E. coli Base Strains

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Standing on the Shoulders of a Tiny Giant ; EcoSal Plus Journal

Base Strains

Name	Genotype / Phenotype	Features	Resistances	Auxotrophies	Non-utilizations
MG1655	str. K-12 F^{-} $^{-}$ *ilvG*$^{-}$ *rfb-50 rph-1 fnr*?	Prototypical K-12 strain. Valine toxicity in absence of isoleucine, due to *ilvG* frameshift. Partial pyrimidine starvation from polar effects of *rph-1* on *pyrE* causes 9–13% slower growth in minimal medium. Slow growth in M9 galactose (t_d=200–300 min). Some strain variants have an *fnr* deletion that causes defects in anaerobic respiration. P1 phage susceptible due to IS in *rfb* O-antigen biosythesis gene cluster. Genome paper (old), paper (new). Essential genome. Genome. BioCyc. Allele variations. Allele table.	—	—	—
NEB Turbo	str. K-12 F[*traD36 proAB* $^{+}$ *lacI* ^{q} *lacZM15 fhuA2*] *glnV44*(*supE44*) *thi-1* (*lac-proAB*) *galE15 galK16* R(*zgb-210*::Tn*10*)Tet^{S} *endA1* (*hsdS-mcrB*)*5* (r_K^- m_K^-) = str. K-12 TG1[JM101 (*hsdS-mcrB*)*5* (r_K^- m_K^-)] *endA1*]	endonuclease I-deficient. *lacI* ^{q}. Exceptional competence (*galE*$^{-}$). Amber suppressor UAG>CAG(Gln). T_1 phage resistant. Blue/white-screening with *lacZ*. Non-conjugative F (*traD36*). Parent: TG1. Grandparent: JM101. Genome.	Nit^R $2dGal^R$	Thiamine	Galactose, Lactose
DH10B (Invitrogen) = TOP10 (Thermo) NEB 10-beta	str. K-12 F^{-} *(ara-leu)7697* (*rapA'-cra'*)] (*lac*)*X74*[('*yahH-mhpE*)] DUP (514341-627601)[*nmpC-gltI*] *galK16 galE15 e14*$^{-}$ (*icd* ^{WT} *mcrA*) 80d*lacZ M15 recA1 relA1 endA1* Tn*10.10 nupG rpsL150*(Str^R) *rph* $^{+}$ *spoT1 (mrr-hsdRMS-mcrBC)*(r_K^- m_K^-) $^{-}$ Missense(*dnaA glmS glyQ lpxK mreC murA*) Nonsense(*chiA gatZ fhuA? yigA ygcG*) Frameshift(*flhC mglA fruB*) NEB 10-beta: [DH10B *fhuA*]	Recombination-deficient. Relaxed. Endonuclease I-deficient. *lacI* ^{q}. Clones large plasmids. Exceptional competence (*galE*$^{-}$). Blue/white-screening with *lacZ*. Improved cloning 5-mC DNA. P1 phage-resistance. Parent: MC1061 Tandem duplication of genes b0553–b0655; double gene dosage. Genome paper. Genome. BioCyc.	Str^R $2dGal^R$	Leucine	Arabinose, Lactose, Galactose
NEB Stable	str. K-12 NEB 10-beta F[*proAB lacI*^{q} *(lacZ)*M15 *zzf::*Tn*10*(Tet^R)]	Shown to exceed performance of Stbl3 in maintenance of repetitive DNAs. Reported genotype is identical to 10-beta except with additional F plasmid and Tet^R.	Str^R Tet^R $2dGal^R$	Leucine	Arabinose, Lactose, Galactose
DH5 NEB 5-alpha	str. K-12 F^{-} *endA1 glnV44(supE44) thi-1 recA1 relA1 gyrA96*(Nal^R) *nupG purB20* 80d*lacZ*M15 (*lacZYA-argF*)U169 *hsdR17*(r_K^- m_K^+) $^{-}$ NEB 5-alpha: DH5 *fhuA*	Recombination-deficient. Relaxed. Endonuclease I-deficient. Clones large plasmids. Amber suppressor UAG>CAG(Gln). Slow growth in M9 from *purB-20.* Blue/white-screening with *lacZ. Methylates EcoKI sites.* DH5 genome A, B, C. NEB 5-alpha genome paper. NEB 5-alpha genome. BioCyc. Genetic properties.	Nal^R	Thiamine	Lactose
Mach1	str. W *recA1398 endA1 fhuA* 80d *lacZ M15* (lac)*X74 hsdR*(r_K^- m_K^+)	Recombination-deficient. Endonuclease I-deficient. *lacI*$^{-}$. Blue/white-screening with *lacZ*. T1/T5/80 phage-resistant. Blue/white-screening with *lacZ*. Derivative of str. W (ATCC 9637). Patent: construction/ properties. Genome (str. W parent). BioCyc.			Lactose
BW25113	str. K-12 F^{-} *(araD-araB)567 lacZ4787* (::*rrnB-3*) $^{-}$ *rph-1 (rhaD-rhaB)568 hsdR514*(r_K^+)	*lacI* $^{+}$ Keio collection background. Parent: BD792 Genome paper. Genome. BioCyc.			Arabinose, Rhamnose, Lactose

