Supplementary Information for

The transcriptional repressor PerR senses sulfane sulfur by cysteine persulfidation at the structural Zn^{2+} site in *Synechococcus* sp. PCC7002

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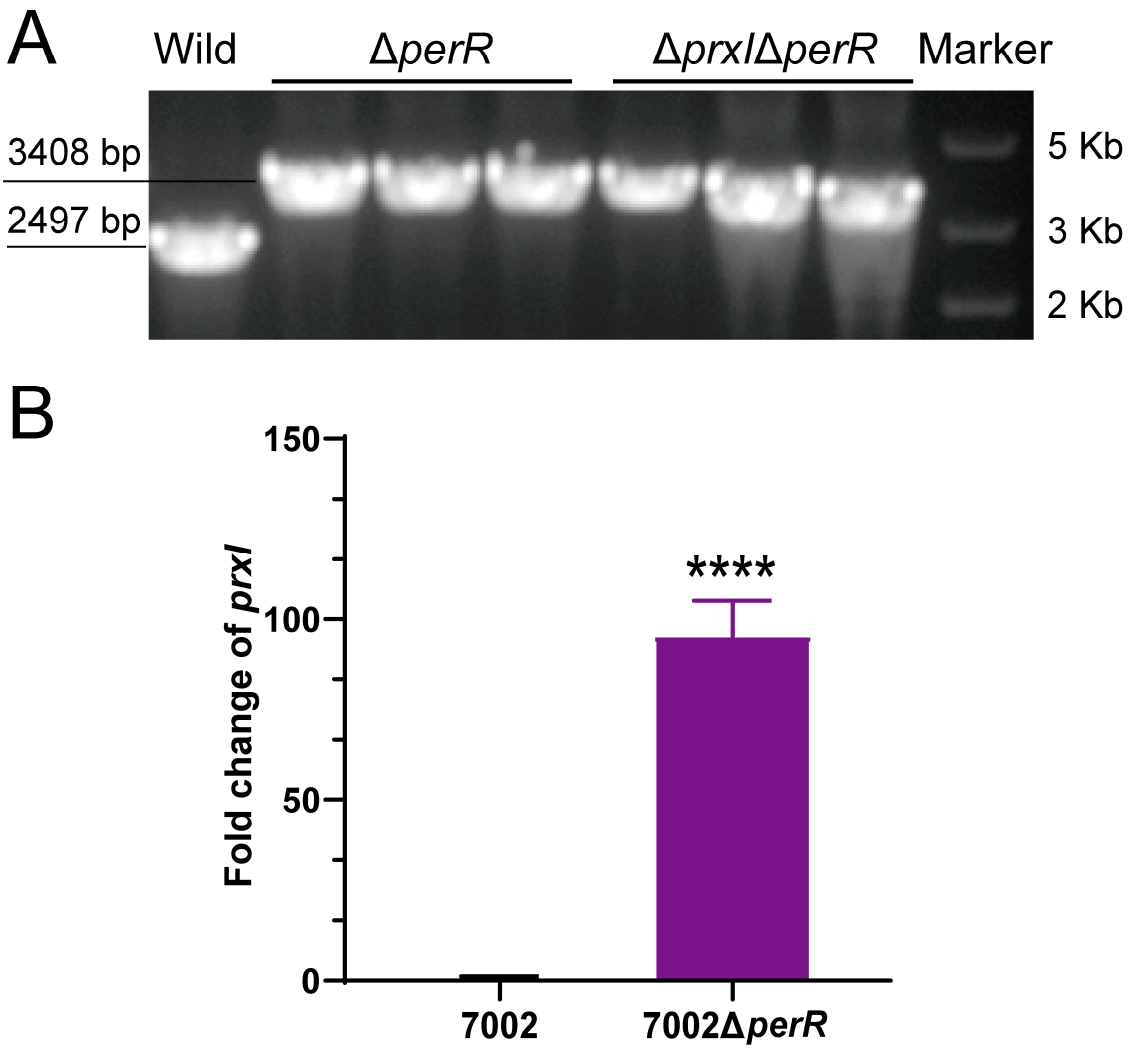


Figure S1. The deletion of *perR* was verified by PCR and its effect on the transcriptional level of *prxI*. **(A)** A 3408 bp fragment was generated while the *perR* gene was replaced by the chloramphenicol resistance cartridge. **(B)** PerR inhibited the expression of *prxI* in PCC7002. The transcriptional level of *prxI* in PCC7002Δ*perR* upregulated about 100-fold than that of the wild type verified by qPCR. ****, $p < 0.0001$.

