

- ❖ Name & Designation : Mr. Shyam Lal Mudavath, Ph.D. Student.
- ❖ Address : Medicine Institute of Medical Sciences, BHU, Varanasi
- ❖ Name of the International Conference/ Seminar/Symposium/ Workshop : Congress & Exhibition on Nanobiotechnology 2014.
- ❖ Title of the abstract accepted : Noncovalent complexation of amphotericin B with amine modified grapheme for visceral leishmaniasis.
- ❖ Date & Venue : 2-4th June 2014, Munster, Germany.
- ❖ Money sanctioned : Rs 86,200/-
- ❖ Money reimbursed : Rs 86,200/-

Participation Report

Organization of the conference

47 outstanding scientists from 12 different countries addressed today's challenges and potentials in Nanobiotechnology in 5 different application areas from the academic as well as from the industrial perspective. The session "New Faces NRW" presented young scientists from the state of North Rhine-Westphalia. An industrial exhibition as well as company presentations addressed the latest achievements in the commercialization of Nanobiotechnology. There were 7 sessions covering different applications areas including 2 Keynote lectures. Each session included 2-3 invited speakers and 4 further speakers

Academic Highlights

Day 1

Session 1: Theme for session was Nano for Therapy and started with Dr. Dan Peer highlighting the personalized nanomedicine has the power of combining nanomedicine with clinical and molecular biomarkers achieving improve prognosis and disease management as well as individualized drug selection and dosage profiling to ensure maximum efficacy and safety. In this presentation, I will also detail aspects of personalized nanomedicine both from the drug and the carrier standpoint. This is followed by Dr. Agnès Pottier lecture on Lessons learned from nanomedicine development. Then Dr. Langer K explained the approach for Ligand-Modified Nanoparticles for Improved Drug Delivery. Another interesting lecture by Dr. Eugenia LL Yeo on simultaneous photothermal and photodynamic therapy with a single nano-device. Followed by lectures of Michael Maas and F.M. Goycoolea reported the synthesis of novel submicron capsules self-assembled from nanodiamonds featuring high shell stability. These capsules, which we call diamondosomes, are self-assembled from negatively charged as well as positively

charged detonation nanodiamonds at the decane/water interface using the lipids stearic acid or stearyl amine to induce shell formation. "Soft" biopolymersomes as drug/gene carriers and their interactions with epithelial cells and bacteria. S. Leinfelde reported the Functionalized Silicon Nanoparticles for Radiation and Gene Therapy

Session 2: This session was focused on Analytics of Bio/Nano Materials. First lecture was an invited talk by Roland H. Stauber on The Nanoparticle-Protein Corona – Relevance for Nanomedicine and –Toxicology. This was followed by Ewald Niehuis on results illustrating the strength of combined in-situ TOF-SIMS / SFM measurements and the potential for a wide range of applications. Yves Emery explained the basics of DHM, explaining how the DHM is label-free, non-scanning, and why it enables to measure in any sample environmental condition. Multifunctional plasmonic and Bright Silica probes for the in situ characterization of nanoparticle-biointeraction by Janina Kneipp. This was followed by company presentations.

Day 2:

Session 3: Theme for this session was Nano for Regenerative Medicine. The first lecture was about an overview about the different textile technologies and their impact for tissue engineering in general and cardiovascular tissue engineering specifically by Stefan Jockenhövel. Three-dimensional (3D) polymer and carbon scaffolds for future cell replacement therapy and bioartificial organs were presented by Jenny Emnéus. Dr. Walter Gerike talked about the Nanostructured biomaterials for better clinical outcomes. Parylene-based flexible neural probes with PEDOTcoated surface for recording of the brain activity was well addressed by Dr. Valentina Castagnola. Next to this there was a lecture on Laser-generated bioactive nanoparticles in aqueous Polymer-capsules for burn wound therapy by Nina Million.

Session 4: It was about "New Faces – Young Scientists in North Rhine-Westphalia". P. Besenius gave lecture about Controlled Self-Assembly of Functional Peptide Materials in Water. Application of calcium phosphate nanoparticles in biomedicine was briefly summarized by Dr. V Sokolova. Dr. Ahmad Fawzi Hussain described a simple, controlled and robust method for generating nanoimmunotheronostics reagents by combining molecular targeting, drug/imaging nanocarrier in one system using SNAP-tag technology. This system offers the potential of high specificity, efficacy and safety, for the simultaneous detection and suppression of cancer cells expressing the epidermal growth factor receptor (EGFR). Laser based functionalization for graded immobilization of biomolecules on biocompatible polymer surfaces was explained by

Nadine Nottrodt and was very informative. Single Molecule Translocation through Nanopores Investigated with Optical Tweezers by Lukas Galla.

