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INFORMATION FOR AUTHORS

Manrise Technical Review. At this time, the most widely recognized means of increasing the probabilities of surviving clinical death involve the induction of solid state hypothermia, a low temperature state in which chemical and biological processes are essentially arrested. Most information published in MTR will be directly relevant to this subject.

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References. All references should be cited in the text, indicated by arabic numbers, in parentheses, on the line. The reference list must appear on a separate sheet in order of citation, not alphabetical order. The following minimum data will be given: names of authors, complete title of article cited, name of journal (standard abbreviations acceptable), volume number, first and last page numbers, year of publication.

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EDITORIAL

"There is only one fundamental alternative in the universe: existence or non-existence--and it pertains to a single class of entities: to living organisms. The existence of inanimate matter is unconditional, the existence of life is not: it depends on a specific course of action. Matter is indestructible, it changes its forms, but it cannot cease to exist. It is only a living organism that faces a constant alternative: the issue of life or death. Life is a process of self-sustaining and self-generated action. If an organism fails in that action, it dies; its chemical elements remain, but its life goes out of existence. It is only the concept of 'Life' that makes the concept of 'Value' possible. It is only to a living entity that things can be good and evil."

These words from Galt's speech in "Atlas Shrugged" introduce the fundamental philosophical distinction of life and non-life[1]. For the living creature, the acceptance of death is rationally impossible. The acceptance of death is the acceptance of non-existence, but since non-existence is nothing, and since "nothing" is not just another form of "something", the acceptance of death, which is the acceptance of nothing, is non-acceptance.

The widespread acceptance of the phenomena called death is primarily founded in irrational speculation rooted in desires to evade the obvious facts of reality. Within properly decorated intellectual cells, many sit trembling and pretend that the universe is a tiny rose garden instead of vast distances in space filled with whirling galaxies of stars. Rose garden intellectual activities, rooted in unfounded dogma, include assertions without proof, demands for faith, the uncritical acceptance of conclusions based on authority, and the immediate, frantic expulsion of those who ask unrestrained and penetrating questions. Rose garden blindfolds are nearly impossible to remove. For most people, the shock of perceiving oneself as an independent, self-responsible living entity in an infinite universe is too much to bear.

Some persons are not blinded to reality, and yet they do not act to evade death. They do not accept it, but they do not fight it. Their feeling is that escape is impossible. Is this feeling realistic?

In some ways it is! The inevitable death of mammals seems as fixed a principle as gravity. Not one of them has ever escaped it. The parallels with spores and rotifers seem hopelessly farfetched, and history has exposed most attempts to divert death as hoaxes and frauds, well intentioned or otherwise.

(continued on page 105)

1. *Atlas Shrugged*, by Ayn Rand, Random House, New York, 1957.

PRELIMINARY PROTOCOL FOR THE PREPARATION OF CLINICALLY DEAD HUMAN SUBJECTS FOR LOW TEMPERATURE STORAGE

Prepared by Peter Gouras, M.D.

August 18, 1970

The paper which follows is presented as a historically significant document. It was prepared over two years ago as a preliminary protocol, and was not intended for publication at that time. This preliminary procedure brought forth a large volume of correspondence relating to cryonics methods, and in June of 1971 Dr. Gouras presented a highly refined protocol at the fourth annual cryonics conference in San Francisco (proceedings as yet unpublished). This later information, in turn, has formed the basis for the "Instructions for the Induction of Solid State Hypothermia in Humans" and many of the papers published in MTR. We are grateful to Dr. Gouras for his permission to publish his original protocol, in the form in which it was privately distributed to many workers in cryonics in 1970. -- Editor.

When the decision that clinical death has occurred is made, a licensed physician should sign the death certificate as soon as possible. If a physician is not available, one should be notified immediately and crushed ice packs or equivalent should be applied to the head while waiting (this can almost be considered therapeutic if the patient proves to be still alive).

As soon as a death certificate has been signed, the entire body should be cooled to about 1°C as soon as possible. The way this is done will depend upon the circumstances at the time. If at home, it might be best to remove all contents from the refrigerator and put the body inside, taking precaution that the temperature inside is not below 0°C (in general it is about 5°-10°C except for the freezer compartment). Then arrange for transportation to a perfusion center as quickly as possible. If death occurs in the hospital and no refrigeration is immediately available, have the body moved as soon as possible to the morgue storage facility which is usually at a relatively cool temperature.

If optimum conditions are arranged so that equipment can be moved in as soon as clinical death is pronounced, I would proceed as follows.

Cool the body as rapidly as possible to 1°-2°C and start transportation to a perfusion center. It would be nice if both cooling and transportation could be performed simultaneously. This could be done if a refrigerator unit, large enough to contain the body, set to cool to 1°C could be put on wheels and operated by both the mains supply when available, and chargeable wet cell batteries while in transport (i.e., in airplanes or moving vans).

The question of whether cardiac compression and oxygen therapy at this time will prove beneficial is difficult to answer. If it delays the cooling to 1°C in any way, I fear that it will be detrimental. Even if it doesn't, it may prove more harmful than helpful.

I have recently visited the laboratory of Dr. Hossman (Max Planck Institute for Brain Research in Cologne, Germany) who published a recent paper in Science (1970) demonstrating recovery of cat brain at 37°C from total ischemia of one hour duration, and whose results I can support from my own experiments on mammalian retina. He thinks that a little blood flow to an ischemic brain may be more harmful than none at all because it tends to produce more swelling.

