Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary Information

On-chip analysis, indexing and screening for chemical producing bacteria in microfluidic static droplet array

Supplementary Figure S1.

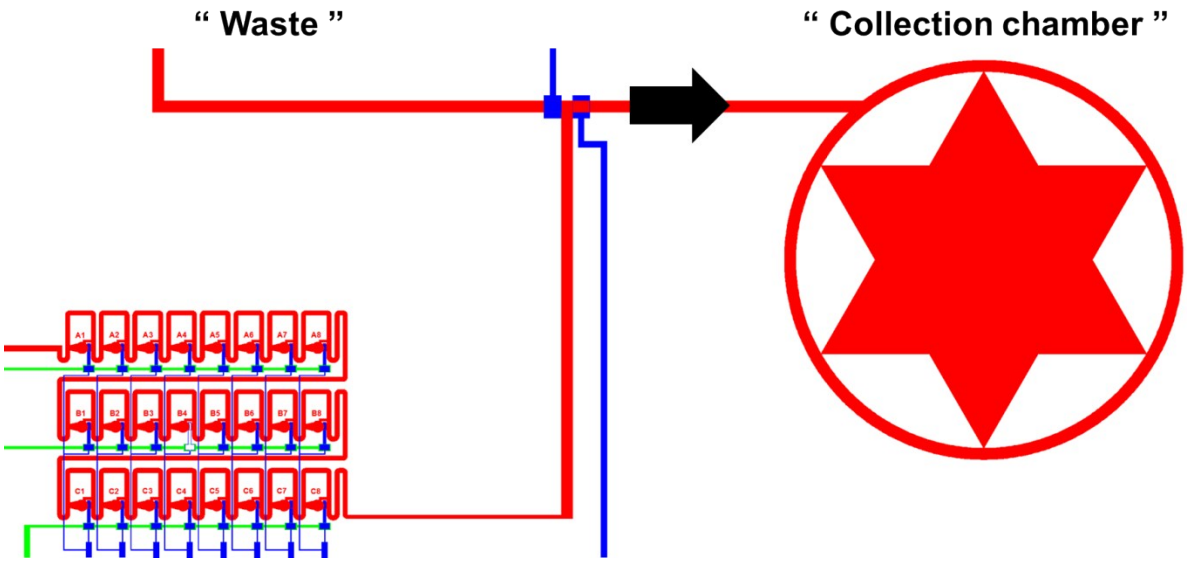
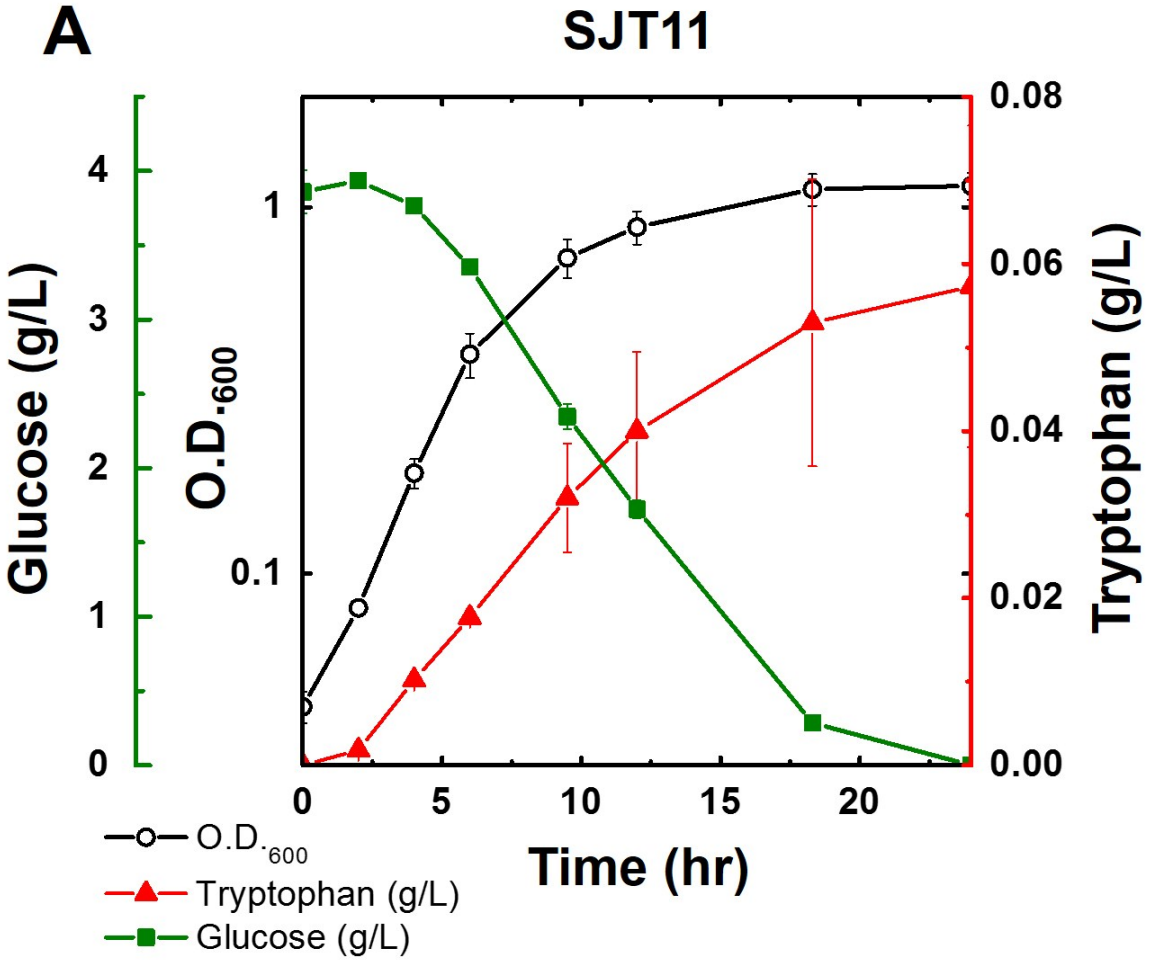


