LOW OXYGEN CONDITIONS AND STEM CELLS

BAKER RUSKINN

Cell Type	Oxygen Conditions	Duration	Affected Cellular Events	References
C2C12 myoblasts	6% vs. 21%	72 h	ROS production, differentiation	[1]
HSCs ($CD34^+$ cells)	5% vs. 21%	7 days	ROS levels, antioxidant enzymes (SOD, CAT and GPx), glutathione redox state	[2]
Human Dermal Fibroblasts (HDFs)	5% vs. 21%	72 h	ROS production, enzymatic and non-enzymatic antioxidant response system, DNA damage, extracellular matrix (ECM) proteins	[3]
DPSCs	3% vs. 21%	Up to passage 25	Oxidative stress parameters (ROS, MDA, carbonylation, antioxidant defenses), proliferation, stemness (OSKM)	[4]
MSCs from adipose tissue	3% vs. 20%	Up to 22 passages	Genetic stability, glycolytic function, cell differentiation and ROS production and targets (Protein carbonylation and MDA)	[5]
NSCs	3% vs. 21%	10 days	Survival, renewal potential and differentiation	[6]
BMSCs	2% vs. 20%	12 days	Proliferation kinetics, metabolism, differentiation potential	[7]
BMSCs	1% vs. 21%	7 days	Proliferation, migration, morphology, adhesion molecules, osteogenic differentiation	[8]
MSCs from umbilical cord	1.5%, 2.5%, 5%, 21%	70 h	Proliferation, metabolism, pH, oxygen consumption	[9]
ADSCs	1% vs. 20%	72 h	Proliferation, ROS generation, migration, OSKM	[10]
Muscle Precursor Cells (MPCs)	5%, 10%, 15%, 20%	Up to passage 2	Cell cycle regulation (p21 and p27), Proliferation	[11]
BM-MSCs and ADSCs	2% vs. 21%	Up to passage 10	Morphology, differentiation potential, genomic stability, telomere length, mitochondrial membrane potential, ATP content	[12]
Central Nervous System (CNS) Precursor Cells	2%, 5%, 20%	Up to passage 2 (35 days)	Proliferation, HIF1α, apoptosis, multilineage differentiation potential	[13,14]
MSCs from umbilical cord	3% vs. 21%	Up to passage 12	Proliferation, HIF1α, ERK signalling pathway, stemness (OCT3/4 and Nanog), p21, p16, p53	[15]
BM-MSCs	5% vs. 21%	Up to passage 15	Donor age, differentiation potential, SA-β-Gal, miRNA sequencing, KEGG signalling pathways	[16]
BM-MSCs	1% vs. 21%	Up to passage 4	Migration, proliferation, apoptosis, differentiation potential, PTEN-PI3K/AKT signalling pathway, miRNAs, HGF and VEGF	[17]
Satellite Cells	1% vs. 21%	48 h	Quiescence, self-renewal, miRNAs, Notch signalling pathway, transplantation efficiency	[18]
CSCs	0.5%, 5%, 21%	Up to passage 10	Proliferation, survival, migration, SA-β-Gal, apoptosis	[19]
MSCs from umbilical cord	2.2% vs. 21%	24 h	ROS levels, migration, HIF1α, VEGF	[20]
ESCs	1–5% vs. 21%	Up to passage 50	Morphology, colony growth, differentiation, hGC production, embryoid body formation	[21]
ESCs	4% vs. 20%	Up to passage 50	Morphological differentiation, microarray and transcriptome profiling, HIF, stemness	[22]
Neural Crest Stem Cells	5% vs. 20%	12 days	Survival, proliferation, multilineage differentiation	[23]
BM-MSCs	1, 3, 5, 10% vs. 21%	7 days	Viability, proliferation, self-renewal, osteogenic differentiation	[24]
C2C12 myoblasts, Satellite Cells and NSCs	1% vs. 21%	7 days	Notch signalling pathway, undifferentiated state maintenance	[25]
BM-MSCs and HSCs	5, 12, 20%	10 days	ROS content, proliferation, directional differentiation, apoptosis, cell cycle, migration	[26]

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BM-MSCs	2% vs. 18%	2 weeks	Osteogenic and adipogenic differentiation, HIF1α, VEGF	[27]
BM-MSCs	1% vs. 21%	7 days/4 weeks	Proliferation, migration, stemness (OCT3/4, Nanog, SALL4, KLF4), differentiation	[8]
MSCs	2% vs. 20%	7 days	Proliferation, osteogenic differentiation	[28]
BM-MSCs	0.2% vs. 21%	7 or 14 days	Osteogenic and adipogenic differentiation, HIF1α	[29]
MSCs	1, 2, 3, 4, 6% vs. 21%	2, 4, 8, 24, 48, 72 h	Adipogenic differentiation	[30]
BM-MSCs	3% vs. 21%	Isolation and expansion (4 weeks)	Chondrogenic differentiation, cell surface markers, ECM formation, expansion, HIFs	[31]
BM-MSCs	2% vs. 20%	14 days	Chondrogenic differentiation	[32]
MSCs	1% vs. 21%	21 days	Osteogenic differentiation, HIFs	[33]
WJ-MSCs	3% vs. 21%	Up to passage 13	Growth kinetics, SA-β-Gal, differentiation, HIFs, p16, p21, p53, karyotype	[34]
ADSCs	1% vs. 21%	Up to passage 2	Proliferation, multilineage differentiation, stemness (Nanog, SOX2)	[35]
ESCs (dorsal pancreatic bud)	3%, 8%, 21%	24h or 7 days	Cell differentiation, HIF1α gene and protein expression	[36]
ESCs	3–5% vs. 20%	Up to passage 3	Morphology, proliferation, pluripotency (SOX2, Nanog and OCT3/4), HIFs	[37]
BM-MSCs	1% vs. 21%	14 days	Proliferation, differentiation, self-renewal	[38]
WJ-MSCs	5% vs. 21%	2-4 weeks	Proliferation, stemness (OCT3/4, Nanog, REX1 and SOX2), HIFs, differentiation	[39]
BM-MSCs	5% vs. 21%	Up to passage 2	Morphology, differentiation, transcriptional profiling, metabolism, adhesion	[40]
Dermal Fibroblasts into iPSCs	1%, 5%, 21%	40 days	Efficiency of reprogramming into iPSCs (ESC markers, teratoma formation)	[41]
Fibroblasts, ESCs and iPSCs	2%, 5%, 21%	2 weeks	Reprogramming efficiency, HIFs, metabolism (OCR and ECAR)	[42,43]

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