I feel that this external cardiac massage is not going to be done very efficiently, being carried out in most cases by amateurs in the technique, and consequently will not supply very much adequately oxygenated arterial blood to the brain. It will inevitably slow down the cooling process, which in addition to the Hossman effect described above makes it reasonable to eliminate this procedure.

The body should arrive at a perfusion center as rapidly as possible, but if it has been kept at 1°C during transport, things can proceed more slowly and systematically. It would be ideal if perfusion could be done without elevating body temperature at all. As I see it, the only simple way to do this is to have a cold room (1°C) within which those carrying out the perfusion procedure could work conveniently. This would be a useful thing to have. If this is not available, the dissection will have to take place at room temperature and the body will presumably be kept cool with ice packs. The perfusate itself should be chilled to about 1°C and once it gets started will also help to keep the body temperature down.

The most useful entrance points for perfusion would appear to be the common carotid artery and the internal jugular vein. These can be found in the lower, somewhat anterior, third of the neck either on the right or left side. The person doing the dissection should be reasonably skilled and experienced in such an operation; a professional mortician, for example, might be a good candidate as a substitute for a surgeon in this situation. Semi-sterile technique should be used, i.e. boiled instruments, sterile gloves and perfusate, general cleanliness, etc.

A tube (probably about 1/4 to 1/2 inch in diameter) from the perfusion system (bled of all air bubbles) should be inserted into the carotid artery, probably first in the cranial direction, and a ligature tied around it and the artery to prevent extravasation of the perfusate. The vein should be incised and a drain inserted with a plunger to remove venous clots. Some arrangement should be made to weigh the venous drainage during perfusion so that an estimate can be made of what quantity of fluid entered and what left the body during the entire procedure.

The perfusate should initially be 20% dimethyl sulfoxide (DMSO) in a mammalian Ringer's solution to which heparin has been added. It might be advisable to buffer this solution to pH 7.4 with a Tris-buffer. I am not absolutely certain whether it is important to add Dextran (albumin substitute) to minimize swelling during perfusion. It would probably be wiser to do so because I am recommending larger volumes of perfusate than have heretofore been used. The quantity I estimate to be necessary is about 5 liters per kilogram of body weight; e.g., an 80 kilogram man would require about 400 liters of 20% DMSO solution. After this amount of perfusion the total body concentration of DMSO will be a bit more than 15% because of dilution with body water. Hopefully it will be evenly distributed throughout the body.

A little less than half the perfusate should be given to the head by positioning the arterial tube in the cranial direction; then the direction of the tube should be reversed so that it is pointing caudally and a little less than half perfused to the trunk. The remainder should be used to wash the lungs several times using a syringe or its equivalent.

I also suggest that a manometer (perhaps a simple mercury one) be connected to the perfusion tube in order to measure the perfusion pressure, which hopefully can be kept within the physiological range (i.e. 100-200 mm. Hg.). The pressure source for perfusion should preferably be a pump which can be easily regulated. If this fails or is not available, gravity is a good substitute (providing the ceiling is not too low).

After this perfusion is completed I am recommending a second one with 40% DMSO in Ringer's solution, perhaps with Dextran, but heparin shouldn't be necessary. The volume will have to be the same as before, i.e. 5 liters per kilogram of body weight, which for an 80 kilogram man would be an additional 400 liters to perfuse. This time perfuse the trunk first, then the head, in order to avoid switching tube too often and to give the higher concentration of DMSO to the brain last at this temperature. Wash the lungs as before. After this second perfusion the total volume of perfused fluid will be 10 liters per kilogram of body weight and the DMSO concentration should be about 35% or better. The body could now be cooled to about -20°C without freezing any body water.

This concentration of DMSO is still not the optimum for affording the maximum cryoprotective effects of DMSO. Based on the eutectic diagram of DMSO versus H_2O (Farrant, 1967) the concentration of 60% DMSO would appear to be the optimum. Farrant, in particular, brings this point out clearly in his recent work. I would strongly recommend that we attempt to achieve this concentration for our subjects. I don't believe such a concentration can be easily reached by simple perfusion because of the viscosity of this solution and the vascular resistance at 1°C or lower.

An alternative method can be recommended for distributing these higher concentrations of DMSO throughout the body, which in itself also offers several unique advantages. I call this the "diffusion" method in contrast to the "perfusion" method described above. If DMSO can permeate tissues readily, and all indications are that this material has absolutely remarkable permeation properties in most biological tissues, then it might be able to enter the body through the skin and body orifices to eventually reach the brain and deeper structures. If the time constant of this diffusion process is not too slow (and it would be beneficial to us to have someone determine this) then the entire body can be submerged in a mammalian Ringer's solution (without Dextran or heparin) to which increasing amounts of DMSO could be added while stirring.

As the DMSO concentration begins to equilibrate with the body core and the brain in particular, the temperature of the entire bath can be gradually lowered so that the lowest temperature possible is obtained without H_2O freezing out of solution. For example, the body, already having been perfused with the 20% and 40% DMSO solutions, can now be submerged in a vat of 50% DMSO at a temperature of about -15°C. After the body equilibrates to this concentration, perhaps in 24 hours (it would be wonderful if this time were shorter rather than longer), the temperature could be lowered to about -30°C and the concentration of DMSO increased to 60%, its optimum value. After equilibration to this concentration of DMSO there is an enormous gain in low temperature tolerance, since H_2O will not freeze until -150°C.

