Continuous in situ Determinations of the Blood O$_2$ Content by an Oximetric Method

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With the aid of Erma PWA-5 oximeter and Erma Model 303 hemoglobinometer, continuous in situ determinations of the blood oxygen content were undertaken in the dog. The oxygen content values obtained in this way were found to be in close agreement with those obtained by direct manometric method of Van Slyke and Neill.

The manometric method of Van Slyke and Neill (1924) remains the universal standard for accurate blood O$_2$ content determination. However, the time required for this method limits the number of samples that can be analyzed under rapidly changing experimental conditions. Moreover, this method has a drawback in that it cannot be used for continuous in situ determinations.

To overcome these difficulties, the oximetric determination of the blood oxygen content was undertaken using Erma PWA-5 oximeter. Throughout the experiments using the dog heart-lung preparations, the venous blood flowing out of the coronary sinus was led to the cuvette of the oximeter at constant rate (10 ml/min) by a peristaltic pump (Harvard Model 1203) and its O$_2$ saturation was continuously recorded with an ink-writing oscillograph. A small amount of blood was withdrawn at times from a site in the preparation just distal to the cuvette of the oximeter and its oxygen content was determined directly by the manometric method of Van Slyke and Neill. Using Erma hemoglobinometer (Model 303), the hemoglobin content was also determined on the same sample. From the value of O$_2$ saturation recorded at the time of withdrawal of the blood sample, the oxygen content was calculated according to the following equation:

\[ \text{O}_2 \text{ content (vol. \%) } = 1.36 \times \text{hemoglobin content (g/dl)} \times \text{HbO}_2 \text{ saturation (%) } \times 0.01 \]

Fig. 1 illustrates the O$_2$ content values obtained by the oximetric method as plotted against the O$_2$ content values of the same blood samples determined directly by Van Slyke and Neill method. As can be seen from this figure, the values obtained by these two methods were in close agreement (r=0.98), indicating that...
Fig. 1. O₂ content values of the blood samples determined by the oximetric method as plotted against those of the same blood samples determined by the manometric method of Van Slyke and Neill.

The oximetric method can be used as a reliable method for continuous in situ determinations of the blood oxygen content.

Reference