Brit. J. Ophthal. (1967) **51**, 1

COMMUNICATIONS

ORGANIZATION AND ADMINISTRATION OF WESTMINSTER-MOORFIELDS EYE-BANK*†

BY

D. B. ARCHER AND P. D. TREVOR-ROPER

From the Department of Ophthalmology, Westminster Hospital, and Moorfields Eye Hospital, London

THE WESTMINSTER-MOORFIELDS EYE-BANK was officially inaugurated in January, 1965, the metropolitan centre of a network planned by the Ministry of Health. We present here our experiences in organizing this unit, our travails, and our conclusions, which we hope may be of some help to others facing the same problems elsewhere. In addition to this, the detailed examination of the 270 eyes banked during the first 7 months, with an analysis of the *post mortem* changes in the last 200 of these, has yielded information which we feel to be worth recording.

"Eye-Banks" had, of course, existed in Britain for some years previously, as centres for the quick distribution of donor corneal material; but always as a sideline to specific hospital eye-departments where the consultants happened to have a special interest in corneal surgery—notably at the Westminster Hospital and the Queen Victoria Hospital, East Grinstead (Rycroft, 1965); but the introduction of new techniques for corneal grafting, better materials for suturing, and the recognition that many conditions previously thought inoperable were now amenable to surgery, have created a widening demand for fresh and preserved donor materials. This demand became greater after the successful introduction in detachment surgery of aspirated donor vitreous, and of donor sclera for embedding procedures; and to this may soon be added a call for corneal material for reconstructive surgery of the eyelids.

To satisfy such needs it became imperative to organize as efficiently as possible the collection and distribution of donor eyes, and particularly to discover a satisfactory method of storage that would preserve the material for full-thickness grafting for longer than the permissible 2 to 3 days. Thus it was felt that any major eye-bank should carry with it a research unit, which would concurrently seek to determine the many and varied factors that contribute to the perfect graft and the full recovery of sight. Happily a technique for the successful prolonged storage of material at low temperatures had just been elaborated in the Westminster unit (Mueller, Casey, and Trevor-Roper, 1964), and the success of such deep-frozen corneae has subsequently been confirmed elsewhere (Kaufman, 1965; Mueller, O'Neill, Trevor-Roper, Reiter, and Ludek, 1966).

* Received for publication December 15, 1965.
† Address for reprints: Department of Ophthalmology, Westminster Hospital, London, S.W.1.

To cope with the needs of Great Britain, the Ministry of Health has devised a plan of regional eye-banks placed at strategic points to serve their local needs; for instance, eye-banks are already functioning in Belfast, Birmingham, Bristol, Cardiff, East Grinstead, Glasgow, and Manchester. The small eye-bank which had been created at the Westminster Hospital in 1957 (largely by the initiative of Dr. T. Casey), was therefore enlarged as a joint Westminster-Moorfields enterprise. This, we hoped, would cover the demands of the Greater London area, and if necessary supplement the needs of other hospitals in the British Isles; at the same time it could send limited quantities abroad to meet urgent requirements, for in most tropical countries the need for grafting material is enormous, and the organization for obtaining it barely exists.

It would be only proper to add that, in respect of our eye-bank organization, we are many years behind our American neighbours, where many efficient regional banks are already established; and the International Eye-Bank in New York will send donor material to countries abroad, although, because of the time-factor, this is largely restricted to preserved material, suitable only for lamellar grafting—a therapeutic but of limited value as a sight-restoring measure.

Functions of an Eye-Bank

The primary functions of an eye-bank are:

(*a*) To develop a greater source of donor eyes through donations by the public at death;

(*b*) To co-operate in making this material readily available for qualified surgeons;

(*c*) To establish research units within the eye-bank, which would make the best possible use of material available, and would investigate methods of enhancing the quality of material provided for grafting, and methods of storing and preserving eyes for use when fresh material was not available.