If this diffusion technique proves feasible, it could greatly simplify the entire procedure. It could conceivably eliminate "perfusion" altogether (which requires a considerable amount of technical proficiency, causes a delay in cooling, and is fraught with a number of hazards such as air emboli, excess perfusion pressures, blood clot obstruction preventing flow to local regions, etc.).

With the diffusion technique the body would be immediately submerged in a vat containing Ringer's solution and DMSO as soon as it is received and presumably already at 1°C. Gradually increasing amounts of DMSO could be added to this solution (depending upon the time constants of diffusion) and the temperature could be continuously lowered, until a concentration of 60% DMSO and a temperature of -150°C are reached. Under these circumstances the concentration of DMSO and the temperature of the entire solution could be tailored to minimize osmotic gradients of DMSO, toxicity of DMSO (which is lower at lower temperatures), and to continuously maximize the cryoprotective effect of DMSO at each temperature until -150°C is achieved.

Whether the body temperature should be reduced even further to the temperature of liquid nitrogen is still a moot point in my mind. The temperature of -150°C is the magic number for DMSO based on its eutectic diagram (I have not seen such eutectic diagrams for glycerol or ethylene glycol). If we lower the temperature beyond this point we shall have to expect some freezing of H_2O, ice formation, hyperconcentration, osmotic shifts, and consequent biological damage. It will, of course, be much less by this route than by any other I can envision at present. Well regulated refrigerators, mains operated, reaching -150°C are probably commercially available and might serve as a useful buffer unit in anticipation of subsequent cooling to the temperature of liquid nitrogen.

I might add that after the subject has been completely cooled and stored, one should include a thorough record of his medical history and a complete account of what took place during the cooling procedure.

<u>My recommendations are unique in the following ways:</u>

1) The use of larger amounts of DMSO approaching the optimum cryoprotective concentration of 60%.

2) The use of larger volumes of perfusate to minimize dilution of DMSO by body H_2O.

3) The use of a lower temperature (1°C) for perfusion, if possible, to minimize toxicity from DMSO itself.

4) The suggestion of DMSO diffusion rather than perfusion in the final phase of the procedure to build up terminal DMSO concentration of 60%.

5) The suggestion that it would be advisable for us to support some research to determine how long it takes for DMSO to equilibrate with the brain of an intact animal submerged in a known concentration of DMSO.

6) The suggestion that, if this time were not extraordinarily long, it might obviate the entire perfusion stage and thereby greatly simplify and improve the entire cooling procedure.

7) The elimination of external cardiac compression if it delays cooling in any way, and even if it doesn't it may prove to be more harmful than helpful.

My decisions have been made after considerable reading in this field as well as from personal experience in perfusing a part of the mammalian central nervous system, the retina. The references cited at the end are those which I consider most important for the points I have developed in this preliminary protocol. They represent only a small fraction of the material reviewed.

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CRYONIC SUSPENSION MOBILE UNIT

