Data Article

Data on the fate of MACS® MicroBeads intramyocardially co-injected with stem cell products

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ABSTRACT

The data presented in this article are related to the research article “Intramyocardial Fate and Effect of Iron Nanoparticles co-injected with MACS® purified Stem Cell Products” (Müller et al., 2017) [1]. This article complements the cellular localization of super-paramagnetic iron dextran particles (MACS® MicroBeads) used for magnetic activated cell sorting (MACS®). Data evaluate the time-dependent detachment of these nanoparticles from CD133+ haematopoietic stem cells (HSCs) and CD271+ mesenchymal stem cells (MSCs). Furthermore, the influence of these stem cells as well as of nanoparticles on cardiac remodeling processes after myocardial infarction (MI) was investigated.

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Specifications Table

| Subject area | More specific subject area | Type of data | How data was acquired | Data format | Experimental factors | Experimental features | Data source location | Data accessibility |
|--------------|-----------------------------|--------------|-----------------------|-------------|----------------------|-----------------------|---------------------|-------------------|
| Biology      | Intramyocardial transplantation of MACS® purified stem cell products | Image, graph, figure, text file | Structured illumination microscopy (Zeiss ELYRA PS.1 LSM 780), flow cytometry (BD LSR-II), histological staining | Analyzed | CD133+ and CD271+ stem cells were automatically (using the CliniMACS® Prodigy BM-133 system) and manually (using Mini MACS® technology) isolated from human bone marrow (BM) | Investigation of the Intracellular localization and time-dependent detachment of MACS® MicroBeads from stem cells using the Labeling Check Reagent-FITC (Milenyi Biotec). Impact of MACS® MicroBeads on collagen deposition after myocardial infarction using an ischemia/reperfusion mouse model and Sirius Red staining. | Rostock University Medical Center, Schillingallee 69, 18057 Rostock, Germany | The data are available with this article |

Value of the data

- MACS® is the most commonly used technique for the purification of stem cell subpopulations intended for the treatment of cardiovascular diseases.
- Data about the binding of MACS® MicroBeads to stem cells are crucial for in vivo application of stem cell products.
- Data provide information about the effect of co-injected MACS® MicroBeads on cardiac remodeling processes after MI.
- Data can be useful for other researchers analyzing the cardiac regeneration potential of MACS® purified stem cells products.
- Data clarifies the safety of MACS® MicroBeads for clinical application.

1. Data

The data include information about the cellular localization of MACS® MicroBeads (labelled with Labeling Check Reagent-FITC) right after the manual MACS® based isolation of CD133+ and CD271+ stem cells (Fig. 1). The detachment of FITC-labelled MACS® MicroBeads was evaluated by measuring the time-dependent fluorescence intensity of MACS® purified CD133+ cells incubated under cell culture conditions (37 °C in StemSpan™ H3000) using flow cytometry (Fig. 2). Furthermore, the effect of manually and automatically (Good Manufacturing Practice (GMP)-conform) MACS® purified CD133+ and CD271+ stem cells as well as of MACS® MicroBeads on fibrosis after MI was assessed in a cardiac ischemia/reperfusion mouse model by histological staining (Fig. 3).
2. Experimental design, materials and methods

2.1. Sternal BM harvesting

Sternal BM aspirates were obtained as previously described [2].

2.2. CD133⁺ and CD271⁺ cell isolation

CD133⁺ and CD271⁺ cells were automatically and manually isolated as previously described [1,3].

2.3. Microscopic analysis

For staining, cells were incubated with Labeling Check Reagent-FITC (Miltenyi Biotec) and CellMask™ Plasma Membrane Stains (Thermo Fisher Scientific, Schwerte, Germany). Subsequently, samples were mounted with Fluoroshield™ with DAPI (Sigma-Aldrich, Taufkirchen, Germany) on microscope slides. To evaluate the localization of MACS® MicroBeads, labelled cells were subjected to three-dimensional structured illumination microscopy (SIM) using the ELYRA PS.1 LSM 780 system (Carl Zeiss, Jena, Germany). Images were acquired as z-stacks and processed with ZEN software (Carl Zeiss). Final images were obtained by creation of maximum projections.

2.4. Assay to address the detachment of MACS® MicroBeads

Mean fluorescence of MACS® MicroBeads labelled CD133⁺ cells was measured using flow cytometry. At respective time points samples were taken from cultured cells and incubated with human FcR Blocking Reagent (Miltenyi Biotec), CD133/2 (293C3)-PE antibody (Miltenyi Biotec), 7-Amino-Actinomycin (7-AAD) staining solution (Becton Dickinson, Heidelberg, Germany) and Labeling Check Reagent-FITC. Samples were measured using BD LSR-II flow cytometer (Becton Dickinson) and raw data were analysed with FACSDiva software version 6.1.2 (Becton Dickinson).
CD133⁺ cells were isolated using manual MACS® technology and incubated under cell culture conditions at 37 °C. At respective time points (0 h (A); 2.5 h (B); 18 h (C); 24 h (D); 48 h (E); 72 h (F)) MACS® MicroBead staining was performed with Labeling Check Reagent-FITC and fluorescence intensity was measured by flow cytometry. Unstained cells were used as control (G). Green: Cells positive for MACS® MicroBeads. Blue: Cells negative for MACS® MicroBeads.
2.5. Generation of cardiac ischemia/reperfusion and intramyocardial injections

This study was approved by the federal animal care committee of the Landesamt für Landwirtschaft, Lebensmittelsicherheit und Fischerei Mecklenburg-Vorpommern (LALLF, Germany) (LALLF M-V/TSD/7221.3-1.1-088/11). To simulate MI, severe combined immunodeficiency beige (SCID bg) mice (CB17.Cg-PrkdcscidLystbg-J/Crl) were anesthetized and after thoracotomy the left anterior descending coronary artery (LAD) was ligated. After 45 min, each mouse received an intramyocardial application of $1 \times 10^5$ cells or 1.3 μl of CD133 MACS MicroBeads mixed with Growth Factor Reduced (GFR) Matrigel™ Matrix (Corning, Berlin, Germany). The untreated MI control group (MI-C) underwent the same surgical treatment with GFR Matrigel™ Matrix application. Injections were performed along the border of the blanched myocardium and LAD ligation was removed. The healthy control group (SHAM) underwent identical surgical procedures as the MI-C group without LAD ligation.

2.6. Histological investigations

Three weeks after cardiac surgery, murine hearts were embedded in Tissue-Tek® O.C.T.™ Compound (Zoeterwoude, Netherlands) and snap-frozen. To investigate fibrosis, 5 μm thick slices were cut from two different horizontal myocardial infarction levels and stained with Sirius Red (Division Chroma, Muenster, Germany) and Fast Green FCF (Sigma-Aldrich). Sirius Red positive regions (indicating collagen deposition) were examined in the infarction border zone (BZ) in five randomly chosen fields (each per section; one section per level; 400 × ) using computerized planimetry.

2.7. Statistical analysis

All statistical analyses were performed using SigmaPlot 11.0 (Systat Software GmbH, Germany). Student’s t-test was applied to determine the significance. All values are presented as mean ± standard error of the mean (SEM).

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Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2017.06.035.

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