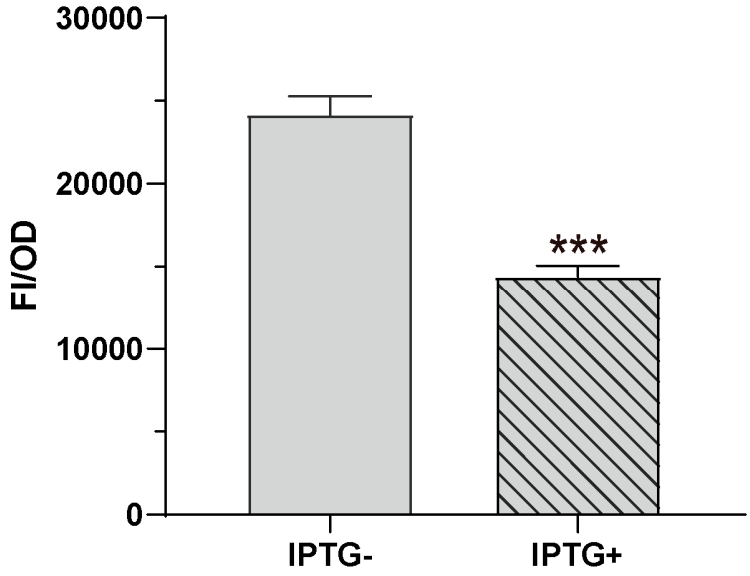


Figure S2. The expressed PerR could act on the *prxI* promoter and inhibit the expression of GFP. The expression of *perR* downregulated the fluorescence of GFP in *E. coli* BL21 containing the plasmid pBBR-*perR*-P_{prxI}-*egfp*. IPTG was used to induce PerR expression, which inhibited the expression of *egfp*. ***, $p < 0.001$.

Table S1 Strains and plasmids used in this study

Strain or plasmid	Description/characteristic	Source/reference
Strains		
PCC7002	Wilde type	This study
PCC7002Δ*perR*	PCC7002 with *perR* deletion	This study
	perR (Accession: ACA99824.1)	
PCC7002Δ*perR*Δ*prxI*	PCC7002 with *perR* and *prxI* deletion	This study
	prxI (Accession: WP_012306421.1)	
E. coli DH5α	Cloning strain	Novagen
E. coli BL21(DE3)	Cloning strain	Novagen
Plasmids		
pMal-C2X	expression vector	0ur lab
pMal-*perR*	pMal-C2X containing *perR*	This study
pJET1.2-Blunt	Cloning vector	Thermo Fisher
pET30	Cloning vector	0ur lab
pET30-*perR*	pET30 containing *perR*	This study
pJET-*perR*-del	*perR* complementation vector	This study
pBBR1MCS-2	Expression vector	This study
pBBR-P_{lacI}-PerR-P_{prxI}-	*prxI* promoter activity reporter with	This study
eGFP	PerR	

Table S2 Primers used in this study

Primer name	Sequence
perR-del-1	AGCACACATCCCAACAACAGC
perR-del-2	CCAACTTAATCGCCTTGCAGCAGAGGGTAACAGTGTGG TCGGT
perR-del-3	ACCGACCACACTGTTACCCTCTGCTGCAAGGCGATTAA GTTGG
perR-del-4	GTGGGGATTGGTGTGGCTTCATACGACAGGTTTCCCGA CTGG
perR-del-5	CCAGTCGGGAAACCTGTCGTATGAAGCCACACCAATCC CCAC
perR-del-6	CATTTGTGTAGCGTGAATCAGG
pet30-*perR*-F	TAAGAAGGAGATATACATTTGATTTCACCTTGGCCCAT TCG
pet30-*perR*-R	TGGTGGTGGTGGTGCTCGAGAGCACGGCAGTCCGCAC
prxI-qPCR-F	AACGGTGAATTTACCCGCAA
prxI-qPCR-R	CCCTTGATGTAAGCCAGCAT
PerR-prxI-gfp-1 *gfp* (Accession: AAG29478.1)	CCGGCTCGTATGTTGTGTGGAATTGATTTCACCTTGGCC CATTC
PerR-prxI-gfp-2	TTAAGCACGGCAGTCCGCACA
PerR-prxI-gfp-3	TGTGCGGACTGCCGTGCTTAACAAAGCCCGAAAGGAA GCTGAG