Walter E. Runkel

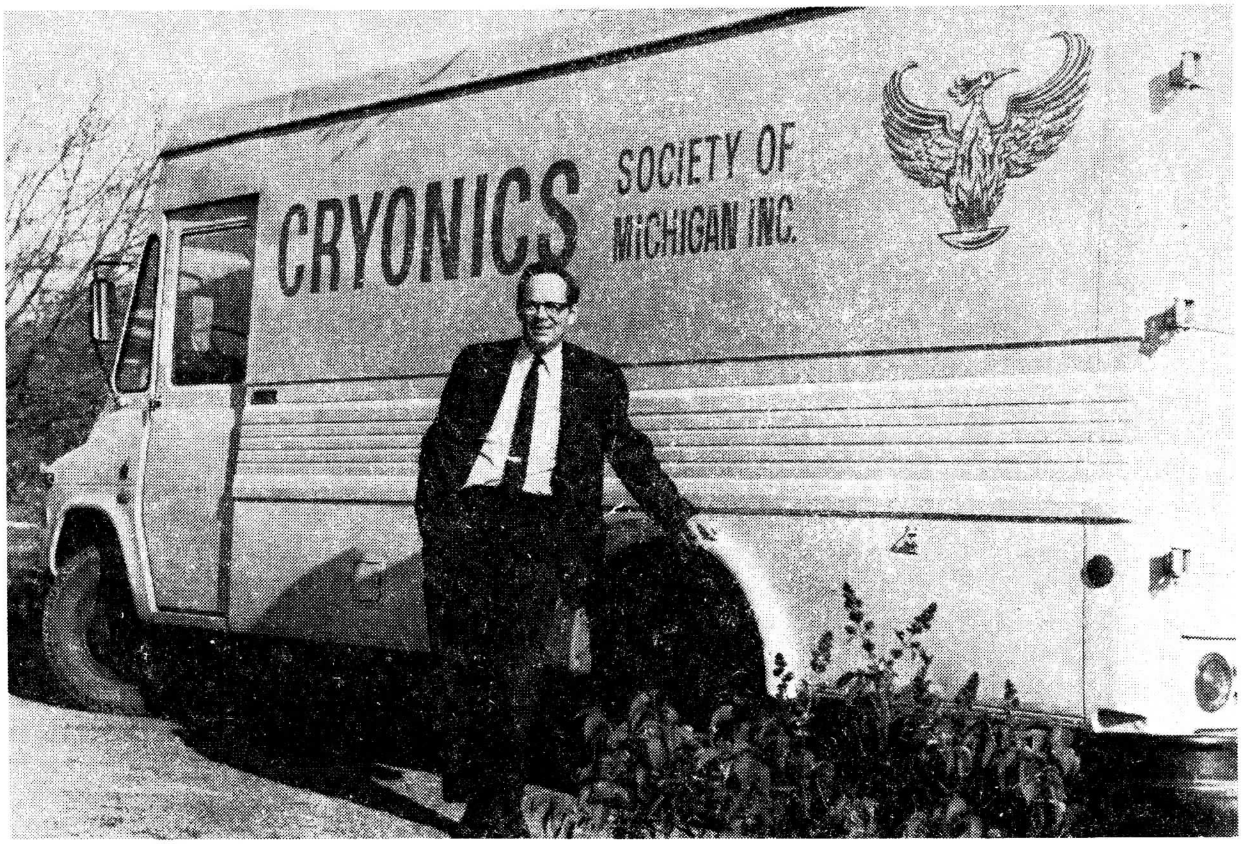
Cryonics Society of Michigan

The mobile unit of the Cryonics Society of Michigan (CSM) is the first functioning cryonics emergency vehicle. Having had the van for several years, CSM has had an opportunity to outfit the mobile unit for use in bringing SSH procedures and materials to a member who may require cryonic rescue from biological death. In a cryonics emergency, time is a critical factor. The Cryonics Society of Michigan with their emergency unit, has one very good answer to this critical time element -- Editor.

In 1968, the Cryonics Society of Michigan authorized a committee, headed by Professor Robert Ettinger, to purchase a van to be used as a mobile cryonics suspension facility. They selected a vehicle that they felt was spacious enough to meet the needs of the society for years to come.

At the present time, this mobile unit is completely outfitted for Phase I of the cryonic suspension process, or the resuscitation and cooling of human bodies. The equipment consists of a perfusion table, a stretcher, a Westinghouse Iron Heart resuscitation machine, a large bottle (244 liters) of oxygen plus four small bottles of oxygen, several cabinets for storing chemicals and incidentals, a temperature-controlled insulated chest, a pair of CB transceivers, and a built-in battery charger.

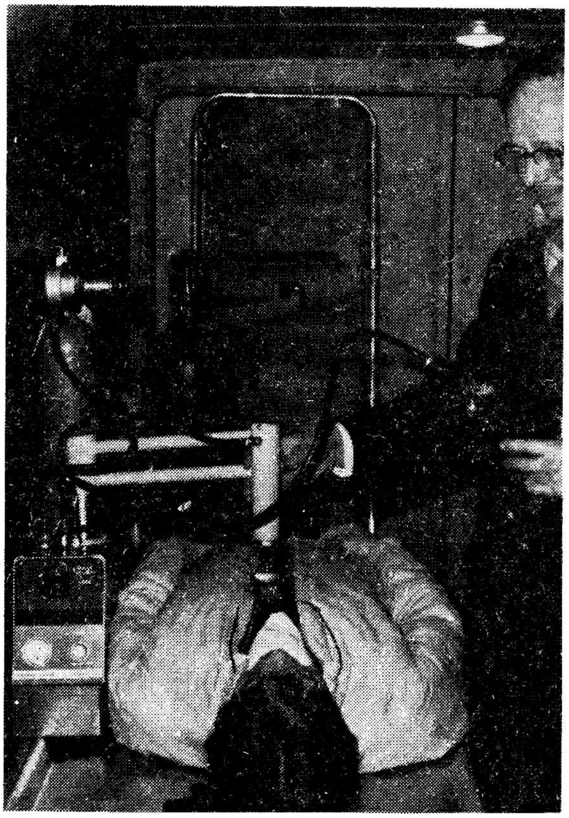
The perfusion table is a stainless steel embalming table, with wheels and a folding undercarriage, and has raised sides and a drain at one end. The stretcher also has folding undercarriage and wheels, and can be operated by one man if necessary. The Iron Heart is a device used to maintain the respiratory and circulatory systems in the human body. It is a simple device consisting mainly of an adjustable plunger mounted on a platform along with a small bottle of oxygen. The plunger, operated by the compressed oxygen, applies pulses of pressure to the thorax region, at the rate of approximately



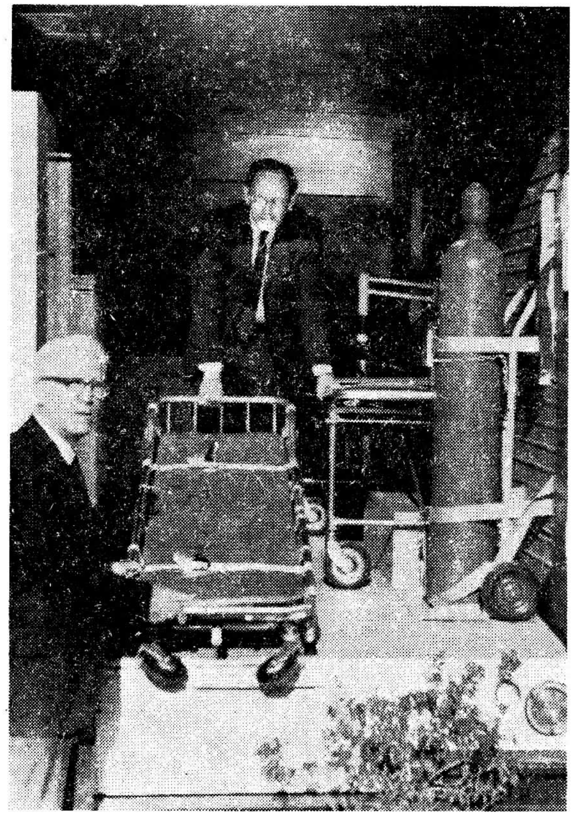
CSM Van -- Professor R. C. W. Ettinger

one cycle per second. This intermittent pressure directly above the heart keeps the heart working, and also keeps the lungs functioning in a normal manner. Also, oxygen is supplied to the patient via a face mask.

