**Table S1: Study Characteristics of included studies**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study  (years) | Type of Ischemia | Species | Total No. | Sex | Anaesthetic | Donor species | Type of stem cell | Dose Range | Time of admin (mins) | Method of administration |
| Choi2016[1] | Temporary | mouse | 15 | male | tiletamine | human | BMSCs | 1.0×105 | 1440 | systematic(IV) |
| Jiang2018[2] | Temporary | rat | 60 | male | chloral hydrate | rat | BMSCs | unclear | 0 | systematic(IV) |
| Zhao2020[3] | Temporary | rat | 160 | both | chloral hydrate | rat | ADSCs | 2.0×106 | unclear | systematic(IV) |
| Tian2019[4] | Temporary | rat | 30 | male | chloral hydrate | mouse | NSCs  (modified) | 5.0×106 | 360 | systematic(IV) |
| Zhang2011 [5] | Temporary | rat | 48 | unclear | chloral hydrate | rat | NSCs | 1.0 ×106 | unclear | stereotaxic |
| Inoue2013 [6] | Permanent | rat  rat | 14  10 | male  male | isoflurane  isoflurane | human  human | SHED  BMMSCs | unclear  unclear | 4320-21600  4320-21600 | intranasal  intranasal |
| Du2014[7] | Temporary | rat | 100 | male | chloral hydrate | rat | ADSCs | 5.0×105 | 1440 | systematic(IV)  systematic(IA)  stereotaxic |
| Liu2009[8] | Permanent | rat | 72 | female | chloral hydrate | rat | MSCs | 1.0×106 | 1440 | stereotaxic |
| Tobin2020[9] | Temporary | rat | 12 | female | isoflurane | rat | MSCs | 1.25×106 | 180 | systematic(IV) |
| Zong2017[10] | Temporary | rat | 90 | male | chloral hydrate | rat | BMSCs  (modified) | 1.0×106 | 1440 | stereotaxic |
| He2018[11] | Temporary | rat | 21 | male | chloral hydrate | rat | BMSCs | 2.0×106 | 720 | systematic(IV) |
| Nito2018[12] | Temporary | rat | unclear | male | halothane | human | DPSCs | 1.0×106 | 0  180 | systematic(IV) |
| Zhang2017[13] | Temporary | rat | 48 | male | chloral hydrate | human | NSCs  (modified) | 5.0×106 | 1440 | systematic(IV) |
| Souza2017[14] | Temporary | rat | 16 | female | ketamine | unclear | BMMCs | 1.0×106 | 1440 | stereotaxic |
| Li2015[15] | Temporary | rat | 48 | male | chloral hydrate | rat | BMMCs | 1.0×107 | 1440 | systematic(IV) |
| Son2019[16] | Temporary | rat | 40 | male | isoflurane | human | MSCs | 2.0×105 | unclear | stereotaxic |
| Huang2018[17] | Temporary | rat | unclear | male | isoflurane | unclear | MSCs  (modified) | 2.0×106 | 1440 | systematic(IV) |
| Zhang2018[18] | Temporary | rat | 42 | male | chloral hydrate | rat | BMSCs | 3.0×106 | 10080 | intranasal  systematic(IV)  systematic(IA) |
| Yang2015[19] | Temporary | rat | 24 | unclear | unclear | rat | BMSCs | 5.0×106 | 4320 | systematic(IV) |
| Liu2011[20] | Temporary | rat | 78 | male | chloral hydrate | rat | BMSCs  (modified) | 3.0×106 | 1440 | systematic(IV) |
| Zhang2006 [21] | Temporary | rat | 16 | male | halothane | rat | BMSCs | 2.0×106 | 1440 | systematic(IA) |
| Shen2007 [22] | Temporary | rat | 25 | female | halothane | rat | MSCs | 3.0×106 | unclear | systematic(IV) |
| Koh2008 [23] | Temporary | rat | 36 | unclear | pentobarbital | human | UCMSCs | 6.0×105 | 20160 | stereotaxic |
| Lim2011[24] | Temporary | rat | 74 | male | isoflurane | human | UCMSCs | 1.0 ×106 | 4320 | systematic(IV) |
| Bao2011[25] | Temporary | rat | 72 | male | chloral hydrate | human | BMSCs | 5.0×105 | 4320 | stereotaxic |
