Antimicrobial Effects

Vijay Kothari[1]

1 Nirma University

Conventionally 'antimicrobial effect' has been understood as inhibitory or killing effect exerted by an agent on microbial growth, and this effect can be either microbistatic or microbicidal. However, now it is clear that differnt natural products/ chemotherapeutic agents (e.g. antibiotics at sub-MIC levels) can exert a variety of antimicrobial effects on target pathogens, which always does not involve killing or growth-inhibition. Hence in recent years various terms like anti-infective, anti-pathogenic, anti-virulence, anti-quorum sensing, etc. have come to be used frequenclty in published literture. Though they all can fit under the broad umberalla of the phrase 'antimicrobial', owing to the conventional perception of 'antimicrobial' term being associated with a negative effect on microbial growth, it becomes more useful to use each of these terms in their most appropriate context.

1. Antimicrobial:

We can use this term in its borad sense, to describe any sort of negative effect on any of the bacterial traits e.g. quorum sensing (QS), metabolism, growth, physiology, virulence, pathogenicity, susceptibility to antibiotics and/or host defences, etc. For referring specifically to the effect on microbial growth we may use the terms 'microbicidal' or 'microbistatic' as the case may be.

2. Anti-infective:

This term can be used to describe such effect of any agent which intereferes binding of the pathogens to the host cells, and thus not allowing the pathogenic microbe to establish infection (by preventing the entry of pathogen into the host). Some agents fitting into this category may be effective as a prophylactic measure. They may not exert any significant direct effect on microbial growth.

3. Anti-virulence:

This term can be used to describe such effect of any agent which curbs expression of the virulence traits (e.g. biofilm formation, efflux pump activity, haemolysis, siderophore production, etc.) of the pathogen with no or minimal effect on its growth.

Among above 'antimicrobial effects' microbistatic and microbicidal effects can easily be

identified thorugh routine *in vitro* susceptibility tests i.e. disc diffusion or broth dilution assay. However detecting those described at serial no. 2-3 above will require differnt types of assays. Assay for reliable detection of the anti-infective effect will necessariy involve a host (e.g. *Caenorhabditis elegans* or mice). It is not unusaul for a single 'antimicrobial' agent to exert anti-infective/ anti-virulence effect at lower concentrations, and growth-inhibitory effect at higher concentrations. In such cases, proper use of terminology describing their effect over a particular concentration range becomes very important.