Antimicrobial Drug Resistance in Bacteria Isolated from Sick Animals and Their Environment in Year 2011-2012 at Central Disease Diagnostic Laboratory, Indian Veterinary Research Institute, Izatnagar

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Abstract
In the study, a total of 372 strains of bacteria including 114 Gram positive (Aerococcus, Bacillus, Enterococcus, Pedicococcus, Staphylococcus, Streptococcus) and 258 Gram negative (Aeromonas, Agrobacterium, Bordetella, Brucella, Burkholderia, Citrobacter, Dermatophilus, Enterobacter, Erwinia, Escherichia, Klebsiella, Morganella, Pasteurella, Pragia, Proteus, Pseudomonas, Salmonella, Streptobacillus) isolated from referred cases were tested for their antimicrobial sensitivity against 25 antimicrobial disk (amikacin, amoxyccillin + clavulanic acid, amoxyccillin + sulbactam, amoxyccillin, ampicillin, ampicillin + sulbactam, ampicillin, cloxacillin, azithromycin, cefalexin, cefexime, chloramphenicol, ciprofloxacaxin, ciprofloxacaxin, clindamycin, colistin, cotrimoxazole, erythromycin, gentamicin, imipenem, nalidixic acid, nitrofurantoin, novobiocin, penicillin G, streptomycin, tetracycline and vancomycin). All gram positive strains were sensitive to imipenem and amoxyccillin + sulbactam. Gram positive strains were comparatively more sensitive than Gram negative bacteria to most of the antimicrobials except for chloramphenicol, azithromycin, colistin and nalidixic acid. Besides, more than 90% Gram positive isolates were sensitive to amoxyccillin (93.1%), amoxyccillin + clavulanic acid (97.1), amoxyccillin + sulbactam (95%), gentamicin (92.7%) and nitrofurantoin (90.7%). On Gram negative bacteria none of the antimicrobial was effective against all the strains. The most effective antimicrobial (gentamicin) was effective on only 91.1% strains closely followed by imipenem (90%), amoxyccillin + sulbactam (89.7%), chloramphenicol (88.6%) and ciprofloxacazin (81.1%). Out of 25 drugs, 10 could not inhibit growth of more than 50% Gram negative bacteria. The results suggested prevalence of extended spectrum B-lactamase and metallo-B-lactamase producer bacteria in sick animals and their environment.

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Resistance to antimicrobial agents was noticed soon after these life-saving drugs were introduced into human and animal medicine. But we are not sure that how much role the use of antimicrobial drugs have played in emergence of antimicrobial drug resistance but the role in spread of drug resistance gene is certainly associated with use of antimicrobials in human or animal practice. Though many people debated on good and adverse effects of antibiotic use, everyone knows that now a days, health largely depends on antimicrobial medicines to treat conditions considered as incurable about a few decade ago [1]. Antimicrobial drug resistance (AMDR) makes the treatment ineffective,
therefore judicious use of antimicrobial therapy is essential to safeguard these life saving drugs for future generations [1]. Overuse and misuse of antibiotics are main causes of the increasing prevalence of antibiotic resistance among bacteria [2]. Role of veterinary antimicrobial drug use and certain industrial farming practices have been considered as very important factors playing role in emergence of multiple drug resistant (MDR) bacteria causing concern not only for veterinarians and animal farmers but also to human health [2, 3]. The judicious use can be based on routine antimicrobial drug sensitivity assays for bacterial isolates particularly from clinical cases. In the present report an account of drug resistance pattern in bacteria isolated from veterinary clinical cases is presented. This type of information is scantily available on bacterial isolates from animals and their environment in India. The information may be useful to veterinary clinicians in designing the antimicrobial therapy.

1. Materials and Methods

In the study, a total of 372 strains of bacteria including 114 Gram positive (Aerococcus 2, Bacillus 19, Enterococcus 1, Pediococcus 1, Staphylococcus 32, Streptococcus 59) and 258 Gram negative (Aeromonas 5, Agrobacterium 1, Bordetella 2, Brucella 3, Burkholderia 5, Citrobacter 3, Dermatophilus 2, Enterobacter 19, Erwinia 2, Escherichia 102, Klebsiella 27, Morganella 1, Pasteurella 16, Pragia 2, Proteus 18, Pseudomonas 29, Salmonella 19, Streptobacillus 1) isolated from clinical samples of referred (mostly from Veterinary Polyclinic, IVRI, Izatnagar, Bareilly and also from other parts of the country) cases (sick animals), environment of sick animals and their handlers, were tested for their antimicrobial sensitivity against 25 antimicrobial discs (Hi-Media, Mumbai, amikacin, amoxycillin clavulanic acid, amoxycillin sulbactam, amoxycillin, ampicillin, ampicillin sulbactam, ampicillin cloxacillin, azithromycin, cefalexin, cefixime, chloramphenicol, ciprofloxacin/ enrofloxacin, clindamycin, colistin, cotrimoxazole, erythromycin, gentamicin, imipenem, nalidixic acid, nitrofurantoin, novobiocin, penicillin G, streptomycin, tetracycline and vancomycin) using disc diffusion assay [4].

2. Results and Discussion

The results of antimicrobial drug sensitivity (Fig. 1) revealed that none of the drug was able to inhibit growth of all 372 bacterial strains. All Gram positive strains were sensitive to imipenem and amoxycillin sulbactam. Gram positive strains were comparatively more sensitive than Gram negative bacteria to most of the antimicrobials except for chloramphenicol, azithromycin, colistin and nalidixic acid. Besides, more than 90% Gram positive isolates were sensitive to amoxycillin (93.1%), amoxicillin clavulanic acid (97.1), ampicillin sulbactam (95%), gentamicin (92.7%) and nitrofurantoin (90.7%). On Gram negative bacteria none of the antimicrobial was effective against all the strains. Gentamicin, the most effective antibiotic effectively inhibited only 91.1% of Gram negative strains, it was closely followed by imipenem (90%), amoxycillin sulbactam (89.7%), chloramphenicol (88.6%) and ciprofloxacin (81.1%). Out of 25 drugs 10 could not inhibit growth of more than 50% Gram negative bacteria. The results suggested production of extended spectrum β-lactamases by several strains of bacteria (resistance to ampicillin, amoxicillin, cefalexin, cefixime etc.). Resistant to imipenem in one strain each of Escherichia coli, Pseudomonas aeruginosa, Bordetella bronchiseptica and Proteus vulgaris which could be countered by EDTA indicated their metallo-β-lactamase production potential [5, 6]; however, none of the four isolate was from sick animals but from animal handlers or from the environment. It was interesting to observe that strains were equally or more resistant to newer antimicrobials (ciprofloxacin, enrofloxacin, cefalexin, azithromycin) than to older ones (tetracycline, gentamicin, amoxicillin, ampicillin, nitrofurantoin and cotrimoxazole). Combinations of clavulanic acid or sulbactam made the antimicrobials more effective against Gram positive and Gram negative bacteria, respectively, indicating the wide spread presence of ability to produce β-lactamases by the pathogenic bacteria [5, 6].
The observations revealed that extended spectrum B-lactamase and metallo-B-lactamase producer strains are common in animals and their environment. The antimicrobial therapy in veterinary practice can be made economic and more effective through using cheaper and older antimicrobials too. However, to be more precise antimicrobial sensitivity assays must be used in veterinary practice at least in cases of prolonged and essential antimicrobial therapies.

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References