Michael J. Franklin, Ph.D.

Professor
Department of Microbiology and Immunology
College of Letters and Science
Montana State University

Contact Information:
Email: umbfm@montana.edu
Phone: 406-994-5658
Office: Cooley Laboratory 213, Montana State University, Bozeman, MT, 59715

Education:

1991: Ph.D., University of Tennessee
1986: M.S., University of Georgia
1984: B.S., University of Georgia
1996: Post-Doc, University of Tennessee and VA Medical Center

Academic Appointments:
1984-1986: Graduate Teaching and Research Assistant, Department of Microbiology, University of Georgia
1986-1991: Graduate Research Assistant, Department of Microbiology, University of Tennessee
1991-1996: Post-doctoral Researcher, Department of Microbiology and Immunology, University of Tennessee and Veterans Affairs Medical Center
1996-2002: Assistant Professor, Department of Microbiology, Montana State University
2002-2014: Associate Professor, Department of Microbiology, Montana State University
2008-2009: Interim Department Head, Department of Microbiology, Montana State University
2014-present: Professor, Department of Microbiology, Montana State University

Awards and Honors:
2007: Fergusen Professor, Department of Microbiology

Research Support:
Current:

- R01-AI113330: 03/01/2014-03/01/2020, Resuscitation of P. aeruginosa biofilm cells from dormancy, The goals of this proposal are to investigate expression and role of rmf and hpf, P. aeruginosa proteins that convert ribosomes to an inactive state. mRNA for rmf and hpf were identified as abundant transcripts in biofilm cells that are dormant and antibiotic tolerant., Role: PI
- R21-AI140163: 05/25/2018-04/30/2020, Genetic and physiological analyses of *P. aeruginosa* dormancy factors, The overall goals of this proposal are to use a novel genetic screening strategy to identify genetic factors required for P. aeruginosa to maintain viability during dormancy., Role: PI

Past:

- R01-AI113330: 03/01/2014-03/01/2019, Resuscitation of P. aeruginosa biofilm cells from dormancy, The goals of this proposal are to investigate expression and role of rmf and hpf, P. aeruginosa proteins that convert ribosomes to an inactive state. mRNA for rmf and hpf were identified as abundant transcripts in biofilm cells that are dormant and antibiotic tolerant., Role: PI

Publications:

1. Franklin, M.J. and D.E. Ohman (2002) Mutant Analysis and Cellular Localizations of the AlgI, AlgJ, and AlgF proteins required for the O acetylation of *P. aeruginosa* alginate. J. Bacteriol. 184:3000-3007.
2. Nivens, D.E., D.E. Ohman, J. Williams, and M.J. Franklin (2001) Role of Alginate and Alginate O-Acetylation in the Formation of *Pseudomonas aeruginosa* Microcolonies and Biofilms. J. Bacteriol. 183:1047-1057.
3. Pier G.B., F. Coleman, M. Grout, M.J. Franklin, and D.E. Ohman (2001) Role of Alginate O-acetylation in the resistance of mucoid *Pseudomonas aeruginosa* to opsonic phagocytosis. Infect. Immun. 69:1895-1901.
4. Franklin, M.J., S.A. Douthit and M.A. McClure (2004) Evidence that the *Pseudomonas aeruginosa algI/algJ* gene cassette, required for alginate O acetylation, evolved by lateral gene transfer. J. Bacteriol.186:4759-4773.

5. Guragaina, M. M.M. King, K.S. Williamson, A.C. Pérez-Osorio, T.Akyama, S. Khanama, M.A. Patrauchan, and M.J. Franklin (2016) Role of the two-component regulator, CarSR, in regulating *Pseudomonas aeruginosa* calcium homeostasis and calcium-induced virulence factor production. J. Bacteriol. 198(6):951-63. doi: 10.1128/JB.00963-15.
6. Stewart, P.S., M.J. Franklin, K.S., Williamson, J.P. Folsom, L. Boegli, and G.A. James (2015) Contributions of stress responses to antibiotic tolerance in *Pseudomonas aeruginosa* biofilms. Antimicrob Agents Chemother. 59:3838-47.
7. Patrauchan, M.A., S. Sarkisova, and M.J. Franklin (2007) Strain-Specific proteome responses of *Pseudomonas aeruginosa* to biofilm growth and to calcium. Microbiology 153: 3838-3851.
8. Sarkisova, S, M.A. Patrauchan, D. Berglund, D.E. Nivens, and M.J. Franklin (2005) Calcium-induced virulence factors associated with the extracellular matrix of mucoid *Pseudomonas aeruginosa* biofilms. J. Bacteriol. 187: 4327-4347.
9. kiyama, T., K.S. Williamson, and M.J. Franklin (2018) Expression and regulation of the *Pseudomonas aeruginosa* hibernation promoting factor. Molec. Micobiol. 110:161-175 (doi: 10.1111/mmi.14001).
10. Akiyama, T, K.S. Williamson, R. Schaefer, C. Chang, and M.J. Franklin (2017) Resuscitation of Pseudomonas aeruginosa from dormancy requires hibernation promoting factor (PA4463) for ribosome preservation. Proc. Natl. Acad. Sci USA, 114: 3204–3209, doi: 10.1073/pnas.1700695114.
11. Williamson, K.S. A. C. Perez-Osorio, L. Richards, B. Pitts, K. McInnerney, P. S. Stewart, and M.J. Franklin (2012) Heterogeneity in *Pseudomonas aeruginosa* biofilms includes expression of ribosome hibernation factors in the antibiotic tolerant subpopulation and hypoxia induced stress response in the metabolically active population. J. Bacteriol. 194:2062-73.
12. Perez-Osorio, A.C., K. Williamson, L. Jennings, and M.J. Franklin. (2010) Heterogeneous *rpoS* and *rhlR* mRNA levels and 16S rRNA/rDNA ratios within *Pseudomonas aeruginosa* biofilms, sampled by laser capture microdissection J. Bacteriol. 192:2991-3000.
13. James, G.A., Zhao, A.G., Usui, M., Underwood, R.A., Nguyen, H., Beyenal, H., Pulcini, E., Agostinho, A., Bernstein, H.C., Fleckman, P., Olerud, J., Williamson, K.S., Franklin, M.J., and P.S. Stewart (2016) Microsensor and transcriptomic signatures of oxygen depletion in biofilms associated with chronic wounds. Wound Repair Regen. 24(2):373-83. doi: 10.1111/wrr.12401.
14. Kim, J., J. Hahn, M.J. Franklin, P.S. Stewart, and J. Yoon (2009) Tolerance of dormant and active cells in *Pseudomonas aeruginosa* PA01 biofilm to antimicrobial agents. Journal of Antimicrobial Chemotherapy 63:129–135.
15. Walters MC 3rd, F. Roe, A. Bugnicourt, M.J. Franklin, and P.S. Stewart (2003) Contributions of Antibiotic Penetration, Oxygen Limitation, and Low Metabolic Activity to Tolerance of *Pseudomonas aeruginosa* Biofilms to Ciprofloxacin and Tobramycin. Antimicrob Agents Chemother.47:317-323.
16. Anderl, J.N., M.J. Franklin, and P.S. Stewart (2000) Role of diffusive penetration limitation in *Klebsiella pneumonia* biofilm resistance to ampicillin and ciprofloxacin. Antimicrobial. Agent. Chemother. 44:1818-1824.