Human Dermal Fibroblasts and Bone-Marrow Mesenchymal Stem Cells properties under Silver and Lithium Condition

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Wound healing pass through inflammation, proliferation, and remodeling phases [1, 2]. Skin fibroblasts (SFs) play a major role in skin damage repair [3]. Mesenchymal stem cells (MSCs) modulate local environment in damage tissues, activate endogenous progenitor cells, and secrete various factors [4]. MSCs can differentiate into keratocytes, epithelial cells, and endothelial cells in skin [1, 5]. The "Bodyguard" contains silver and lithium ions. Silver ion caused DNA destruction. Aim of the study was testing cytotoxicity of silver and lithium ions in a free (salts) and bound (composition “Bodyguard”) state on SFs and MSCs function.

The human SFs adhered to plastic, formed a monolayer of polygonal cells, and was positive to CD73 (98.0±0.5), CD90 (97.0±2.0) and CD105 (96.0±2.0) surface markers. Human bone-marrow MSCs obtained from human bone-marrow adhered to plastic, formed monolayer of fibroblast-like morphology cells, expanded, and was positive to CD73 (81.0±4.0), CD90 (73.0±8.0) and CD105 (77.0±6.0)surface markers.

TABLE I. EFFECT OF “BODYGUARD”, $AGNO_3$, AND $LI_5C_6H_5O_7$ ON FUNCTION OF HUMAN DERMAL FIBROBLASTS AND BONE-MARROW MESENCHYMAL STEM CELLS *IN VITRO* (M ± SD)

Human skin fibroblasts						
Control	0.64±0.01	7±3	25±3	0.47±0.01	19.44±0.59	70±20
Bodyguard	0.59±0.01*	12±3	22±4	0.44±0.01*	19.41±1.09	120±20*
$AgNO_3$	0.65±0.02	21±4*	20±3	0.43±0.001*	18.99±0.69	30±10*
$Li_3C_6H_5O_7$	0.65±0.03	14±3*	20±3	0.44±0.01*	19.45±1.1	42±10*
$AgNO_3/Li_3C_6H_5O_7$	0.64±0.01	11±3	16±2*	0.44±0.01*	20.59±1.11*	24±10*
Human bone-marrow mesenchymal stem cells						
Control	0.67±0.01	55.2±5.1	17±3	0.44±0.01	20.6±0.4	80±20
Bodyguard	0.69±0.01*	41.4±16.9	17±4	0.44±0.01	20.9±0.21	100±20
$AgNO_3$	0.69±0.03	51.9±10.6	13±3	0.46±0.01*	21±0.8	50±10*
$Li_3C_6H_5O_7$	0.65±0.03	72.1±13.5	15±3	0.46±0.01*	22.3±0.6	50±10*
$AgNO_3/Li_3C_6H_5O_7$	0.62±0.03	52.4±10.4	10±2*	0.45±0.01*	21.1±0.4*	40±10*

Note. CFU, colony forming units; MPO, myeloperoxidase activity; NO, nitric oxide; *p<0.05 compared with control.

This study demonstrated that human skin fibroblasts growth with “Bodyguard” in culture medium showed lower proliferative activity and intracellular myeloperoxidase activity, and increased number of apoptotic cells. Silver salt and lithium salt alone or in combination promote scratched wound closure, myeloperoxidase activity, and decreased apoptosis of skin fibroblasts.

Human bone-marrow mesenchymal stem cells under “Bodyguard” condition promote proliferation. While silver salt and lithium salt alone or it is combination increased myeloperoxidase activity, and decreased apoptosis of MSCs.

Finally, the results suggested that “Bodyguard” is promising in down-stream human skin fibroblasts viability.