SIMPLIFIED GAS ANALYSIS

NO. III. THE DISSOCIATION CURVE FOR OXYGEN AND THE CO COMBINING POWER OF BLOOD

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For accurate determination of the relative amounts of reduced and oxyhemoglobin in blood exposed to atmospheres containing varying partial pressures of oxygen no method surpasses that of Barcroft and his coworkers.[1]

The principle of this method is to expose a small quantity of blood in a thin film on the walls of a relatively large cylindrical vessel (tonometer) containing a mixture of nitrogen and oxygen gases until equilibrium has become established between the partial pressure of the oxygen in the atmosphere and the absorption of oxygen by the blood. Some of the blood is then transferred to a bottle connected with a differential manometer and shaken with dilute ammonia water, by which it becomes laked and takes up its maximal load of oxygen, thereby causing shrinkage in the volume of air, the degree of which is indicated by the manometer. The oxygen-saturated blood is then shaken with ferricyanide of potassium which dislodges the oxygen and causes the pressure in the bottle to rise. From the displacement of the fluid in the manometer in the two observations, the percentage of saturation of the blood with oxygen is readily calculated.

For use by a class of students the method is not practical because of the difficulty of providing suitable mixtures of oxygen and nitrogen with which to fill the tonometer and because of the expense of the differential manometer. The first of these difficulties is overcome by exposing the blood to a partial vacuum instead of a mixture of gases, a principle which has also been applied by W. G. Macallum, who uses a modified Van Slyke pipette both as tonometer and analysis apparatus.[2] The advantage of a partial vacuum over a mixture of oxygen and nitrogen is that the partial pressure of oxygen is readily calculated from the degree to which the tonometer is evacuated, measured by a barometer. In the present method the blood after exposure to partial vacuum is transferred to a simple form of differential blood gas manometer in which there are no glass stopcocks, pressure adjustment being made by the use of the pressure adjuster described elsewhere.[3] Even with these simplifications, the technic is by no means easy, but the great importance of having the student clearly understand the principles of the method used for securing the data necessary to plot the dissociation curve amply repays the time he devotes to the experiment. Indeed without actually doing this experiment, it is the opinion of the writer that the average student rarely acquires any clear conception of the [illegible] tion of the blood. After he has conscientiously performed the [illegible] he other hand, the whole problem becomes clearer, even although