Restrictions on obtaining Eyes

The laws concerning the removal of eyes from the deceased vary from country to country. In many East European countries it is unnecessary to obtain permission from relatives of the deceased, and thus the supply in such countries is theoretically unlimited, while in most Middle Eastern and African countries, because of religious rites and customs, it is virtually impossible to obtain fresh donor eyes.

The conditions for removal of eyes from the deceased in Great Britain are largely embodied in the Corneal Grafting Act, 1952; but this, by regularizing the conditions, in fact only stiffens the obstacles to speedy removal.

Basically eyes are obtainable for therapeutic reasons from:

(*a*) Patients who have bequeathed their eyes, either verbally or in writing;

(*b*) Patients who have donated their bodies to various hospitals, provided permission is obtained from the hospital concerned;

(*c*) A patient after his death, with the permission of his relatives;

(*d*) Patients, without relatives, dying in hospital, provided permission has been obtained from the person having control and management of the hospital;

(*e*) Persons under the charge of the coroner, provided his permission has been granted.

The removal of all eyes must be carried out by a registered medical practitioner, who must have satisfied himself by personal examination of the body that life is extinct.

Sources of Eyes (Fig. 1)

Although our eyes have been collected as far as 100 miles from base, an eye-bank run by a small team aiming to collect eyes as soon as possible after death should restrict its sources of eyes; in London we try to limit this to a 10-mile radius of the hospital.

Most of our eyes (65 per cent.) have been obtained from *terminal care homes.* The majority of these are run by voluntary organizations, often with very dedicated personnel, who will go to great lengths to co-operate. The eyes thus obtained are ideal in that:

(*a*) Most of the patients are relatively young, with eyes that are "well-preserved";
(*b*) The patients rarely suffer from exposure keratitis;
(*c*) The source is constant, predictable, and not seasonal.

The *teaching hospitals* in the area provide the second-largest source (23 per cent.); most of these were very valuable, being enucleated from patients with acute disease, and being well-preserved.

Geriatric units and old people's homes were also very valuable sources, but the eyes were often less satisfactory for corneal grafting on account of exposure keratopathies, corneal opacities, and chronic infection of the conjunctival sacs.

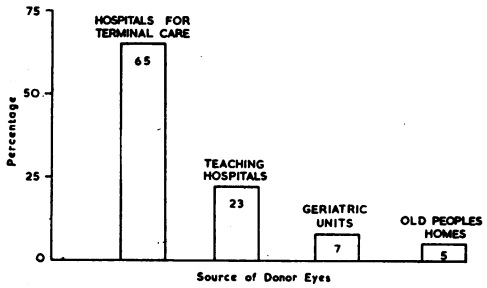

FIG. 1.—Sources of donor eyes.

Liaison and Propaganda

It rapidly became clear that the most important single factor in maintaining a good and constant stream of donor-eye material was a close liaison between the eye-bank team and the medical and nursing staff of the source hospitals and institutions.

Initially all potential sources were visited by a member of the team, and the best possible methods of providing donor eyes were discussed. Literature was provided by the eye-bank and by the Royal National Institute for the Blind, and this was distributed to members of staff and to any relatives asking for information. Lectures and informal discussions were given to interested groups, films of corneal grafting shown, and surgical demonstrations arranged. Members of the medical staff were invited to see techniques of corneal grafting.

It was also very necessary continually to boost the interest of medical and nursing staff in centres already providing donor material by frequent visits, as a change of staff and circumstances soon leads to a dwindling supply. It was found that when members of the eye-bank team were absent for any reason, the supply of eyes fell off rapidly.

An attempt was made to remind the public of the need for donor eyes—through the lay press and broadcasting; the efforts of the R.N.I.B. in this field are invaluable. This is important, as most eyes are donated by relatives, and it is of great value if they are aware of the huge need in this field.

The approach to the relatives of patients who have just died must obviously be quiet, tactful, and sincere. It has been our experience that relatives are often more willing to donate than one is to ask; in the collection of more than 350 eyes no objections have been encountered, nor have any difficulties arisen.