Figure S1. Structure of downstream of SDA device. Desired cells are harvested in collection chamber; otherwise, cells are wasted by switching the valves.

Supplementary Figure S2.



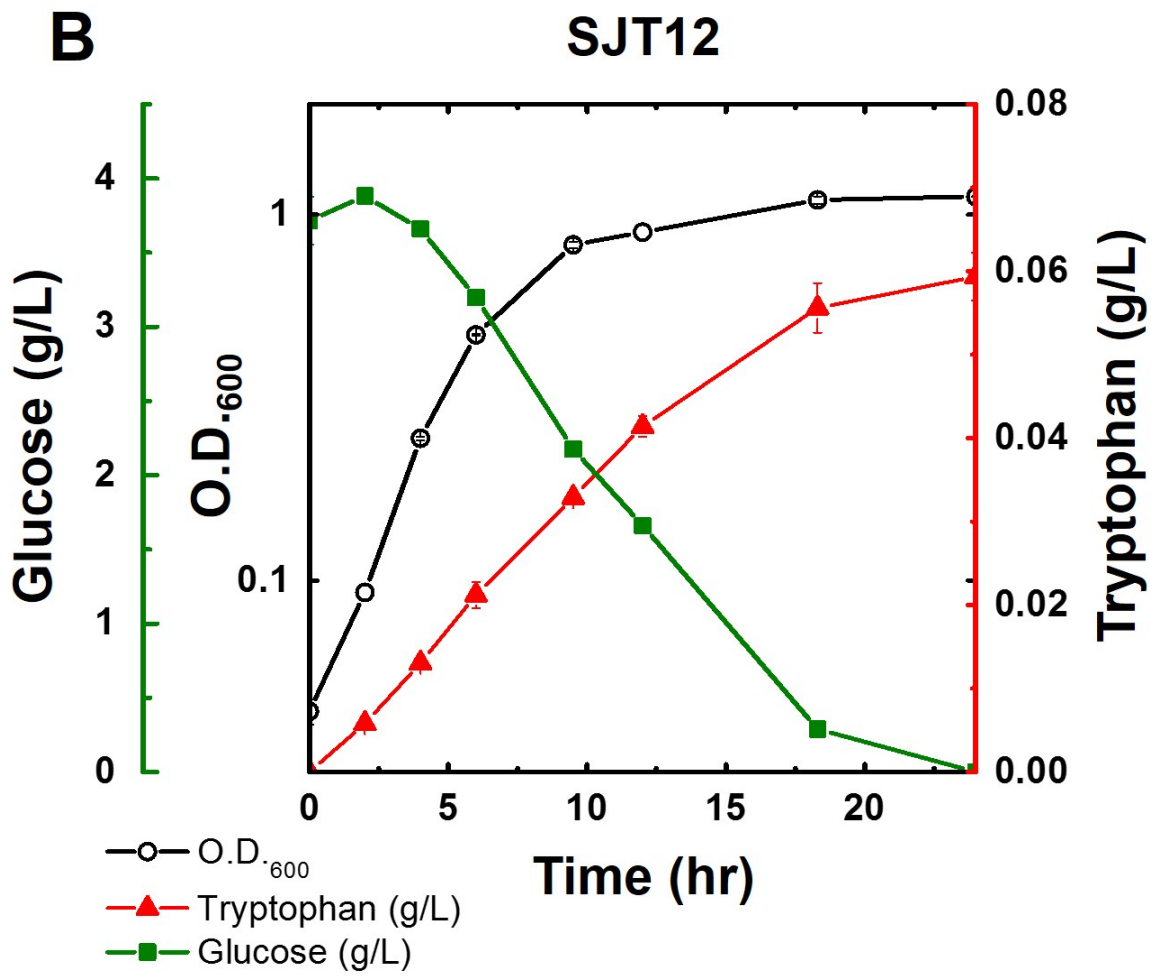


Figure S2. HPLC measurements from flask culture of chip-screened variants. Tryptophan production, $O.D._{600}$, and consumption of glucose of the *E. coli* (A) SJT11, (B) SJT12 were represented by red triangles, black open circles, and green square, respectively.

