

HUMAN TISSUE ACQUISITION AND ITS USE FOR TEACHING IN AUCKLAND, NEW ZEALAND

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New Zealand is a relatively small country with approximately the same land mass as Britain, but with a population of only 3.5 million. There are only two medical schools, one in Dunedin on the South Island, and one in Auckland on the North Island.

The city of Auckland is the largest in New Zealand with a population base of almost one million people in the greater area. By means of a well-structured donor program, the supply of bequeathed human cadavers is more than adequate to meet the needs of the undergraduate courses in gross anatomy at the School of Medicine.

The Auckland Medical School, Departments of Anatomy and Radiology, currently accept up to 30 cadavers (bequests) per year. Twenty of these requested bodies will be used by second and third year medical students for dissection and the remainder will be saved for prosections, serial sectioning, and plastination purposes.

The medical school enrollment is 120 students per year. In the second year dissection laboratory 5 or 6 students share a cadaver throughout their anatomy course.

The second year students begin their clinically oriented gross anatomy and radiology courses with examination of the lower limb, upper limb, thorax, abdomen and pelvis. In the first semester of the third year, students examine the head and neck region.

The Human Tissue Act

In 1964 an act of parliament was consolidated relating to "The Removal of Human Tissue for Medical Education and Research". This act is known as The Human Tissue Act and sets the criteria under which human tissue may be used (Department of Health, 1965). The Governor General of New Zealand authorizes the establishment of a School of Anatomy and the Minister of Health appoints licensed anatomists. Only licensed anatomists, of which there are only three at the Auckland School of Medicine, are permitted to accept a bequeathed body.

The Anatomy Department, of the School of Medicine, may receive up to 20 formal letters of inquiry in a week from the general public stating in writing their wish to bequeath their body to the school after death. For many of them this decision has been a long-standing wish, of their adult life, to contribute to medicine in some constructive way. The occupations, religions and ages of these bequeathed bodies vary considerably; however, ethnic origin is almost always invariably Caucasian.

The acknowledgment of a written intention to bequeath your body to the School of Medicine, prior to death, is in no

way an insurance of final acceptance by the school upon your death. Many factors, at the time of death, enter into the licensed anatomists decision to accept or reject any bequeathed body. Certain infectious diseases and coroner's case autopsies may preclude acceptance of individual bodies. As well, the next-of-kin must be in agreement with the intention to donate.

Under New Zealand law the immediate next of kin is the lawful possessor of the body, of a relative, after death and may have ultimate authority to donate that body and any parts thereof to a medical school or hospital for educational, research or transplant purposes. In all cases the family is contacted by the licensed anatomist, who may at that time address any questions they may have regarding disposal or disposition of remains of the deceased, prior to uplift of the body from the location of death. In instances where the next-of-kin cannot be found the authority to disperse the body to the school may be passed on to an appropriate administrator of the institution at which the individual has died.

Almost all bequests come from the greater Auckland area. There must be no suspicious circumstances surrounding the death of a donor who is being requested for the above mentioned purposes. Upon death, the attending physician must issue a "Medical Certificate of Causes of Death" if an autopsy is not required. Thus, the previously indicated intent of the deceased, the approval of the next-of-kin and the acceptance by the licensed anatomist secures the bequest.

Under the terms of this act all bequeathals of cadavers must be registered under the office of the Detective Superintendent of the New Zealand Police, headed by a special designate the "Inspector of Anatomy". Any receipt of cadavers, intention to dissect them, numbers of cadavers in storage (reported quarterly by the School) or permission to dispose of them, must be reported to the inspector. No dissection may proceed without his/her written approval. The inspector may visit the school and request any documentation (i.e. permission of next of kin) relating to a particular bequest at any time.

Donation of Tissue for Transplantation

The organ tissue and transplantation program is managed separately from the bequeathal program. Generally, no part of a cadaver bequeathed to the School of Medicine is used for therapeutic or transplant purposes. Whether organs or tissues are specifically used for transplantation is the responsibility of a transplant donor co-ordinator. His or her primary area of concern is the post mortem retrieval of suitable donor organs. Permission, to retrieve organs, upon death of a donor, is obtained by the donor co-ordinator from the next-of-kin, if necessary. Following this, heart valves, corneas, skin or bone specimens may be harvested for transplant or research and teaching purposes.

