Role of efflux pumps in bacterial resistance

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Antimicrobial resistance is emerging globally at an alarmingly rapid rate. It appears that efflux protein pumps on bacterial membrane play a major role in confering resistance against multiple antimicrobial drugs. This talk will focus on efflux pumps in gram-negative *Pseudomonas aeruginosa*. These pumps are tripartite protein complexes consisting of innner-membrane, periplasmic, and outer-membrane proteins. These tripartite protein complexes pump out drugs before they can act on the bacterial targets. However, the tripartite protein complexes are not mere pumps. They also affect genetic regulation and cellular processes in bacteria. For instance, the presence of a drug induces higher expression of the efflux pumps, which, in turn, increases the net efflux. Also, the efflux pumps can transport out quorum-sensing molecules, which induce virulence and biofilm formation to further increase bacterial resistance. Thus, the coupling of structural process (extrusion of drugs through the pump), genetic regulation (drug-induced expression of efflux genes), and cellular process (virulence and biofilm induced by quorum-sensing molecules) underpin the biological function of an efflux pump. This talk will summarize the results obtained in a multi-disciplinary project on the nature of the individual processes and their coupling. This talk will conclude that not only do the *Pseudomonas* efflux pumps confer additional drug resistance via biofilm formation but also they lead to resistance against host innate immune response.