Supplementary Table S1. Oligonucleotides used in this study

Name	Sequence (5'-3')[a, b, c, d]
f2161_F	ccgcatgaccgcgcgatgcgaagttcctatactctctggagaataggaacttctcaagatcccctcacgctg
f2161_R	cgcgacgacaggcacatgcggaagttcctattctccagagagtataggaacttcagagcgcttttgaagctgg
del_trpR_F	cgcacgtttatgatatgctatcgtactctttagcgagtacaaccgggggagcatgaccggcgcgatgc
del_trpR_R	gcctgatgcgacgctgccgcgtcttatcatgcctaccaaacatattgaaagctcagcggatctcatgcgc
chk_trpR_F	ccacggaatggggacgtcgttac
chk_trpR_R	cgctgagtccgtttcataatgccgtgtat
del_tnaA_F	gcgaattaatcggtatagcagatgtaatattcacagggatcactgtaattccgcatgaccgcgcgatgc
del_tnaA_R	tgtagggtaagagagtggctaacatccttatagccactctgtagtattaacgcgacgacaggcacatgcg
chk_tnaA_F	gcaccttccttagtaaatgatggtgcttgcatatat
chk_tnaA_R	gatgccacctttagaggaaggctatttttgttatt
del_trpE_F	aacggttctggcaaatattctgaaatgagctgttgacaattaatcatcggagatgggaattagccatggtcc
del_trpE_R	aggttgtacgtaaaagagtcgatattatcgagcagcagaatgtcagccatgtgtaggctggagctgcttc
chk_trpE_F	atggctgtgcaggtcgtaaatcactgc
chk_trpE_R	gtcgccaggcgttcaattaaggtttgc
styp_trpE_F	aGGTACC*ttgacggctagctcagtcctaggtacagtgctagcACCACACGACAAAGGAGC ATCAATT*atgcaaacaccaaaacccacgctcgaa
styp_trpE_R	aGAGCTCtcagaaggtctcctgtgcatgatgcg
mut_trpE_F	cgctgctgctggaattcgcggatatcgacag
mut_trpE_R	ctgtcgatatccgcgaattccagcagcagcg
ins_trpE_R	aggttgtacgtaaaagagtcgatattatcgagcagcagaatgtcagccatcagaaggtctcctgtgcatgatg
del_aroG_F	gatctcgtttttcgcgacaatctggcgtttttcttgctaattccaggatgagatgggaattagccatggtcc
del_aroG_R	cggttgcaaaccagggtaaagcgaagtaaacgtcattcgtttaaaatgaggtgtaggctggagctgcttc
ins_aroG_F	gatctcgtttttcgcgacaatctggcgtttttcttgctaattccaggat*ttgacggctagctcagtcctaggtacagt gctagcGACTATTTCAAAAGGAGCATCACGA*atgaattat
ins_aroG_R	cggttgcaaaccagggtaaagcgaagtaaacgtcattcgtttaaaatgaggagatgggaattagccatggtcc
chk_aroG_F	ccaggttatgaaacgcagcagagaatcttg
chk_aroG_R	gttcgacgagaatttcaaaccgctgaaacg
ins_tktA_F	cgggcgagtagattgcgcaacatgcgagcatgatccagagatttctgaaggagatgggaattagccatggtcc
ins_tktA_R	tccatgctcagcgcacgaatagcattggcaagctctttacgtgaggacat*ATGTGATGCTCCTTTGA GTTTTTTTgctagcactgtacctaggactgagctagccgtcaa*gtgtaggctggagctgcttc
chk_tktA_F	cgctcagtctcagtataaggaaaagcgca
chk_tktA_R	gggtgaccggatttggctttctgta
pr_ppsA_F	cagatttgcgcaacgctgggatcagtcttaaaaagtaaaaaaatatattt*ttgacggctagctcagtcctaggtac agtgctagc*ggcctggtgatgatggcgggatcg
pr_ppsA_R	ccgagttggttataccaaagcaccagcggtgacgagccattgttggacattcagaagaactcgtcaagaaggc g
chk_ppsA_F	cacagaagcgtagaacgttatgtctgg
chk_ppsA_R	cgttttatccagcagttcataaatgcg
rpsLA128G	cgttagtcagacgaacacggcatactttacgcagcgcggagttcggttttctaggagtggtagtatatacacgag tacatacgccacgtttttgcgggcat

chk_rpsL_F	cgaacacccgggaggtctttaac
chk_rpsL_R	ggcaacagttaaccagctggtacg
rneo_F	ggcctggtgatgatggcgggatcg
rneo_R	tcagaagaactcgtcaagaaggcg
ppsA_UTRLibrary	gttataccaaagcaccagcggtgacgagccattgttggacat*NNNNNNNNNNNNNNNNNNNN* *NNNNN*gctagcactgtacctaggactgagctagccgtcaaaaatata

[a]Capital letters indicate restriction sites.

