



Allison Hubel <hubel001@umn.edu>

Low temperature management of cells, sustainability program, LinkedIn discussions and more

2 messages

BioCoR <biocor@me.umn.edu>

Tue, Sep 13, 2011 at 9:15 AM

Reply-To: biocor@me.umn.edu

To: hubel001@umn.edu



September 2011 Newsletter

Dear Allison,

There are only two 'seasons' in academia: the academic year and summer. The ~ 20,000 undergraduates are returning to the U of MN campus, which tells me summer is over. Sigh.

BioCoR has been busy over the summer: we have added the biopreservation research consortium and a sustainability program. There have been additions to the library and updating of the BioCoR website. Finally, we have started a LinkedIn discussion group and have launched our first discussion topic.

Upcoming deadlines:

- Early registration deadline for the sustainability webinar is coming up: October 3, 2011. Register now and get a discount.
- Biopreservation Research Consortium (BRC) planning meeting is scheduled for the end of October/early November. The planning meeting is open to current and prospective BRC members. If you want to participate, please contact us at biocor@me.umn.edu.

As always, your comments are very important to us. We expect to see you at www.biocor.net.

BioCoR is a national resource focused on advancing the science, technology and practice of biospecimen preservation. We are dedicated to developing biopreservation protocols, improving preservation and storage technologies, establishing standards and guidelines and training individuals and institutions in the science and technology of biopreservation.

More information can be found on the **BioCoR** website: www.biocor.net. Or you may contact us now at biocor@me.umn.edu

The Management of Mammalian Cells at Low Temperatures

John G. Baust
UNESCO Professor
SUNY-Binghamton

The use of reduced temperature as an energy-deprivation strategy is widely applied in agricultural, medical and the basic sciences specialties often with unique objectives. These objectives typically include a) ex vivo cell, tissue and organ preservation, b) transient in situ cell and tissue protection, and c) cell and tissue ablation (targeted destruction). While each of these objectives relies on a reduction in temperature, the protocol by which heat is extracted, and hence outcome, varies significantly.

Preservation

The low temperature preservation of mammalian cells, tissues and organs typically falls within the domains of hypothermic storage or cryopreservation. Both approaches to the preservation of biologics rely on the addition of a liquid media to mitigate the cold stress (i.e. organ preservation solutions or cryopreservation cocktails). The induction of hypothermia is typically provided for short-term ex vivo maintenance (hours to days) in a clinical setting in anticipation of transplantation. Cryopreservation represents an extension of hypothermia with the objective of reducing temperatures to as low a nadir as would be conducive to long-term survival (years to decades). With most cryopreservation processes, ice formation is triggered in a relatively "precise" manner to "control" the concentration of the preservative solutes contained in the cryopreservation cocktail and to support the phase transition of the residual intracellular and extracellular solvent into a glassy (vitrified) state in which metabolism is considered nil. Cryopreservation processes depend on the precise management of cryopreservation agent type and concentration, their addition and removal, cooling and warming rates and the accomplishment of a constant nadir storage temperature. Most often, temperatures approaching -196 C are considered optimal. It is now recognized that preservation outcome especially for cells requires critical management of the entire "cold chain" process.

Protection

The use of low temperature to provide transient protection is distinct from preservation in that there is neither a long-term intent nor precisely managed processes related to addition and removal of the protective media, cooling and warming rates and nadir temperature. A "cryo-protective" application does not provide cellular preservation in the classical sense but simply provides a transient environment designed to mitigate the damaging effects of either prolonged normothermia through metabolic suppression, inhibition of oxidative stress responses or acute freezing by minimizing ice growth. The protective effects of low temperature are most commonly applied to inhibit either biological (inflammation) or physical (ice formation) processes in vivo for relatively short time intervals. One enhancing effect of mild freezing recently reported is the promotion of new cell growth (neovascularization). With either in vivo or in vitro applications, protection may be afforded for a few minutes at temperatures near 0 C (+/- 10 C)

Targeted Ablation

By changing the cooling process for cells and tissues, an ablative outcome may be obtained. Cryo-destruction relies on the rapid cooling of a targeted structure in a cyclic manner. Neither protective nor preservative agents are applied to the targeted tissue. Combinatorial strategies may be employed to exacerbate the damaging consequences of hypothermia and freezing. Targeted freeze temperatures can be variable but typically range between -15 and - 40 C.

Further precision (targeting) may be accomplished with ablative therapies when combined with either or both a "cryo-sensitizing" or "cryo-protective" agent not involving the use of a standard cryopreservation strategy (protocol). The history of integrative "cryo-ablation-cryo-protective" strategies reveals that physical, thermal and chemical adjuncts have been utilized. Physical "displacement" of the non-targeted (peripheral) tissue from the target has been common. The addition of peripheral and central warming devices (i.e. catheters as heat sources) can afford protection but have the potential to compromise the ablative intent. The injection of chemical-based solutions (i.e. saline, sugar solutions, DMSO) in the peripheral region of the freeze target to inhibit the progression of the freezing process is often reported.

