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Establishment And Cryopreservation Of Fibroblast Cell Line From A Sumatran Rhinoceros (Dicerorhinus Sumatrensis)

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Abstract

Cell lines have been established to preserve the genetic material of endangered animals. This study aims to establish, characterize and authenticate fibroblast cells derived from the kidney tissue of a Sumatran rhinoceros' carcass. The primary cultures were obtained using the mixed enzymatic-explant method, supplemented with complete media and maintained at 37°C with 5% CO2 in an incubator. Following routine trypsinization, viability and growth curves were generated through the Trypan Blue counting method.Cellular senescence was quantified by Sa-P-gal staining assay and G-banding for karyotyping. As a result, the cell derivation had generated 81 frozen stocks. The viability of cells at P5 and P10 showed reasonable recovery after six months. Cell population doubling time at P5 was 20.45 hours, while it was 22.35 hours at P10 and P15. The senescence level significantly increased from P5 to P10, and was especially significant at P15.Genetic stabilities were considered stable at P5 and P10, with frequency of over 70 %. In conclusion, this study was able to derive a primary fibroblast culture from the preserved tissue of a Sumatran rhinoceros, with certain changes in morphology, senescence level, growth curves and cell viability as the number of passages increased

Author Keywords

characterization; cryopreservation; fibroblast cells establishment; Sumatran rhinoceros; Sustainability

References

- Aoued, H. S., Singh, M.
  Recovery of fibroblast-like cells after 160 days of postmortem storage of goat skin tissues in refrigerated media
  (2015) *Journal of Veterinary Science & Technology*, pp. 2-5.
  06(04)

- Bakhoum, S. F., Silkworth, W. T., Nardi, I. K., Nicholson, J. M., Compton, D. A., Cimini, D.
  The mitotic origin of chromosomal instability
  (2014) *Current Biology*, 24 (4), pp. R148-R149.

- Bolhaqueiro, A. C. F., Ponsioen, B., Bakker, B., Klaasen, S. J., Kucukkose, E., van Jaarsveld, R. H., Kops, G.
  Ongoing chromosomal instability and karyotype evolution in human colorectal cancer organoids
  (2019) *Nature Genetics*, 51 (5), pp. 824-834.

- Caro-Maldonado, A., Muoz-Pinedo, C.
  Dying for something to eat: How cells respond to starvation
  (2011) *The Open Cell Signaling Journal*, 3, pp. 42-51.

- Chen, H., Li, Y, Tollefsbol, T. O.
  Cell senescence culturing methods
  (2013) *Methods in Molecular Biology (Clifton, N.J.)*, 1048, pp. 1-10.

- Davis, J. M.
  (2011) *Animal cell culture / Elektronische Ressource*,
  Chichester: Wiley-Blackwell

- Estrada, J. C., Torres, Y., Benguria, A., Dopazo, A., Roche, E., Carrera-Quintanar, L., Perez, R. A., Bernad, A.
  Human mesenchymal stem cell-replicative senescence and oxidative stress are closely linked to aneuploidy
  (2013) *Cell Death & Disease*, 4 (6), p. e691.

- Freshney, R. I.
  (2015) *Culture of animal cells: A manual of basic technique and specialized applications*, pp. 187-196.
  (7th ed., New York: John Wiley & Sons

- Gordon, D. J., Resio, B., Pellman, D.
  Causes and consequences of aneuploidy in cancer
  (2012) *Nature Reviews Genetics*, 13 (3), pp. 189-203.

- Guan, W. J., Liu, C. Q., Li, C. Y, Liu, D., Zhang, W. X., Ma, Y H.
  Establishment and cryopreservation of a fibroblast cell line derived from Bengal tiger (Panthera tigris tigris)
  (2010) *Cryo Letters*, 31 (2), pp. 130-138.

- Havmøller, R., Payne, J., Ramono, W., Ellis, S., Yoganand, K., Long, B., Burgess, N.
  Will current conservation responses save the critically endangered Sumatran rhinoceros Dicerorhinus sumatrensis?
  (2016) *Oryx*, 50 (2), pp. 355-359.

- Hong, S, Park, S. H., Chung, Y. H., Kim, O.
  A newly developed consensus polymerase chain reaction to detect Mycoplasma species using 16S ribosomal RNA gene
  (2012) *Hanguk Kachuk Wisaeng Hakhoe Chi*, 35 (4), pp. 289-294.

- Ingebritson, A. L., Gibbs, C. P., Tong, C., Srinivas, G. B.
  A PCR detection method for testing Mycoplasma contamination of veterinary vaccines and biological products
  (2015) *Letters in Applied Microbiology*, 60 (2), pp. 174-180.

- Khalili, A. A., Ahmad, M. R.
  A review of cell adhesion studies for biomedical and biological applications
  (2015) *International Journal of Molecular Sciences*, 16 (8), pp. 18149-18184.

- Khan, M., Gasser, S.
  Generating primary fibroblast cultures from mouse ear and tail tissues
  (2016) *Journal of Visualized Experiments: JoVE*, (107), p. 53565.

- Kwist, K., Bridges, W. C., Burg, K. J.
  The effect of cell passage number on osteogenic and adipogenic characteristics of D1 cells
  (2016) *Cytotechnology*, 68 (4), pp. 1661-1667.

