ICMR International Travel Support for Non-ICMR Scientist

No. 3/2/TG-55(1)/HRD-2014

- **Name & Designation** : **Dr. Sujana Mohanty, Associate Professor.**
- **Address** : **Dept. of Microbiology, AIIMS, Bhubaneswar-751019.**
- **Neurology, AIIMS, New Delhi-110029.**
- **Name of the International Conference/ Seminar/Symposium/ Workshop** : **3rd International Conference on Antimicrobial Research (ICAR) 2014.**
- **Title of the abstract accepted** : **Multiple mechanisms of carbapenem resistance in entero bacteriaceae bloodstream: A molecular study in and Indian Hospital.**
- **Date & Venue** : **1-3rd October 2014, Madrid, Spain.**
- **Money sanctioned** : **₹ 87419/-**
- **Money reimbursed** : **₹ 85,564/-**

Participation Report

The Conference, III International Conference on Antimicrobial Research 2014 (ICAR2014) was conducted by Formatex Research Centre, Badajoz, Spain. The event was held at Faculty of Medicine, Complutense University of Madrid, University City, Madrid, Spain from 1st – 3rd October 2014. A total of approximately 45 countries participated in the event, with number of participants being 450. There were a total of 11 sessions, held in parallel sessions, spread over a period of three days, with both oral and poster presentations. The oral presentations were held in 2 halls: Hall 1- "Ramon y Cajal" lecture theatre and Hall 2- "Professor Botella" room.

B. Academic highlights of the Training/Workshops

(i) **New Development presented at the Conference**

Sessions – The different sessions were-

Day 1 – i) Clinical and medical microbiology, infectious diseases and antimicrobials. Public health. Strengthening of innate immune system as antimicrobial strategy

ii) Biofilms

iii) Bacteriophages

The session on Clinical and Medical Microbiology, Infectious Diseases started with a keynote lecture on "Rapid detection and identification of Microbial agents" in which different types of detection methods specially pertaining to molecular detection of pathogens were enumerated. The session presented new and interesting findings, namely, Antibacterial activity of Antarctic lichens against MDR nosocomial pathogens; Antibiotic resistance of Viridans Group Streptococci isolated from Dental plaques; Antimicrobial photodynamic therapy (PDT): from bench to bedside and vice vers; Antimicrobial susceptibility, virulence factors and enterotoxigenic genes of food isolates of coagulase-positive Staphylococcus; Antimicrobial treatment of nonspecific men's urethritis as a promising method for treatment of fertility; Blueprint of the serotype distribution and antimicrobial resistance in human Salmonellosis in Belgium, etc. The total extract and methanolic fraction of Antarctic lichen *Ramalina terebrata* had the best antibacterial activity upon MDR pathogens (MRSA, VRE, ESBL-producing *E.coli*) followed by the total extract and methanolic fraction of *Himantornia lugubris*. The antimicrobial pattern of 635 Viridans Group Streptococci from Korea showed high rates of resistance to ampicillin, 9.1 % resistance to erythromycin, and 31% resistance to tetracycline. The most resistance species were *Streptococcus sanguis* and *S. salivarius*. Antimicrobial PDT was examined *in vitro*, in mice and in patients. More than half of the mice with *Vibrio vulnificus* septicaemia survived after Toluidine blue O-mediated PDT. PDT also enhanced wound healing in chronic infected ulcers in patients, with potential to become an alternative or adjuvant antimicrobial therapy. The study of non-specific men's urethritis from Russia revealed 75% Gram-positive bacteria (*Staphylococcus* spp., *Streptococcus* spp., *Corynebacterium* spp.), 22% Gram-negative bacteria (*E. coli*, *Citrobacter*, *Neisseria* spp.) and 24% Candida. After 7 days of therapy, 89% of patients had no

symptoms. In a five-year period, the Belgian Reference Center for *Salmonella* received 16, 544 human *S. enterica* strains. The investigators identified 377 different serotypes, with predominance of serotypes Typhimurium and Enteritidis. Quinolone resistance, manifested as 16.4% nalidixic acid and 4.4% ciprofloxacin resistance was mainly mediated by GyrA residues, Ser83 and Asp87.

In the session on biofilms, the new topics discussed were- Adhesion property of the highly adhesive bacterium *Acinetobacter* sp. Tol 5 mediated by a new trimeric auto transporter adhesion; Analysis of activity of blood serum and IgG for the ability to destroy biofilms microorganisms; Anti-biofilm peptide combinations against *Pseudomonas aeruginosa* and *Staphylococcus aureus*, antibiotic resistance and biofilm formation of *Staphylococcus aureus* clinical isolates; Crowning novel *E. coli* colonizing behaviour: implications for the development of new anti-biofilms formation drugs; Epidemiology of alteration types of medical implants in ICU etc. A novel enzymatic antimicrobial and anti-biofilm system was also presented by an Austrian Group of researchers who focussed their study on oxidoreductase Cellobiose Dehydrogenase, with ability to reduce molecular oxygen using a broad range of di-, oligo- and polysaccharides as electron donors.