| Ikegame2011[26] | Temporary | mouse  mouse | 19  19 | male  male | isoflurane isoflurane | mouse  mouse | BMSCs  ADSCs | 1.0 ×106  1.0 ×106 | 90  90 | systematic(IV)  systematic(IV) |
| Song2011 [27] | Temporary | rat | 24 | male | unclear | cell line | NSCs | 4.0 ×106 | 1440-10080 | systematic(IV) |
| sugiyama2011[28] | Temporary | rat | 48 | male | isoflurane | porcine | SP cells | 1.0 ×106 | 1440 | stereotaxic |
| Wang2013 [29] | Temporary | rat | 40 | male | halothane | cell line | MSCs | unclear | 1440 | systematic(IV) |
| Jensen2013 [30] | Temporary | rat | 20 | male | isoflurane | cell line | NSCs | 2.5×105 | 10080 | stereotaxic |
| Cheng2015 [31] | Temporary | rat | 36 | male | pentobarbital | cell line | NSCs | 5.0×106 | 1440 | systematic(IV) |
| Boltze2006 [32] | Permanent | rat | 36 | unclear | ketamine | human | UCBCs | 1.0×106 | 1440 | systematic(IV) |
| Cho2010[33] | Temporary | rat | 134 | male | unclear | human | MSCs  (modified) | 6.0×105 | 20160 | stereotaxic |
| Lapi2015 [34] | Temporary | rat | 182 | male | alpha-chloralose | rat | BMSCs | 1.0×106 | 120 | systematic(IA) |
| Lam2020[35] | Temporary | rat | 60 | female | ketamine | rat | MSCs | 8.0×105 | 1440 | stereotaxic |
| Yamaguchi2018[36] | Temporary | rat | 58 | male | unclear | human | MSCs | 1.0×106 | 1440 | systematic(IA) |
| Gutiérrez-Fernández2015[37] | Permanent | Rat  rat | 30  30 | male  male | ketamine  ketamine | Human  rat | ADMSCs  ADMSCs | 2.0×106 | unclear | systematic(IV) |
| Zhang2017[38] | Temporary | mouse | unclear | male | ketamine | mouse | NSCs | 1.0×106 | 1440 | stereotaxic |
| Lin2020[39] | Temporary | rat | 70 | male | isoflurane | rat | EPCs | 1.2×106 | 180  4320  10080  20160 | systematic(IA) |
| Salehi2020[40] | Temporary | rat  rat | 72  72 | male  male | chloral hydrate  chloral hydrate | rat  rat | NSCs  BMSCs | 2.0×106  2.0×106 | 0  0 | systematic(IV)  systematic(IA) |
| Kong2018[41] | Temporary | rat | 60 | male | isoflurane | human | PDMCs  (modified) | 1.0×105 | 1440 | stereotaxic |
| Yang2018[42] | Permanent | rat | 90 | male | isoflurane | rat | BMMCs | 3.0×106 | unclear | systematic(IV) |
| Zhu2017[43] | Temporary | rat | 80 | male | chloral hydrate | rat | NSCs  (modified) | 5.0×105 | 4320 | stereotaxic |
| Bacigaluppi2016[44] | Temporary | mouse | unclear | male | isofluorane | mouse | NPCs | 1.0×106 | 4320 | systematic(IV) |
| Li2018[45] | Permanent | rat | 90 | male | isoflurane | rat | BMSCs | 1.0×106 | unclear | systematic(IV) |
| Sowa2018[46] | Temporary | rat | 151 | male | halothane | human | DPSCs  (modified) | 1.0×106 | unclear | systematic(IV) |
| Paudyal2020[47] | Temporary | rat | 40 | male | isoflurane | human | ADMSCs | 1.0×106 | unclear | stereotaxic |
| Bi2018[48] | Temporary | rat | 180 | male | unclear | rat | BMSCs | 1.0×106 | 1440 | stereotaxic |
| Ryu2018[49] | Temporary | rat | 40 | male | isoflurane | rat | ADMSCs | unclear | 2880 | stereotaxic |
| Wang2015[50] | Temporary | mouse | unclear | male | isoflurane | unclear | NSCs  (modified) | 5.0×104 | 120 | stereotaxic |
| Yang2017[51] | Temporary | rat | 126 | male | isoflurane | human | MAPCs | 1.2×107 | 1440 | systematic(IV) |
| Zhang2018[52] | Temporary | rat | 120 | male | chloral hydrate | rat | NSCs | 8.0×105 | unclear | stereotaxic |
