Quorum sensing in urinary isolates of Pseudomonas aeruginosa

To further test the hypothesis, Dr. Toussaint will perform evolution experiments to compare the development of lasR mutations with versus without QS inhibitors.

Two genes that encode QS, lasI and rhIA are regulated by lasR and RhIR. The figure below demonstrates a breakdown in the traditional QS hierarchy that regulates virulence. This figure demonstrates that RhIR regulates QS independently of LasR within a urinary isolate: there is high rhIA activity (rhla-GFP expression, in red) despite a nonfunctional lasR mutation (no lasI-GFP expression, in blue, and no expression from the negative control, in green).

Dr. Jean-Paul Toussaint
IM resident, Class of 2021

Pictured at far right, with lab members (Left to right): Ajai Dandekar, MD PhD, Nicole Smalley, Kyle Asfahl PhD, Maxim Kostylev PhD

*Pseudomonas aeruginosa* is an antibiotic-resistant bacterium that causes serious infections predominantly in the lungs, but also in blood and the urinary tract. Through a process called Quorum Sensing (QS), the bacteria release diffusible molecules that stimulate adjacent bacteria to express cellular products important for their growth and virulence. Once the Pseudomonas colony reaches a certain density, genetically regulated QS signals auto-induce a more pathogenetic phenotype. QS inhibitors are being considered as potential therapies for *P. aeruginosa* infections.

Dr. Toussaint and colleagues hypothesized that presence of a QS inhibitor would select for *P. aeruginosa* with QS gene mutations. Knowing that urine contains a natural QS inhibitor (urea), they sequenced the lasR gene in *P. aeruginosa* isolated from 39 clinical urine samples and found that QS gene adaptations are more common than previously suspected.