Session 5: The theme for this session was Nano for Diagnostics, Imaging and Sensing. The first lecture was about LipImage™ nanodots bring a new light on diagnostic by Patrick Boisseau. Vinod Subramaniam summarizes our work on systematically studying the interaction of alphasynuclein oligomers with lipid membranes, in an attempt to understand the mechanisms by which these oligomeric species may manifest toxicity. Elemental Bioimaging of Silver Nanoparticles in Tissues by delivered by Uwe Karst. H.G. Breunig has presented their studies on the penetration of zinc oxide (ZnO) nanoparticles, commonly used as UV filters in commercial sunscreens, into human skin. The role of CXCR4 Targeted- and MMP Responsive-Iron Oxide Nanoparticles for Enhanced Magnetic Resonance Imaging was lectured by Dr. Juan Gallo Paramo. Dr. Verena C. Stimberg Studying the impact of membrane properties on ion channel activity in a microfluidic format – an important aspect in drug development. Next a key note lecture by Omid C. Farokhzad Targeted polymeric nanoparticles: From Discovery to clinical trials.

Day 3:

Session 6: The theme for this session was Nano Toxicology. Dr. Vicki Stone stated the session with Studies on the mode of action of nanotoxicity. Alexandra Kroll discussed the results on genetic diversity, composition of EPS, and 3D structure and the concentrations of dissolved, total, and periphyton associated Ag. Followed by lecture on Safety Assessment of Nanomaterials: Scientific Developments for the Requirements of Industry by Sergio Anguissola. Zinc Oxide Nanoparticles Toxicity – a size dependent tale of ions and particles Jürgen Schnekenburger. Development of method for determination of the effective dose that reaches the cellular monolayer by monitoring nanoparticle deposition *in vitro* was shared by Dr. P. Colpo. Followed by a talk outlining nano-ecotoxicological results obtained from toxicity testing with AgNPs, using the OECD standard test species. The effect studies cover *in vitro* and *in vivo* effects and include mode-of-action, behavioural and population effects.

Session 7: It was devoted to the Nanomedicine in Europe. New horizons to drive the future of Medicine European Technology Platform on Nanomedicine intend to lead the domain by Patrick Boisseau. Dr. Cristina Paez-Aviles detailed lecture on Nanobiotechnology and Nanomedicine: Innovation and Commercialization Challenges towards H2020. Next ArtiVasc 3D – Artificial

vascularized scaffolds for 3D tissue regeneration by Arnold Gillner. Following which Dr. R. Förch talked about the Active wound dressings based on biological mimicry. Dr. Serge Picaud gave a lecture on The Neurocare project: diamond and graphene as electrode materials in Brain-Machine Interfaces.

SUMMARY OF THE SCIENTIFIC CONTRIBUTION BY THE PARTICIPANT

I presented my poster on **Noncovalent complexation of Amphotericin B with Amine modified Graphene for Visceral Leishmaniasis**. We evaluated a novel formulation of Amphotericin B (AmB) conjugated to amine-modified graphene (f-Gr) for safety and efficacy over conventional AmB. The f-Gr was prepared in a gentle one step process of non covalent (amine) functionalization with the help of amino acid L-cysteine. Non-covalent functionalization of graphene with π - π interactions works as the binding force between graphene and the ligand. This amine functionalized graphene sheet is further conjugated to AmB. The conjugate (f-Gr-AmB) was characterized by FTIR, SEM, TEM and Raman spectroscopy that established successful attachment of AmB to f-Gr. Cytotoxicity of amine modified graphene Amphotericin B (f-Gr-AmB) is assessed *in vitro* against J774A.1 macrophage cell lines and *in vivo* in Swiss mice. Antileishmanial activity of f-Gr-AmB is tested *in vivo* in hamsters and against J774A.1 macrophage cell lines *in vitro*. FTIR, SEM, TEM and Raman spectroscopy showed successful attachment of AmB to f-Gr. The f-Gr-AmB was found to exhibit lesser cytotoxicity towards J774A.1 cells than AmB, and did not induce any hepatic or renal toxicity in Swiss albino mice. *In vitro* antileishmanial assay in J774A.1 showed significantly enhanced efficacy of f-Gr-AmB over AmB. Furthermore, Percentage Inhibition of amastigote replication in hamster model of VL was significantly higher in f-Gr-AmB treated group (87.8%) compared to AmB (70.4%). These results suggest that f-Gr-AmB could be a safe and effective alternative to conventional AmB in the treatment of VL.

In conclusion the attending of this conference provided me with the opportunity to represent India at an international forum. I also reaped the benefits of seeing the current research in our field up close and the latest technologies that are being used such an experience can help me in defining my future research career and the contacts established at this conference can be useful at later times to establish mutually beneficial collaborations.

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