Supplementary Table 1 ***In vitro*** **neurogenesis (including neural differentiation, cell reprogramming and transdifferentiation) on 2D platforms**

Initial cell population	**Target cell type**	**Transcription factors**	**Small molecules**	**Soluble factors (including neurotrophic factors, growth factors, *etc.*)**	**Time**	**Conversion efficiency (%)**	**Neuronal subtypes (%)**	**Ref.**
Mouse embryonic fibroblasts (MEFs)/mouse postnatal	Functional neurons	Ascl1, Myt1l, Brn2	/	EGF, bFGF	Approximately 8D-13D	Approximately 20%	Glutamatergic, GABAergic, excitatory cortical neurons (Tbr+: 53%)	[1]

tail-tip fibroblasts								
Human embryonic fibroblasts/ human fetal lung fibroblast cells	Dopaminergic neurons	Ascl1, Myt1l, Brn2, Foxa2, Lmx1a	/	/	Approximately 28D	Dopaminergic (Approximately 5%/Approximately 20%)		[2]
Mouse tail tip fibroblasts	Midbrain dopaminergic neurons	Ascl1, Pitx3, Lmx1a, Nurr1, Foxa2, EN1	/	FGF-8, Shh	Approximately 18D	9.10%	Dopaminergic	[3]
Human fibroblasts	Neurons	NeuroD2, miR-9/9*, miR-124/NeuroD2,	VPA, db-cAMP	BDNF, NT-3, bFGF	Approximately 30D	Approximately 50%/Approximately 80%	Glutamatergic, GABAergic	[4]

		ASCL1, MYT1l, miR-9/9*, miR-124						
Human fibroblasts	Neurons	/	VPA, CHIR99021, Repsox, forskolin, SP600125, G06983, Y-27632, dorsomorphin, cAMP	BDNF, GDNF, NT-3, bFGF	Approximately 14D	Approximately 20%	Glutamatergic (> 80%), GABAergic (Approximately 5%)	[5]
MEFs	Neuronal cells	/	Forskolin, ISX-9, CHIR99021, I-BET151	bFGF, BDNF, GDNF	Approximately 16D-20D	> 90%	Glutamatergic, GABAergic	[6]

Human fetal fibroblasts/ human postnatal fibroblasts	Neuronal cells	Ascl1, Myt1l, Brn2, NeuroD1	/	BDNF, GDNF, NT-3, CNTF	Approximately 3W-4W	2%-4%	Glutamatergic (~70%)	[7]
Human postnatal fibroblasts	Induced neurons	Ascl1, Ngn2	SB431542, CHIR99021	Noggin, BDNF, GDNF, NT-3	Approximately 23D	> 80%	Glutamatergic (35%), GABAergic (20%), serotonergic (5%)	[8]
Human adult astrocytes	Neuronal cells	/	VPA, CHIR99021, Repsox, forskolin, I-Bet151, ISX-9	BDNF, GDNF, IGF	Approximately 12D	Approximately 8%	Glutamatergic (70%), cholinergic (7%)	[9]
Human fetal lung fibroblasts	Cholinergic neurons	Ngn2	Forskolin, dorsomorphin	BDNF, GDNF, NT-3,	Approximately 14D	> 90%	Cholinergic (>90%)	[10]

				bFGF				
MEFs	Dopaminergic neurons	Ascl1, Nurr1, Lmx1a	/	/	Approximately 16D	Approximately 20%	Dopaminergic (85 ± 4%)	[11]
Postnatal human fibroblasts/adult human fibroblasts	Neurons	MiR-124, Myt1l, Brn2	Forskolin	Noggin, BDNF, GDNF, bFGF	Approximately 15D	Approximately 50%/1.5%-11.2%	Glutamatergic (44%/28%)	[12]
Human pluripotent stem cells (hPSCs)	Forebrain GABA interneurons	/	cAMP, compound E, purmorphamine/Shh	BDNF, GDNF, IGF-1	Approximately 25D	> 90%	GABAergic (> 90%): CB (Approximately 25%); SST (Approximately 15%); PV (Approximately 15%); nNOS (< 1%)	[13]
Mouse	Induced	Ascl1, Myt1l,	/	-	Approxim	> 5%	Glutamatergic	[14]

hepatocytes	neurons	Brn2			ately 14D		(35/200 = 17.5%)	
Human embryonic stem cells (hESCs)	Forebrain GABAergic neurons	Ascl1 (five serine residues are substituted with alanine), Dlx2, LHX6, miR-124	/	BDNF, GDNF, NT-3, IGF-1	Approximately 35D	> 90%	GABAergic (84.5 ± 3.5%)	[15]
Human astrocytes	Neurons	/	LDN193189, SB431542, TTNPB, TZV, CHIR99021, VPA, DAPT, SAG, purmorphamine	BDNF, IGF-1, NT-3	Approximately 8D	Approximately 65%	Glutamatergic (88.3 ± 4%), GABAergic (8.2% ± 1.5%)	[16]