| Moisan2016[53] | Temporary | rat | 78 | male | unclear | human | BMSCs | unclear | unclear | systematic(IV) |
| Zhao2002[54] | Permanent | rat | 41 | male | methohexital sodium | human | BMSCs | unclear | 10080 | stereotaxic |
| Kurozumi2004[55] | Temporary | rat | 64 | unclear | halothane | human | BMSCs  (modified) | 5.0×105 | 1440 | stereotaxic |
| Li2005[56] | Permanent | rat | 18 | unclear | halothane | rat | MSCs | 3.0×106 | 10080 | systematic(IV) |
| Wu2008[57] | Temporary | rat | 23 | female | isoﬂurane | rat | BMSCs | 3.0×106 | 1440 | systematic(IV) |
| Andrews2008[58] | Temporary | rat | 22 | male | pentobarbital | human | BMSCs | 1.5×106 | 10080 | stereotaxic |
| Li2008[59] | Temporary | rat | 28 | male | isoflurane | human | MSCs | 1.0×106 | 1440 | systematic(IV) |
| Liao2009 [60] | Temporary | rat | 50 | male | chloral hydrate | human | UCMSCs | 2.0×105 | 1440 | stereotaxic |
| Chen2009 [61] | Temporary | rat | 75 | male | pentobarbital | rat | NSCs  (modified) | 5.0×105 | 4320 | stereotaxic |
| Stroemer2009[62] | Temporary | rat | 86 | male | halothane | cell line | CTX0E03 cells | 4.5×105 | 40320 | stereotaxic |
| Jin2010[63] | Permanent | rat | 40 | male | isoﬂurane | cell line | NPCs | 1.2×105 | 30240 | stereotaxic |
| Shen2010 [64] | Temporary | rat | 160 | male | isoflurane | rat | NSCs | 1.0 ×107 | 60 | systematic(IV) |
| Jiang2011 [65] | Temporary | rat | 20 | female | halothane | human | iPSCs | 8.0×105 | unclear | stereotaxic |
| Tang2014 [66] | Temporary | rat | 40 | male | ketamine | rat | MSCs | 1.0×106 | 1440 | stereotaxic |
| Ma2015[67] | Permanent | mouse | 29 | male | ketamine | mouse | NSCs | unclear | 2880 | systematic(IV) |
| Zhao2015 [68] | Temporary | rat | 36 | male | chloral hydrate | human | UCMSCs | unclear | 1440-20160 | intranasal |
| Gutiérrez-Fernández2011[69] | Permanent | rat | 60 | male | ketamine | rat | MSCs | 2.0 ×106 | 90 | systematic(IV)  systematic(IA) |
| Otero-Ortega2015[70] | Permanent | rat | 72 | male | isoflurane | rat | ADMSCs | 2.0×106 | 1440 | systematic(IV) |
| Veizovic 2001[71] | Temporary | rat | 32 | male | halothane | mouse | MHP36 cells | 7.5×104 | 20160-30240 | stereotaxic |
| Kamiya2008[72] | Temporary | rat | 41 | male | halothane | rat | BMMCs | 1.0×107 | 90 | systematic(IA) |
| Hicks2009 [73] | Permanent | rat | 51 | male | isoﬂurane | cell line | NPCs | 8.0×105 | 10080 | stereotaxic |
| Gutiérrez-Fernández2013[74] | Permanent | rat  rat | 20  20 | male  male | ketamine ketamine | rat  rat | BMSCs ADMSCs | 2.0 ×106  2.0 ×106 | 90  90 | systematic(IV)  systematic(IV) |
| Huang2014 [75] | Temporary | mouse | 18 | male | isoflurane | human | NSCs | 1.0×105 | 1440 | stereotaxic |
| Eckert2015 [76] | Temporary | mouse | 20 | male | isoflurane | cell line | NSCs | 1.0×105 | 1440 | stereotaxic |
| Vats2019[77] | Temporary | rat | 30 | female | unclear | rat | MSCs | 1.0×105 | 360 | systematic(IA) |
| Lin2017[78] | Temporary | rat | 40 | female | unclear | human | UCMSCs | 1.2×106 | 1440 | systematic(IV) |
| Sibov2019[79] | Temporary | rat | 43 | female | halothane | human | AFSCs | unclear | 60 | systematic(IV) |
| Zuo2019[80] | Temporary | rat | 124 | both | pentobarbital | human | UCMSCs | 2.0×106 | unclear | systematic(IV) |