DB3.1	str. K-12 F⁻ *gyrA462*(CcdB^R) *endA1 glnV44* (*sr1-recA*) *mcrB mrr hsdS20*(r$_B$ $^-$ m$_B$ $^-$) *araC14 galK2 lacY1* (*gpt-proA*)*62 rpsL20*(Str^R) *xylA5 leuB6*(Am) *mtl-1 lacI*$^-$?	CcdB-resistant by gyrase mutation, not CcdA. Recombination-deficient. Endonuclease I-deficient. Amber suppressor UAG>CAG(Gln). Parent: HB101.	CcdB^R Str^R 2dGal^R	Proline, Leucine	Galactose, Lactose, Xylose, Mannitol, Arabinose?
OmniMAX2	str. K-12 F[*proAB*$^+$ *lacI* ^{q} *lacZM15* Tn*10*(Tet^R) *ccdAB*] *mcrA* (*mrr-hsdRMS-mcrBC*)(r$_K$ $^-$ m$_K$ $^-$) 80d*lacZ M15* (*lacZYA-argF*)U169 *endA1 thi-1 recA1 relA1 gyrA96*(Nal^R) *fhuA2 panD*	CcdB-hypersensitive. T1/T5/80 phage resistant. Recombination-deficient. Relaxed. Endonuclease I-deficient. Clones large plasmids. Amber suppressor UAG>CAG(Gln). Blue /white-screening with *lacZ*.	Tet^R Nal^R	Thiamine, Pantothenate	Lactose
XL1-Blue	str. K-12 F[*proAB* $^+$ *lacI* ^{q} *lacZM15* Tn*10*(Tet^R) *recA1 endA1 gyrA96*(Nal ^{R}) *thi-1 hsdR17 glnV44*(*supE44*) *rel A1 lac*	Recombination-deficient. Relaxed. Endonuclease I-deficient. *lacI* ^{q}. Amber suppressor UAG>CAG(Gln). Blue/white-screening with *lacZ*.	Tet^R Nal^R	Thiamine	
NEB *dam* $^-$ */dcm* $^-$ = ER2925	str. K-12 *ara-14 leuB6*(Am) *fhuA31 lacY1 tsx78 glnV44(supE44) galK2 galT22 mcrA dcm6 hisG4 rfbD1 R*(*zgb210*::Tn*10*(Tet^S) *endA1 rspL136*(Str^R) *dam13*::Tn9(Chl^R) *xylA5 mtl-1 thi-1 mcrB1 hsdR2*	Host for isolating plasmids free of Dam /Dcm methylation for transformation into methylation-sensitive hosts. Increased mutation rate as a side-effect. Endonuclease I-deficient. T1/T5/80/T6 phage-resistant. Amber suppressor UAG>CAG(Gln). Low but noticeable frequency of Kan^R mutations. ColE1 replicons are suppressed in *dam*$^-$ strains.	Chl^R Str^R Nit^R Cka^R 2dGal^R	Thiamine, Histidine	Galactose, Xylose, Arabinose, Mannitol
ET12567 (ATCC BAA-525)	str. K-12 F⁻ *dam-13*::Tn*9*(Chl^R) *dcm -6 hsdM hsdR zjj(opgB)-202*::Tn*10*(T et^R) *recF143 galK2 galT22 ara-14 lacY1 xyl-5 leuB6 thi-1 tonA31 rpsL136*(Str^R) *hisG4 tsx-78 mtl-1 glnV44*	Host for isolating plasmids for transformation into *Streptomyces* or other organisms that have *E. coli* methylation-sensitive restriction systems. UV-sensitive (*recF*). ColE1 replicons are suppressed in *dam*$^-$ strai ns. Phage T6 and ColK-resistant (*tsx*). Amber suppressor UAG>CAG(Gln).	Chl^R Str^R Tet^R	Leucine, Thiamine, Histidine	Arabinose, Galactose, Mannitol