MEFs	Induced neurons	Ascl1	/	BDNF, GDNF	Approximately 21D	Glutamatergic (Approximately 40%)		[17]
MEFs	Spinal motor neurons	Ascl1, Brn2, Myt1l, Lhx3, Hb9, Isl1, Ngn2	/	CNTF, BDNF, GDNF	Approximately 10D	Cholinergic (5%-10%, Hb9: GFP+/total MEFs transduced)		[18]
MEFs	GABAergic neurons	Ascl1, Foxg1, Sox2, Dlx5, Lhx6	/	/	Approximately 21D	Approximately 18%	GABAergic (> 80%): GAD+ (Approximately 90%), GABA+ (Approximately 90%), PV (Approximately 90%)	[19]
hESCs	Cortical interneuron	/	XAV939, LDN193189, SB431542	Shh, BDNF, FGF-2	Approximately 18D	> 80%	GABAergic, cholinergic	[20]

hESCs/hPSCs	Neurons	Ngn2	/	BDNF, NT-3	Approximately 21D	> 90%	Glutamatergic	[21]
hESCs	Neural progenitors/neurons	/	SB431542, AA, CHIR99021, db-cAMP/DAPT, Y-27632	Noggin, BDNF, GDNF, Shh	Approximately 21D	> 80%	Dopaminergic	[22]
hPSCs	GABAergic neurons	Ascl1, Dlx2	/	BDNF	≥ 5W	93.2 ± 3.4% (Ascl1, Dlx2, Myt1l-induced cells)	GABAergic (Approximately 90%)	[23]
hESCs	Neural cells	/	SB431542, cAMP, AA/RA, AA	Noggin, BDNF, Shh, FGF-8, GDNF, TGF-β3/BDNF, Shh	Approximately 11D	>80%	Dopaminergic/motoneurons	[24]

hESCs	Dopamine neurons	/	SB431542, LDN193189, CHIR99021, purmorphamine, DAPT, cAMP, AA	Shh, FGF-8, BDNF, GDNF, TGF-β3	Approximately 25D	Approximately 75% (TH+/total cells)	Dopaminergic (Approximately 20%, TH+/FoxA2+)	[25]
hESCs	Cortical pyramidal neurons	/	Y-27632	Noggin	Approximately 44D	Glutamatergic (~60%)		[26]
Mouse postnatal astroglia from the cerebral cortex	Functional neurons	Ngn2/Dlx2	/	BDNF	Approximately 10D	70.2% ± 6.3%/35.9% ± 13.0%	Glutamatergic/GABAergic	[27]
Human adult cortex	Neuronal cells	Sox2, Ascl1	/	/	Approximately	48% ± 9%	GABAergic	[28]

pericytes					5-6W		
Human fetal astrocytes	Neurons	/	DAPT, CHIR99021, SB431542, LDN193189, Y-27632, AA	BDNF, NT-3, IGF-1	Approximately 14D	Glutamatergic (78%), GABAergic (2%), dopaminergic (1%)	[29]
Human newborn foreskin fibroblasts	Neurons	/	CHIR99021, LDN193189, A83-01, RG108, dorsomorphin, forskolin, Y27632, DAPT, purmorphamine, ISX9, P7C3-A20,	BDNF, GDNF, NT-3, IGF-1	Approximately 14D	82.1% ± 1.6% Glutamatergic (89.1% ± 0.9%), GABAergic (≤ 8%)	[30]

			PD0325901				
hNPCs	Nociceptive sensory neurons	/	CHIR99021, LDN193189, SB431542, DAPT, SU5402, Y-27632	FGF-2, NGF, BDNF, GDNF	Approximately 10D	75%	Nociceptors (> 60%)	[31]
hNPCs	CNS cortical neurons	/	LDN193189, SB431542, DAPT, SU5402, PD0235901, XAV939, Y-27632, db-cAMP, AA	BDNF	Approximately 13D	Approximately 70%	Cortical neurons (> 50%)	[32]

