A Low Temperature (-68°C.) Storage Cabinet

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A temperature of about -70°C. is desirable for storing many unstable biological materials, especially some viruses.

Electric refrigerators which give this temperature are expensive and may break down. Solid CO_2 readily gives the desired temperature, but the specimens must usually be sealed in glass to be protected from CO_2 gas, and the cost of CO_2 may be high. Horsfall and Ginsberg (1951) describe a cabinet for use in a cold room in which the CO_2 is contained in two compartments separated from the storage compartments. Heat is conducted to the CO_2 by the metal of the dividing partitions and the drawers in the storage compartment.

We have modified the original design and obtained somewhat lower storage temperatures and greater efficiency, although the cabinet is not in a cold room and is smaller. To reduce heat uptake as much as possible the outside of the cabinet was made approximately cuboidal ($124 \times 122 \times 97\text{ cm.}$) and 20 cm. thickness of expanded rubber ("onozote") was used as insulation. In the case of the lids, which contained 10 cm. of expanded rubber, 10 cm. or 20 cm. thick cotton-wool pads were placed underneath. To improve heat conduction the inner compartment and partitions were manufactured from 18 gauge copper sheet and the storage drawers from 16 gauge aluminium sheet. No effects of electrolysis due to the use of dissimilar metals have so far been noticed, the surface of the aluminium being treated with KOH. The storage compartment, $78 \times 56 \times 38\text{ cm.}$, holds 20

drawers each with 16 inclined fixed shelves. The shelves will each take from three universal containers to about 50 stoppered 2-ml. test-tubes. The top of the storage and CO_2 compartments is constructed on a teak frame, and CO_2 diffusion through the teak is reduced by sticking polythene film over the surface facing the CO_2 compartment. It was found that soda lime efficiently absorbs CO_2 at -70°C. and about 1 lb. in cotton bags can reduce the concentration in the storage compartment from 12 to 5% overnight.

Outside of cabinet.

The cabinet is housed in a wooden hut. It is loaded once a week with CO_2 in 25 lb. cakes—125 lb. (56.8 kg.) in winter and 150 lb. (68.2 kg.) in summer. This operation takes five to 10 minutes. The CO_2 consumption is 2.5–3 lb./day/cu. ft. of storage space. The temperature in the top of the storage compartment is always -68°C. or a few degrees lower and the CO_2 concentration there varies from 0.2 to 0.6%. Guinea-pig complement and various labile viruses have been stored in screw-capped bottles or stoppered glass tubes for periods of six to 12 months so far with no apparent decrease in activity.

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REFERENCE

Horsfall, F. L., Jr., and Ginsberg, H. S. (1951). *J. Immunol.*, **61**, 443.