JTK165EK (DIAL strain)	str. K-12 MC1061 *upp*:(*pir folA*(Tmp^R)) (*rfbB–wbbL*)::*repA* 1) *upp*::(P$_{con}$(*BBa_J23100*)-rbs(?)-*pir $_{R6K}$ -BBa_B0015*(*rrfBt-T7.TE*) - *FRT* - P$_{con}$(*BBa_J23119*)-*4krbs-folA*(Tmp^R)-*tR2 - FRT*) 2) (*rfbB–wbbL'*)::(P$_{con}$(*BBa_J23119*) -rbs(?)-*repA$_{ColE2-P9}$ -BBa_B0015*(*rrf Bt-T7_TE*) - *FRT*)	*pir* $^+$ *repA* $^+$: Replicates conditional *oriV* $_{R6K}$ and *oriV* $_{ColE2}$ plasmids. Relaxed. *lacI*$^-$. Improved cloning 5-mC DNA. Ob tained by Shyam Cas9-curing plasmid from Addgene #85150.	Str^R Tmp^R	Leucine	Galactose, Lactose, Arabinose
EC100D	str. K-12 F⁻ *mcrA* (*mrr-hsdRMS-mcrBC*) 80d*lacZM15* (*lac*)X74[(*'yah H-mhpE*)] *recA1 endA1 araD139* (*ar a-leu*)*7697 galU galK* $^-$ *rpsL*(Str^R) *d eoR(?) pir* $^+$ *-folA*(Tmp^R)	*pir* $^+$: Replicates conditional *ori* $_{R6K}$ plasmids using genomic *pir* at medium copy 15. Recombination-deficient. Endonuclease I-deficient.	Str^R Tmp^R 2dGal^R		Galactose, Lactose, Arabinose
BW25141	*(araD-araB)567 lacZ4787(::rrnB-3) (phoB-phoR)580* $^-$ *galU95 uidA3::pir* $^+$ *recA1 endA9*::*FRT rph-1 (rhaD-rhaB)568 hsdR514*(r$_K$ $^-$ m$_K$ $^+$)	*pir* $^+$: Replicates conditional *ori* $_{R6K}$ plasmids using genomic *pir* at medium copy 15. Deletion of *phoBR*. Recombination-deficient. Endonuclease I-deficient. Paper.			Arabinonse, Rhamnose, Lactose
BW23474	*(argF-lac)169 uidA4::pir-116 recA1 rpoS396*(Am) *endA9*::*FRT rph-1 hsdR514*(r$_K$ $^-$ m$_K$ $^+$) *rob-1 creC510*	*pir* $^+$: Replicates conditional *ori* $_{R6K}$ plasmids using genomic *pir-116* at high copy. Recombination-deficient. Endonuclease I-deficient. CGSC.			Lactose
MFD*pir*	MG1655 *glvB*::[RP4-2 Tet^R::Mu Mu1::*aac(3)IV*(Apr^R) *aph(3)VIII* (Kan^S) *nic35* Mu2::*ble*(Zeo^R)] *dapA*::(*erm B-pir-116*)(Ery^R) *recA*	IncP(RK2/RP4) non-self-transmissable conjugation donor. DAP (diaminopimelate) auxotroph. Recombination-deficient. *pir* $^+$: Replicates conditional *ori* $_{R6K}$ plasmids using genomic *pir-116* at high copy. Paper. Genome.	Ery^R Apr^R Zeo^R	DAP	
Syn613 (ev5)	MDS42 recoded(TCG,TCA,TAG) *se rT serU prfA*	0.7 MB-shortened, IS/prophage-free strain MDS42 recoded with synonymous CDS mutations for serine codons TCG, TCA and amber stop TAG. Deleted of corresponding tRNA and release factor. Evolved for improved growth rate. Paper.		–	?

