

Editorial

Injudicious use of antibiotics and the emergence of antibiotic resistance

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Although, Fleming first discovered the antibiotic derived from the fungus *Penicillium notatum* in 1929, but it was not earlier than 1940 when penicillin could be produced in pure form for human use.¹ It was a revolution in the treatment of infections and the simple diseases which were fatal in the past were treated effectively and promptly. In the next few years there was a lot of research in this field and several different groups of antibiotics with varied spectra were introduced in the market. Almost all the pharmaceutical companies started manufacturing antibiotics both derived from living organism and later synthetically. Several formulations became available including tablets, capsules, injections and infusions. Then came an era of broad-spectrum antibiotics which were effective against different types of microorganisms. These drugs had an advantage of prescription without getting the report of culture and sensitivity but had several side effects.

In recent years there is increasing concern

that the antibiotic era is coming to an end. Firstly, because the production of new agents has come to a standstill and secondly, the bacteria are showing great ingenuity in developing resistance to the antibiotics in common use.

There are some bacteria which are still sensitive to the antibiotics used against them for years. These include *Chlamydia trachomatis* to tetracyclines and macrolides, *Streptococcus pyogenes* and *Treponema pallidum* to penicillins and most anaerobes to metronidazole. Against this rosy background is the emerging problem of antibiotic resistance. This includes penicillin-resistant *pneumococci* and emerging strains of *meningococci*, multi-drug resistant *Salmonella typhi*,² multi-drug resistant *mycobacteria*,³ methicillin and multidrug resistant *Staphylococcus aureus* (MRSA), vancomycin-insensitive *S. aureus* (VISA)⁴ and vancomycin-resistant *enterococci* (VRE).⁵

Bacterial resistance to antibiotics can emerge in three ways. Firstly, when all the sensitive bacteria have been eradicated by the use of a certain antibiotic, the remaining resistant colony of bacteria is free to multiply. This is the most common form of antibiotic resistance. Secondly, bacteria may

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acquire resistance by mutation, in their genetic makeup and hence become insensitive to the lethal effects of a drug. This resistance is transferred vertically from one generation of bacteria to the next. Lastly, the point of concern is the transferable drug resistance. Here, extrachromosomal genetic information affecting the expression of resistance contained in a plasmid or a transposable section of chromosomal DNA can be transferred from one bacterium, which is non-pathogenic to another previously susceptible organism. This often takes place in the bowel or skin and may involve variety of different organisms. Examples of resistance originating in commensals or environmental bacteria and transferring it to pathogens include tetracycline resistance from *enterococci* to *pneumococci* and *gonococci*, and erythromycin resistance from *Bacillus sphaericus* to *Bacteroides fragilis*.⁶

Several physical changes occur in a bacterium, when it becomes resistant to an antibiotic. These include decrease in the permeability of cell membrane for that specific antibiotic, alteration in ribosomes, alteration in cell wall precursors or target enzymes and emergence of auxotrophs that require growth substrates different from that required by the parent organism.

In a report published by the House of Lord's Select Committee on Science and Technology in August 2004, the problem of emergence of antibiotic resistance is recognized with a lot of concern and highlights that misuse of antibiotics in human and veterinary medicine, farming

(growth promoters), aquaculture and plant culture.

All medical professionals must be very discreet in using antibiotics. It is always preferable to do culture & sensitivity before starting the therapy, but if an antibiotic has to be given immediately then give a drug which is likely to affect the suspected microorganism causing a particular illness, rather than writing a broad-spectrum antibiotic. Since there are several drug companies manufacturing antibiotics, available at surprisingly cheaper rates, one should prescribe good quality drugs, manufactured by standard companies in order to avoid the problem of drug resistance. Furthermore, evidence-based guidelines on antibiotic use should be followed in our departments and taught to both the undergraduate and postgraduate students. It is further recommended to devise a surveillance or feedback system for the detection of antimicrobial resistance and to bring it into the notice of others in scientific forums and journals.

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