

STEM CELL & IPSC RESEARCH

The hPSC Small Molecule Toolkit

Five molecules do most of the work in human pluripotent stem cell culture. Here are the concentrations the literature converged on and the failure modes nobody prints on a datasheet

Quick reference

MOLECULE	CAPSID SKU	TARGET	CONC.	TYPICAL WINDOW
Y-27632 2HCl	C07470	ROCK1/2 · Ki 220 / 300 nM	10 μ M	1–24 h post-dissociation
CHIR-99021 HCl	C08972	GSK-3 β / α → Wnt ON	1–10 μ M *	Titrate per line
SB431542	C07487	ALK4/5/7 · blocks SMAD2/3	10 μ M	Neural induction
LDN-193189	C08723	ALK2/3/6 · blocks SMAD1/5/8	100–500 nM	Paired with SB431542
DMH1	C12479	ALK2 — selective	Titrate	Spares AMPK / VEGFR2
PD0325901	C07457	MEK1/2 · non-ATP-competit	0.5–1 μ M (2i)	Naive pluripotency

CHIR-99021 concentration and exposure duration are protocol-dependent. In hiPSC cerebral organoids, treatment at 1, 10 and 50 μ M produced distinct dose-dependent outcomes; do not transfer these conditions directly to other hPSC systems. Concentrations and exposure conditions are representative of published experimental use and may vary by cell line, culture system, protocol and experimental objective. Researchers should optimize conditions for their specific system.

Three things worth knowing

- **More Y-27632 will not save your cells.** Treatment with 10 μ M Y-27632 can reduce dissociation-induced apoptosis and improves cloning efficiency without affecting pluripotency and higher doses do not substantially improve survival. If cells still die after dissociation, the problem is upstream: enzyme exposure, time to re-plating, or stock integrity.
- **CHIR-99021 is a dial, not a switch.** Published cerebral organoid work spans 1, 10 and 50 μ M, with dose-dependent effects on apoptosis, proliferation, differentiation and migration. There is no correct CHIR concentration only the correct one for your line, your protocol and your lot.
- **BMP inhibitors are not interchangeable.** Dorsomorphin carries meaningful AMPK and VEGFR2 off-target activity; DMH1 was developed for ALK2 selectivity. If your phenotype could plausibly involve metabolic or angiogenic signalling, the choice is not cosmetic.

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