded that both the Rotahaler and Misthaler had advantages over the standard metered dose inhalers, and were useful in the management of young children with asthma.

Mouth-Piece

Two letters were published, one from Dr Hennig Imberger who commented on Judy Roget's article "The Wet Spirometer in 1984" and the other a response from Judy.

Also included in Hennig Imberger's letter was a comment on a question I posed in the December 1983 issue of VOLUME:

<u>Do You Know</u> whether the oxygen uptake term in the Fick equation for the estimation of cardiac output should be expressed at BTPS or STPD?

Dr Hennig Imberger responded as follows:

> "In the light of trying to "get to" and "build on" relevant fundamentals, I would like to comment on "Do You Know", page 10 December 1983 issue. The question really required us, not so much to recall or remember or even to look up in an authorative text whether the answer is STP or BTP, but to work out, or reason, what the principles underlying the Fick method requires.
> The underlying principle is simply that of the conservation of the mass of oxygen as the gas is taken up by the blood. That is, the oxygen uptake rate is equal to the rate of increase of oxygen in the blood, which in turn is equal to the difference in oxygen content per volume of blood between arterial blood (lung exit point) and venous blood (lung entry point) all multiplied by the volume rate of blood passing through the lungs (ie multiplied by the cardiac output).
> If the oxygen uptake and the oxygen contents per volume of the two bloods are known, the above equation yields by simple algebra the cardiac output. So far oxygen can obviously be measured in any condition provided that the oxygen uptake is measured under the same conditions (same pressure and temperature eg STP, BTP, … (saturation is irrelevant)) as the oxygen difference measurement in the bloods.

The oxygen content would generally be obtained from the percentage saturation of haemoglobin (measured directly or via the oxygen tensions and the haemoglobin dissociation curves), the haemoglobin content of the blood and the haemoglobin carrying capacity (given as 1.39 ml STP of oxygen per gm haemoglobin).
By adding the dissolved oxygen as determined from the oxygen in the blood being 0.00305 (ml STP/100ml/mmHg O_2 tension the total oxygen contents are found. Consequently, when using the above figures oxygen uptake needs to be measured at STP. However, the haemoglobin capacity and oxygen solubility can equally well be quoted at BTP requiring BTP uptake measurement.

(Any Comments? Can anyone suggest why did Hennig deliberately omitted the "D" out of STPD? DPJ)

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

David P. Johns PhD, CRFS, FANZSRS

david.johns@utas.edu.au

Tel: (03) 6226 4801