The session on Bacteriophages discussed on Artlysins – a novel class of enzyme-based antibacterials that quickly kill MDR *Pseudomonas aeruginosa* and their persisters. Another topic was Effectiveness of phage-based probiotic dietary supplement in the prevention of *E. coli* traveller's diarrhoea: a small-scale study. In a study from Russia on "Epidemiological and clinical efficacy of bacteriophages in the treatment and prevention of infectious diseases", bacteriophage containing preparations *Sh. flexneri* (1, 2, 3, 4, 6), *Sh. sonnei* and Salmonellosis bacteriophage phage groups (A, B, C, D, E) were tested. The drug was highly active against 89.0% strains of *E. coli*, 85.0% *Staphylococcus*, 88.0% *Streptococcus*, 72.0% *Proteus* and 89.0% *K. pneumoniae*.

Day 2- i) Antimicrobial materials science and surface chemistry. Antimicrobials in consumer products.

ii) Techniques and methods

iii) Antimicrobial physics

iv) Antimicrobial chemistry

v) Antimicrobial natural products. I: Peptides

In the second day, a lot of discussion was generated on Peptides as antimicrobial natural products. A researcher group from Italy and USA investigated the anti-Pseudomonal efficacy of a frog skin-derived AMP, Esculentin, in vitro and in mouse models of lung/ ocular *Pseudomonas* infections. Results revealed that Esculentin Esc (1-21) has a rapid anti-pseudomonal activity against both free-living and biofilm forms of this pathogen with a membrane perturbing activity as a plausible mode of action. This limits the emergence of resistance. A novel natural product, humidimycin (MDN-0010) isolated from liquid culture broths of the actinomycete *Streptomyces humidus* potentiates the antifungal activity of caspofungin and itraconazole was the findings of a multicentric group from Spain and Germany. Similarly studies from Poland revealed the possible use of a chelatable cyclic lipopeptide amphisin produced by *Pseudomonas fluorescence* DSS73 against MDR microorganisms *E. coli*, *Enterococcus faecalis*, *S. epidermidis*, *Proteus mirabilis* and *Candida albicans*. A group demonstrated that lipopeptides pseudofactin II and surfactin effectively decrease cell surface

hydrophobicity of *C. albicans* strains thereby modifying the Candida cell wall. The action of S20- a synthetic peptide- as an antimicrobial and anticancerous agent was evaluated.

Topics of interest in the session- Antimicrobial materials science and surface chemistry and antimicrobials in consumer products included- A new highly antimicrobial bio-inspired protein-based polymer designed for medical devices; an alginate lyase functional coating catalysis-independent to prevent *P. aeruginosa* adhesion; antibacterial application of functionalized soluble graphene; antimicrobial effects of silver nanoparticles on planktonic and sessile communities of pathogenic bacteria; antituberular and cytotoxic properties of new hydrazine derivatives; design and synthesis of antimicrobial cyclic lipopeptides etc.

A lot of new Techniques and methods to detect antimicrobial resistance in pathogens were discussed. A study group from Russia highlighted on the comparison of different methods for detection of methicillin susceptibility to coagulase-negative staphylococci. A researcher group from France discussed on the Diffusion, bioavailability and reactivity of antibiotics against *Staphylococcus aureus* biofilms: a new approach by Dynamic Fluorescence Imaging. Another study was ELISA for detection of immunoglobulin IgA and IgG against HPV. A study was presented from Czech Republic regarding separation, identification of methicillin-resistant from methicillin-susceptible Staphylococcus aureus in blood and their antimicrobial susceptibility by electrophoretic methods in fused silica capillaries etched with supercritical water.

Day 3 - i) Antimicrobial natural products II: Terrestrial and marine organisms

ii) Bio control. Biosynthesis of antimicrobials

iii) Antimicrobial resistance – Mechanisms of action of antimicrobial agents. Attenuation of virulence as antimicrobial strategy

The final day started with a keynote lecture on "Role of efflux pumps in bacterial resistance" in which the speaker gave a lucid presentation on the structure and function of efflux pumps in Gram-negative bacteria and its potential role in antimicrobial resistance as well as in other cellular functions. The role of terrestrial and marine organisms as antimicrobial natural products was discussed. Some of these are enumerated below. A study of two medicinally important plant extracts of the genus Lippia against two predominant uropathogens, *E. coli* and *Klebsiella pneumoniae* exhibited significant antimicrobial effect against both the clinical isolates Synergistic effect of these leaf extracts with different solvents and a broad spectrum antibiotic (streptomycin) were also checked. Antistaphylococcal activity of *Callistemon lanceolatus* Sweet leaf extract showed minimum inhibitory concentration of 16 μg/ml. The attenuation of virulence as antimicrobial strategy was a new concept. It had the following papers- A drug repositioning screen identified pentetic acid as a potential therapeutic agent to suppress Elastase-mediated virulence of *Pseudomonas aeruginosa,* Genetic characterization and virulence control by calcineurin in the dimorphic fungus *Paracoccidiodes brasiliensis*, and the use of Tetraspanins as potential barriers to infection.