| Yamashita2017[81] | Temporary | mouse | 44 | male | isoflurane | Murine | NSCs | 5.0×105 | unclear | stereotaxic |
| Zhang2018[82] | Temporary | rat | 90 | male | unclear | rat | ADMSCs | 1.0×106 | 11520 | stereotaxic |
| Cheng2018[83] | Temporary | mouse | 118 | male | ketamine | rat | MSCs | 1.0×105 | unclear | stereotaxic |
| Abd El Motteleb2017[84] | Temporary | rat | 60 | male | unclear | human | MSCs | 1.5×105 | 30 | unclear |
| Cherkashova2019[85] | Temporary | rat  rat | 30  27 | male | isoflurane  isoflurane | human  human | MSCs  NPCs | unclear  unclear | 1440  1440 | systematic(IV)  systematic(IV) |
| Park2015[86] | Temporary | rat | 48 | male | Rompun | human | MSCs | 5.0×105 | 2880 | stereotaxic |
| Park2017[87] | Temporary | rat | 23 | male | xylazine | human | MSCs | 5.0×105 | 2880 | stereotaxic |
| Hou2016[88] | Temporary | mouse | 79 | both | unclear | mouse | NSCs | 2.5×105 | unclear | stereotaxic |
| Hosseini2015[89] | Temporary | rat  rat | 20  20 | male  male | halothane  halothane | rat  rat | MSCs  NSCs | 1.0×105  1.0×105 | 1440  10080 | stereotaxic |
| Chi2018[90] | Temporary | rat | 108 | male | unclear | rat | ADMSCs | 2.0×106 | 0  720  1440 | systematic(IV) |
| Xie2019[91] | Temporary | rat | 70 | male | unclear | human | BMSCs | 1.0×107 | 4320 | stereotaxic |
| Ryu2016[92] | Temporary | rat | 14 | male | unclear | human | NSCs | 1.2×105 | 1440 | stereotaxic |
| Hosseini2020[93] | Temporary | rat | 60 | unclear | halothane | rat | NSCs | 2.0×105 | -1440  5760 | stereotaxic |
| Saraf2019[94] | Temporary | rat | 30 | female | unclear | rat | MSCs | 1.0×105 | unclear | systematic(IA) |
| Oh2020[95] | Temporary | rat | 29 | male | ketamine | human | iPSCs | 2.0×105 | 10080 | stereotaxic |
| Vahidinia2019[96] | Temporary | rat | 28 | male | isoflurane | rat | BMSCs | 1.0×106 | 180 | systematic(IV) |
| Wu2015[97] | Temporary | rat | 28 | male | chloral hydrate | human | PDMCs | 5.0×104 | 0 | stereotaxic |
| Leu2010[98] | Temporary | rat | 40 | male | unclear | rat | ADMSCs | 2.0×106 | 1440 | systematic(IV) |

Abbreviations: BMSCs=Bone marrow mesenchymal stem cells; MSCs=marrow stromal cells; hATSCs= human adipose tissue-derived stromal cells; UCBC=human umbilical cord blood cells; NSPCs=neural stem/progenitor cells; NSCs=neural stem cells; NPCs=neural progenitor cells; UCMSCs= umbilical cord derived mesenchymal stem cells; ADSCs= adipose-derived stem cells; ADMSCs= adipose-derived mesenchymal stem cell; iPSCs= Induced pluripotent stem cells; SP= side population; AFSCs=amniotic fluid-derived stem cells; SHED=human exfoliated deciduous tooth; BMMCs=bone marrow mononuclear cells; UTCs=umbilical tissue-derived cells; PDMCs=placenta-derived multipotent stem cells; iNSCs=induced neural stem cells; DPSCs=Dental Pulp Stem Cells; MAPCs=Multipotent Adult Progenitor Cells; EPCs=endothelial progenitor cells; IV= intravenous; IA= intra-arterial

**Table S2 Information about the passage that used for stem cells**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study  (years) | animal type | number of the passage | culture medium | supplement |
| Choi2016[1] | mouse | unclear | LG-DMEM | 10%FBS |
| Jiang2018[2] | rat | 3, 4, 5 | DMEM | 10%FBS, penicillin, streptomycin |
| Zhao2020[3] | rat | 3 | LG-DMEM | 10%FBS |