BW29655	str. K-12 F$^-$ (*araBAD*)*567 lacZ4787*(::*rrnB-3*) $^-$ (*envZ-ompR*)*520*(::*FRT*) (*rhaBAD*)*568 hsdR514*(r_K^- m_K^+) *rph* $^+$ =str. K-12 BW25113 *rph*$^+$ (*envZ-ompR*)*520*(::*FRT*)	Base strain for refactored light systems . Described in this study. *lacI* $^+$.			Arabinose, Lactose, Rhamnose
Marionette-Clo sAJM. 1504	str. DH10B *glvC*::(Marionette cluster*)(Chl^R)	DH10B with Marionette transcription factor cluster.	low Chl^R 5 mg/L	Leucine	Arabinose, Lactose, Galactose
Marionette-Pro sAJM. 1505	str. BL21 *glvC*::(Marionette cluster*) (Chl^R)	BL21 with Marionette transcription factor cluster. (no DE3 and T7 RNAP.)	low Chl^R 5 mg/L		Galactose
Marionette-Wild sAJM. 1506	str. K-12 MG1655 *glvC*::(Marionette cluster*)(Chl^R) *[*hisIt* P_{J23119}-*phlF*^{AM}-*cymR*^{AM}-*luxR*-*vanR*^{AM} *araC*$_{UTR}$ P_{lacI}-*lacI*^{AM}-*tetR*-*araC*^{AM}-*araE ihfAt* P_{J23100} -*betI*^{AM}-*ttgR*^{AM}-*pcaU*^{AM}-*nahR*^{AM}-*cinR*^{AM} *hisLt cat*(Chl^R)]	MG1655 with Marionette transcription factor cluster*.	low Chl^R 5 mg/L		
BL21(DE3)	str. B F$^-$ *ompT gal dcm lon hsdS*$_B$ (r_B $^-$ m_B $^-$) (DE3[*lacI* P_{lacUV5}-*T7p07 ind1 sam7 nin5*]) [*malB* $^+$]$_{K-12}$(^{S})	*lac*-inducible T7 RNAP. proteases$^-$ *dcm* $^-$ motility$^-$. Genome paper1, paper2a, paper2b, paper2c. Genome. Biocyc.			Galactose
Rosetta™ (DE3) pLysS (Novagen)	str. B BL21(DE3) pLysSRARE[*T7p20 ileX argU thrU tyrU glyT thrT argW metT leuW proL cat ori* $_{p15A}$] (Chl^R)	*lac*-inducible T7 RNAP. proteases$^-$. *dcm*$^-$. pLysSRARE Expresses rare-codon tRNA $^{Arg, Ile, Gly, Leu, Pro}$: *argU*(AGG, AGA), *ileX*(AUA), *leuW*(CUA), *proL*(CCC), *glyT*(GGA), in addition to T7 lysozyme, with a p15A *ori*. T7 lysozyme reduces T7 RNAP background activity and facilitates lysis.	Chl^R		Galactose
BLIM	str. B BL26 Blue F$^-$ *ompT hsdS*(r_B $^-$ m_B $^-$) *gal dcm lac* T_1 ^{R} Parent strain BL26 Blue additionally had F[*proAB lacI* ^{q} *lacZM15*::Tn*10*(Tet^R)]	Parent strain BL26 Blue (Novagen) was cured of F plasmid and made T1 phage-resistant, according to source.		Proline?	Galactose, Lactose
BioDesignER (RE1000)	str. K-12 MG1655 *ilvG*$^+$ *bioAB*::red [P_{N25}-*tetR* P_{tetO2}-*gam-bet-exo-dam*] SS7::*cymR* ^{q} P_{CP8}-*araE* P_{con}-*araC araBAD lacI* ^{q1} *dnaG* $_{Q576A}$ *recJ sbcB*	TetR-controlled recombination system. Mutations to stabilize ssDNA. Constitutive *lacI*, *araC*, *tetR*, *cymR*. Linear *ara* induction from constitutive *araE*. Faster minimal media growth from *ilvG*+.		Biotin	Arabinose
Nissle 1917	pMUT1[*ori* $_{ColE1}$] pMUT2[*ori* $_{ColE2}$]	Wild, gut-colonizing strain used as a probiotic. Has native ColE1 and ColE2 plasmids. History. Nissle engineering. Genome. BioCyc.			?