- Lee, B. Y., Han, J. A., Im, J. S., Morrone, A., Johung, K., Goodwin, E. C., Kleijer, W. J., Hwang, E. S.
  Senescence-associated beta-galactosidase is lysosomal beta-galactosidase
  (2006) *Aging Cell*, 5 (2), pp. 187-195.

- Lian, J., Lv, S., Liu, C., Liu, Y., Wang, S., Guo, X., Nan, F., Ma, X.
  Effects of serial passage on the characteristics and cardiac and neural differentiation of human umbilical cord Wharton's Jelly-derived mesenchymal stem cells
  (2016) *Stem Cells International*, 2016, p. 9291013.

- Mastromonaco, G. F., Perrault, S. D., Betts, D. H., King, W. A.
  Role of chromosome stability and telomere length in the production of viable cell lines for somatic cell nuclear transfer
  (2006) *BMC Developmental Biology*, 6, p. 41.

- Menon, S. N., Flegg, J. A., McCue, S. W., Schugart, R. C., Dawson, R. A., McElwain, D. L.
  Modelling the interaction of keratinocytes and fibroblasts during normal and abnormal wound healing processes
  (2012) *Proceedings. Biological Sciences*, 279 (1741), pp. 3329-3338.

- Mestre-Citrinovitz, A. C., Sestelo, A. J., Ceballos, M. B., Baranao, J. L., Saragueta, P.
  Isolation of primary fibroblast culture from wildlife: The Panthera onca case to preserve a south American endangered species
  (2016) *Current Protocols in Molecular Biology*, 116, p. 287128714.

- Mishra, B., Ragini, S. R., Kashiv, I. L., Ratho, R. K.
  Preservation of continuous cell lines at -85°C: A low-cost alternative for resource limited countries
  (2010) *Indian Journal of Pathology & Microbiology*, 53 (4), pp. 742-744.

- Moore, J., Maitland, D.
  (2014) *Biomedical technology and devices*, pp. 295-275.
  (2nd ed., Boca Raton: CRC Press

- Neuhuber, B., Swanger, S. A., Howard, L., Mackay, A., Fischer, I.
  Effects of plating density and culture time on bone marrow stromal cell characteristics
  (2008) *Experimental Hematology*, 36 (9), pp. 1176-1185.

- Orazizadeh, M., Hashemitabar, M., Bahramzadeh, S., Dehbashi, F. N., Saremy, S.
  Comparison of the enzymatic and explant methods for the culture of keratinocytes isolated from human foreskin
  (2015) *Biomedical Reports*, 3 (3), pp. 304-308.

- Pavel, M., Renna, M., Park, S. J., Menzies, F. M., Ricketts, T., Fullgrabe, J., Rubinsztein, D. C.
  Contact inhibition controls cell survival and proliferation via YAP/TAZ-autophagy axis

(2018) *Nature Communications*, 9 (2961), pp. 1-18.

- Phipps, S. M., Berletch, J. B., Andrews, L. G., Tollefsbol, T. O.
  Aging cell culture: Methods and observations
  (2007) *Methods in Molecular Biology (Clifton, N.J.)*, 371, pp. 9-19.

- Rottem, S., Kosower, N., Kornspan, J.
  (2012) *Contamination of tissue cultures by Mycoplasmas; in biomedical tissue culture*, pp. 35-58.
  United Kingdom: IntechOpen Limited

- Ryder, O. A., Onuma, M.
  Viable cell culture banking for biodiversity characterization and conservation
  (2018) *Annual Reviews of Animal Biosciences*, 6, pp. 83-98.

- Schulz, R., Noelker, L. S., Rockwood, K., Sprott, R. L.
  (2006) *The encyclopedia of aging*, pp. 191-195.
  New York: Springer

- Seluanov, A., Vaidya, A., Gorbunova, V.
  Establishing primary adult fibroblast cultures from rodents
  (2010) *Journal of Visualized Experiments: JoVE*, (44), p. 2033.

- Siengdee, P., Klinhom, S., Thitaram, C., Nganvongpanit, K.
  Isolation and culture of primary adult skin fibroblasts from the Asian elephant (Elephas maximus)
  (2018) *PeerJ*, 6, p. e4302.

- Uphoff, C. C., Drexler, H. G.
  Detecting Mycoplasma contamination in cell cultures by polymerase chain reaction
  (2004) *Methods in Molecular Medicine*, 88, pp. 319-326.

- Wagner, J., Damaschke, N., Yang, B., Truong, M., Guenther, C., McCormick, J., Huang, W., Jarrard, D.
  Overexpression of the novel senescence marker P-galactosidase (GLB1) in prostate cancer predicts reduced PSA recurrence
  (2015) *PloS One*, 10 (4), p. e0124366.

- Walcott, B., Singh, M.
  Recovery of proliferative cells up to 15- and 49-day post-mortem from bovine skin stored at 25°C and 4°C, respectively
  (2017) *Cogent Biology*, 3 (1), p. 1333760.

- Yang, H., Wang, H., Ren, J., Chen, Q., Chen, Z. J.
  cGAS is essential for cellular senescence
  (2017) *Proceedings of the National Academy of Sciences of the United States of America*, 114 (23), pp. E4612-E4620.

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