The Iron Heart or heart-lung machine is normally strapped to the perfusion table, but it can quickly be removed and mounted on the stretcher for portable use.



Application of Westinghouse "Iron Heart"



View into Van through rear doors

The temperature-controlled chest is used to store liquids that would be damaged by cold weather. At the moment we have 48 liters of distilled water in plastic bottles and 12 liters of Ringer's solution stored here. Eventually, concentrated solutions of Collins II solution will be included in this storage. The chest can also be used for cooling liquids by adding ice to a container in the chest.

In one of the cabinets, we have 52 liters of 80% dimethyl sulfoxide (DMSO) in plastic jugs. We have it pre-mixed in this manner because pure DMSO freezes too readily, at approximately 18°C (65°F), while the 80% solution does not freeze until around -34°C (-30°F). This permits simple all-weather storage. (We do not plan on using the DMSO in the van, but we want it on hand when we arrive at any perfusion center.)

In another cabinet, we have measured-out packets of chemicals to make 40 liters of Collins II solution. Also on hand is heparin, isopropyl alcohol (to be mixed with crushed ice to form a cooling slush) and bags of rock salt. Incidentals include plastic bags, gloves, aprons, tubes, and buckets, and disposable scalpels and syringes.

The mobile unit is completely wired for 110 volt operation, which provides power for the fluorescent lights throughout the van and for the AC receptacles. External power is supplied through an auto-disconnect plug at the rear of the van. When the van is parked in its usual storage space, the external power is always connected, so that power is always provided for the battery charger and the temperature-controlled chest.

All the equipment is securely fastened down so that the van is ready to roll at any time. Quick disconnects are used on the stretcher, heart-lung machine, and all the other items that may be used outside of the van.

In the future, we plan to add a refrigerator-freezer for the cooling and storage of perfusate, a perfusion pump and reservoir, a 110 volt generator on the van engine so that we will have AC power when the van is in motion, and an automatic switch-over system to switch from external power to internal power.

At this time, the van has never taken part in an actual case of cryonic suspension. It has, however, been used on standby service four times, so that we have obtained a little practice in the use of it. For this standby service, the van was parked near the hospital where the patient was under care, with bags of crushed ice on hand and everything in readiness.

At the moment, the van, equipped as it presently is, can only be used for resuscitation and external cooling. In the future, we plan to expand our capabilities to the point where internal cooling can also be performed. We should be able to do this with the installation of the perfusion pump and reservoir plus an extension of our present techniques.

This then is how we visualize the complete operation of our mobile unit in an ideal situation: the van would be parked outside the hospital or other building where the patient was located, and if clinical death occurred, members of our group - along with a mortician - would go into action.

Using the stretcher, we would pack the patient in ice and also initiate resuscitation with the heart-lung machine. Once in the van, the patient would be transferred to the perfusion table along with the heart-lung machine. Here cooling would be augmented by more ice packs around and under the head and body.

After this external cooling activity was under control, the mortician would initiate internal cooling by perfusing the body with chilled Collins solution. When the body temperature had reached approxiamtely 0°C, they would set off for the nearest perfusion center, where Phase II of the Cryonic Syspension process - perfusion with DMSO and cooling with dry ice to -97°C - would take place.

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REVIEWS OF EXISTING LITERATURE

successful cryopreservation of skin

Until recently, skin could not be preserved for longer than two weeks. Now skin is being preserved, using glycerol as a protective additive, for as long as six months by storing it at liquid nitrogen temperatures. The greatest problems experienced are with immunological rejection of differing skin types.

["Wrap in plastic, freeze, and skin keeps for months", Medical World News, June 28, 1972.]

Surgeons at the Shriners Burns Institute and Massachusetts General Hospital have developed a method of banking skin for six months. Until now, skin could not be kept longer than two weeks. Skin was frequently unavailable when grafts were needed. The new method overcomes the time problem and is termed as "practical and inexpensive".

Dr. Conrado C. Bondoc, a surgeon at the institute as well as the hospital and Dr. Charles E. Higgins, Associate Director of the blood bank at Mass General, were prime movers in the search for a better means of preserving skin. A technique devised by Sir Peter Medawar, an English immunologist, was of fundamental importance.

The skin is first treated with a 15% (the article does not state whether w/w or w/v) solution of glycerol "which does not freeze". After equilibration of the glycerol into the tissues, the skin is placed in an envelope made of polyethylene. The envelope is sealed against outside gases and liquids and is impervious to wide temperature variances. A cooling velocity of 1°C/minute is used until a temperature of -70°C is reached. The cooling rate is then increased (final velocity not given) until the temperature of liquid nitrogen is reached.