| Tian2019[4] | rat | unclear | DMEM | 10%FBS, FGF, EGF, penicillin, streptomycin |
| Zhang2011 [5] | rat | unclear | non hematopoietic stem cell medium | penicillin, streptomycin |
| Inoue2013 [6] | rat | 3, 4, 5 | DMEM | antibiotic, mesenchymal cell growth supplement |
| Du2014[7] | rat | 3 | LG-DMEM | 10%FBS, antibiotic |
| Liu2009[8] | rat | 3 | DMEM | 10%FBS, antibiotic |
| Tobin2020[9] | rat | unclear | unclear | unclear |
| Zong2017[10] | rat | unclear | LG-DMEM | 10%FBS |
| He2018[11] | rat | 3 | DMEM | 15%FBS |
| Nito2018[12] | rat | 3 | DMEM | 10%FBS |
| Zhang2017[13] | rat | unclear | DMEM | 10%FBS, 5% horse serum, penicillin, streptomycin |
| Souza2017[14] | rat | unclear | unclear | unclear |
| Li2015[15] | rat | unclear | DMEM | 15%FBS |
| Son2019[16] | rat | 6, 7, 8, 9, 10, 11, 12 | LG-DMEM | 10%FBS |
| Huang2018[17] | rat | unclear | unclear | unclear |
| Zhang2018[18] | rat | 2 | DMEM | EGF, FGF, penicillin, streptomycin |
| Yang2015[19] | rat | unclear | LG-DMEM | 10%FBS |
| Liu2011[20] | rat | 3 | DMEM | 10%FBS, penicillin, streptomycin, amphotericin B |
| Zhang2006 [21] | rat | 3, 4 | α-MEM | 10%FBS, penicillin, streptomycin, amphotericin B |
| Shen2007 [22] | rat | unclear | unclear | unclear |
| Koh2008 [23] | rat | unclear | unclear | unclear |
| Lim2011[24] | rat | 5, 6, 7, 8 | α-MEM | 10%FBS |
| Bao2011[25] | rat | 5 | DMEM | 10%FBS, penicillin, EGF, PDGF |
| Ikegame2011[26] | mouse | 2 | DMEM | 10%FBS, 1% antibiotic |
| Song2011 [27] | rat | unclear | DMEM | 5%FBS, 5% horse serum, penicillin, streptomycin, EGF, FGF |
| sugiyama2011[28] | rat | unclear | EBM-2 | 10%FBS, IGF1, EGF, VEGF |
| Wang2013 [29] | rat | 1 | DMEM | 1%FBS, GF |
| Jensen2013 [30] | rat | unclear | ESM | FGF-2 |
| Cheng2015 [31] | rat | unclear | DMEM | 10%FBS, 5% horse serum, penicillin, streptomycin |
| Boltze2006 [32] | rat | unclear | unclear | unclear |
| Cho2010[33] | rat | unclear | HG-DMEM, MEM | 10%FBS |
| Mitkari2014 [34] | rat | 3 | LG-DMEM | plasma, penicillin, streptomycin |
| Lam2020[35] | rat | unclear | DMEM | 10%FBS, penicillin, streptomycin |
| Yamaguchi2018[36] | rat | unclear | normal media | FGF |
| Gutiérrez-Fernández2015[37] | rat | 3 | DMEM | 20%FBS, penicillin, streptomycin |
| Zhang2017[38] | mouse | 3, 4, 5 | DMEM | FGF, EGF |
| Lin2020[39] | rat | unclear | DMEM | 10%FBS |
| Salehi2020[40] | rat | 4, 5, 6 | α-MEM | 10%FBS, penicillin, streptomycin |
| Kong2018[41] | rat | 5 | α-MEM | 10%FBS, penicillin, streptomycin |
| Yang2018[42] | rat | unclear | DMEM | 10%FBS |
| Zhu2017[43] | rat | 3 | DMEM | 4%FBS |
| Bacigaluppi2016[44] | mouse | 15 | unclear | unclear |
| Li2018[45] | rat | 3, 4 | LG-DMEM | 11%FBS, penicillin, streptomycin |
| Sowa2018[46] | rat | 7, 8, 9 | DMEM | 10%FBS, antibiotic |
| Paudyal2020[47] | rat | unclear | DMEM | 10%FBS |
| Bi2018[48] | rat | 3 | DMEM | 15%FBS, penicillin G, streptomycin |
| Ryu2018[49] | rat | 5, 6 | DMEM | 10%FBS, penicillin, streptomycin |
| Wang2015[50] | mouse | unclear | α-MEM | 5%FBS, gentamycin |
| Yang2017[51] | rat | unclear | unclear | unclear |
| Zhang2018[52] | rat | 2 | DMEM | 10%FBS, penicillin, streptomycin |
| Moisan2016[53] | human | 2 | unclear | unclear |
| Zhao2002[54] | rat | 26 | DMEM | dexamethasone, penicillin, streptomycin |
| Kurozumi2004[55] | rat | 40 | DMEM | 10%FBS |
