Parameters for modelling

Parameter	explanation	Value	Reference
$K_{D_{dcas9*}}$	Dissociation constant of dcas9 to gRNA	10 pM normal gRNA 1 nM truncated gRNA	Chen, J., & Doudna, J. (2017) Rusk, N. (2017) Wright, A. *et al* (2015)
$k_{unbind_{dcas9*}}$	Unbinding rate of dcas9 and gRNA	1 min	estimated
$K_{bind_{RQ}}$	Bindg rate og luxR to AHSL	10 1/min	Weber, M., & Buceta, J. (2013).
$k_{unbin_{RQ}}$	Unbinding rate of luxR to AHSL	0.1 min	Weber, M., & Buceta, J. (2013).
$k_{bind_{(RQ)2}}$	Dimerization rate of luxR:AHSL	0.05 1/min	Weber, M., & Buceta, J. (2013).
$k_{unbind_{(RQ)2}}$	Undbindg rateof luxR:AHSL dimer	1 min	Weber, M., & Buceta, J. (2013).
$k_{bind_{lux}}$	Binding rate of luxR:AHSL dimer to promotor	0.05 1/min	Weber, M., & Buceta, J. (2013).
$k_{unbind_{lux}}$	unBinding rate of luxR:AHSL dimer to promotor	10 min	Weber, M., & Buceta, J. (2013).
$k_{synthesis}$	AHSL synthesis rate by luxI	0.04 min	Weber, M., & Buceta, J. (2013).
Dif	Diffusion rate of AHSL over membrane	`1.41/(min um^2)` `0.0682 1/(min um^2)`	Estimated from Weber, M., & Buceta, J. (2013).. Alternatively estimated from IGEM ecolibirum population model home page.
D_{AHSL}	Diffusion constant of AHSL in cytosol	1.1880000*10^6 um^2 /hour	*Viscopedia.com*
$mRNA\ trate$	Transcription rate of RNA polymerase	30/s	Bionumbers.org
$protein\ trate$	Translation rate of ribosome	15/s	Bionumbers.org
T_{mRNA}	Degradation constant for mRNA	0.347 1/min	Weber, M., & Buceta, J. (2013).
$T_{protein}$	Degradation constant for protein	0.002 1/min	Weber, M., & Buceta, J. (2013).
δ_{gRNA}	gRNA produces pr. second	2.9890e-14 nmol/min	Estimated from mRNA transcription rate and RNA length (BLAST)
δ_{mdcas9}	Dcas9 mRNA production pr. min	0.0728 *10^-14 nmol/min	Estimated from mRNA transcription rate and mRNA length (BLAST)
δ_{mluxR}	luxR mRNA production pr. min	0.3985 *10^-14 nmol/min	Estimated from mRNA transcription rate and mRNA length (BLAST)
δ_{mluxI}	luxI mRNA production	0.5162 *10^-14	Estimated from mRNA transcription rate

	pr. min	nmol/min	and mRNA length (BLAST)
σ_{dcas9}	Dcas9 protein production pr. min	0.1092 *10^-14 nmol/min	Estimated from protein translation rate and protein length (BLAST)
σ_{luxR}	luxR protein production pr. min	0.5978*10^-14 nmol/min	Estimated from protein transcription rate and protein length (BLAST)
σ_{luxI}	luxI protein production pr. min	0.7743*10^-14 nmol/min	Estimated from mRNA translation rate and protein length (BLAST)
α_luxR	Relative expression of active to non active lux R promotor	0.001	Weber, M., & Buceta, J. (2013).
α_luxI	Relative expression of active to non active lux R promotor	0.01	Weber, M., & Buceta, J. (2013).
α_dcas9	Relative expression of active to non active lux R promotor	0.001	etimated
$V0_{symbiont}$	Initial volume of symbiont	1.5 um^3	Weber, M., & Buceta, J. (2013)./Bionumbers
$V0_{host}$	Initial volume of host	500 um^3	Bionumbers.org
$t0$	e.coli protein excretion	10^-16 mol/cell/h	Estimated from Gu, P *et al* (2012) Wang, J. *et al* (2013)
$T0$	Host protein consumption	10^-18 mol/cell/h	Estimated from number of ribosomes in yeast and based on Fantes, P (1976)
$AHSL\ degrada$	AHSL degradation rate	0.001 1/min	Weber, M., & Buceta, J. (2013).
$\Delta G_{Hydrogen-bo}$	Gibbs free energy og a hydrogen bond	0.5-2 kcal/mol	Sheu, S *et al* (2003)
$\Delta G_{unspecific\ pro}$	Gibbs free energy of unspecific protein interaction with DNA	0.6 kcal/mol	Afek, A. *et al*. (2014)
Number of ribosomes in yeast	Number of ribosomes in yeast	187000 units	Bionumbers.org
Number of Helicases in E.coli	Number of Helicases in E.coli	50 units	Bionumbers.org
$K_{D\ Helicase}$	Dissociation constant for helicase to orgin of replication	200 nM	Raney, K *et al* (1994)
$K_{D\ dcas9*:origin}$	Dissociation constant of an active dcas9 to	0.8 nM	Sternberg, S. *et al* (2015)
Fraction of tryptophan in proteins	Fraction of tryptophan in proteins	1.3%	*Tiem.utk.edu*. *AMINO ACID FREQUENCY*. (2017)

