RESULTS

Table I shows that a marked reduction in contamination was effected by using UV radiation in the Gallenkamp oven. After subtracting the number of colonies estimated to be due to the pouring process (ie, filter paper control or F.P.C. level) a 67-5% reduction at 35°C, and a 100% reduction at 45°C and 55°C were found. Plates dried in the incubator at 35°C showed a level of contamination intermediate between the ultraviolet radiation-dried plates and those dried in the oven without ultraviolet radiation. At 55°C, incubator contamination was similar to that in the oven without ultraviolet radiation.

The temperature range chosen for testing the special Laboratory and Thermal Equipment cabinet (38-48°C) proved to be satisfactory both for speed of drying and for prevention of contamination, so other temperatures were not employed. Table II gives the results with this cabinet. After subtracting the filter paper control colonies, 96 colonies on the 359 plates dried without ultraviolet radiation were reduced to nine colonies on the 360 ultraviolet radiation plates, a reduction of 90-7% in drying contamination.

<table>
<thead>
<tr>
<th>Temperature (C)</th>
<th>Contamination Rate for Three Experiments with L.T.E. Cabinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra-violet</td>
<td>Ultra-violet</td>
</tr>
<tr>
<td>Off</td>
<td>On F.P.C.</td>
</tr>
<tr>
<td>38-48°</td>
<td>Total 121/359 34/360 13/186 Total minus F.P.C. 96/359 9/360 0</td>
</tr>
<tr>
<td>Duration of exposure 1 min (fan off), 10 min (fan on), no extra time</td>
<td></td>
</tr>
</tbody>
</table>

SUMMARY

A new type of cabinet for drying culture plates is described, which dries 120 plates in 11 minutes with negligible contamination.

Acknowledgements are due to Mr Dobbin, senior technician, and other members of technical staff whose help was invaluable, and also the South Eastern Regional Hospital Board (Scotland) for grants enabling the work to be carried out.

A custom-built hospital blood bank

D. G. CHALMERS From the Department of Pathology, University of Cambridge

The siting of the stored blood required for transfusion in a busy general hospital is most important. Observation has shown that many laboratories, torn between the need to provide easy accessibility by hospital staff and by laboratory staff, have been forced to site their blood bank in relatively inconvenient positions. The construction of a new wing of the John Bonnett Clinical Laboratories in 1959 allowed us to attempt a solution in ideal circumstances. This unit has now been working for eight years and has been found to provide a satisfactory solution to the problem. In an era when extensive laboratory building is contemplated our experience may be of value to those whose responsibility includes the blood bank.

The transfusion laboratory was sited on the ground floor leading off the main entrance hall of the laboratory wing, thus making it readily accessible to visiting hospital staff. The siting of a conventional blood bank refrigerator in the hall was discarded as, although this would have been of convenience to those collecting the cross-matched blood, the staff manning the transfusion laboratory would have been continually moving from the refrigerator to the transfusion room and back throughout the course of the day. It was therefore decided to build a specially designed refrigerator into the wall separating the transfusion laboratory from the main hall. The refrigerator was divided into two sections. One half was only accessible from within the laboratory; access to this half was through two doors (see illustration A), and its use was reserved for blood stored and not cross-matched. The other half of the refrigerator was again accessible from the laboratory side by two doors; in the top half of this section was installed a series of round trays pivoting on a central axis. This form of blood storage is common in Scandinavia. A modification introduced was that the trays were divided into compartments, each compartment having a number. Each tray rotated independently of the trays above or below. The lower part of this section of the refrigerator was left unshelved. This section could also be entered from the hall outside the laboratory through two duplicate doors see illustration B. The upper of these doors opened onto the rotating trays and as this was used by non-technical staff two perspex sheets were placed on either side of the opening leaving a gap of some eight inches in the centre to allow blood bottles to be removed. This was an attempt to reduce heat exchange when the door was left open. The lower part of this section, as previously stated, was unshelved and was designed for the reception of crates of blood from the Blood Transfusion Centre. Should the laboratory be

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unmanned when delivery was made the National Blood Transfusion Service official could leave the blood in the refrigerator in complete safety.

The system of issuing cross-matched blood in our hospital has been in use for some 18 years. No blood bank record book is kept. Instead each bottle received from the transfusion centre is given a card of the appropriate group colour. On this card is entered the bottle number, the date of receipt, and date of expiry. When the bottle is cross-matched the patient’s name, hospital number and date of cross-matching are added. The card is then placed in a rack next to the refrigerator and to the card is added the number of the compartment in the rotating tray in which the bottle has been placed. A nurse coming from the ward to collect blood for a patient brings with her the hospital notes or the treatment card. She identifies the cross-match card on the rack and from this she can determine the position of the bottle in the refrigerator. She then opens the refrigerator, rotates the rack until the correct number appears in the opening and takes the bottle. She closes the refrigerator, checks the details on the bottle label against the details on her treatment sheet, signs the card which was in the rack, and leaves it in a box. She then returns to the ward with the bottle. In this way hospital staff are able to collect cross-match blood at any time day or night without reference to the laboratory staff. Only in cases in which there appears to be discrepancies in numbers is it necessary to disturb the staff during their routine work. There is no difficulty in identifying a bottle or in finding it as its position is clearly marked. The possibility of bottles being over-turned in the general shuffling which goes on in the standard type of refrigerator is eliminated.