| Li2005[56] | rat | unclear | unclear | unclear |
| Wu2008[57] | rat | unclear | IMDM | 10%FBS, penicillin G, streptomycin |
| Andrews2008[58] | rat | unclear | unclear | unclear |
| Li2008[59] | rat | 6 | DMEM | 10%FBS |
| Liao2009 [60] | rat | 4, 5, 6 | α-MEM | 10%FBS, penicillin, streptomycin, EGF |
| Chen2009 [61] | rat | 4 | DMEM | proliferation: 4%FBS |
| Stroemer2009[62] | rat | 1 | normal media | growth factors: FGF, EGF |
| Jin2010[63] | rat | unclear | DMEM | LIF, FGF-2 |
| Shen2010 [64] | rat | 1 | DMEM | insulin |
| Jiang2011 [65] | rat | unclear | standard human embryonic stem cell culture medium | unclear |
| Tang2014 [66] | rat | 3, 4, 5, 6 | HG-DMEM | 10%FBS |
| Ma2015[67] | mouse | 5, 6 | DMEM | 10%FBS, antibiotic, EGF |
| Zhao2015 [68] | rat | 3, 4, 5 | DMEM | 10%FBS |
| Gutiérrez-Fernández2011[69] | rat | 3 | DMEM | 20%FBS, penicillin, streptomycin |
| Otero-Ortega2015[70] | rat | 3 | unclear | unclear |
| Veizovic 2001[71] | rat | unclear | unclear | unclear |
| Kamiya2008[72] | rat | 1 | unclear | unclear |
| Hicks2009 [73] | rat | 44 | DMEM | 20%FBS, penicillin, streptomycin, FGF |
| Gutiérrez-Fernández2013[74] | rat | 3 | DMEM | 20%FBS, penicillin, streptomycin |
| Huang2014 [75] | mouse | unclear | HG-DMEM | FGF, EGF, LIF |
| Eckert2015 [76] | mouse | 3 | DMEM | EGF, FGF |
| Vats2019[77] | rat | 5 | DMEM | 10%FBS |
| Lin2017[78] | rat | unclear | normal media | unclear |
| Sibov2019[79] | rat | 3 | α-MEM,  LG-DMEM | α-MEM: 15%FBS  LG-DMEM: penicillin, streptomycin, amphotericin B |
| Zuo2019[80] | rat | unclear | LG-DMEM | 10%FBS, penicillin, streptomycin |
| Yamashita2017[81] | mouse | unclear | DMEM | EGF, FGF, penicillin, streptomycin |
| Zhang2018[82] | rat | 3 | DMEM | unclear |
| Cheng2018[83] | mouse | unclear | DMEM | 10%FBS |
| Abd El Motteleb2017[84] | rat | unclear | DMEM | 10%FBS |
| Cherkashova2019[85] | rat | 5 | DMEM | 10%FBS, penicillin, streptomycin |
| Park2015[86] | rat | unclear | α-MEM | 10%FBS |
| Park2017[87] | rat | unclear | α-MEM | 10%FBS |
| Hou2016[88] | mouse | 3 | DMEM | EGF, FGF |
| Hosseini2015[89] | rat | unclear | DMEM | EGF, FGF |
| Chi2018[90] | rat | unclear | DMEM | unclear |
| Xie2019[91] | rat | 5 | DMEM | 10%FBS |
| Ryu2016[92] | rat | unclear | DMEM | 5%FBS, 5% horse serum, penicillin,  streptomycin, EGF, FGF |
| Hosseini2020[93] | rat | unclear | DMEM | 5%FBS, 10%FBS, EGF, FGF |
| Saraf2019[94] | rat | unclear | unclear | unclear |
| Oh2020[95] | rat | unclear | DMEM | 5% knock-out serum replacement, FGF |
| Vahidinia2019[96] | rat | 3, 4, 5 | DMEM  LG-DMEM | 10%FBS, penicillin, streptomycin |
| Wu2015[97] | rat | unclear | unclear | unclear |
| Leu2010[98] | rat | unclear | DMEM | 10%FBS |

Abbreviations: DMEM= dulbecco's modified eagle medium; α-MEM= a-minimum essential medium; IMDM= iscove's modified dulbecco medium; ESM= embryonic stem cell medium; LG-DMEM= low-glucose dulbecco's modified eagle's medium; HG-DMEM= high-glucose dulbecco's modified eagle's medium; EBM-2= endothelial basal medium-2; FBS= fetal bovine serum; EGF= epidermal growth factor; FGF= fibroblast growth factor; LIF= leukemia inhibitory factor; PDGF= platelet-derived growth factor; IGF1= insulin-like growth factor 1; VEGF= vascular endothelial growth factor.