The calculation methods for conversion efficiency are different in different articles (the main difference is whether the cell survival rate is considered). The references should be consulted for more detail. "Neuronal subtypes" represent the ratio of neurons with specific subtypes to the converted neurons; if the data are not shown, then they were not mentioned in the article. If "conversion efficiency" and "neuronal subtypes" are merged into one table cell, then the data show the proportion of the specific neurons with specific subtypes induced from the initial cell types. AA: Ascorbic acid; BDNF: Brain-derived neurotrophic factor; bFGF: Basic fibroblast growth factor; cAMP: Cyclic AMP; CNTF: Ciliary neurotrophic factor; db-cAMP: Dibutyryl cAMP; EGF: Epidermal growth factor; GDNF: Glial cell line-derived neurotrophic factor; IGF: Insulin-like growth factor; NGF: Nerve growth factor; NT-3: Neurotrophin-3; RA: Retinoic acid; Shh: Sonic hedgehog; TGF-β3: Transforming growth factor b3; TZV: Thiazovivin; VPA: Valproic acid; /: None; conversion efficiency: The ratio of the target cell types to the initial cell types.

Supplementary Table 2 Small molecules applied in neural lineage induction

Compound	Mechanism of Action	Application	Ref.
SB431542	TGF-β1/ALK4/ALK5/ALK7 inhibitor	Inhibits TGF-β signaling and induces neuroepithelial identity and facilitates cell reprogramming	[8,24]
LDN193189	Inhibits BMP type1 receptors ALK2/ALK3	Inhibits BMP signaling and induces neuroepithelial identity (to replace noggin)	[20,29]
Dorsomorphin/compound C	Inhibits BMP type1 receptors ALK2/ALK3/ALK6	Suppresses BMP-mediated SMAD activation by blocking BMP type I receptor function	[10]
CHIR99021/CT99021	GSK3b inhibitor	Activates Wnt signaling and induces neural crest identity; promotes neuronal differentiation, including axonal outgrowth and synapse formation; facilitates D-V pattering	[22,25,31]

XAV939	A potent tankyrase inhibitor that targets Wnt/b-catenin signaling	Inhibits Wnt signaling and induces CNS lineages	[20,32]
Forskolin	cAMP activator	Activates cAMP/PKA-CREB signaling to promote neural survival, proliferation and differentiation	[10,12]
Dibutyryl-cAMP	PKA activator	Activates cAMP/PKA-CREB signaling to promote neural survival, proliferation and differentiation	[22,32]
Purmorphamine	A Smoothened receptor agonist	Activates shh signaling and leads to A-P pattering	[13,25]
SAG	Potent Smoothened receptor agonist	Activates shh signaling and leads to A-P pattering	[16]
ISX9	Mediates NeuroD reporter gene induction via activation of $Ca2^{+}$ influx	Induces neural induction by increasing the expression of transcription factor NeuroD1	[6]
Y27632	ROCK1 inhibitor	Improves cell viability	[26]

Thiazovivin	ROCK inhibitor	Enhances stemness maintenance of ESCs and cell reprogramming efficiency	[16]
PD0235901	A selective and cell-permeable MEK inhibitor	Suppresses neural proliferation and facilitates neural differentiation	[31,32]
SU5402	VEGFR2/FGFR/PDGFR/ EGFR inhibitor	Suppresses neural proliferation and facilitates neural differentiation	[31,32]
DAPT	A potent g-secretase inhibitor that blocks Notch signaling	Suppresses neural proliferation and facilitates neural differentiation	[31,32]
Compound E	A potent g-secretase inhibitor that blocks Notch signaling	Suppresses neural proliferation and facilitates neural differentiation	[13]
Repsox	TGFbR-1/ALK5 inhibitor	Improves cell reprogramming efficiency by replacing the transcription factor Sox2	[5,9]
I-BET151	A BET bromodomain inhibitor that inhibits	Promotes cell reprogramming and	[9]

	BRD4, BRD2, and BRD3	disrupts the gene expression program of initial cells	
TTNPB	RA analog and the nuclear receptor RAR agonist	Promotes cell reprogramming	[16]
RA/all-trans-RA	Natural agonist of RAR nuclear receptors; binds to PPARb/d	Spinal cord patterning	[33,34]
Valproic acid	Histone deacetylase inhibitor	Promotes cell reprogramming	[4,5]
Ascorbic acid/vitamin C	An endogenous antioxidant agent	Plays a role in neuronal differentiation and maturation	[22,24,29]
RG108	DNA methyltransferases inhibitor	Promotes cell reprogramming	[30]

ALK: Activin receptor-like kinase; BET: Bromodomain and extraterminal domain; BRD: Bromodomain-containing protein; BMP: Bone morphogenetic protein; cAMP: Cyclic-AMP; CNS: Central neural system; CREB: cAMP-responsive element binding; EGF: Epidermal growth factor; FGFR: Basic fibroblast growth factor receptor; GSK3b: Glycogen synthase kinase 3b; MEK: Mitogen-activated extracellular activated signal-regulated kinase; PKA: Protein kinase A; PDGFR: Platelet-derived growth factor receptor; PPAR: Peroxisome proliferator activated receptor; RA: Retinoic acid; RAR: Retinoic acid receptor; ROCK: Rho-associated coiled-coil containing kinases; Shh: Sonic hedgehog; TGF-β1: Transforming growth factor b1; VEGFR: Vascular endothelial growth factor receptor.