Since it is evident that nearly all our donor material does, in fact, come from hospitals and

institutions, it may well be asked whether we are justified in asking the public to bequeath their eyes, and whether all the expense and trouble involved in distributing and filing the R.N.I.B. leaflets is worth while, when the chances of any individual testator's eyes being used are so remote. We feel that the propaganda and bequeathal forms, and the organization that goes with all this is nevertheless amply justified, simply in that it causes the public to face this moral issue, so that they can be ready with their assent, should they or their relatives face death in an appropriate hospital. We believe that the disappointment of relatives, who may seek in vain to carry out the bequeather's wish, would be avoided if it were made clear that, for the majority who die out of reach of an eye-bank, the bequest will remain but a selfless gesture, although none-the-less well worth making.

Policy and Principles

(*a*) Eyes must be collected, once donated, irrespective of inconvenience or (at first sight) of unsuitability of the eyes.
(*b*) Eyes are not purchased, neither is any charge made for supplying them to any surgeon.
(*c*) Except in an emergency, eye-tissue is distributed to ophthalmic surgeons on a first-come, first-served basis. Priority is given to surgeons requiring material for full-thickness grafting.
(*d*) Except in cases of extreme shortage, every attempt is made to provide two healthy eyes for one operation.
(*e*) The names of the donor and recipient are not disclosed; but where requested the relatives of the patient providing the donor eyes are informed of the use of the eyes and the success of the operation.
(*f*) The eye-bank does not compete with other eye-banks, and avoids seeking donor eyes from hospitals already in contact with other eye-banks. It will supply other eye-banks with material if at all possible.
(*g*) All eyes are collected by a member of the medical staff of the eye-bank team.
(*h*) As eyes are so difficult to obtain, the wastage of them must be kept to an absolute minimum, by efficient organization and by the use of long-term storage methods.
(*i*) The eye-bank team is available to aid other hospitals in obtaining eyes, should they lack facilities for collecting eyes donated to them.

Personnel

(a) Director— Responsible for co-ordinating activity of eye-bank and providing funds for special purposes. This will normally be a Consultant Surgeon in charge of an ophthalmic unit where grafting predominates.
(b) Registrar— Responsible for collection of eyes, organization and control of eye-bank, and distribution of eyes. This will often be a part-time job of one of the clinical staff of the unit, or in other circumstances a local General Practitioner, possibly retired, who finds such work convenient.
(c) Research Work— Surgeon, Biochemist.
(d) Secretary
(e) Ophthalmic Surgeons connected with Bank—
1. Assessment of material;
2. Results of grafting.

Administration

(A) Collection of Eyes

All calls to the eye-bank indicating that eyes are available are taken by the secretary, who informs the members of the team on duty. A 24-hour cover is given, and no eyes are collected without relatives' permission.

The eyes are collected as soon as possible. There is ample evidence that the success of full-thickness grafts is directly related to the time between the death of the patient and the removal of eyes, so that every effort is made to reduce this time to a minimum.

Fig. 2 shows that 54 per cent. of eyes are banked within 4 hours and 72 per cent. within 6 hours of death.

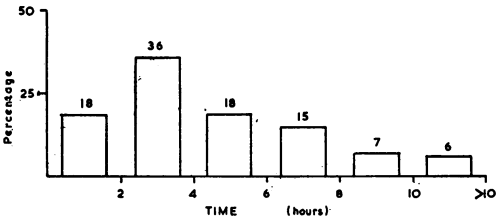

FIG. 2.—Time of banking donor eyes after death.

A prepared pack of instruments for collection is kept in readiness at the eye-bank, and fitted with sterile jars in a specially-prepared donor tray (*e.g.* a "Technitray"—provided by Luckham Ltd.). In view of the small but efficient transport-boxes available, a special collecting van with refrigerator was deemed unnecessary.