**Table S3 Quality assessment of the included studies (References is on the next page)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1)  Peer reviewed publication | (2)  Control of temperature | (3)  Random allocation | (4)  Blinded assessment | (5)  Anesthetic without neuroprotective activity | (6)  Sample size calculation | (7)  Appropriate animal model | (8)  Compliance with animal welfare regulations | (9)  Statement of conflict of interests | Quality score |
| Choi2016[1] | √ | √ | √ | √ | √ | ? | √ | √ | √ | 8 |
| Jiang2018[2] | √ | √ | √ | √ | √ | ? | √ | √ | √ | 8 |
| Zhao2020[3] | √ | √ | √ | √ | √ | ? | √ | √ | √ | 8 |
| Tian2019[4] | √ | √ | √ | √ | √ | ? | √ | √ | √ | 8 |
| Zhang2011 [5] | √ | ? | √ | √ | √ | ? | √ | √ | √ | 7 |
| Inoue2013 [6] | √ | √ | √ | √ | ? | ? | √ | √ | √ | 7 |
| Du2014[7] | √ | √ | √ | √ | √ | ? | √ | √ | ? | 7 |
| Liu2009[8] | √ | √ | √ | √ | √ | ? | √ | √ | ? | 7 |
| Tobin2020[9] | √ | √ | √ | √ | ? | √ | √ | √ | ? | 7 |
| Zong2017[10] | √ | √ | √ | √ | √ | ? | √ | √ | ? | 7 |
| He2018[11] | √ | √ | √ | ? | √ | ? | √ | √ | √ | 7 |
| Nito2018[12] | √ | √ | √ | √ | ? | ? | √ | √ | √ | 7 |
| Zhang2017[13] | √ | √ | ? | √ | √ | ? | √ | √ | √ | 7 |
| Souza2017[14] | √ | √ | √ | √ | ? | ? | √ | √ | √ | 7 |
| Li2015[15] | √ | √ | √ | √ | √ | ? | √ | ? | √ | 7 |
| Son2019[16] | √ | √ | √ | √ | √ | ? | √ | √ | ? | 7 |
| Huang2018[17] | √ | √ | √ | √ | ? | ? | √ | √ | √ | 7 |
| Zhang2018[18] | √ | √ | √ | √ | √ | ? | √ | √ | ? | 7 |
| Yang2015[19] | √ | √ | √ | √ | ? | ? | √ | √ | √ | 7 |
| Liu2011[20] | √ | √ | √ | ? | √ | ? | √ | √ | √ | 7 |
| Zhang2006 [21] | √ | √ | √ | √ | ? | ? | √ | √ | ? | 6 |
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**Table S4 Study characteristics accounting for heterogeneity of neurological function scores**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| neurological function scores |  | Number of animals | number of comparisons | Effect size (95% CI) | P | P |
| Pooled estimate |  | 5200 | 141 | -3.37(-3.83, -2.90） |  |  |
| Type of ischemia | Temporary | 4497 | 121 | -3.59(-4.09, -3.09) | 0.13 | 0.057 |
| Permanent | 703 | 20 | -1.85(-3.84, 0.3) |
| recipient species | rat | 4848 | 127 | -3.55(-4.06, -3.03) | 0.22 | 0.108 |
| mouse | 352 | 14 | -1.92(-4.22, 0.39) |
| sex | Male | 4182 | 118 | -3.5(-4.00, -3.01) | 0.95 | 0.959 |
| female | 371 | 12 | -3.67(-5.90, -1.44) |
| Both | 363 | 3 | -2.48(-7.90, 2.95) |
| unclear | 262 | 8 | -3.01(-4.87, -1.16) |
| Anaesthetic | halothane | 706 | 19 | -4.64(-6.01, -3.28） | 0.23 | 0.154 |
| isoflurane | 1345 | 45 | -2.97(-3.83, -2.12） |
| ketamine | 475 | 16 | -3.86(-5.36, -2.37） |
| pentobarbital | 293 | 6 | -2.06(-3.96, -0.15） |
| chloral hydrate | 1155 | 32 | -3.66(-4.82, -2.51） |
| unclear | 917 | 17 | -3.34(-4.13, -2.54） |
| others | 309 | 6 |  |
| Donor species | mouse | 199 | 10 | -0.81(-1.48, -0.14） | 0.00001 | 0.189 |
| human | 1827 | 46 | -3.46(-4.33, -2.59） |
| rat | 2746 | 66 | -3.46(-4.13, -2.78） |
| porcine | 108 | 3 | -6.02(-7.92, -4.11） |
| Cell line | 317 | 12 | -3.98(-5.73, 2.24） |
| Stem cell | MSCs | 3020 | 81 | -3.31(-3.91, -2.71) | 0.59 | 0.76 |