Supplementary Table 3 ***In vitro*** **3D neural differentiation and subsequent application**

Cell Type	Biomaterials	Application	Ref.
Human neural progenitor cells (hNPCs)	Matrigel	Disease Modeling (AD)	[35]
hNPCs	Matrigel	Disease Modeling (AD)	[36]
hNPCs	Matrigel	Disease Modeling (AD)	[37]
Rat neural stem cells (NSCs)	Collagen Ⅰ	NSC growth and differentiation	[38]
Neural stem/progenitor cells	Rat-tail collagen-based nerve conduits with anchored bFGF	Tissue engineering (repair of facial nerve injuries, connected 8-mm facial nerve defects in rats)	[39]
Neural stem and progenitor cells isolated from embryonic rat cortical or subcortical neuroepithelium	Collagen Ⅰ	Neural differentiation into functional neuronal circuits	[40]
Rat primary neural precursor cell	Collagen Ⅰ	Investigation of the proliferation and differentiation of NPCs	[41]

expansion, differentiation			
Mouse embryonic stem cells (mESCs)	Nunc Lab-Tek II tissue-grade polystyrene chamber slides were coated with either type-I collagen (collagen-1), gelatin, laminin, poly-d-lysine (PDL) or fibronectin; collagen-1, Matrigel, gelatin, hyaluronic acid and a synthetic peptide-RAD16-II seeded in the same slides	Evaluation of the role of ECM proteins on mESC differentiation into neural and glial lineages in vitro	[42]
Mouse embryonic, postnatal, and adult neural stem/progenitor cells	Collagen - hyaluronan	Survival, proliferation, and differentiation into neurons	[43]

Rat NPCs	Collagen-cetuximab, an EGFR antagonist	Tissue engineering (spinal cord injury)	[44]
Rat NPCs	Sodium hyaluronate collagen scaffold loaded with bFGF	Tissue engineering (traumatic brain injury)	[45]
Rat NPCs	A collagen microchannel scaffold carrying paclitaxel-liposomes	Tissue engineering (spinal cord injury repair)	[46]
Rat NPCs	RADA16-IKVAV (AcN-RADARADARADARADAIKVAV-CONH2) (purity > 85%)	Tissue engineering (traumatic brain injury)	[47]
Rat NPCs/NSCs	RADA16-RGD (Ac-(RADA)4-DGDRGDS) and RADA16-IKVAV (Ac-(RADA)4-RIKVAV)	Tissue engineering (sciatic nerve defect, intracerebral hemorrhage, and spinal cord transection)	[48]

Rat neural stem/progenitor cells	PuraMatrix	Tissue engineering (brain injury)	[49]
Human fetal NPCs	Laminin 1-functionalized PuraMatrix	Survival and neuronal differentiation of hNPCs	[50]
Neonatal mouse cerebellum C17.2 stem cells	Poly (L-lactic acid) (PLLA) nano/micro fibrous scaffolds	NSC differentiation and neurite outgrowth	[51]
Neonatal mouse cerebellum C17.2 stem cells	PLLA nanofibrous scaffold	NSC differentiation and neurite outgrowth	[52]
Human SH-SY5Y neuroblastoma cells; rat embryonic cortical neurons	Electrically polarized PLLA aligned nanofibers	NSC differentiation and neurite outgrowth	[53]
Rat NSCs	PEG-RGD-TnC	Survival, growth and differentiation of NSCs	[54]
mNSCs (fetal midbrain-derived)	Star-PEG-heparin hydrogel	Tissue engineering (PD)	[55]
Human	PEG hydrogels	hNSC neurite extension and	[56]

induced pluripotent stem cells (iPSCs) derived human NSCs (hNSCs)		neural differentiation	
mESCs	Poly (lactic - co - glycolic acid) (PLGA) scaffolds	Neural differentiation	[57]
Rat NSCs and Schwann cells	PLGA polymer scaffold	Tissue engineering (transection spinal cord injury)	[58]
hNSCs	Polypyrrole (PPy)	Neural differentiation	[59]
Rat pheochromocytoma (PC12) cells	PPy/SWCNT films	Improvement of the electrode–neural tissue interface	[60]
Rat PC12 cells	PPy/PDLLA conduit	Tissue engineering (rat sciatic nerve defect)	[61]
Mouse embryonic NSCs	Single-walled carbon nanotube (SWCNT)−polyelectrolyte multilayer thin films	Neural differentiation	[62]
Rat embryonic	Chondroitin	Neuron-enriched network	[63]

