Technical methods

Depending upon the intensity of the bands, the sensitivity of the instrument is adjusted by selecting one of the four cams of varying slope. The bands are sufficiently demarcated and deeply stained to show the difference in LD₃ and LD₄ isoenzyme patterns of normal red cells and pernicious anaemia red cells (Fig. 4).

SUMMARY

Cellulose acetate gel (Cellogel) blocks form an ideal medium for the separation of lactic dehydrogenase isoenzymes. Primarily intended for electrophoresis of plasma proteins, they can be used for isoenzyme separations if the slight modifications described are incorporated. No prior preparation of the medium is required; separation is very rapid and direct staining with minimal quantities of reactant fluid is possible. All five lactic dehydrogenase isoenzyme bands are separated clearly and intensely enough to allow of good reflectance scanning by the Chromoscan integrating densitometer.

REFERENCES


Low temperature storage container using carbon dioxide

K. E. K. ROWSON AND B. W. J. MAHY From the Cancer Research Department, The London Hospital Medical College, London

Electric refrigerators which will maintain temperatures of −70°C are now readily available and reliable. However, the initial cost of such refrigerators is high and the danger of a mechanical or power failure cannot be completely eliminated. Liquid nitrogen is particularly valuable for preserving cells (Nagington and Greaves, 1962), but it is neither so easy to handle nor so readily available as solid carbon dioxide, which is satisfactory for preserving viruses.

Low temperature storage containers using solid carbon dioxide have recently been described by Ring (1964) and Busby, House, and MacDonald (1964). The success of such a container depends on adequate thermal insulation, good conduction between the solid carbon dioxide and the specimens, and the prevention of condensation in the insulating material used for its construction. In the container described below insulation was provided by expanded polystyrene, good conduction internally was assured by an inner aluminium lining, and condensation was prevented from penetrating the insulation by a complete covering of polyester resin reinforced with fibre glass. The latter material is easily moulded by hand to form a continuous inner and outer covering, and any ice which forms on the inner surface near the top of the box is easily removed. The expanded polystyrene provides a good barrier to conducted heat, but not to radiant heat, which is reflected by the internal aluminium container.

MATERIALS AND METHOD OF CONSTRUCTION

The container is constructed from 6 in. thick expanded polystyrene (Jablo Plastics, Jablo Group Sales, Ltd., Mill Lane, Waddon, Croydon, Surrey), as shown in the diagram (Fig. 1). The necessary pieces are cut from two standard sheets (one 4 ft. × 4 ft. and one 2 ft. × 6 ft.), and glued together with U.S. adhesive and hardener (also from Jablo Plastics). To provide a well-fitting lid which allows excess carbon dioxide to escape, the upper edge of the box and the lower surface of the lid are covered with ½ in. plywood. Before the fibre glass and polyester resin (Filabond Polyester resin No. 8748A, James Beadel & Co. Ltd., 26 Old Bailey, London, E.C.4) are applied the box is given three coats of oil paint to prevent the styrene in the resin attacking the expanded polystyrene. This difficulty may alternatively be overcome by using polyurethane foam (Baxenden Chemical Co. Ltd., Baxenden, Lancs.) in place of expanded polystyrene, but the cost of

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Technical methods

OPERATING EXPERIENCE

Three compartments were used for solid carbon dioxide, which was added twice a week, and three for specimens, which were in sealed glass ampoules to avoid contact with carbon dioxide. During a period of three weeks, when the box was opened on average twice a day, 195 lb. of carbon dioxide was used up. During this period the highest and lowest temperature recorded at the bottom of one of the compartments near an outside wall were \(-57^\circ\)C. and \(-75^\circ\)C. respectively, with a mean temperature of \(-67^\circ\)C.

The total cost of the materials for this container, with a storage capacity of 1.5 cubic feet, was £33, and the annual running cost is about £75. An electric refrigerator of comparable capacity costs over £600 and would cost about £80 per year to run, excluding maintenance which on average would be £30 per year.

### TABLE

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Storage Capacity (cu. ft.)</th>
<th>Initial Cost (£)</th>
<th>Load when operating (watts)</th>
<th>Running Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our CO₂ box</td>
<td>1.5</td>
<td>33²</td>
<td>—</td>
<td>73²</td>
</tr>
<tr>
<td>Frigidaire VLR-27</td>
<td>2.4</td>
<td>895</td>
<td>1,000</td>
<td>58⁴</td>
</tr>
<tr>
<td>Fisons IP 275</td>
<td>3.0</td>
<td>695</td>
<td>1,000¹</td>
<td>79</td>
</tr>
<tr>
<td>L.E.C. CL 10B</td>
<td>0.6</td>
<td>310</td>
<td>500</td>
<td>29⁴</td>
</tr>
<tr>
<td>CL 15B</td>
<td>1.5</td>
<td>624</td>
<td>1,000¹</td>
<td>58⁴</td>
</tr>
<tr>
<td>CL 30B</td>
<td>3.0</td>
<td>892</td>
<td>1,500</td>
<td>87⁴</td>
</tr>
</tbody>
</table>

¹Excluding the cost of maintenance which is about £30 per year over a period of seven to eight years.
²Materials only. The box can be built in the laboratory
³Calculated on the cost of 156 blocks of solid carbon dioxide per year at 9/4d. each. No maintenance.
⁴When the external temperature is about 70°C, the refrigeration unit would be operating about 80% of the time. The cost of electricity is taken as 2d. per unit.
⁵When both compressors are operating the load is 2,000 watts, but normally one compressor operates all the time, and the other operates for five minutes every hour.

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Low temperature storage container using carbon dioxide.

K E Rowson and B W Mahy

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