Rapid thawing is essential for good survival of the tissue. To accomplish this, the tissue is placed in a 37°C water bath. Body temperature is reached (by the banked skin) within one minute.

After successful use of this banked skin in hamsters, it was cautiously tried on humans two years ago. Since that time, over 500 sq. ft. of banked skin has been used on several hundred patients.

Although not all problems related to skin grafts are solved by using banked skin, the new method diminishes some of the major problems. One of the biggest problems yet to be dealt with in permanent grafts is that of immunological rejection.

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criteria of death in cases involving resuscitation machinery

Traditionally, the cessation of heartbeat and respiration has been the primary criteria for the pronouncement of clinical death. Advances in medical technology such as mechanical and chemical means of artificially supporting these functions has made it increasingly more difficult to actually determine whether or not a patient is really "alive". A Task Force on Death and Dying of the Institute of Society, Ethics, and the Life Sciences studied various recommendations for new criteria of death and the following is a report of their deliberations.

["Refinements in Criteria for the Determination of Death: An Appraisal", Special Communication, Journal of the American Medical Association, 221: 48-53, 1972.]

To begin with, the report establishes guidelines for judging the proposed criteria of death. The signs need to be clear and distinct, based on tests and observations easily performed and interpreted by an ordinary physician or nurse. Results should be generally unambiguous.

The new criteria for death are meant to be necessary for only those cases where there is irreversible coma with permanent brain damage and those cases involving the obscuration of traditional signs of death (observable and palpable signs) by the use of resuscitation machinery. Where traditional signs of death can be clearly established, they are still considered definitive.

A report of the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death is cited as "the most prominent proposal of new criteria and procedures for determining, in difficult cases, that death has occurred". The Harvard report presented the following criteria:

(1) Unreceptiveness and unresponsiveness to external stimuli and inner need;

(2) No spontaneous muscular movement or respiration;

(3) No detectable brain reflexes;

(4) Flat electroencephalogram (EEG).

These criteria are all discussed in detail. Additionally, the report suggests that the findings be verified on a repeated test 24 hours later, and that observations under hypothermia and drugs (CNS depressants) be excluded. These two suggestions could be troublesome to cryonics objectives. In our favor, however, is the recommendation that the patient be declared dead "*before any effort is made to disconnect a respirator*" (italics mine). This certainly is a desirable procedure for our purposes.

The reasons for this latter recommendation, according to the article, are that this procedure would "provide a greater degree of legal protection to those involved. Otherwise the physicians would be turning off a respirator on a person who is, under the present strict, technical application of the law, still alive."

Some objections have been raised to the use of a flat EEG as a criterion of death. One objection being that the proper machinery is not always readily available. The Harvard report recognizes this difficulty, and does not consider the electroencephalographic examination mandatory. Based on recent reports of patients with flat EEGs who continued to breath spontaneously, the Task Force rejects the proposition that "EEG determinations are sufficient as the sole basis for determination of death", and urges that the "clinical and more comprehensive criteria of the Harvard report be adopted" by the medical profession.

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not for space heat

In ten cases reported, hibachi (charcoal grills) containing hot charcoal were used to warm sleeping areas. The result in most cases was death from carbon monoxide poisoning.

["The Hazardous Hibachi: Carbon Monoxide Poisoning Following Use of Charcoal", E. F. Wilson, T. H. Rich, H. G. Messman, Journal of the American Medical Association, 221:405-406, 1972.]

Ten cases (five recently brought to the attention of the Medical Examiner's Office of the State of Utah and five others found in reviews of the literature) point out the dangers of using hibachi broilers, full of hot coals after the cooking of dinner, to warm enclosed areas such as campers, vans, and unventilated rooms.

The inhalation of carbon monoxide causes hypoxia (low oxygen content) in the tissues by impairing the oxygen transport ability of the blood. At high altitudes tudes (and campers quite often are) and other situations where oxygen content in the air is low, the effect of any given concentration of carbon monoxide will be correspondingly more dangerous.

Warnings are usually printed on bags of lump charcoal and charcoal briquets (the latter being the more dangerous), but seldom are warnings seen on hibachis that the use of these broilers to warm enclosed spaces is hazardous.

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court rules in favor of suspendee

The following press release has far reaching legal implications. For some time, persons making preparations for cryogenic preservation have worried about the very real possibility of leaving financial provisions to cover their long-term, low-temperature storage only to have the surviving family reverse their wishes and seize the monies for themselves. The following documents a precedent in which the courts have ruled against the challenge of the survirors.

["Foundation Keeps Will: Reject kin's appeal in frozen body case", Glendale News Press (California), July 15, 1972.]

"Los Angeles (UPI) -- A judge ruled Friday against a challenge by 12 grandchildren in preserving the will of a college teacher who left $100,000 to a foundation that froze his body in hopes of bringing him back alive some day.

Superior Court Judge Julius M. Title made the ruling in the case of James H. Bedford of Glendale, who died of lung cancer January 12, 1967 at the age of 73.

Bedford became the first person to have his body frozen after death in the so-called science of cryogenics which will attempt to revive him if the disease which caused his death can be cured.

Thirteen days before his death, Bedford revoked a trust set up for his 12 grandchildren and bequeathed the money to the International Foundation for Cryonics Research, Inc.

His grandchildren challenged the will, contending Bedford was unduly influenced to change the document.

In his ruling, the judge said the 'preponderence of the evidence' showed Bedford had the mental capacity to knowingly revoke the trust.