I presented my paper entitled "Multiple mechanisms of carbapenem resistance in Enterobacteriaceae bloodstream isolates: a molecular study in an Indian hospital" in the session "Antimicrobial resistance- Mechanisms of action of antimicrobial agents" which was appreciated by participants from other institutes of other countries. In this session, there were many interesting presentations, like Analysis of quinolone and oxyiminocephalosporin resistance mechanisms in

Salmonella in Uruguay. The authors detected 108/583 nalidixic acid-resistant, 9/583 oxyiminocephalosporin-resistant and 2/583 isolates resistant to both. Thirteen isolates carries *qnrB* alleles, mostly *qnrB19*, whereas one isolate carried *qnrB2*. ESBLs were detected in eight strains whereas three strains carried CMY-like plasmidic AmpC genes. Other interesting presentations were "Increasing resistance to β-lactams associated to hyper production TEM-1 β-lactamase in *Haemophilus influenzae*" and "Susceptibility of Aspergillus species isolated from cutaneous and visceral lesions to antifungal drugs in Iran".

(ii) New Development resulting from the Conference (222 words)

I presented my paper entitled "Multiple mechanisms of carbapenem resistance in Enterobacteriaceae bloodstream isolates: a molecular study in an Indian hospital" in the session "Antimicrobial resistance- Mechanisms of action of antimicrobial agents" which was appreciated by participants from other institutes of other countries. Two groups with similar interest on carbapenem resistance and extended spectrum beta-lactamase mediated resistance expressed interest to collaborate further. I was interested on a paper from Uruguay entitled "Analysis of quinolone and oxyiminocephalosporin resistance mechanisms in *Salmonella* in Uruguay", on which I plan to work on similar lines. This will be helpful to delineate the quinolone and cephalosporin resistance mechanisms in Indian Salmonella isolates and will lead to optimum therapeutic benefits to our patients. The different methods for detection of methicillin susceptibility to coagulase-negative staphylococci can be employed in our set-up to provide accurate methods of detection of methicillin resistance in *Staphylococcus* isolates. I discussed with a researcher group from Japan on "Trend of bacteria isolated from patients with acne vulgaris in Japanese University hospital" to perform a study to know the profile of bacteria associated with acne vulgaris in our region and detect the resistance mechanisms associated if any. Participation in the conference has helped in academic interaction and exchange of research ideas with faculty and students from other institutes of the world which has enriched my diagnostic & research outlook.

(iii) Name of the Publication in case your work is recommended for publications

My paper was accepted and published in the conference proceedings (copy attached) in the book, "Book of abstracts" III International conference on Antimicrobial Research. I was also the co-author of a paper presented at the conference (copy attached). The details are as follows:

a) **Srujana Mohanty**, Indu Biswal, Rajni Gaind. Multiple mechanisms of carbapenem resistance in Enterobacteriaceae bloodstream isolates: a molecular study in an Indian hospital. Book of abstracts, III International conference on Antimicrobial Research 2014, pp: 465

b) Indu Biswal, Rajni Gaind, Neeraj Kumar, Vikas Manchanda, **Srujana Mohanty**, V. Ramesh, Manorama Deb. In vitro antimicrobial susceptibility of *Propionibacterium acnes* isolated from acne patients in India. Book of abstracts, III International conference on Antimicrobial Research 2014, pp: 379

Participant's contribution to the Conference (122 words)

My contribution to the conference was in the form active participation and academic contribution in the conference as a delegate from India discussing the relevant medical issues of our country with other participants, thus seeking for appropriate solutions. I contributed in the form of poster presentation "Multiple mechanisms of carbapenem resistance in Enterobacteriaceae bloodstream isolates: a molecular study in an Indian hospital" and defended my presentation. I was also the co-author of another poster "In vitro antimicrobial susceptibility of *Propionibacterium acnes* isolated from acne patients in India" presented by my colleague. I was much interested in the keynote lecture on "Role of efflux pumps in bacterial resistance"; I discussed some of my doubts with the speaker and contributed to the scientific exchange.