Portable Temperature Regulating Device for Organ Transportation

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Technology description

A portable temperature regulating device that could be integrated to either static cold storage (SCS) or perfusion devices for organs transportation.

Background

In current practice, for transportation, organs are stored under hypothermic conditions either in an ice bath kept around 3 to 4 degrees Celsius, or in a perfusion storage apparatus that utilizes an ice bath to not only keep the organ ‘cool’ but also to cool buffers that are circulated through the organ at 3 to 4 degrees Celsius. Recently, there has been a move away from hypothermic storage at 4 degrees Celsius to a more ‘physiologic’ temperature of 37 degrees Celsius, referred to as normothermic storage.

However, the ‘optimum’ temperature for organ storage has not been defined and will likely vary based on the organ itself, perfusion solutions and potential rehabilitation interventions. While some organs may be adequately preserved using conventional and short term 4-degree Celsius storage, there is growing data that there is likely a wide range in optimal temperatures for solid organ storage between 4 to 37 degrees. Thus the optimal strategy for organ storage and transportation remains to be defined but will include a range of temperatures – each optimal for the phases of transportation, storage and rehabilitation.

Currently, there is no easily portable technology that can provide this complex regulation of organ storage temperatures. The current products, i.e., commercially available organ transport devices, neither have the ability to easily adjust the organ temperature between 4 and 37 Celsius, nor do they have the capability to vary the organ temperature during transportation, all in a practical form factor.

Technology Overview

A portable dynamic temperature regulating device has been developed at Western University to address these limitations. The developed technology has the ability to control the product temperature at a constant set-point temperature, independent from the surrounding external environment. Through a combination of a passive heat source and a passive cold sink, in conjunction with an active control system, this technology not only maintains a set temperature, but also has the ability to dynamically adjust the product storage condition over a wide temperature range during transport, without a requirement for a bulky form factor, or an external active power source.

Application area

• Main focus is organ transportation but the technology can be used whenever a dynamic, highly sensitive temperature control transportation is needed, ex: vaccines, biological species, biological samples/products, etc.

Advantages

·Flexibility: maintain a constant temperature or vary the temperature of the organ as needed.
·Adaptability: easily change or ramp temperatures as more data defining ideal temperatures and more agents to reduce injury become clinically available.
·Portability: convenient size to transport organs within hospitals, and in current vehicles and aircraft.
·Innovative temperature control mechanism: no need for external power supply.
·Compatibility: could be integrated to any temperature-controlled container including static cold storage (SCS) or perfusion machines.

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