'While the personal view of this court may be that the spending of substantial monies on the so-called science of cryogenics represents bad business or professional judgement, it is nevertheless not for this court to impose its own ideas as to whether the decedent should or not have determined to leave a substantial amount of his money for such a purpose,' the judge said."

LLC

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frozen embryos produce viable mice

The successful use of frozen sperm (animal and human) in artificial insemination is well known. Now, though, success is even reported in the use of mice embryo cells which have been frozen to dry ice temperatures (-79°C).

["Embryo cells thawed to produce mice", Los Angeles Times, August 10, 1972.]

"Bar Harbor, Me (AP) -- A University of Cambridge geneticist reported Wednesday that he had been able to freeze a fertilized mouse egg for storage, then thaw it later, to produce normal mice.

"While sperm, including human sperm, has been frozen for later use, the scientist said this was the first time a fertilized egg had been deeply frozen in storage.

"The report came from Dr. David G. Whittingham, of the Cambridge Strangeways Laboratory and Physiology Department, at a meeting on medical genetics.

"Although Whittingham's research interests include embryonic development in mammals, he did not discuss possible implications of his work for humans.

"He said he had taken fertilized mouse eggs -- technically embryos but developed only to eight cells -- and frozen them at 79 degrees below zero centigrade.

"The cells are then thawed, cultured further in the test tube and implanted in foster mother mice, not necessarily the original source of the eggs, where the cells continued growing to eventually produce normal litters.

"Whittingham said the new technique enables genetic researchers to preserve mutant strains for later use if desired and also enable the researchers to establish the standard for strains of mice."

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FORUM

A Special Report

THE 9TH INTERNATIONAL GERONTOLOGY CONGRESS

Kiev, USSR, July 2-9, 1972

Reported by Helen Silver

Without a doubt, the science of aging has come of age. Nearly 4,000 delegates from 43 countries recently (July 2-9) met in Kiev, USSR, to discuss aging. The goal of the 9th International Gerontology Congress was to unite efforts of world scientists of various specialties to solve problems connected with 1) investigation of processes and mechanisms of aging, 2) development-course-prevention-and-treatment of diseases in the aged, and 3) to search for means of prolonging human lifespan.

Those assembled represented basic researchers (in molecular biology, immunology, cytology, etc.), specialists in aging of the brain, heart, lung, kidney, specialists in nutrition and drugs for the aged, specialists in the care and treatment of the aged (sociologists, psychologists, economists and administrators of hospitals and nursing homes).

A thousand papers were read in one of four languages: Russian, English, French, and German, with highly skilled Russian university students acting as simultaneous interpreters. So, with a switch of a knob plus earphones, one was able to hear the paper in his own language.

Although no breakthroughs were presented, a solid basis of material was laid for the next International Gerontology Congress, the 10th, to be held in Israel in 1975. But following are a number of highlights from the 9th at Kiev:

I. Corroboration of Dr. Denham Harman's original work was voiced in a number of papers. It was Dr. Harman, of the U.S., who found in his work with rats that Vitamin E could block the oxidation of free radicals and hence prolong the lifespan of these animals. From his work and the corroboration of it, it is now conceded that free radicals are the most important element in aging, and to block their damage with anti-oxidants, such as Vitamin E, is a milestone of discovery.

II. A paper read by Dr. Makinodan, also from the U.S. (AEC Oak Ridge Laboratory, Tennessee), was significant in the field of immunology. He likens the immune system to a police system, which protects the body from bacteria, viruses, mutated cancer cells. As we age, he said, the system breaks down, leaving the body unprotected. In his mice studies he found that by freezing in liquid nitrogen (-196°C) spleen cells of young mice and later reinjecting them into their older bodies, he was able to revitalize youthful processes. He concluded with the hope of utilizing such a procedure to revitalize bodies of aging humans.

(I was told that when breakthroughs do occur, they will come from the fields noted above, namely molecular biology and immunology.)

III. Another paper extremely well received, judging by standing room only attendance, was that of still another American, Dr. Caleb Finch, newly appointed to the Department of Biology at USC, Los Angeles. His work with lower animals indicates that the brain is the pacemaker for aging, setting the movement of aging in all the systems of the body.

Similar to Finch's findings but dealing with the human subject, Dr. V. M. Dilman of Leningrad, USSR, hypothesizes that the hypothalamic area of the human brain likewise initiates the aging process. These two papers plus others on the subject of the endocrine system and aging will be published shortly in the U.S.

In the field of nutrition and drugs to prevent aging, the Russians have the field to themselves. Dr. Anna Aslan dominates the area with her 20 years of treatment of aging with Gerivital (procaine) plus polyvitamin therapy. Her work was corroborated by a number of scientists, but to the Western world her work remains controversial.

On the whole, Russian science believes that the rate of aging can be slowed, longevity increased, by the development of new drugs. But prior to this, according to Dr. Aslan, a model for aging must be established, and the skills and knowledge of chemists, pharmacologists, and biologists must be united toward this effort.

The USSR has a Gerontology Institute of 5,000 elderly patients who have been observed, tested, and treated for 14 years. This institute is the envy of U.S. scientists, who hope to have such an entity when Congress passes a law in August establishing a U.S. Gerontology Institute, to be housed at the National Institute of Health in Bethesda, Maryland. Only by such means can the full scope of aging be identified and ameliorated. To date, our gerontology efforts are being carried on at Boston Medical School, Gerontology Centers at Baltimore and Duke Universities, plus a newly-established Dr. Ethyl Percy Andrus Gerontology Center at USC, Los Angeles.