PerR-prxI-gfp-4	GCGCTTAATGCGCCGCTACA
PerR-prxI-gfp-5	TGTAGCGGCGCATTAAGCGCGAAAGCCTTAGAAACGACCG
PerR-prxI-gfp-6	CTAGTATTTCTCCTCTTTCTCTAGATGTGGACCTCTTGGATAGTGT
PerR-prxI-gfp-7	TCTAGAGAAAGAGGAGAAATACTAGATGAGTAAAGGAGAAGAACTTTTC
PerR-prxI-gfp-8	CTTACAATTTCCATTCGCCATTCATTATTTGTATAGTTCATACATGCCAT
PerR-prxI-gfp-F	TTCCACACAACATACGAGCCGG
PerR-prxI-gfp-R	TGAATGGCGAATGGAAATTGTAAG
PerR C19S-F	GTCGTCTCTTCTTCCTCCAAAACCATGTCCCAAGC
PerR C19S-R	TTGGAGGAAGAAGAGACGACAAGGAAATAATGGGGGCTAT
PerR C121S-F	TTCGTCTCTCGAGACTGCGGGGCCATCCAAGAT
PerR C121S-R	CCGCAGTCTCGAGAGACGAAATGGTGGTGCGGATTAACATT
PerR C124S-F	CGAGACTCTGGGGCCATCCAAGATCTGCCTTG
PerR C124S-R	TGGATGGCCCCAGAGTCTCGACAGACGAAATGGTGGTG
PerR C137S-F	TTTAGCTCTTTTGATTTGGGTCAGTTTGCGACGCAAGTTAC
PerR C137S-R	ACCCAAATCAAAAGAGCTAAAGGCTTGCCAAGGCAGATCTTG

PerR C160S-F	GGACTTTCTGCGGACTGCCGTGCTTAATCGA
PerR C160S-R	ACGGCAGTCCGCAGAAAGTCCCTTAACGGTTACTTCATAGCT
PerR C163S-F	GCGGACTCTCGTGCTTAATCGAGCACCACCACC
PerR C163S-R	CTCGATTAAGCACGAGAGTCCGCACAAAGTCCCTTAACGGTTA

Table S3 The queries used in the phylogenetic analysis of PerR

Accession number	Name	Species
AKL85385.1	Transcriptional regulator PerR	*Bacillus atrophaeus*
P71086.1	Peroxide operon regulator	*Bacillus subtilis*
Q97FU2.1	Transcriptional regulator PerR	*Clostridium acetobutylicum*
Q57083.1	HTH-type transcriptional regulator PerR	*Escherichia coli*
Q2G282.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q5HN74.1	Peroxide-responsive repressor PerR	*Staphylococcus epidermidis*
Q8CNQ7.1	Peroxide-responsive repressor PerR	*Staphylococcus epidermidis*
Q49YQ6.1	Peroxide-responsive repressor PerR	*Staphylococcus saprophyticus*
Q4L7G4.1	Peroxide-responsive repressor PerR	*Staphylococcus haemolyticus*
Q99T18.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q7A4T8.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q5HER3.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q6GFJ6.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q7A0J4.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q2FFN4.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q2YU25.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q6G873.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*
Q9RQL3.1	Peroxide-responsive repressor PerR	*Staphylococcus aureus*

Table S5 The OxyRs in cyanobacteria.

Accession number	Name	Species
WP_110149640.1	hydrogen peroxide-inducible genes activator	*Nostoc sp. 3335mG*
WP_110149354.1	hydrogen peroxide-inducible genes activator	*Nostoc sp. 3335m*
PWL20063.1	DNA-binding transcriptional regulator OxyR	*Synechococcus sp. XM-24*
OWY61394.1	DNA-binding transcriptional regulator OxyR	*cyanobacterium TDX16*
WP_211737531.1	hydrogen peroxide-inducible genes activator	*Leptolyngbya sp. 15MV*
MBV5256979.1	hydrogen peroxide-inducible genes activator	*Synechococcus moorigangaii CMS01*
WP_068790708.1	hydrogen peroxide-inducible genes activator	*Phormidium willei*
MBC7758490.1	LysR family transcriptional regulator	*Phormidesmis sp. FL-bin-119*
MBY0493784.1	LysR family transcriptional regulator	*Cyanobacteria bacterium*