Supplementary Table 1 | Plasmids used in this study

Name	Size (bp)	Resistance	Origin of replication	Description	Reference
pLH401	4,770	C	ColE1	Constitutive *ccaR* expression, $P_{cpcG2\text{-}172}$:*sfgfp*, constitutive *mcherry* expression	This study
pLH405	4,730	C	ColE1	Constitutive *ccaR* expression, $P_{cpcG2\text{-}172}$:*gfpmut3**, constitutive *mcherry* expression	This study
pLH407	2,650	C	ColE1	Constitutive *mcherry* expression	This study
pLH412	6,282	S	p15A	Constitutive *ccaS(H534A)*, *ho1*, and *pcyA* expression	This study
pLH413	3,848	C	ColE1	Constitutive *ccaR(D51N)* expression, $P_{cpcG2\text{-}172}$:*rcsA*	This study
pSR43.6	6,282	S	p15A	Constitutive expression of *ccaS, ho1,* and *pcyA*	Schmidl et al, 2014
pSR49.2	4,543	S	p15A	Constitutive expression of *ccaS*	Schmidl et al. 2014
pMVK201.2	3,848	C	ColE1	Constitutive expression of *ccaR*, $P_{cpcG2\text{-}172}$:*rcsA*	This study
pMVK228	4,588	S	p15A	Constitutive expression of *ccaS*	This study

C: chloramphenicol, S: spectinomycin

Supplementary Table 2 | Genbank Accession Numbers

Name	Genbank Accession #
pLH401	MN617156
pLH405	MN617157
pLH407	MN617158
pLH412	MN617159
pLH413	MN617160
pSR43.6	MN617163
pSR49.2	MN617164
pMVK201.2	MN617161
pMVK228	MN617162

Supplementary Table 3 | Bacterial and worm strains used in this study

Strain	Plasmids	Background	Resistance	Description	References
BW25113	None	BW25113	None	Keio parent strain	Baba et al., 2006
Δ*rcsA*	None	JW1935-1	K	Low CA production	Baba et al., 2006
Δ*lon*	None	JW0429-1	K	High CA production	Baba et al., 2006
LH01	pLH401,pSR43.6	JW1935-1	C,S,K	**Fig. 1,** microscopy	This study
LH02	pLH401, pSR49.2	JW1935-1	C,S,K	ΔPCB control for LH01	This study
LH03	pLH405, pSR43.6	JW1935-1	C,S,K	**Fig. 1**, cytometry	This study
LH04	pLH405, pSR49.2	JW1935-1	C,S,K	ΔPCB control for LH03	This study
LH05	pLH407, pSR43.6	JW1935-1	C,S,K	mCherry-only control for cytometry	This study
LH06	pMVK201.2,pLH412	JW1935-1	C,S,K	CcaS(H534A) control for MVK29 (**Fig. 3**)	This study
LH07	pLH413, pSR43.6	JW1935-1	C,S,K	CcaR(D51N) control for MVK29 (**Fig. 3**)	This study
MVK29	pMVK201.2,pSR43.6	JW1935-1	C,S,K	Green light-induced CA secretion (**Fig. 3**)	This study
MVK46	pMVK201.2,pMVK228	JW1935-1	C,K	ΔPCB control for MVK29 (**Fig. 3**)	This study

K: kanamycin

Name	Genotype	CGC Strain ID	Description	References
glo-1	*glo-1*(zu391) X	JJ1271	Used for optogenetic induction of GFP expression in the worm gut. Exhibits fewer intestinal granules, which enables lower host background fluorescence. (**Fig. 1**)	Han et al., 2017
ges-1	*raxIs51*[$P_{ges\text{-}1}$::*mitoGFP*]	MCW351	Used for optogenetic induction of CA production in the worm gut. Mito-GFP used to observe mitochondrial morphology. (**Fig. 3**)	Han et al., 2017
sqt-3	*sqt-3*(e2117) V	CB4121	Temperature-sensitive strain used for longevity studies. (**Fig. 4**)	Han et al., 2017

Supplementary Table 4 | Statistical analysis of worm lifespan experiments

Replicate #1							
Strain	**Light Condition**	**Lifespan** (Mean ± s.e.)	***p*-value 1** (G vs.R)	***p*-value 2** (G-H vs. G-L)	***p*-value 3** (vs. ΔRcsA)	***p*-value 3** (vs. Δlon)	**Total Number** (censor)
JW1935-1	Red	6.58 ± 0.16				<0.0001	62 (0)
	Green-L	6.50 ± 0.17	0.631			<0.0001	48 (0)
	Green-H	6.60 ± 0.15	0.972	0.639		<0.0001	63 (0)
MVK29	Red	7.05 ± 0.20			0.062	<0.0001	64 (0)
	Green-L	8.56 ± 0.23	<0.0001		0.029	0.732	66 (0)
	Green-H	9.66 ± 0.28	<0.0001	0.001	<0.0001	0.192	59 (0)
Δlon	Red	8.72 ± 0.29			<0.0001		46 (0)
	Green-L	8.21 ± 0.31	0.368		<0.0001		52 (0)
	Green-H	9.06 ± 0.32	0.322	0.085	<0.0001		49 (0)

Replicate #2							
Genotype	**Light Condition**	**Lifespan** (Mean ± s.e.)	***p*-value 1** (G vs.R)	***p*-value 2** (G-H vs. G-L)	***p*-value 3** (vs. ΔRcsA)	***p*-value 3** (vs. Δlon)	**Total Number** (censor)
JW1935-1	Red	6.64 ± 0.18				<0.0001	45 (0)
	Green-L	6.46 ± 0.16	0.481			<0.0001	59 (0)
	Green-H	6.61 ± 0.17	0.933	0.519		<0.0001	56 (0)
MVK29	Red	7.00 ± 0.24			0.157	<0.0001	50 (0)
	Green-L	8.57 ± 0.25	<0.0001		<0.0001	0.672	56 (0)
	Green-H	9.66 ± 0.27	<0.0001	0.002	<0.0001	0.222	58 (0)
Δlon	Red	8.73 ± 0.29			<0.0001		48 (0)
	Green-L	8.15 ± 0.33	0.291		<0.0001		47 (0)
	Green-H	9.08 ± 0.28	0.322	0.052	<0.0001		61 (0)

Censor worms are those that are lost or exhibit body bursting