One problem suggested by refrigerator engineers when this system was being designed was the excessive number of doors in relation to the size of the refrigerator. In practice this is not a problem; as will be seen from the specifications, the refrigerator is cooled by use of a fan and this fan automatically switches off when any door is opened. In addition the opening of a door on the outside of the refrigerator illuminates a red light over the doors on the transfusion side and the staff will not open their door until this light goes out. It has been found occasionally that the air temperature of the refrigerators does rise two or three degrees if the doors are frequently opened. However, a Bristol Recording Chart is connected to a thermometer placed inside a blood transfusion bottle containing glycerol, thereby simulating as nearly as possible a bottle of blood. The temperature of this has never been found to vary more than one degree under normal working conditions. As an additional safeguard the alarm system works off air temperature controls, thereby guaranteeing that warning is given of a breakdown long before the temperature of the blood bottle has risen. An additional advantageous feature is the large cooling surface of the refrigerator; this enables the cooling surface to be maintained slightly above freezing point and there is no need to defrost the refrigerator. The only maintenance required is the occasional emptying of the drip tray.

FIG. 1A and B. **The blood bank showing the arrangement of the blood bottles and access from the laboratory and the hall.**
SPECIFICATIONS

The capacity of the refrigerator\(^1\) is approximately 44 cubic feet. The cabinet is insulated throughout with 4 inches of compressed cork, encased outside with painted plywood and inside with stipple-glazed asbestos sheeting. Internal lighting is provided with automatic operation on opening and closing the doors. Cooling is by means of a Prestcold plate type of evaporator and serviced by a Prestcold superprasmatic condensing unit with a \(\frac{1}{2}\) H.P. integral electric motor. Air circulation is controlled by a fan drawing air over the evaporating unit. The fan is cut out by door-operating switches. An audible buzzer and warning light operate should the air temperature fall below 4\(^\circ\) or rise above 7\(^\circ\). This system operates by independent batteries. The blood temperature is recorded by a Bristol single-pen recorder with the thermometer placed in a standard 1-pint blood transfusion bottle containing glycerol.

\(^1\)Built and installed by Prestcold (East Anglia) Limited, Windsor Road, Bedford.

Letter to the Editor

A PAPER TEST FOR OCCULT BLOOD IN FAECES
USING ORTHO-DIANISIDINE

Sir,

Benzidine was commonly used in the past for the detection of occult blood in faeces. It is no longer generally available because of its carcinogenic properties and ortho-tolidine is now frequently used for both paper and tube tests. Huntsman and Liddell (1961) described a paper test using o-tolidine and sodium perborate which had several advantages over the more tedious tube tests. Recently, however, we have encountered considerable batch variation with o-tolidine, some batches being quite unsuitable for occult blood tests. Wahba (1966) described a tube test for occult blood in faeces using ortho-dianisidine. In order to overcome the problem of batch variation, while retaining the speed and simplicity of paper tests, we have modified the perborate test of Huntsman and Liddell by using o-dianisidine instead of o-tolidine.

The two stock reagents we use are a 2% solution of o-dianisidine in glacial acetic acid (A.R.), which will keep for two weeks if stored in the dark, and a 2% solution of sodium perborate in water. The sodium perborate is dissolved by warming to 56\(^\circ\)C, and the solution then cooled immediately. This solution should be prepared freshly on the day of use. The working reagent is prepared by mixing equal volumes of these solutions, and should be used within one hour of preparation.

The method is carried out by placing a filter paper circle (Whatman no. 1) on a clean white tile. A thin smear of faeces, about the size of a postage stamp, is made in the centre of the filter paper, and six drops of working reagent spotted on to the centre of the smear. A definite blue or green colour appearing within two minutes, and spreading outside the area of the smear, is regarded as positive. A positive reaction is graded as \(+ + + + +, + + +, + + +\) or + according to the intensity of the colour developing within two minutes.

In order to determine the sensitivity of the o-dianisidine paper test, we have compared results obtained by the above method with those obtained using the benzidine tube test, in which the sensitivity depends upon the concentration of benzidine solution used. Varley (1962) stated that if the test is carried out using 10% or 5% benzidine solutions, negative results could be taken to exclude gastrointestinal bleeding, but positive results were of doubtful significance. With 3% or 1% solutions, however, positive results could be accepted with a high degree of certainty, but some cases of gastrointestinal bleeding might be missed. We selected for comparison the tests using 3% and 5% benzidine, since these provide satisfactory upper and lower limits of sensitivity.

From the table it can be seen that there was good overall agreement between results obtained with the
A custom-built hospital blood bank.

D G Chalmers

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