Political intrigue became a reality at the beginning of the Gerontology Congress, when Dr. Zhores Medvedev, USSR's leading microbiologist, was bodily forced from the meeting hall, placed in a government-driven car and sped back to his home in Moscow. He was threatened with arrest if he returned. Some American scientists who witnessed the affair and who knew there would be trouble in Medvedev's attendance, were ready to take up arms in protest over the abduction, but realizing they were guests of the country, they cooled their emotions and reluctantly proceded to the discussion rooms. However, it should be noted in passing that in the past these very same Americans were instrumental in having Medvedev released from the psychiatric ward where he had been placed because of his differences with the political regime.

It is my information that, currently, American and other scientists are attempting to place Medvedev in a professorial position either in England or the U.S. Medvedev's contribution to the chemistry of aging is highly significant. His theory, the genetic-error theory, hypothesizes that with time the genetic code becomes error-ridden in transcription and replication, so that the correct code, "I am a human being", becomes, "I am a hu bei...", and this error, multiplied during a life-time, causes aging.

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E R R A T A

The following are corrections to "Mathematical Models of Perfusion Processes" by Art Quaife, Manrise Technical Review, Volume 2, Number 2·3, June, 1972.

Page 30; the third paragraph from bottom, second sentence, should read: "In this case, D is the diffusion constant for the pair of substances".

Page 32; the equation near the bottom of the page should be:

$$D_{DMSO,water} \approx 4.5 \times 10^{-6} \; cm^2/sec$$

Page 39; the paragraph following equation [34], second sentence, should read: "Thus, the model predicts that T_s falls very quickly..."

Page 51; section VIII; the third sentence in the first paragraph should read: "It is not clear how this difference should be resolved,....."

Page 55; equation [98] should be:

$$j_s \approx .70 \quad ; \quad j_w \approx .30$$

Page 59; equation [108] should be:

$$Q_{min} = (W_p + W_b)\, C_f = 29 \text{ kg. DMSO}$$

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Editorial continued:

The skeptic demands proof--he is certainly entitled to make this demand. But he is not entitled to any relief from the consequences of procrastination. If a man dying of thirst is told "dig here for water" and he demands proof of the water's existence before digging, he dies of thirst as a consequence. It is reasonable that he should ask whether this is the *right* place to look for water, and whether digging is preferable to the searching of large areas, but it is *not* reasonable that the man dying of thirst should lie down and give up. Skepticism has its limitations and drawbacks.

So some delude themselves as to the nature of death, and most of the rest give up resistance as hopeless. Man has walked on the moon, harnessed atomic energy, and spent millions of man-years in devising and using incredibly complex systems designed to destroy life in all its forms. Yet, the conquest of death is bypassed as hopelessly impossible. Will this state of affairs continue? Not for much longer!

Mankind needs a new goal. The social insect experiment (collectivism) has had many recent trials and little enthusiasm is left for it. The southeast Asian debacle, accomplishing nothing, has left the bitter taste of blood in too many mouths for war to be a further source of political entertainment. Suppression of the intellect in favor of forcibly induced dogma had a thousand years of exercise, ending in the Renaissance, and few will want to try that again.

The existence of continued growth of science and technology, along with the boarded off dead ends of negative human interaction leave only one route fully open: the development of human potential to its ultimate limits of expression. Each individual must seek his own survival and fulfillment, through voluntary teamwork with those of similar disposition. Life extension is the first goal of the rational living entity, and that is where the center of action is moving.

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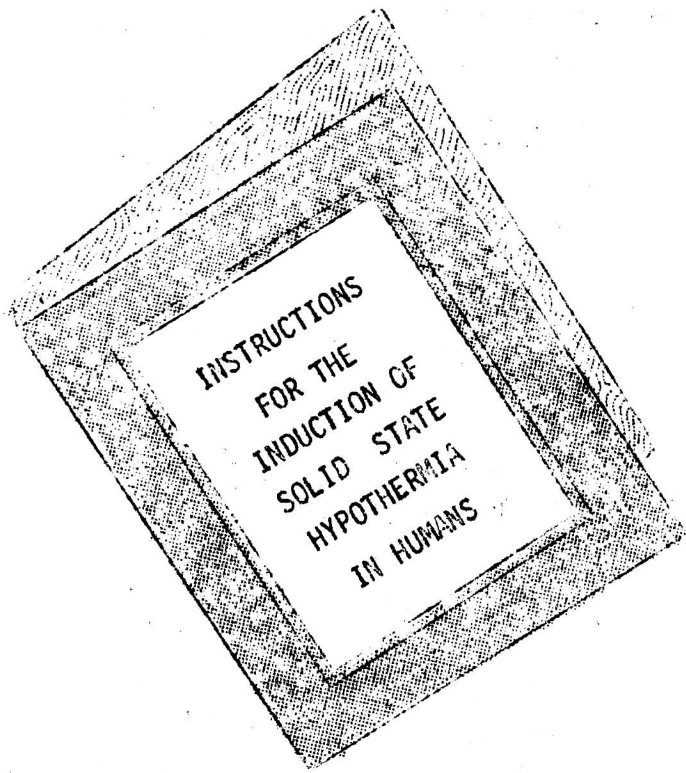

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