Case Study Biocide Resistance

Project Topic: Regulation of antimicrobial resistance genes in biofilms in response to sodium hypochlorite

Project Partner: University of Pittsburgh

Sample type: Pseudomonas biofilms

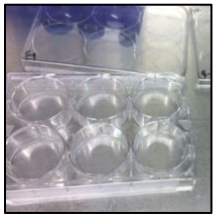
Target Molecule: RNA

Laboratory Analysis:
Exposure of *Pseudomonas fluorescens* biofilms to different sodium hypochlorite concentrations, recovery and sequencing of mRNA from experimental and control groups

Bioinformatic Analysis:
Quality control, read mapping, differential gene expression analysis, gene annotation, pathways reconstruction

Summary:
Differential expression analysis resulted in the identification of significantly up- and downregulated genes in response to sodium hypochlorite. Following annotation of these genes, results were used to reconstruct cellular pathways which may be used by *Pseudomonas* biofilm cells to develop resistance to oxidative biocides.

More details:
https://www.tandfonline.com/doi/abs/10.1080/08927014.2019.1605357



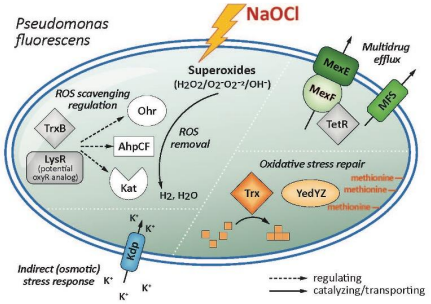


Table 1. Up-regulated *P. fluorescens* genes related to oxidative stress, efflux, transport, and transcription regulation.

Locus Tag	Gene	Description	Fold change Rep 1	Rep 2	Rep 3	Rep 4
Oxidative stress related genes						
PFLU_RS08440	*ohr*	Organic hydroperoxide resistance protein	82.24	31.13	4.40	10.05
PFLU_RS14570	*ahpC*	Alkyl hydroperoxide reductase subunit C	3.40	3.10	5.93	11.69
PFLU_RS14575	*ahpF*	Alkyl hydroperoxide reductase subunit F	2.05	2.56	2.09	4.11
PFLU_RS25330	*trxB*	Thioredoxin reductase	2.36	2.88	3.28	3.58
PFLU_RS25630	*yedY*	Periplasmic sulfoxide reductase subunit Y	4.77	3.20		
PFLU_RS26240	*katA*	Catalase		1.73*	2.15	3.89
Efflux, transport, and membrane related genes						
PFLU_RS14265	*mexE*	Multidrug efflux RND transporter periplasmic subunit	4.97	8.77	3.40	6.65
PFLU_RS02795	-	Membrane protein	5.41	6.14	2.52	9.20
PFLU_RS10540	*terC*	TerC like membrane protein	14.26	7.10		
PFLU_RS19180	*ssuF*	Organosulfonate utilization protein, transporter	3.81	2.38		
PFLU_RS03250	*copZ*	Substrate-binding periplasmic protein	2.43		3.41	3.80
PFLU_RS06620	-	*Pseudomonas* membrane protein	4.07	13.01		
PFLU_RS28760	*potAB*	ABC transporter permease potA or potB	59.60	18.43		
PFLU_RS08225	*kdpA*	Potassium-transporting ATPase subunit KdpA			2.34	2.31
PFLU_RS07315	*araJ*	Arabinose efflux permease transporter		∞		2.4
Transcription regulation related genes						
PFLU_RS28745	*araC*	AraC family transcriptional regulator	12.76	15.34	2.63	1.89*
PFLU_RS27245	–	Translocase, transcription regulator	12.8	4.76	4.2	1.83*
PFLU_RS14210	*tetR*	TetR family transcriptional regulator	3.60		2.93#	8.35
PFLU_RS03275	*lysR*	LysR family transcriptional regulator	2.57		3.37	
PFLU_RS06855	*arsR*	ArsR family transcriptional regulator			2.23	5.20
PFLU_RS24860	*iscR*	Iron-sulfur cluster assembly transcription regulator		1.95*	2.07	2.67
PFLU_RS22250	-	Anti-sigma factor	2.96	5.48		

*Upregulated < 2-fold
P-value > 0.01