References:

Afek, A., Schipper, J., Horton, J., Gordân, R., & Lukatsky, D. (2014). Protein−DNA binding in the absence of specific base-pair recognition. *Proceedings Of The National Academy Of Sciences*, *111*(48), 17140-17145. http://dx.doi.org/10.1073/pnas.1410569111

Chen, J., & Doudna, J. (2017). The chemistry of Cas9 and its CRISPR colleagues. *Nature Reviews Chemistry*, *1*(10), 0078. http://dx.doi.org/10.1038/s41570-017-0078

Fantes, P., Roberts, L., & Huetter, R. (1976). Free tryptophan pool and tryptophan biosynthetic enzymes in Saccharomyces cerevisiae. *Archives Of Microbiology*, *107*(2), 207-214. http://dx.doi.org/10.1007/bf00446842

Gu, P., Yang, F., Kang, J., Wang, Q., & Qi, Q. (2012). One-step of tryptophan attenuator inactivation and promoter swapping to improve the production of L-tryptophan in Escherichia coli. *Microbial Cell Factories*, *11*(1), 30. http://dx.doi.org/10.1186/1475-2859-11-30

Raney, K., Sowers, L., Millar, D., & Benkovic, S. (1994). A fluorescence-based assay for monitoring helicase activity. *Proceedings Of The National Academy Of Sciences*, *91*(14), 6644-6648. http://dx.doi.org/10.1073/pnas.91.14.6644

Rusk, N. (2017). Biochemistry: CRISPR kinetics. *Nature Methods*, *14*(7), 650-651. http://dx.doi.org/10.1038/nmeth.4360

Sheu, S., Yang, D., Selzle, H., & Schlag, E. (2003). Energetics of hydrogen bonds in peptides. *Proceedings Of The National Academy Of Sciences*, *100*(22), 12683-12687. http://dx.doi.org/10.1073/pnas.2133366100

Sternberg, S., LaFrance, B., Kaplan, M., & Doudna, J. (2015). Conformational control of DNA target cleavage by CRISPR–Cas9. *Nature*, *527*(7576), 110-113. http://dx.doi.org/10.1038/nature15544

Tiem.utk.edu. *AMINO ACID FREQUENCY*. (2017). Retrieved 1 November 2017, from http://www.tiem.utk.edu/~gross/bioed/webmodules/aminoacid.htm

Wang, J., Cheng, L., Wang, J., Liu, Q., Shen, T., & Chen, N. (2013). Genetic engineering of Escherichia coli to enhance production of l-tryptophan. *Applied Microbiology And Biotechnology*, *97*(17), 7587-7596. http://dx.doi.org/10.1007/s00253-013-5026-3

Weber, M., & Buceta, J. (2013). Dynamics of the quorum sensing switch: stochastic and non-stationary effects. *BMC Systems Biology*, *7*(1), 6. http://dx.doi.org/10.1186/1752-0509-7-6

Wright, A., Sternberg, S., Taylor, D., Staahl, B., Bardales, J., Kornfeld, J., & Doudna, J. (2015). Rational design of a split-Cas9 enzyme complex. *Proceedings Of The National Academy Of Sciences*, *112*(10), 2984-2989. http://dx.doi.org/10.1073/pnas.1501698112

Viscopedia.com. *Water – viscosity table and viscosity chart*. (2017). Retrieved 1 November 2017, from http://www.viscopedia.com/viscosity-tables/substances/water/