Shyam Can Obtain:

Name	Genotype / Phenotype	Features	Resistances	Auxotrophies	Non-utilizations
DH1	str. K-12 F$^-$ $^-$ *endA1 recA1 relA1 gyrA96*(Nal^R) *thi-1 glnV44*(*supE44*) *hsdR17*(r_K $^-$ m_K $^-$)	Recombination-deficient. Relaxed. Endonuclease I-deficient. Efficient 40–60kb plasmid transformer. Amber suppressor UAG>CAG(Gln). DH5 parent	Nal^R	Thiamine	
JM109	str. K-12 *endA1 recA1 relA1 gyrA96*(Nal^R) *thi-1 glnV44*(*supE44*) *(lac-proAB) hsdR17*(r_K $^-$ m_K $^+$) F[*traD36 proAB* $^+$ *lacI* ^{q} *lacZM15*]	Recombination-deficient. Relaxed. Endonuclease I-deficient. Amber suppressor UAG>CAG(Gln). Blue/white-screening with *lacZ*.	Nal^R	Thiamine	

BLR (DE3) (Novagen®)	str. B F^{-} *ompT hsdS* $_{B}$(r_{K}^{-} m_{B}^{-}) *gal dcm* (DE3) *(srl-recA) 306*::Tn*10* (Tet^{R})	*lac* -inducible T7 RNAP. protease OmpT^{-}. Recombination-deficient. *dcm*$^{-}$.	Tet^{R}		Galactose
BLR (DE3) pRIL (Novagen®)	str. B F^{-} *ompT hsdS* $_{B}$(r_{B}^{-} m_{B}^{-}) *gal dcm* (DE3 [*lacI* P_{lacUV5} *-T7p07 ind1 sam7 nin5*]) *(srl-recA)306*::Tn*10*(Tet^{R}) pRIL[*arg U ileY leuW ori* $_{p15A}$](Chl^{R})	*lac*-inducible T7 RNAP. protease OmpT^{-}. Recombination-deficient. *dcm*$^{-}$. pRIL overexpresses rare-codon tRNA$^{Arg, Ile, Leu}$ *argU* (AGA, AGG), *ileY* (AUA), *leuW* (CUA) from a p15A replicon.	Chl^{R} Tet^{R}		Galactose
DP10	str. DH10B (*araFGH*) (*araEp* P_{cp8}-*araE*(*araE* ^{q})	Deletion of Arabinose consumption genes. Constitutive *araE*. Others, see DH10B.	Str^{R}	Leucine	Arabinose, Lactose
RU1012	str. MH215[MH70[MC4100 [F^{-} [*araD139*]B/r (*lacZYA-argF*) U169 e14^{-} *flhD5301 (fruK-yeiR)725*(*fruA25*) *relA1 rpsL150*(Str^{R}) *rbsR22 (fimB-fimE)632*::IS*1 deoC1* $^{-}$] malQ7] *(ompC-lacZ)10-25*] *envZ*::Kan^{R}	Relaxed	Str^{R} Kan^{R}		Lactose, Fructose
JTK165JJ (DIAL strain)	str. MC1061 *upp*:(*pir folA*(Tmp^{R})) (*rfbB–wbbL*)::*repA* 1) *upp*::(P_{con}(*BBa_J23100*)-rbs(?)-*pir-BBa_B0015*(*rrfBt-T7. TE*) - *FRT* - P_{con}(*BBa_J23119*)-*4krbs-folA*(Tmp^{R})-*tR2* - *FRT*) 2) (*rfbB–wbbL'*)::(P_{con}(*BBa_J23119*)-rbs(?)-*repA-BBa_B00 15*(*rrfBt-T7_TE*) - *FRT*)	relaxed. *lacI*$^{-}$. Propagates R6K and ColE2 replicons. Improved cloning 5-mC DNA.	Str^{R} Tmp^{R}	Leucine	Galactose, Lactose, Arabinose
BW27783	str. K-12 BW25113 F^{-} $^{-}$ *(araD-araB)567 lacZ4787*(::*rrnB-3*) *(araH-araF)570*(::*FRT*) *araEp-532*::*FRT* P_{cp8}-*araE535 rph-1 (rhaD-rhaB)568 hsdR514*(r_{K}^{-})	Constitutive *araE* (ara transporter) expression, expanding dynamic range of *araBp* (P_{BAD}) induction.			Arabinose, Rhamnose, Lactose
DGF-298	str. K-12 W3110, (*recC ptr recB recD*)::P_{lac} -*bet-exo*(Kan^{R}) *ilvG* $^{+}$ *rph* $^{+}$ ***(hella shit)***	35% reduced genome (2.98 Mbp from WT 4.6 Mbp). 3.62 Mbp parent strain			

Syn613(ev5)