NPCs	sulfate/MWCNT scaffold	formation	
Rat Schwann cells	Collagen I-Matrigel composite scaffolds	Cell survival and morphology	[64]
Neuronal and glial cells from rat cerebral cortices	PLGA/MWCNTs nanofibrous scaffolds	Cell survival and proliferation	[65]
iNSCs derived from mouse embryonic fibroblasts (MEFs)	PLGA-PEG scaffolds	Tissue engineering (spinal cord injury, SCI)	[66]
PC12 cells	Lysine-doped PPy/RSSP/PLLA/NGF	Tissue engineering (nerve transection)	[67]
Rat Schwann cells	Erythropoietin controlled-releasing PLA/MWCNTs/gelatin nanofibrils	Tissue engineering (sciatic nerve defect)	[68]

AD: Alzheimer's disease; bFGF: Basic fibroblast growth factor; EGFR: Epidermal growth factor receptor; ESC: Embryonic stem cell; iPSC: Induced pluripotent stem cell; MEF: Mouse embryonic fibroblast; MWCNT: Multiwalled carbon nanotube; NGF: Nerve growth factor; NPC: Neural progenitor cell; NSC: Neural stem cell; PD: Parkinson's disease; PDL:

Poly-D-lysine; PDLLA, poly (D, L-lactic acid); PEG: Poly (ethylene glycol); PLA: Poly (lactic acid); PLGA: Poly (lactic-co-glycolic acid); PLLA: Poly (L-lactic acid); PPy: Polypyrrole; RSSP: Regenerated spider silk protein; SWCNT: Single-walled carbon nanotube; TnC: tenascin-R.

Supplementary Table 4 Microarray-based screening in 2D or 3D platforms

2D/3D	Substrate	Intermediates/3D gels	Extracellular signals	Spots	Patterning methods	Cell type	Demonstration	Reference
2D	Epoxy-coated glass slides	Dip-coated in 4 vol% pHEMA	25 different acrylate, diacrylate, dimethacrylate and triacrylate monomers	1728	The larger format CMP9B or CMP6B pins with a Pixsys 5500 robot	Human ESCs (hESCs)	hESC growth and differentiation	[69]
2D	Epoxy-coated glass slides	4 v/w % pHEMA	Acrylate polymers (16 major monomers were mixed pairwise with 6 minor monomers in the following ratios: 100/0, 90/10, 85/15, 80/20, 75/25 and 70/30)	1728	A robotic pin printer	Human embryoid body (hEB) cells	hEB cell adhesion	[70]

2D	Glass slides	3-(trimethoxysilyl)-propyl methacrylate; polyacrylamide gel	32 different combinations of five ECM molecules (collagen I, collagen III, collagen IV, laminin and fibronectin)	256	SpotArray 24 equipped with Stealth SMP 3.0 split pins	Mouse ESC (mESCs), primary rat hepatocytes	Maintenance of primary rat hepatocyte phenotype, differentiation of mESCs toward an early hepatic fate	[71]
2D	4-well plates	PEG hydrogels	ECM proteins and Notch signaling proteins	2016	A robotic spotter equipped with an 8-pin head	Mouse NSCs (mNSCs)	The roles of integrin and Notch signaling in NSC fate and niche-dependent NSC	[72]

							regulation	
2D	Glass slides	Aldehyde-derivatized slides	44 signaling combinations containing ECM components and putative signaling factors that promote neurogenesis and gliogenesis and prevent or elevate both	352	Noncontact arrayer for printing	Primary human NPCs (hNPCs)	Neural specification and differentiation	[73]
2D	Microscope slides	NaOH etching, methacrylate silanization, glutaraldehyde activatio	ECM proteins, growth factors, small molecules and glycans	6400	SpotArray 24 with TeleChem SMP3 pins spaced 9 mm apart to print the arrayed cellular microenviron	hPSCs	Cell attachment, growth and proliferation	[74]

