indeed for the sick.[1] These two fruits have been classed for a long time as antiscorbutic agents. It is therefore important to determine as near quantitatively as possible their antiscorbutic potency in the raw state and after subjection to heat treatment such as is ordinarily employed in the preservation and cooking of these materials.

Experiments have been conducted on guinea pigs on a basal diet adequate in all respects except the antiscorbutic vitamine. To determine the presence or absence of this latter factor in raw, dried and cooked apples and bananas a daily allotment of these foods has been fed to the animals. We have found that a per diem dose of 10 grams of raw apples or of bananas will protect a guinea pig against scurvy for three months. On the contrary an equivalent amount of these foods cooked at 100° C. for fifteen minutes or dried at 55–60° C. (with the exception of apples which showed some antiscorbutic potency) or dried at 55–60° C. and cooked for fifteen minutes at 100 °C. will not protect the animals against scurvy.

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The determination of lung volume without forced breathing.

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The dilution method for determining lung volume, invented by Davy and modified by Bohr and his coworkers, and recently by Lundsgaard and Van Slyke, rests on the principle of mixing the air in the lungs with a known volume of foreign gas (H_2 or O_2), and calculating the air content of the lungs from the extent to which either the foreign gas or the nitrogen of the lung air (Lundsgaard and Van Slyke) is diluted. This method yields satisfactory results when the subject can breathe deeply, so that 4 or 5 respirations cause complete mixture of the lung air with the diluting gas. When the subject, however, because of weakness or respiratory disturbance, cannot greatly increase the depth of his respirations, so much time is required for complete mixture that volume changes due chiefly to absorption of oxygen make accurate results unobtainable.

[1] Myers, V. C., and Rose, A. R., *J. A. M. A.*, 1917, lxviii, 1022.

We have been able to avoid this difficulty by modifying the principle, and basing the calculation not upon the dilution of one gas, but upon the volume ratio of two gases. The subject breathes to and from a bag containing oxygen, sufficient to satisfy his requirements for the length of the experiment, and mixed with the oxygen a known volume of hydrogen approximating the volume of the nitrogen in the lungs. The CO_2 is removed by a scrubber of sodium hydroxide shells. After mixture is complete, the N_2 and H_2 in the gas are determined. Since

$$\frac{\text{initial vol. } N_2 \text{ in lung air}}{\text{initial vol. } H_2 \text{ in bag}} = \frac{\text{final per cent. } N_2 \text{ in gas mixture}}{\text{final per cent. } H_2 \text{ in gas mixture}},$$

$\text{vol. } N_2 = \text{vol. } H_2 \times \frac{\text{per cent. } N_2}{\text{per cent. } H_2}$. Since the nitrogen constitutes 0.791 of the air, the volume of air in the lungs is $\frac{\text{vol. } N_2}{0.791}$. The air volume thus determined is corrected by subtracting air present in the dead space of the apparatus at the start, also any air present as impurity in the oxygen or hydrogen used. Changes in volume of oxygen or CO_2 in the system do not affect the results, and absorption of hydrogen is negligible. Without changing the respiration from that normal at rest, results for residual air are obtained after about 2 minutes breathing that are not altered by further breathing and that agree with the results obtained by the Lundsgaard-Van Slyke method in subjects capable of properly cooperating in the latter. The error of the present method does not appear to exceed 4 per cent. of the lung volume estimated.

For the safe use of hydrogen two precautions are essential: The hydrogen, especially if made by the action of acid on a metal, such as zinc, should be tested for arsine to avoid fatal poisoning; and flames should be kept away from the apparatus to prevent explosion.