| NSPCs | 1163 | 39 | -4.05(-5.73, -2.38) |
| others | 1017 | 21 | -3.51(-4.62, -2.40) |
| Cell manipulations | Gene-modification | 710 | 18 | -4.19(-6.39, -1.98） | 0.39 | 0.582 |
| none | 4490 | 123 | -3.39(-3.90, -2.87） |
| Dose range | <1\*10^5 | 60 | 4 |  | 0.09 | 0.045 |
| (1-5)\*10^5 | 1325 | 33 | -4.97(-6.72, -3.21) |
| >5\*10^5 | 3464 | 92 | -3.29(-3.85, -2.72) |
| unclear | 351 | 12 | -2.98(-4.00, -1.96) |
| Time of admin | <1d | 1184 | 39 | -1.95(-2.49, -1.41) | 0.0003 | 0.315 |
| 1-7d | 2640 | 84 | -3.60(-4.22, -2.99) |
| >7d | 541 | 16 | -3.96(-5.42,-2.51) |
| unclear | 1236 | 19 | -3.74(-5.85, -1.63) |
| Method of administration | Stereotaxic | 2510 | 62 | -3.97(-4.88, -3.07) | 0.16 | 0.83 |
| Systemic | 2719 | 81 | -3.15(-3.75, -2.55) |
| intranasal | 53 | 3 | -2.90(-3.73, -2.07) |

**Table S5 Study characteristics accounting for heterogeneity of infarct volume**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| infarct volume |  | Number of animals | number of comparisons | Effect size (95% CI) | P | P |
| Pooled estimate |  | 5200 | 141 | -11.37(-12.89, -9.85) |  |  |
| Type of ischemia | Temporary | 4497 | 121 | -11.99(-13.65, -10.33) | 0.001 | 0.243 |
| Permanent | 703 | 20 | -6.94(-9.6, -4.29) |
| species | rat | 4848 | 127 | -11.08(-12.67, -9.49) | 0.25 | 0.852 |
| mouse | 352 | 14 | -17.01(-27.01, -7.01) |
| sex | Male | 4204 | 118 | -10.96(-12.47, -9.46) | 0.00001 | 0.44 |
| female | 371 | 12 | -16.72(-27.05, -6.39) |
| Both | 363 | 3 | -12.77(-16.08, 9.46) |
| unclear | 262 | 8 | -3.31(-5.84, -0.78) |
| Anaesthetic | halothane | 706 | 19 | -11.67(-22.24, -1.10) | 0.0001 | 0.028 |
| isoflurane | 1345 | 45 | -17.09(-19.98, -14.2) |
| ketamine | 475 | 16 | -4.98(-9.05, -0.92) |
| pentobarbital | 293 | 6 | -14.16(-32.1, 3.78) |
| chloral hydrate | 1155 | 32 | -8.05(-10.31, 5.79) |
| unclear | 917 | 17 | -9.39(-11.35, -7.44) |
| others | 309 | 6 | -12.82(-22.75, -2.90) |
| Donor species | mouse | 199 | 10 | -15.94(-24.92, -6.96) | 0.36 | 0.097 |
| human | 1827 | 46 | -12.48(-16.4, -8.55) |
| rat | 2746 | 66 | -10.79(-12.60, -8.97) |
| porcine | 108 | 3 |  |
| Cell line | 317 | 12 | -8.13(-12.72, -3.54) |
| Stem cell | MSCs | 3020 | 81 | -10.81(-12.72, -8.9) | 0.47 | 0.623 |
| NSPCs | 1163 | 39 | -10.59(-14.12, -7.05) |
| others | 1017 | 21 | -13.50(-17.50, -9.50) |
| Cell manipulations | Gene-modification | 710 | 18 | -13.29(-20.09, -6.48） | 0.55 | 0.844 |
| none | 4490 | 123 | -11.27(-13.01, -9.53） |
| Dose range | <1\*10^5 | 60 | 4 | -10.00(-12.95, -7.05) | 0.54 | 0.886 |
| (1-5)\*10^5 | 1325 | 33 | -12.42(-14.65, -10.19) |
| >5\*10^5 | 3464 | 92 | -10.64(-12.62, -8.66) |
| unclear | 351 | 12 | -13.61(-27.25, 0.02) |
| Time of admin | <1d | 1184 | 39 | -14.74(-18.27, -11.21) | 0.03 | 0.024 |
| 1-7d | 2640 | 84 | -10.39(-12.41, -8.38) |
| >7d | 541 | 16 | -8.74(-11.56, -5.92) |
| unclear | 1236 | 19 | -7.74(-11.43, -4.05) |
| Method of administration | Stereotaxic | 2510 | 62 | -9.85(-11.89, -7.82) | 0.00001 | 0.923 |
| Systemic | 2719 | 81 | -12.58(-15.36, -9.81) |
| intranasal | 53 | 3 | -2.17(-3.87, -0.47) |