

Golovastov et al. (Abstract)

Cellular Therapy and Transplantation (CTT), Vol. 3, No. 9

doi: 10.3205/ctt-2010-No9-abstract19

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Abstract accepted for "4th Raisa Gorbacheva Memorial Meeting on Hematopoietic Stem Cell Transplantation", Saint Petersburg, Russia, September 18–20, 2010

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A study of cord blood samples' colony-forming activity

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Abstract

Umbilical cord blood is a source of hematopoietic stem cells for transplantation in treatment of many devastating blood diseases and genetic metabolic disorders. Transplantation success depends on hematopoietic stem and progenitor (called colony-forming units (CFU)) cell numbers.

Aim: To analyze the colony-forming activity of umbilical cord blood samples before and after freezing (cryopreservation).

Methods: The leukocyte fraction of cord blood was derived using Rubinstein's double centrifugation method. The colony-forming activity of cord blood was determined. The mononuclear cell fraction containing hematopoietic progenitors was incubated in the methylcellulose medium MethoCult H4435 (StemCell Technologies) over 14 days. Numbers of CFU-E, BFU-E, CFU-GM, and CFU-GEMM were estimated using standard methods.

Results: 124 samples of cord blood were tested. CFU-E made up 6.2% of all grown colonies, BFU-E 55.8%, CFU-GM 33.1%, and CFU-GEMM 4.5%. A moderate positive correlation between living CD34+ stem cell numbers and the total colony number was found ($r=0.676$; $p<0.01$). The most significant positive correlation between the CD34+ cell number and colony type was found in the case of BFU-E ($r=0.633$; $p<0.01$), in comparison with the other colony types: CFU-E, CFU-GM, and CFU-GEMM ($r=0.418$; $r=0.452$, and $r=0.42$; $p<0.01$, respectively). There was a weak tendency toward colony number decrease after thawing as compared to the CFU numbers before freezing in the same samples, however a significant difference was not found.

Keywords: cord blood, hematopoietic stem cells, colony-forming units, transplantation

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