(B) Enucleation of Eyes

It is often difficult to maintain absolute sterility in the enucleation of eyes, but it is well worth while to remove eyes in as sterile a state as possible. Sterile gloves and a mask are worn. The field of operation is covered with sterile towels, but we do not attempt to clean the operation site (as recommended in certain U.S. banks). The eye is enucleated using a strictly no-touch technique, taking as much of the optic nerve as possible, to aid in suspension later. A note is made of any overt conjunctival infection and the presence of any orbital disease.*

A small pledget of cotton-wool is left *in situ*, so that there will be no cosmetic blemish. No lid sutures or glass prostheses are used. The eye is put into a dry sterile jar, cornea uppermost, and transported in this way.

Should eyes have to be collected farther afield, a special polyvinyl case packed with ice is used for their transport, and the eyes are supported in a glass "bell" (Mueller, O'Neill, and Trevor-Roper, 1965). They are rapidly brought back to the bank for assessment, and distribution or preservation.

(C) Assessment of Eyes

The eyes, having been secured, are immediately taken to the bank and assessed biomicroscopically. The anterior segment can be conveniently observed by removing the top of the sterile jar.

* It is of interest that in 94 people who had died from carcinomatosis, there was no macroscopic evidence of metastasis in either orbit

A record is kept of the condition of the eye as a whole, the condition of the layers of the cornea, the pupil, and anterior chamber. An assessment of the vitreous fluid is made, for its possible use at a later date.

It is quite possible to examine the fundi of the eyes provided the media are moderately clear, but this has not been considered necessary as a routine procedure so far.

Excluding eyes with known pathology, 200 eyes have been assessed as to the changes which occur in the anterior segment following death. As soon as the circulation is arrested the eyes become soft, no pressure being registered with the Schiötz tonometer.

POST-MORTEM CHANGES OCCURRING IN THE ANTERIOR SEGMENT OF THE EYE IN THE FIRST 20 HOURS FOLLOWING DEATH (200 EYES).—The eyes were enucleated by our surgeons using standard enucleation technique with the minimum of trauma.

(*a*) *Epithelium.*—Within the first half-hour after death the first changes noted biomicroscopically were punctate areas of epithelial degeneration in the axial region of the cornea.

By 2 hours after death most eyes showed diffuse epithelial degeneration, involving the whole surface of the cornea.

By 4 hours the epithelium showed marked oedema and irregularity, with small areas of erosion.

By 6 hours the epithelium became tattered and denuded in any area of mild trauma.

(*b*) *Bowman's Membrane and Stroma.*—Neither of these showed any morbid change on slit-lamp examination; there was no material increase in corneal thickness in the first 6 hours after death.

(*c*) *Descemet's Membrane.*—Almost immediately after death, folds appear in Descemet's membrane. Within half-an-hour of death fine striations appear sub-endothelially at the corneal periphery. In the majority of cases these folds remain peripheral until 2½ hours after death, by which time they begin to spread centripetally until the whole membrane is involved.

The folds in Descemet's membrane are most probably related to the sudden intra-ocular hypotension following death.

It was noted that the appearance of folds was modified by:

(1) AGE OF PATIENT: Folds appeared more rapidly in the older age group; most patients aged over 80 had well-marked folds present within one hour, and patients under 50 had only very slight peripheral striation until as long as 3 hours after death.

(2) TRAUMA DURING ENUCLEATION: An increased number of folds is noticeable after long journeys in a jar, if unsuspended, and also after inexpert enucleation.

(3) EMACIATION OF PATIENTS: In grossly dehydrated and wasted patients, folds in Descemet's membrane were present almost immediately after death.

(*d*) *Endothelium.*—No obvious defects were noted initially; but examination became difficult when marked folds in Descemet's membrane occurred.

(*e*) *Corneal Folds.*—These are full-thickness folds of the cornea, which occurred to some degree in 50 per cent. of eyes removed more than 10 hours after death. They cause grave disorganization of the corneal architecture. They were noted in only one case within 10 hours of death, and this in an old patient who was grossly emaciated.

