Title: Infusion Of Human Bone Marrow-Derived Stem Cells Improved Ovarian Function In Chemotherapy-Damaged Ovaries In Mice.

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**Introduction:** Aging, poor ovarian response and other damaging-acquired conditions like oncologic treatments, lead to an impaired ovarian function. Nevertheless, even when the damaged ovaries have lost their ability to ovulate, they might contain a residual pool of quiescent follicles that could be activated to growth. Infusion of bone marrow-derived stem cells (BMDSC) could provide an ovarian niche for follicular rescue and rejuvenation.

**Objective:** To assess regenerative effects of human BMDSC on chemotherapy-damaged ovaries in mice.

**Methods:** Twelve 8-week old female NOD-SCID mice were treated with two different chemotherapy regimens to induce ovarian damage. Standard treatment (1xChT,n=6) consisted of a single injection of 12mg/kg busulfan (Bu) and 120mg/kg Cyclophosphamide (Cy) while the reduced dose (0.1xChT,n=6) was 1.2mg/kg Bu+12mg/kg Cy. A week later (Day 0) animals from both groups were randomized to receive an injection of PBS (Control,n=3each) or 1x10^6 Human Rhodamine B-labeled BMDSC (BMDSC groups) via tail vein. Controlled ovarian stimulation was induced on day 14 with 10IU of PMSG+hCG. Then ovaries were recovered to evaluate follicle growth, proliferation, apoptosis and vascularization.

**Results:** In the standard chemotherapy groups, antrum cavity formation (BMDSC:10.6±1.8% vs. Control:5.9±2.6%.p=0.01) as well as % of pre-ovulatory follicles (1.6±0.9% vs. 0.2±0.1% respectively,p<0.01) were increased in mice receiving BMDSC when compared to controls. In the reduced dosage groups, BMDSC also increased antrum (BMDSC:8.9±5.2% vs. Control:5.2±1.9%.p=NS) and pre-ovulatory follicles (1.7±0.9 vs. 0.5±0.8 respectively,p=0.04).

When ovarian stroma was examined, improvement in micro-vessel density (1xChT-BMDSC:5.1±0.8% vs. 1xChT-Control:1.8±0.9%.p=0.01), increases in cell proliferation (2.3±0.5% vs. 1.0±0.3%.p=0.04) and decreases in apoptosis (0.5±0.2% vs. 5.1±3.6%.p=0.04) were detected after BMDSC infusion in the standard dose. In the 0.1xChT dose, BMDSC also increased cell proliferation (BMDSC:1.4±0.4 vs. Control:0.7±0.2%.p=0.04) but decreased apoptosis (0.5±0.2 vs. 5.9±3.6 respectively,p=0.04).

**Conclusions:** Human BMDSC infusion improved ovarian function by promoting follicular growth to the pre-ovulatory stage, increasing vascularization and cell proliferation as well as suppressing apoptosis in chemotherapy-damaged ovaries in mice.

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