		n, and fabrication of polyacrylamide gel pads on slides			ment slides			
2D	Agarose-coated glass slides	2% Agarose	190 combinations of 10 ECM proteins	1140	Microcontact printed arrays	Long-term neuroepithelial stem cells (Lt-NES)	Neural differentiation toward TH^{+} neurons	[75]
3D	PDMS membrane with hollowed array	Chitosan solution	32 protein combinations of 5 ECM and cell–cell contact-mediating proteins, including human fibronectin, vitronectin,	96	Pipettes	Bone marrow-derived mesenchymal stem cells	Cell adhesion, proliferation and osteogenic	[76]

			type I collagen, amelogenin and E-cadherin			(BMSCs)	differentiation	
3D	Poly (styrene-co-maleic anhydride) (PS–MA) treated glass slides	Alginate	/	200 or 400	MicroSys™ 5100-4SQ noncontact microarrayer	mESCs	Cell proliferation and neural differentiation	[77]
3D	Four-well cell culture plate	PEG hydrogels	Combinations of ECM proteins with growth factors and signaling factors; stiffness could be adjusted by hydrogels with shear moduli of ~1–50 kPa	2016	A DNA spotter with solid pins was used to spot different protein solutions on micropillars of a	Human MSCs (hMSCs), mNSCs	MSC differentiation and self-renewal of NSCs	[78]

					microfabricated silicon stamp, which were pressed against a thin layer of PEG hydrogel			
3D	1536-well plates/glass slides	PEG gels	Combinations of ECM proteins, cell–cell interaction proteins, soluble factors, different matrix mechanical properties, and matrix mechanical properties	1024	Nanolitre-range liquid handling robot equipped with small-volume dispensing tips	mESCs	Colony formation and self-renewal	[79]
3D	Standard cell culture dishes and multiwell plates	Polystyrene or poly-L-l	/	96 or 384	Liquid handling robots	Human NSCs (hNSCs)	Cellular growth profile,	[80]

		actic acid (PLLA)					morphology, cell-matrix interaction, gene expression and voltage gated calcium channel function	
3D	PS–MA treated glass slides	Alginate	/	384	MicrosSys 5100-4SQ microcontact microarray spotter	hNP cell line ReNcell VM	Cell viability for toxicity	[81]
3D	3-(trimethoxysilyl) propyl	Methacrylated	Combinations of ECM proteins and BMPs	288	SpotBot 3 contact	hMSCs	Osteogenic differentiatio	[82]

	methacrylate treated glass slides	gelatin			microarrayer with four pinheads		n	
3D	Poly (maleic anhydride alt-1-octadecene)-coated micropillar chips	Alginate and growth factor reduced Matrigel	/	NM	S+ Microarrayer	hNP cell line ReNcell VM	Cell viability and high-throughput assessment of lineage-specific differentiation	[83]
3D	Polystyrene microchips with micropillars or microwells	Matrigel	24-compound library consisting of approved drugs, heavy metals, and pesticides	532	MicroSys 5100-4SQ noncontact robotic	hNP cell line ReNcell VM	Cell viability and proliferation for toxicity	[84]

					microarray spotting system			
3D	PS-MA-treated glass slide	Collagen or alginate gels	27 compounds for hepatotoxicity assessment	1080	MicroSys 5100-4SQ microarray spotter equipped with an extended head	MCF7 or Hep3B cells	Cell viability for toxicity	[85]
3D	Polydopamine-coated polystyrene chips	Matrigel	Combinations of 12 soluble differentiation factors	532	MicroSys 5100-4SQ noncontact robotic microarray spotting system	hNP cell line ReNcell VM	hNPC differentiation	[86]

EB: Embryoid body; ECM: Extracellular matrix; ESC: Embryonic stem cell; MSC: Mesenchymal stem cell; NM: Not mentioned; NPC: Neural progenitor cell; NSC: Neural stem cell; PDMS: Poly(dimethylsiloxane); PEG: Poly(ethylene glycol); PLLA: Poly(L-lactic acid); pHEMA, poly(hydroxyethyl methacrylate); PS-MA: Poly(styrene-co-maleic anhydride).