(*f*) *Anterior Chamber.*—In all cases the anterior chamber was clear, but it was found that 2 hours after death 30 per cent. of eyes had a few, and in some cases many, pigment cells suspended in the aqueous humour. The great majority of these eyes had brown irides

and dilated pupils. In no case were the pigment cells adherent to the corneal endothelium. There was no obvious tendency for the pigment to gravitate—probably because of a relatively plasmoid aqueous. No other cells were noted suspended in the anterior chamber in this series.

Pigment in the anterior chamber was seen in patients of all age groups.

(*g*) *Pupil.*—In the great majority of eyes the pupil was dilated and circular; but all varieties from pinpoint to full dilatation were seen.

VITREOUS.—This was examined ophthalmoscopically to exclude any gross vitreous opacities; occasionally lens opacities precluded inspection, but as many of the patients were relatively young, this occurred in only a few cases.

PRACTICAL CONSIDERATIONS

(1) It is imperative that any eye that is to be used for lamellar or full-thickness grafting should be subjected to full biomicroscopic examination.

(2) In a series of 270 eyes enucleated as potential corneal graft material, twelve showed mild corneal disease not visible on macroscopic study.

(*a*) Four showed evidence of anterior uveitis with posterior synechiae, keratic precipitates, and degenerative changes in the corneal endothelium.

(*b*) Four showed fine but significant corneal nebulae (two as a result of exposure keratitis), one was a glaucomatous eye, and one a case of interstitial keratitis.

(*c*) Two showed corneal dystrophic changes deriving from aphakia.

(*d*) Two had diffuse non-specific endothelial opacities.

(3) The use of eyes with arcus senilis is not contraindicated, provided the size of the graft is small and well within the limits of the fat-deposition. Very often an arcus senilis masks a peripheral ulcer, and slit-lamp examination shows mild inflammatory processes in the region of the ulcer.

(4) Jaundice eyes have been considered as fit for full-thickness grafting in view of the findings by Toews and Basu (1962), although such eyes are excluded in many other banks. This is an important consideration, since a relatively high percentage of our donor cases had died from diffuse carcinomatosis, involving the liver. From such eyes we have had no known untoward results.

(5) By and large it is considered that, in eyes of approximately the same state, those donated by younger persons are more valuable and more likely to give a clear graft than those of elderly patients.

Fig. 3 shows that 30 per cent. are from patients aged under 60, and 56 per cent. from patients aged under 70 years.

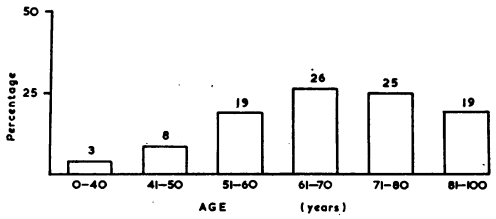

FIG. 3.—Age of donor eyes.

(6)(*a*) As a general principle no eyes from patients with a history or signs of glaucoma are used for full-thickness grafting.

(*b*) No eyes that have had anterior segment operations, even though the cornea

appears normal, are used for full-thickness grafts; these eyes are, however, used for experimental purposes.

(*c*) Eyes are not used when taken from patients with:

(*i*) septicaemia, widespread tuberculosis or syphilis;
(*ii*) any tumour of the eye involving the anterior structures;
(*iii*) leukaemia.

(*d*) If possible, eyes have been avoided for use in full-thickness grafts when removed from patients who have had recent radio-therapy or who have been treated with antimitotic drugs.

(7) No attempt is made to collect eyes from children, because of:

(*a*) corneal curvature difficulties;
(*b*) increased risk of psychological trauma to the parents.

(8) Eyes with severe corneal indentation are not used for full-thickness grafting; an attempt is being made to avoid this by suspending the eyes immediately after enucleation, to counteract any marked intra-ocular hypotony.

