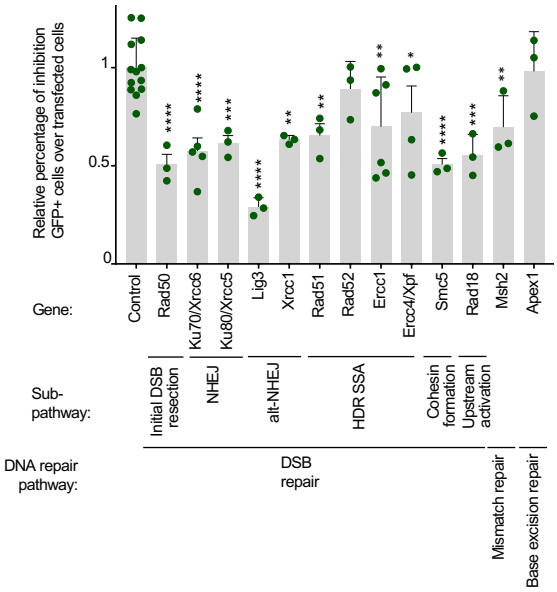
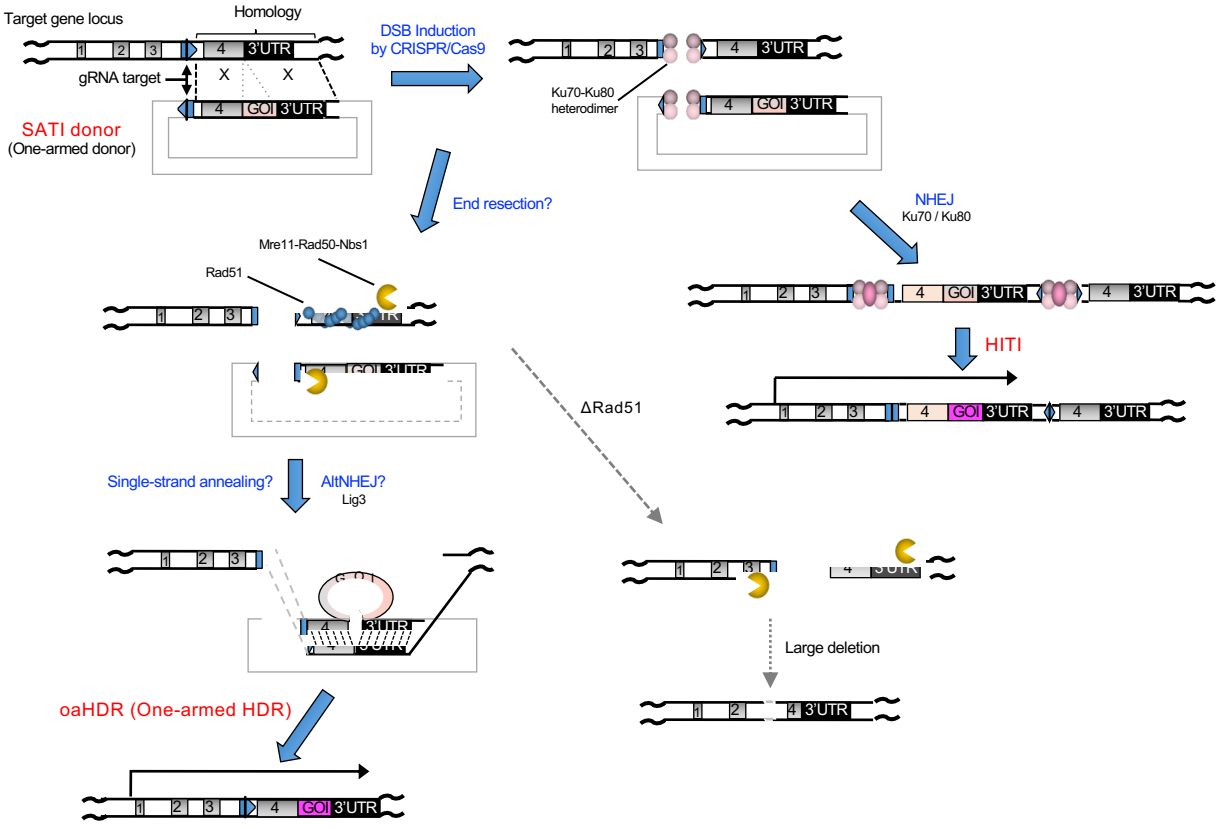
a

Repair pathway	Sub pathway	Gene	Clone ID (Sigma)
DSB repair	Initial DSB resection	*Rad50*	TRCN0000336380
	NHEJ	*Ku70/Xrcc6*	TRCN0000321228
		Ku80/Xrcc5	TRCN0000312877
	alt-NHEJ	*Lig3*	TRCN0000070980
		Xrcc1	TRCN0000077239
	HDR	*Rad51*	TRCN0000012660
	SSA	*Rad52*	TRCN0000233363
		Ercc1	TRCN0000238086
		Ercc4/Xpf	TRCN0000175845
	Cohesin formation	*Smc5*	TRCN0000241751
	Upstream activator	*Rad18*	TRCN0000124781
Mismatch repair		*Msh2*	TRCN0000042496
Base-excision repair		*Apex1*	TRCN0000304312

b



c



Supplementary Figure S9 | oaHDR is a noncanonical HDR pathway mediated by multiple elements of DSB repair. a Gene list of DNA repair related shRNA used in this study. **b** The effect of SATI knock-in efficiency in the presence of indicated shRNAs. n ≥ 4. alt-NHEJ, alternative NHEJ. Data are represented as mean ± s.e.m. The input data points are shown as green dots. *t*-test for analysis comparing each condition versus control transfected with pLKO-shRNA-scramble plasmid. ****P<0.0001, ***P<0.001, ** P< 0.01 and * P<0.05. **c** Model of SATI donor mediated gene knock-in in the oaHDR and NHEJ pathways. Once DSB are induced by Cas9, Ku70/80 heterodimer ligates the break. In some case, end resection is happened by unknown mechanism, genome and/or double strand donor is exposed as single stand. Single strand annealing (SSA) or microhomology and Lig3-mediated Alternative NHEJ (AltNHEJ) is happened, and the GOI (gene of interest) is inserted as oaHDR machinery (left). Because Rad51 stabilize the exposed single-strand DNA, Rad51 deficient may cause large deletion.