277 **Ladewig J**, Mertens J, Kesavan J, Doerr J, Poppe D, Glaue F, Herms S, Wernet P, Kögler G, Müller FJ, Koch P, Brüstle O. Small molecules enable highly efficient neuronal conversion of human fibroblasts. *Nat Methods* 2012; **9**: 575-578 [PMID: 22484851 DOI: 10.1038/nmeth.1972]

278 **Liu ML**, Zang T, Zou Y, Chang JC, Gibson JR, Huber KM, Zhang CL. Small molecules enable neurogenin 2 to efficiently convert human fibroblasts into cholinergic neurons. *Nat Commun* 2013; **4**: 2183 [PMID: 23873306 DOI: 10.1038/ncomms3183]

279 **Ambasudhan R**, Talantova M, Coleman R, Yuan X, Zhu S, Lipton SA, Ding S. Direct reprogramming of adult human fibroblasts to functional neurons under defined conditions. *Cell Stem Cell* 2011; **9**: 113-118 [PMID: 21802386 DOI: 10.1016/j.stem.2011.07.002]

280 **Chanda S**, Ang CE, Davila J, Pak C, Mall M, Lee QY, Ahlenius H, Jung SW, Südhof TC, Wernig M. Generation of induced neuronal cells by the single reprogramming factor ASCL1. *Stem Cell Reports* 2014; **3**: 282-296 [PMID: 25254342 DOI: 10.1016/j.stemcr.2014.05.020]

281 **Espuny-Camacho I**, Michelsen KA, Gall D, Linaro D, Hasche A, Bonnefont J, Bali C, Orduz D, Bilheu A, Herpoel A, Lambert N, Gaspard N, Péron S, Schiffmann SN, Giugliano M, Gaillard A, Vanderhaeghen P. Pyramidal neurons derived from human pluripotent stem cells integrate efficiently into mouse brain circuits in vivo. *Neuron* 2013; **77**: 440-456 [PMID: 23395372 DOI: 10.1016/j.neuron.2012.12.011]

282 **Karow M**, Sánchez R, Schichor C, Masserdotti G, Ortega F, Heinrich C, Gascón S, Khan MA, Lie DC, Dellavalle A, Cossu G, Goldbrunner R, Götz M, Berninger B. Reprogramming of pericyte-derived cells of the adult human brain into induced neuronal cells. *Cell Stem Cell* 2012; **11**: 471-476 [PMID: 23040476 DOI: 10.1016/j.stem.2012.07.007]

283 **Yin JC**, Zhang L, Ma NX, Wang Y, Lee G, Hou XY, Lei ZF, Zhang FY, Dong FP, Wu GY, Chen G. Chemical Conversion of Human Fetal Astrocytes into Neurons through Modulation of Multiple Signaling Pathways. *Stem Cell Reports* 2019; **12**: 488-501 [PMID: 30745031 DOI: 10.1016/j.stemcr.2019.01.003]

284 **Wichterle H**, Lieberam I, Porter JA, Jessell TM. Directed differentiation of embryonic stem cells into motor neurons. *Cell* 2002; **110**: 385-397 [PMID: 12176325 DOI: 10.1016/s0092-8674(02)00835-8]

285 **Ma F**, Zhu T, Xu F, Wang Z, Zheng Y, Tang Q, Chen L, Shen Y, Zhu J. Neural stem/progenitor cells on collagen with anchored basic fibroblast growth factor as potential natural nerve conduits for facial nerve regeneration. *Acta Biomater* 2017; **50**: 188-197 [PMID: 27940160 DOI: 10.1016/j.actbio.2016.11.064]

286 **Li X**, Xiao Z, Han J, Chen L, Xiao H, Ma F, Hou X, Li X, Sun J, Ding W, Zhao Y, Chen B, Dai J. Promotion of neuronal differentiation of neural progenitor cells by using EGFR antibody functionalized collagen scaffolds for spinal cord injury repair. *Biomaterials* 2013; **34**: 5107-5116 [PMID: 23591390 DOI: 10.1016/j.biomaterials.2013.03.062]

287 **Aligholi H**, Rezayat SM, Azari H, Ejtemaei Mehr S, Akbari M, Modarres Mousavi SM, Attari F, Alipour F, Hassanzadeh G, Gorji A. Preparing neural stem/progenitor cells in PuraMatrix hydrogel for transplantation after brain injury in rats: A comparative methodological study. *Brain Res* 2016; **1642**: 197-208 [PMID: 27038753 DOI: 10.1016/j.brainres.2016.03.043]

288 **Ortinau S**, Schmich J, Block S, Liedmann A, Jonas L, Weiss DG, Helm CA, Rolfs A, Frech MJ. Effect of 3D-scaffold formation on differentiation and survival in human neural progenitor cells. *Biomed Eng Online* 2010; **9**: 70 [PMID: 21070668 DOI: 10.1186/1475-925X-9-70]

289 **Yang F**, Murugan R, Ramakrishna S, Wang X, Ma YX, Wang S. Fabrication of nano-structured porous PLLA scaffold intended for nerve tissue engineering. *Biomaterials* 2004; **25**: 1891-1900 [PMID: 14738853 DOI: 10.1016/j.biomaterials.2003.08.062]