(9) Myopic eyes and those in which any vitreous opacities are seen are not used for vitreous aspiration.

(10) Pigment in the anterior chamber is no contraindication to the use of material for full-thickness grafting, unless the endothelium is morbidly involved.

Bacteriology of Donor Eyes

After biomicroscopy all eyes are examined bacteriologically. Cultures are made directly on to blood-agar plates from a platinum loop, with full aseptic precautions. The plates are immediately incubated, and interim reports on organisms and sensitivities are obtained after 24 hours, with a "final" report after 48 hours.

Such information is provided as part of the eye-bank service. Eyes that are heavily contaminated are not supplied. Should pathogenic reports be returned after eyes have been sent out, the recipient hospitals are immediately informed, giving the full spectrum of bacteriological sensitivities; or other fresh eyes are supplied if resources permit.

In a series of 200 eyes collected consecutively, 78 showed no growth in 48 hours, and 94 showed normal commensal inhabitants of the conjunctival sac (Fig. 4).

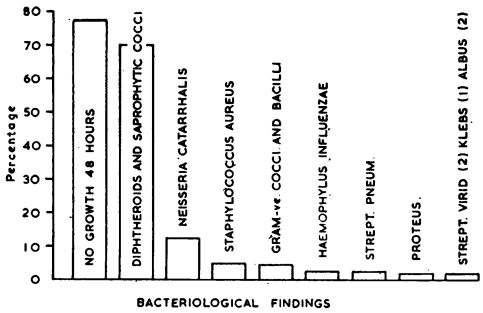

FIG. 4.—Bacteriological findings in donor eyes.

These accounted for more than 90 per cent. of eyes collected. The remaining eyes showed organisms of varying pathogenicity.

This indicates that the great majority of eyes enucleated have a scanty growth of

organisms, or only occasional commensals, and can be used without risk. Even so cultures would seem to be justified, if only to exclude the very small percentage of virulent pathogenic organisms; and cultures are obligatory if there are any signs suggesting a frank conjunctivitis or an overt discharge.

As a routine safeguard, all eyes used by our own surgeons are immersed in sofra-mycin before use; while the eye-bank has been functioning there has not been a single known case of intra-ocular infection following a graft.

(D) Documentation of Eyes

It is most important that an accurate record be kept of details concerning ALL eyes coming into the eye-bank. This serves as direct information for the areas receiving the eyes, and also for the formulation of statistical records.

The following details have been considered the minimum for adequate statistical records:

(*a*) *From Donor Body* (NAME OF PATIENT)

(1) Age of patient—avoid very young eyes
—eyes between 40–65 years most useful
(2) Sex of patient—no sex difference has been noted
(3) Time of death—hour and date
(4) Time of body in mortuary and if refrigeration present
(5) Cause of death
(6) History—any of eye disease—any systemic disease likely to affect eyes (*e.g.* syphilis, tuberculosis).

Owing to the scarcity of eyes, no blood is withdrawn in an attempt to correlate eye-donation with equivalent blood group.

(*b*) *At Eye-Bank*

(1) Institution or hospital supplying eyes
(2) Slit-lamp microscopy
(3) Bacteriology
(4) Time between death and storage at 4° C.
(5) Disposal—to hospital;
—for type of graft or vitreous;
—for research, etc.

All bottles are fully labelled with the relevant data.

(E) Storage of Eyes

All eyes after being returned to the eye-bank, cultured, and assessed, are stored in a standard refrigerator at 4°C. Initially the eyes were *stored dry* in a sterile jar with the cornea facing upwards; but in recent months the eyes have been suspended by suction in a small fitted bell jar, as described by Mueller and others (1965). This ensures absolute protection of the cornea from trauma in handling jars, and prevents folding and indentation of the cornea; after long periods of such suspension the eye does become slightly more hypotonic than usual, but the tension can easily be raised to the required level by injecting sterile saline into the vitreous.

