



Office of Technology Management

"On/Off" Switch for Organs Organ Preservation, Protection and Resuscitation

Technology Reference

CV103

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Field

Organ Preservation
Cardioplegia
Anesthesia

Key Words

Hypoxia
Tissue acidosis
Suspended animation

License Status

Seeking licensing partner

Patent Status

Provisional application filed

Overview

Present methods for dealing with the effects of tissue acidosis during surgical procedures are based upon placing the affected tissues in a state of moderate to deep hypothermia in order to slow tissue metabolism, thereby reducing the rate of lactate formation and delaying the onset of acidosis. Cardioplegia solutions, which induce cardiac standstill with hyperkalemia (excessive heat), are used in conjunction with hypothermia (excessive cold) to provide some measure of additional tissue protection during cardiopulmonary bypass surgery. Similarly, various preservative solutions are used in conjunction with reduced temperatures to delay the onset of acidosis in organs awaiting transplant. There are, however, no specific methods available for preventing tissue acidosis resulting from hypoxic events.

Technical Summary

This invention provides a means of prolonging the preservation, protection, and resuscitation of organs and tissues. It has been discovered that the administration of certain local anesthetics affect cellular metabolism in a manner that permits tissues and organs to become severely hypoxic (low oxygen) or even anoxic (no oxygen) for extended periods of time without developing acidosis (decay). Furthermore, this effect can be reversed by the infusion of certain lipid emulsions with complete restoration of cardiac function. Both the anesthetic and the restorative emulsion can be administered by intravenous injection, infusion or perfusion without the need for ancillary hypothermia, systemic anticoagulation or other measures.

Benefits

- Protect organs during and extend the time for surgical procedures.
- Stabilize patients in non-hospital settings and extend the window of opportunity for the initiation of treatment.
- Substantially delay and possibly prevent the onset of tissue damage resulting from low oxygen including cardiac arrest, acute ischemia, shock and hemorrhage.
- Preserve isolated organs intended for transplant for extended periods of time, allowing more time for tissue typing, recipient selection and transportation.

Areas of Application

- Organ preservation
- Patient stabilization
- Cardiovascular and neurological surgical procedures

Publication

- Weinberg, Guy, R. Ripper, D. Feinstein, and W. Hoffman, (2003), Lipid emulsion infusion rescues dogs from bupivacaine-induced circulatory collapse, *Regional Anesthesia and Pain Medicine*, in press.
- Weinberg, Guy, C. Paisanthasan and R. Hoffman, (2003), The effect of bupivacaine on myocardial tissue hypoxia and acidosis during ventricular fibrillation, submitted to: *Anesthesia and Analgesia*

Stage of Development

- Demonstrated in animal models
- Isolated hearts in progress