[b]Underlined letters indicate homology sequences for recombination.

[c]Italicized letters indicate a synthetic constitutive promoter BBa_J23100.

[d]Italicized, capital letters indicate 5'-UTR sequences.

Supplementary Table S2. Bacterial strains and plasmids used in this study

Name	Relevant characteristics	Source
Strains		
Mach1-T1^{R}	F^{-}φ80(*lacZ*)ΔM15 Δ*lacX*74 *hsdR*($r_K^-m_K^+$)Δ*recA*1398 *endA*1 *tonA*	Invitrogen
W3110	F^{-} *mcrA mcrB* IN(*rrnD-rrnE*)1 λ^{-}	ATCC 27325
SJT0	W3110 *rpsL*	This study
SJT1	SJT0 P_{aroG}-*aroG*::P_{BBa_J23100}- *aroG^{fbr}* P_{tktA}::P_{BBa_J23100} P_{trpE}-*trpE*::P_{BBa_J23100}- *trpE^{fbr}* Δ*trpR* Δ*tnaA*	This study
SJT10	SJT1 P_{ppsA}-UTR::P_{BBa_J23100}-*rpsL-neo*	This study
SJT11	SJT10 *rpsL-neo*:: taaaacgagtagactgagcggaaca	This study
SJT12	SJT10 *rpsL-neo*:: agtacgagagaccaaagacagagga	This study
SJT13	SJT10 *rpsL-neo*:: tgtaattagcacctgagttgtctaa	This study
Plasmids		
pKD46	Red recombinase expression vector, Amp^{R}	(K. A. Datsenko and B. L. Wanner, 2000)
pCP20	FLP expression vector, Amp^{R}	(K. A. Datsenko and B. L. Wanner, 2000)
pMD20	Cloning vector, Amp^{R}	Takara
pGFKF2	pGEM-*FRT-Kan^{R}-FRT*-KpnI-SacI	(J. Yang and S. W. Seo et al., 2013)
pMD20-FKF(f72)	pMD20-*FRT(f72)-Kan^{R}-FRT(f72)*	(J. Yang and S. W. Seo et al., 2013)
pMD20-FKF(f2161)	pMD20-*FRT(f2161)-Kan^{R}-FRT(f2161)*	This study
pAroG^{fbr}	pGFKF2-KpnI-P_{BBa_J23100}- aroG^{fbr}-SacI	(S. C. Kim and B. E. Min et al., 2015)
pTrpE^{fbr}	pGFKF2-KpnI-P_{BBa_J23100}- trpE^{fbr} (*S. typhimurium*)-SacI	This study
pRpsLneo	pMD20-*rpsL-neo*	This study
pTrpRibo	pACYCDuet-P_{BBa_J23100}-*TrpApt*-UTR-gagggtaaga-*tetA-sgfp*	(J. Yang and S. W. Seo et al., 2013)

Supplementary Table S3. Fermentation data of the *E. coli* strains in M9 minimal medium

Strain	L-tryptophan (g/L)	Specific productivity ($g/L/hr/g_{DCW}$)	Specific growth rate (hr^{-1})
SJT0	ND	0	0.552 ± 0.0100
SJT1	0.045 ± 0.0034	0.0043 ± 0.0004	0.497 ± 0.0037
SJT11	0.057 ± 0.0192	0.0059 ± 0.0024	0.422 ± 0.0460
SJT12	0.059 ± 0.0029	0.0061 ± 0.0003	0.485 ± 0.0053
SJT13	0.065 ± 0.0084	0.0071 ± 0.0007	0.453 ± 0.0361

Supplementary references

1. K. A. Datsenko and B. L. Wanner, *Proc. Natl. Acad. Sci. U. S. A.*, 2000, **97**, 6640-6645.
2. J. Yang, S. W. Seo, S. Jang, S. I. Shin, C. H. Lim, T. Y. Roh and G. Y. Jung, *Nat. Commun.*, 2013, **4**, 1413.
3. S. C. Kim, B. E. Min, H. G. Hwang, S. W. Seo and G. Y. Jung, *Sci. Rep.*, 2015, **5**, 13853.