This method of suspension is absolutely essential for the long-distance transport of eyes, as any trauma to the eye results in damage to the corneal endothelial cells, especially those at the corneal periphery, as has been demonstrated by vital-staining of the corneal endothelium (O'Neill, Mueller, and Trevor-Roper, 1967).

Stocker, Levenson, and Giorgiade (1963) have reported the value of human serum in maintaining a clear cornea when prolonged storage was necessary, so in recent months we have also suspended our eyes in a special nutrient medium—"*Parker 199 T.C.*". Such eyes will retain a clear cornea for 96 hours, and an almost clear cornea for 120 hours after death, although this does not necessarily indicate viability of the endothelium.

Of the 154 eyes used for full-thickness grafting, most were supplied within 24 and almost all within 48 hours of death. It was not considered wise to supply eyes older than 48 hours, except in cases of urgency, although clear grafts have been obtained in eyes preserved for much longer. Our records show that clear grafts resulted from material used as soon as 2 and as late as 72 hours after death. The interval between death and refrigeration at 4°C. is shown in Fig. 2. In most cases this was less than 6 hours and in nearly all cases less than 8 hours. It is accepted that this interval should be as short as possible, although we have records of clear grafts in patients when this interval has been as long as 15 hours; until a controlled series is available this figure must remain arbitrary.

(F) Disposal of Eyes (Figs 5 and 6)

This is the direct responsibility of the eye-bank. Because eyes are so difficult to obtain and are given so selflessly by others, and because the demand is so great, every effort must be made to reduce the amount of wastage as much as possible (this has amounted to 5 per cent. in the Westminster-Moorfields Eye-Bank).

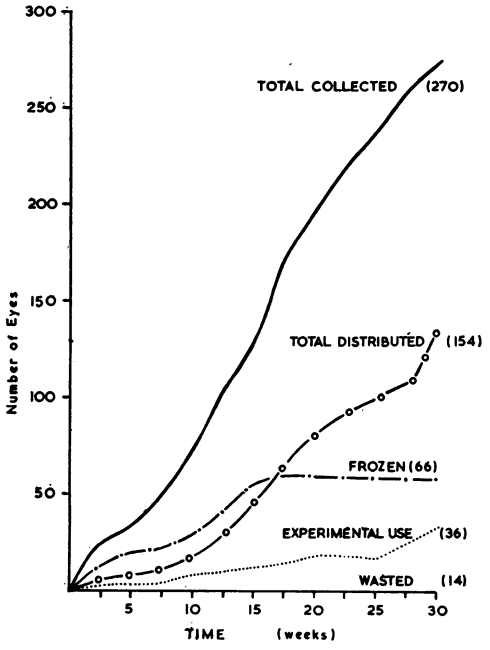

FIG 5.—Distribution and use of 270 donor eyes in the course of 30 weeks.

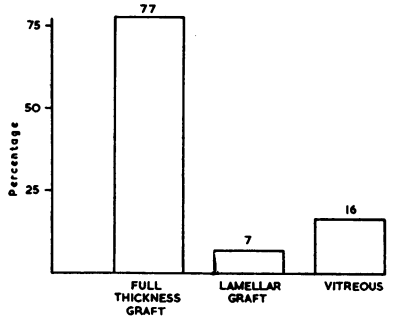

FIG. 6.—Use of donor eyes.

(*a*) *Distribution* (154 fresh eyes)

(1) Fresh eyes are distributed on a first-come first-served basis except in cases of urgency, and eyes for full-thickness grafting take precedence over those for lamellar grafting or for vitreous.

(2) The supply of surgeons' needs has been made much easier by several days' notice of intention to graft. This, along with the supply of frozen eyes, should permit all elective operations without undue delay.

(3) The bank owes its first allegiance to hospitals within the area allocated, but as resources permit other regions are supplied. Regions supplied by the eye-bank already include Ireland, India, Ethiopia, Nigeria, and Sierra Leone; the co-operation of air-lines has been good.

