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Modification of Van Slyke's Gas Apparatus for Determination of CO_2 in Muscle and Other Tissues

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For the determination of CO_2 in muscle and other tissues it is obviously necessary to modify the gas burette of Van Slyke and Neill[1] so that relatively large pieces of material can be introduced into the burette. Ferguson and Irving[2] have proposed to divide the burette into 2 separate parts just below the 2 cc. mark, the 2 parts being connected by means of a ground joint and held together with a pair of springs. In our laboratory several modifications have also been used. The one that seems most satisfactory is shown in Fig. 1.

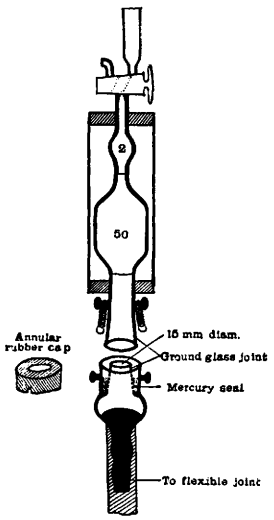

FIG. 1.

Modified gas burette for determination of CO_2 in muscle.

The new feature of the burette is the enlargement of the diameter of the lower stem of the burette and the introduction of a 15 cc. bulb between the burette and the flexible point. The short stem of the bulb is ground on the outside to fit the lower stem of the burette which is ground on the inside. The joint is surrounded by a cup for mercury seal and the cup is provided with an annular rubber cover to prevent the escape of mercury during shaking.

[1] Van Slyke, D. D., and Neill, J. M. *J. Biol. Chem.*, 1924, **61**, 523.

[2] Ferguson, J. K. W., and Irving, L. *J. Biol. Chem.*, 1929, **84**, 143.

For the determination of CO_2 about 0.5 gm. of muscle is taken from the animal and immediately put into a weighed, stoppered test tube containing a solution which stops respiration, hinders lactic acid formation and prevents loss of CO_2. The solution is made by mixing 1 cc. of 0.3 N CO_2-free NaOH and 3 cc. of 0.8% saline containing 65 mg. KCN and 1 gm. NaF per liter, and 2 drops of 0.1% phenol red solution. The tube is weighed again to obtain the weight of the muscle.

The material to be analyzed is introduced into the bulb, the burette is placed on it, stop-cock vaseline being used at the ground glass joint. The bulb and the burette are fastened by a pair of springs. With the cock of the burette open, mercury is admitted into the bulb pushing the material up into the burette and filling it completely with mercury. The tube in which the muscle has been weighed is rinsed with 2-m cc. of H_2O, m being the weight of muscle. The rinsing is introduced into the apparatus in the usual manner, followed by 2 drops of caprylic alcohol and 1 cc. of 1-N lactic acid. The total volume of solution plus that of muscle is 7 cc. The extraction is carried out in the usual manner.

With a 0.5 gm. sample of muscle, we find it necessary to extract for 30 minutes in the vacuum. During the extraction the reacting mixture was drawn once into the lower chamber to rinse it. The burette was allowed to stand for 15 minutes without shaking and then shaken for 15 minutes. Testing with a known solution of Na_2CO_3 we found no difference in the result whether the solution was introduced into the bulb or in the usual way. CO_2 was absorbed with 1 cc. gas-free 1-N NaOH solution. The calculation was done according to the method of Van Slyke and Neill, 1 gm. muscle being regarded as equivalent to 1 cc. of solution.

Our modification of the apparatus has 2 advantages over the form proposed by Ferguson and Irving. First, there is no danger of gas leaking into the chamber during extraction and second, the burette can be water-jacketed as in the usual form of the apparatus.