290 **Lv ZJ**, Liu Y, Miao H, Leng ZQ, Guo JH, Liu J. Effects of multiwalled carbon nanotubes on electrospun poly(lactide-co-glycolide)-based nanocomposite scaffolds on neural cells proliferation. *J Biomed Mater Res B Appl Biomater* 2017; **105**: 934-943 [PMID: 26849161 DOI: 10.1002/jbm.b.33620]

291 **Liu C**, Huang Y, Pang M, Yang Y, Li S, Liu L, Shu T, Zhou W, Wang X, Rong L, Liu B. Tissue-engineered regeneration of completely transected spinal cord using induced neural stem cells and gelatin-electrospun poly (lactide-co-glycolide)/polyethylene glycol scaffolds. *PLoS One* 2015; **10**: e0117709 [PMID: 25803031 DOI: 10.1371/journal.pone.0117709]

292 **Zhang H**, Wang K, Xing Y, Yu Q. Lysine-doped polypyrrole/spider silk protein/poly(l-lactic) acid containing nerve growth factor composite fibers for neural application. *Mater Sci Eng C Mater Biol Appl* 2015; **56**: 564-573 [PMID: 26249628 DOI: 10.1016/j.msec.2015.06.024]

293 **Salehi M**, Naseri-Nosar M, Ebrahimi-Barough S, Nourani M, Khojasteh A, Hamidieh AA, Amani A, Farzamfar S, Ai J. Sciatic nerve regeneration by transplantation of Schwann cells *via* erythropoietin controlled-releasing polylactic acid/multiwalled carbon

nanotubes/gelatin nanofibrils neural guidance conduit. *J Biomed Mater Res B Appl Biomater* 2018; **106**: 1463-1476 [PMID: 28675568 DOI: 10.1002/jbm.b.33952]

294 **Yang J**, Mei Y, Hook AL, Taylor M, Urquhart AJ, Bogatyrev SR, Langer R, Anderson DG, Davies MC, Alexander MR. Polymer surface functionalities that control human embryoid body cell adhesion revealed by high throughput surface characterization of combinatorial material microarrays. *Biomaterials* 2010; **31**: 8827-8838 [PMID: 20832108 DOI: 10.1016/j.biomaterials.2010.08.028]

295 **Flaim CJ**, Chien S, Bhatia SN. An extracellular matrix microarray for probing cellular differentiation. *Nat Methods* 2005; **2**: 119-125 [PMID: 15782209 DOI: 10.1038/nmeth736]

296 **Roccio M**, Gobaa S, Lutolf MP. High-throughput clonal analysis of neural stem cells in microarrayed artificial niches. *Integr Biol (Camb)* 2012; **4**: 391-400 [PMID: 22307554 DOI: 10.1039/c2ib00070a]

297 **Lopes D**, Fernandes C, Nóbrega JM, Patrício SG, Oliveira MB, Mano JF. Screening of perfused combinatorial 3D microenvironments for cell culture. *Acta Biomater* 2019; **96**: 222-236 [PMID: 31255663 DOI: 10.1016/j.actbio.2019.06.047]

298 **Cheng K**, Lai Y, Kisaalita WS. Three-dimensional polymer scaffolds for high throughput cell-based assay systems. *Biomaterials* 2008; **29**: 2802-2812 [PMID: 18405966 DOI: 10.1016/j.biomaterials.2008.03.015]

299 **Meli L**, Barbosa HS, Hickey AM, Gasimli L, Nierode G, Diogo MM, Linhardt RJ, Cabral JM, Dordick JS. Three dimensional cellular microarray platform for human neural stem cell differentiation and toxicology. *Stem Cell Res* 2014; **13**: 36-47 [PMID: 24816401 DOI: 10.1016/j.scr.2014.04.004]

300 **Dolatshahi-Pirouz A**, Nikkhah M, Gaharwar AK, Hashmi B, Guermani E, Aliabadi H, Camci-Unal G, Ferrante T, Foss M, Ingber DE, Khademhosseini A. A combinatorial cell-laden gel microarray for inducing osteogenic differentiation of human mesenchymal stem cells. *Sci Rep* 2014; **4**: 3896 [PMID: 24473466 DOI: 10.1038/srep03896]
301 **Lee MY**, Kumar RA, Sukumaran SM, Hogg MG, Clark DS, Dordick JS. Three-dimensional cellular microarray for high-throughput toxicology assays. *Proc Natl Acad Sci U S A* 2008; **105**: 59-63 [PMID: 18160535 DOI: 10.1073/pnas.0708756105]