(4) The bank is organizing a "Return Information Service" to enable it to decide the state of the eyes on arrival, their anatomical condition, and especially the success of the graft; and to correlate these findings with age, etc., and with the time elapsing between death and refrigeration, and the time between refrigeration and grafting.

(*b*) *Transport.*—It is the responsibility of the hospital needing the eyes to arrange to collect them. Two types of transport are available:

(*i*) *Adjacent Hospitals* (*i.e.* within half-hour's journey).—An ice-bin is adequate.

(*ii*) *Remote Hospitals.*—Special containers made of foamed polystyrene (Mueller and others, 1965) are provided by the eye-bank, as they preserve the best temperature gradients, as well as being light in weight and very inexpensive.

(*c*) *Distribution of Frozen Eyes.*—Any surgeon needing frozen eyes has these provided by the eye-bank. They may be collected by the surgeon or one of his team in a vacuum flask provided by the eye-bank. This contains the frozen eye within an ampoule which is immersed in liquid nitrogen. Instructions for the preparation of the eye for grafting are given. Should the surgeon not be conversant with frozen eye material a member of the eye-bank team is available for defreezing at the time of operation (see Mueller and others, 1964).

(*d*) *Distribution of Eyes for Vitreous.*—These are usually supplied in 2 or 3 pairs, for simultaneous aspiration at the hospital requiring them; this we consider preferable to processing the vitreous at the eye-bank, with an enhanced risk of infection. These eyes are up to 7 days old, and are usually those that were not immediately needed for full-thickness grafting.

(*e*) *Distribution of Eyes for Lamellar Grafts.*—These are usually supplied within 48 hours, but the timing can be much less stringent, and eyes up to 7 days old have been used successfully.

(G) Research

We should like to stress the importance of co-ordinating with such a bank a research programme covering some of the many issues of eye-storage that are yet undetermined. Only then can the full potential of the bank be realized. The investigations completed by our own research unit have been omitted from this survey, and will be published separately.

Summary

We have considered the problems, confronted, and, we hope, resolved, in the setting-up and administration of the metropolitan eye-bank, together with the differing functions and responsibilities that we feel an eye-bank should justly accept. The anatomical and pathological findings of our first series of excised donor eyes have been analysed.

Acknowledgments are due to the other members of our Ophthalmic Department and Eye-bank Research Unit at the Westminster Hospital, particularly to Dr. T. Casey, who organized the bank in the first instance; Dr. F. O. Mueller and Mr. P. O'Neill who, thanks to a generous grant from the Medical Research Council, have been responsible for the research aspect; Prof. A. D. Morgan and his laboratory staff for their pathological assessment; Mrs. V. Hammond and Mr. J. Rodericks for secretarial assistance. Above all we are indebted to the staffs of the various institutions, particularly St. Joseph's Hospice and the Hostel of God, who have co-operated so unstintingly in helping to supply our donor material.

REFERENCES

KAUFMAN, H. E. (1965). *Arch. Ophthal. (Chicago)*, **73**, 907.
MUELLER, F. O., CASEY, T. A., and TREVOR-ROPER, P. D. (1964). *Brit. med. J.*, **2**, 473.
———, O'NEILL, P., and TREVOR-ROPER, P. D. (1965). *Ibid.*, **2**, 267.
———, ———, ———, REITER, H., and LUDEK, R. (1966). *Ibid.*, **2**, 17.
O'NEILL, P., MÜELLER, F. O., and TREVOR-ROPER, P. D. (1967). *Brit. J. Ophthal.*, **51**, 13.
RYCROFT, B. W. (1965). *Trans. ophthal. Soc. U.K.*, **85**, 459.
STOCKER, F. W., LEVENSON, D., and GIORGIADE, N. (1963). *Arch. Ophthal. (Chicago)*, **70**, 554.
TOEWS, R. R., and BASU, P. K. (1962). *Brit. J. Ophthal.*, **46**, 523.