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Природні глибинні евтектичні системи: ефективні альтернативні кріопротектори для кріоконсервування клітин

А.Р. Жесус, А. Пайва, А.Р.К. Дуарте
Кафедра хімії, факультет науки і технологій, Новий університет Лісабона, м. Капарика, Португалія

Natural Deep Eutectic Systems: Efficient Alternative Cryoprotectant Agents for the Cryopreservation of Cells

A.R. Jesus, A. Paiva, A.R.C. Duarte
Departamento de Química, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Caparica, Portugal

Cell cryopreservation with high rates of post-thawing survival remains a major challenge and the formation of ice crystals is one of the major factors for low cell survival. To overcome this problem, a cryoprotectant agent (CPAs) is used, *i. e*., a compound able to decrease the crystallization temperature of the water, contributing to a decrease in ice crystals formation or even being able to avoid their formation. The most common CPAs are DMSO and glycerol. However, their toxicity is highly questionable and safer alternatives are needed. Mankind has always been trying to mimic nature in search of solutions for everyday problems and cryopreservation is no exception. It has been reported that some compounds found in animals living in extremely cold environments are involved in the hibernation process allowing them to survive during winter time [Whaley, 2021]. This fact inspired us to develop a new class of CPAs, the so-called natural deep eutectic systems (NADES). These result from the combination of two or more compounds, usually solid at room temperature, that when mixed at a certain molar ratio become a transparent homogenous viscous liquid and are able to alter the thermal behavior of water [Gertrudes, 2017]. This characteristic makes NADES perfect candidates as CPAs. In fact, our most recent work [Ana Rita Jesus, 2021] showed that NADES present very low toxicity towards mammalian cells and are able to reduce the formation of ice crystals, therefore reducing cell damage during the freezing/thawing processes. Furthermore, post-thawing studies showed that some of these systems are in fact able to efficaciously cryoprotect cells, resulting in high rates of post-thawing cell survival.

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Вплив видалення ДМСО на основні показники кріоконсервованих концентратів аутологічних клітин-попередників з периферичної крові: ретроспективне дослідження у пацієнтів з первинним або вторинним амілоїдозом

М. Яндова[1, 2], П. Мерічка[1], Ї. Грегор[1], М. Ланська[3], Д. Вокуркова[4], І. Фаторова[3], А. Безрук[5], Я. Радоха[3]
[1] Банк тканин, Університетська лікарня, м. Градец-Кралове, Чеська Республіка
[2] Кафедра гістології та ембріології, медичний факультет, Карлів університет, м. Градец–Кралове, Чеська Республіка
[3] 4-е відділення внутрішньої медицини – гематології, Університетська лікарня, м. Градец–Кралове, Чеська Республіка
[4] Відділення імунології та алергології, Університетська лікарня, м. Градец-Кралове, Чеська Республіка
[5] Кафедра медичної біофізики, медичний факультет, Карлів університет, м. Градец Кралове, Чеська Республіка

Influence of the Me_2SO Removal on Key Parameters of Cryopreserved Autologous Peripheral Progenitor Cells Concentrates: a Retrospective Study in Patients With Primary or Secondary Amyloidosis

M. Jandová[1,2], P. Měřička[1], J. Gregor[1], M. Lánská[3], D. Vokurková[4], I. Fátorová[3], A. Bezrouk[5], J. Radocha[3]
[1] Tissue Bank, University Hospital Hradec Králové, Czech Republic
[2] Department of Histology and Embryology, Faculty of Medicine in Hradec Králové, Charles University, Czech Republic
[3] The 4th Department of Internal Medicine – Haematology, University Hospital Hradec Králové, Czech Republic
[4] Department of Immunology and Allergology, University Hospital Hradec Králové, Czech Republic
[5] Department of Medical Biophysics, Faculty of Medicine in Hradec Králové, Charles University, Czech Republic

Clinical application of Me_2SO is regarded safe if the daily dose of 1 g per kg of the patient´s weight is not exceeded. Me_2SO removal after thawing of autologous peripheral progenitor cells (HPC) concentrate is recommended in patients with a risk of arrhythmias and impaired renal functions. The authors present the results of a retrospective study performed on 13 patients. Nine patients suffered from secondary amyloidosis in multiple myeloma and three ones from primary amyloidosis. In one case Me_2SO was removed because of a severe adverse reaction at the beginning of the HPC concentrate infusion. A standard cryopreservation protocol based on the use of 10% Me_2SO in 5% hydroxyethylstarch, controlled rate cooling and storage in a vapour phase of liquid nitrogen was used. Me_2SO removal was performed in the clean room by adding 200 mL of hydroxyethylstarch supplemented with citrate and centrifugation to the initial volume. The thawed bags were transferred to the clinical department in the insulated boxes at 4...8°C and immediately infused. The samples for haematological, immunological and repopulation tests were taken immediately after thawing and at the moment of infusion. As the key parameters did not reveal normal distribution Wilcoxon signed-rank test was used for comparison of the pre- and post-process data. The process of Me_2SO removal did not influence the total nucleated cell, total mononuclear cell and total CFU-GM dose per kg of the patient´s weight. The percentage of $CD34^+$ cells and mononuclear cell post-removal viability and $CD34^+$/kg dose revealed a statistically significant decrease.