

K262

Keynote Lecture

Fitness cost of antibiotic resistance

We are currently losing the benefits of antibiotics to increasingly frequent bacterial resistance. Basic research is required to direct strategic efforts to control this crisis. Solutions will include developing new generations of novel antibiotics but this will not in itself provide a long-term solution to resistance as a problem. We must also understand and address the underlying issues that have led to the current state. Where and how is resistance selected? It is important to know this so that we can address the problem at the source. The principal reservoirs of resistance genes and resistant pathogens are environmental bacteria in and on our bodies and in the wider environment. Recent research shows that very low environmental levels of antibiotics are selective for resistance, emphasizing the need to prevent antibiotic pollution of the environment. How do resistant pathogenic bacteria evolve? What are the crucial stages in the development of clinically relevant antibiotic resistance? The notion that pathogens are either resistant or susceptible is a gross simplification. In the transition from susceptibility to resistance, bacteria can suffer a significant loss of fitness. This sets in train a series of adaptive evolutionary changes in the newly resistant bacteria as they try to ameliorate the costs of increasing resistance. Ongoing research shows that the evolution of high-level resistance can be complex, potentially exposing bacteria to alternative treatments or drug combinations. We need a better understanding of how bacteria adapt to antibiotics and whether we can exploit this knowledge in therapy. These are basic questions that need to be addressed before we commit to possibly misusing a new generation of antibiotics.