The University of Auckland has recently established a brain bank for the purpose of research into neurological diseases. Brains are acquired from donors, by the tissue co-ordinator, through liaison with the next-of-kin at the time of death.

Disposal of Bequeathed Remains

In all cases the dissected remains are placed with the appropriate cadaver for disposal. Each cadaver is placed in a separate wooden casket, identified by a coded number, prior to removal from the medical school to the crematorium. The cadavers are transported to the crematorium, in a hearse, by a licensed funeral director.

Cadavers are cremated, approximately 3 years after acquisition, and the ashes are disposed of as requested by the next-of-kin. Following cremation and a non-denominational service performed by the university chaplain and attended by the head of the Department of Anatomy and the anatomy mortician, about 75% of the ashes of cadavers used are scattered at a local cemetery. The remaining 25% of the cadaver ashes are returned to the next-of-kin for private internment.

At all times the identity of the donor and the treatment of the remains are maintained and kept confidential; as well the wishes of the next-of-kin are put ahead of those of the School of Medicine.

PROCEDURE UPDATE RECYCLING USED ACETONE IN PLASTINATION LABORATORIES

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In 1992, we published a technique for recycling acetone in plastination laboratories (Grondin and Berube, 1992). Our method includes three steps: step one called "freeze-separation" consists of leaving the used acetone at -20°C for 1-2 days and then filtering it through cheese cloth. This step is very efficient to remove fat from the contaminated acetone. The second step, called "vacuum distillation", uses the standard equipment (vacuum pump, freezer, manometer) found in a plastination laboratory and produces an acetone that is 97% pure. The last step, called "physical water extraction", is achieved by adding to the distilled acetone a desiccant that will extract the residual water and bring the purity to 99%. We now use for this step new molecular sieves (Fisher Scientific, catalog number M518-5LB). This new desiccant does not color the distilled acetone like our first one did.

In our original publication (Grondin and Brube, 1992), the second step did not give precise information on the pressure in the system during the distillation process. This was due to the fact that we only had, at that time, a Bennert Manometer which is not suitable to read a pressure higher than 24 cm of Hg. However, as a result of the money we saved on acetone disposal and procurement, we were able to buy a vacuum gauge and add it to our system. This permitted us to measure precisely the pressure during distillation.

For the distillation process, the acetone is heated to a temperature of 45°C to 50°C. Depending on the degree of contamination of the acetone to be distilled, the pressure will vary from 38 cm (15 inches) to 33 cm (13 inches) of Hg. We will never bring the pressure lower than 33cm (13 inches) of Hg-

When boiling stops by itself at 50°C and 33 cm of Hg, the residue, which contains around 25% acetone, is put back in the freezer. After 2 days, ice crystals have formed and the solution is filtered to remove this ice. This remaining fluid is now ready to be distilled with our next batch of contaminated acetone.

The Temperature-Pressure equilibrium required to obtain boiling of the contaminated acetone will always depend on the percentage of acetone found in the mixture (Table 1). A mixture of acetone with a high degree of purity requires less energy to boil. It will then be easier to distill. It will boil at lower temperature and higher pressure.

TABLE 1

TEMPERATURE AND PRESSURE REQUIRED TO OBTAIN BOILING OF CONTAMINATED ACETONE			
% Acetone	Temperature	Pressure	Boiling
70%	45°C	38 cmHg	Good
35%	50°C	35 cmHg	Good
25%	50°C	33 cmHg	Good
			Not

NOTE: All the pressure measures indicated in this text and table are measures of the real pressure in the system during the process. We are not talking of measures of the vacuum applied to the system.

REFERENCE

Grondin, G.G., Berube, R.: A simple and inexpensive Method for Recycling Used Acetone on Plastination Laboratories. J Int Soc Plastination 6: 17-19, 1992.

Editors Note:

The above article originally appeared in Vol. 8 No. 1, ISP Journal. Due to editorial errors, we are reprinting this article in its entirety.

We regret any problems caused by this mistake and constantly strive to do our best for ISP.