Approaches to abate antibiotic resistance

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Antibiotics, one of the wonder discoveries of all times have now become a global health crisis due to the emergence of antibiotic resistance. On Oct, 8, 2015, Dr. Margaret Chan, the Director-General of the World Health Organization, in a meeting in Berlin with G7 Health Ministers has rightly said, "The world is heading towards a post-antibiotic era in which common infections will once again kill". This widespread increase in antibiotic resistance has curbed the lifespan of antibiotics. Therefore there is a strong need to tactically introduce new antimicrobial compounds that can combat the pathogen without any resistance.

To develop antibiotics with less susceptibility to resistance we must target the "Achilles' heel" of bacteria which includes some highly conserved motifs like the pyrophosphate-sugar moiety of lipid II. Since these regions show lesser mutations – and any kind of mutation here usually leads to death – such regions are least prone to antibiotic or drug resistance.[1] In place of nucleic acids, lipids need to be targeted for antibiotic action because those antibiotics targeting the lipids will take comparatively longer time to develop resistance as lipids are less mutable.[2] Instead of a single target and a similar method, antibiotic should attack via different methods at multiple sites. Lastly, cultivation of bacteria should be encouraged in their natural environment i.e. soil for majority of the bacteria.

Recent studies show that approximately 99% of all species in external environment are uncultured bacteria that are promising source of antibiotics.[3] Since many of the bacteria do not grow in artificial laboratory environment, an alternative attempt was made to successfully cultivate them in their native environment.[4-5] Using a similar approach, a new antibiotic "Teixobactin" was discovered recently, isolated from *Eleftheria terrae*, bacteria that were previously unculturable. This antibiotic is found remarkably active against many difficult-to-treat micro-organisms like *Clostridium difficile*, *Mycobacterium tuberculosis* and methicillin-resistant *Staphylococcus aureus* without any evident resistance. [6]

There are diseases like tuberculosis which do not have shorter and better curatives as the available drugs take a long time for efficacy or possess detectable resistance. Therefore there is a real need to prospect either novel antimicrobial agents or new sites for the drugs. This can be achieved using the discussed approach which might lead to paradigm shift.

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