Together, the above offer the prospect of combinatorial approaches designed to selectively protect or destroy one or more cell types within a tissue environment. Investigations designed to selectively maintain (concentrate) one cell type over another are reporting on initial successes in both clinical and basic sciences applications - an intriguing prospect in stem cell harvesting.

30cBioCoR education programsSustainability webinar

Energy consumption associated with the low temperature storage of biospecimens can be considerable. For example, a single -80 C freezer consumes ~\$2,400/ year of electricity and requires 1/4 ton of refrigeration. This webinar will describe the concepts of sustainability audits. In addition, attendees of the webinar will also be given a brief survey to complete and instructions for filling out the survey. This information will be analyzed in order to

make recommendations regarding modifying/improving your practices and the potential costs savings that may be realized.

More information and online registration for the webinar is available on the BioCoR website ([BioCoR sustainability webinar](#)).

Early registration deadline is coming up! Please register before 30Oct2011 to receive a registration discount.

Preservation of molecular, cellular and tissue biospecimens: available on demand

This course was offered in May 2011 and will be offered again in May 2012. We also offer the course on demand for those individuals who cannot attend during the course offering in May. Participants will be sent the course binder and the recorded lectures are available for a 10 day period. We have had a growing number of people take the course on demand.

Information on the lectures offered ([short course lectures](#)) and registration fees for the on demand course ([registration fees](#)) can be found on the website. If you are interested in attending, contact us via email at biocor@me.umn.edu or call Tori at 612.625.6808.

September discussion topic on Linked In

We have added a monthly discussion topic to our LinkedIn group. This month's topic:

Is the preservation of DNA a 'solved problem'? Are current methods of frozen and dry state storage of DNA sufficient for current and even emerging methods of genetic analysis? What are the implications for cryolysis (breakage of DNA strand induced by freezing) on down stream analytical techniques?

If you have not already done so, join our Linked In page ([BioCoR Linked In Page](#)).

What is new on the BioCoR website?

BioCoR has assembled a consortium of industry, government agencies and academic institutions to address common needs in preservation of cell therapies and biobanking. Learn more information on the consortium at our website ([consortium](#)).

We have been adding more articles of interest and ask-the-expert questions into the library. The Newsletter Archive is also popular.



UNIVERSITY OF MINNESOTA *BioCoR would like to acknowledge the support of the College of Science and Engineering and the Academic Health Center of the University of Minnesota.*

[Forward email](#)



This email was sent to hubel001@umn.edu by biocor@me.umn.edu | [Update Profile/Email Address](#) | Instant removal with [SafeUnsubscribe™](#) | [Privacy Policy](#).

BioCoR | University of Minnesota | 111 Church St. SE | Minneapolis | MN | 55455



Sajio Sumida <cryomedicine@aol.com>
To: biocor@me.umn.edu

Tue, Sep 13, 2011 at 6:24 PM

Dear John:

Thank you for your sending me an interesting BioCor New Letter. Yes, as you pointed out, I also have thought and questioned about closely to the problem that you suggested that cryopreservation using electricity or some fuels did exhaust or save of energy.

To your point, cryopreservation using LN2 or electricity has always annoyed me by the problem of waste or saving of energy. I could not answer whether to correspond to the cost of the liquid nitrogen consumed to the cryopreservation while watching the colonies under microscope after thawing marrow cells that had been frozen for 40 years. The cryopreservation has always annoyed me by the problem of waste or saving of energy according to your point. I could not answer whether to correspond to the cost of the liquid nitrogen consumed to the cryo- preservation while watching the colonies under microscope after thawing marrow cells that had been frozen for 40 years. The amount of the payout by books of account of the laboratory was about 1.5 million yen during a year. It becomes about 60 million yen for 40 years. However, because the liquid nitrogen tank had been used for the preservation of other cells and tissues, the judgment of the appropriateness of this amount is difficult.

I would like to contact you about the course et al soon. Because, the problems of ISC are too complex to handle for me, who are a little fatigue, fortunately many unknown international cryo-scientists are supporting and refreshing me to make success the 16th Congress of ISC in Vienna.

Dear John, would you please introduce your new cryoprobe which has the ability to cool faster than the others? At this moment, the number of contributed papers exceeded 50.

Sorry, I could not answer you completely.

Yours sincerely,

Sajio

From: BioCoR [mailto:allison@biocor-umn.ccsend.com] **On Behalf Of** BioCoR

Sent: Tuesday, September 13, 2011 11:16 PM

To: cryomedicine@aol.com

Subject: Low temperature management of cells, sustainability program, LinkedIn discussions and more

September 2011 Newsletter

Dear Sajio,

[Quoted text hidden]

[Quoted text hidden]



BioCoR would like to acknowledge the support of the College of Science and Engineering and the Academic Health Center of the University of Minnesota.

[Forward email](#)



This email was sent to cryomedicine@aol.com by biocor@me.umn.edu |

[Update Profile/Email Address](#) | Instant removal with [SafeUnsubscribe™](#) | [Privacy Policy](#).

BioCoR | University of Minnesota | 111 Church St. SE | Minneapolis | MN | 55455

!