# cryobiology

## Gathered at the fifth annual meeting of the Society for Cryobiology in Washington

THAWING

### Microwaves flunk organ warming test

Thin frozen tissues such as skin and intestine may be thawed in the conventional way, by thermal conduction from warm surroundings. But the process doesn't work on solid organs like kidneys with a relatively much smaller surface area to absorb heat.

Microwaves passed through such tissues, however, generate eddy currents and consequently heat throughout the organ, and theoretically should be able to thaw the organ uniformly. Dr. Ralph Hamilton and co-workers at the University of Pennsylvania School of Medicine in Philadelphia have evaluated such an approach.

Microwave ovens are used to heat vending machine sandwiches. Dr. Hamilton reports his group used such a commercial machine and found the setting between Hot Dog and Hamburger to be the best.

Apparently microwaves at the present time are more suited to frankfurters than to kidneys. The 2,450-megacycle radiation produced rapid thawing and the eight kidneys used in the test were grafted back into the necks of the dogs from which they were taken. All the kidneys, however, developed marked swelling and congestion, and liquefaction necrosis within 4 to 24 days. None survived.

Dr. Hamilton says the kidneys were damaged by a tendency to overheat in some areas.

HEMATOLOGY

### Age makes a difference

Red blood cells are born in the bone marrow, age as they circulate in the bloodstream, and die in a disolution process called hemolysis. As they age they undergo physical and biological changes.

These changes apparently affect the cells' resistance to freezing, experiments with rabbits indicate, reports Dr. Arthur W. Rowe of the New York Blood Center.

Young rabbit erythrocytes were labeled with radioactive iron. Those cells and the rest of the red cells from whole rabbit blood were then suspended in 14 percent glycerol and rapidly frozen in liquid nitrogen. (The glycerol is a protective agent.)

Upon thawing both young and old cells show an equal amount of hemolysis. When the cells are washed with saline solution to rid them of glycerol, however, the older cells show greater hemolytic damage than the young ones.

Dr. Rowe recommends that frozen blood intended for transfusion be selectively hemolysed to weed out older cells, and cells that are damaged, in order to eliminate cells that are unlikely to survive in the recipient.

HEMATOLOGY

### Frozen blood passes clinical trial

Drs. Toshihiko Kamegai and Sajio Sumida of Tokyo's Toho University School of Medicine report the transfusion of 196 units of frozen blood to 62 surgical patients in the past two years.

Frozen red blood cells, on the verge of general use, will provide a major boost to blood banks. At present red blood cells last on the shelf a maximum of 21 days, then must be discarded. For some reason donations are heaviest in the colder months while maximum use of blood occurs in the warmer months.

In the Tokyo study, red blood cells were suspended in a solution of fructose, glucose and glycerol, then frozen in an electric freezer at minus 85 degrees C. The cells were thawed in a 40 degree water bath; 90 percent of the cells recovered.

The researchers report cell survival rate in the recipient is almost as good as with unfrozen blood.

HYPOTHERMIA

### Low temperature blocks cell damage

Cells contain small bodies called lysosomes that contain digestive enzymes. When the cell is severely damaged or killed the lysosomes break open and the enzymes dissolve the cell, thus eliminating undesirable cellular debris. Under some circumstances the lysosomes may break open while there is still hope for the cell and kill it.

Drs. Carl H. Sutton, Donald Frank and Hubert Rosomoff of New York's Albert Einstein College of Medicine and Montefiore Hospital report that freezing injury to dog brains is considerably lessened if the dog's body temperature is lowered to 25 degrees C. Lesions produced by freezing with liquid nitrogen result in far less extensive permanent tissue damage in the cooled dogs than in dogs at normal temperatures.

The researchers say the findings support the theory that lysosomes may act too hastily. They believe the lowered body temperature stabilizes the lysosomal wall, delaying its breakdown and giving the cell time to repair itself. Once repaired, the lysosomes remain intact.

TISSUES

### Intertidal mussel resists freezing

The mussel *Mytilus edulis* is an intertidal species, repeatedly exposed to the air by the falling tide. As a consequence it is exposed in winter to much lower temperatures than creatures that are continually submerged, since air temperature often falls well below that of the sea. *M. edulis* has evolved a way to control its osmosis, the key to freezing tissue damage.

Robert J. Williams of the Naval Medical Research Institute in Bethesda, Md., reports that *M. edulis* can survive freezing of its tissues down to minus 10 degrees C. The nonresistant subtidal clam *Venus mercenaria* tolerates freezing only to minus 6 degrees C. At these respective temperatures both species have 66 percent of the tissue water frozen. The mussel, it turns out, behaves as though about 20 percent of its tissue water is unavailable to osmose out of the cells and freeze. Williams postulates that this bound water allows *M. edulis* to keep its tissues wet enough at lower temperatures to avoid lethal salt concentrations.