DAY 1

Keynote Forum

European Congress on

Vaccines & Vaccination and Gynecologic Oncology

October 26-27, 2018 | Budapest, Hungary

EuroSciCon

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NANOVACCINES FOR ANIMAL DISEASES: THE POLYANHYDRIDE PLATFORM TECHNOLOGY

Adel M Talaat[1], Akanksha Thukral[1], Brock Bakke[1], Kathleen Ross[2], Chungyi Hansen[1], Yashdeep Phanse[1], Balaji Narasimhan[2] and Jorge E Osorio[1]

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The economic success of animal production worldwide hinges on extensive use of vaccines to control bacterial and viral infections. Most of the current antibiotics are not used in food animals to curb the problem of spreading drug-resistant pathogens and anti-viral agents are expensive to use in animals. Despite vaccines are available to combat many of the important pathogens that impact animal health, most of these vaccines do not provide sufficient immunity against emerging infections and are not stable under field conditions. In this project, we are applying synthetic, biodegradable polyanhydride nanoparticles (PAN) to improve efficiency and delivery of protective antigens for prolonged and robust induction of immune responses. We tested this platform technology using two different infection models including bacterial (Johne's disease) and viral (avian influenza) diseases. To start, we examined the fate of PANs in mice and chicken which resulted in no untoward effects on animals, confirming the safety of PAN in two approved models of the target diseases, respectively. We also deciphered the immunogenicity and protective immunity of key antigens encapsulated within PANs in standard immunization and challenge models for testing vaccine efficacy. Immunological assays demonstrated a substantial increase in the levels of antigen-specific T cell responses post-vaccination in the PAN-vaccinated groups as indicated by high percentages of triple cytokine (IFN-γ, IL-2, TNF-α) producing CD8+ T cells, a key marker for successful vaccination. More importantly, when animals were immunized with PAN-based vaccines, superior protection as indicated by lower tissue pathogen loads were elicited for both Johne's disease and avian influenza models. Currently, we are trying more approaches to examine the utility of nanovaccines as platform technology for animal vaccination to overcome problems associated with traditional vaccine applications under field conditions.

Biography

Adel M Talaat is a Microbiologist with a long-term interest in better understanding the pathogenesis of emerging infectious diseases. He has received his Veterinary and Masters' degrees from Cairo University, Egypt and a PhD from the School of Medicine University of Maryland At Baltimore, USA. Currently, he is a Professor of Microbiology at the University of Wisconsin-Madison. His research involves developing new technologies and innovative approaches to understand bacterial pathogenesis and to generate useful therapies (drugs and vaccines). Currently, we are working on the functional genomics of *Mycobacterium tuberculosis* and *M. avium* subsp. *paratuberculosis*. Recently, he and his group started to utilize nanotechnology to develop nano-biosensors and nanovaccines to control animal infections, including avian viral agents. In 2011, he started a biotechnology company (Pan Genome Systems, INC.) to further develop intellectual properties generated by his group (vaccine-based patents) into products useful to improve human and animal health. During the past decade, he has mentored 17 Undergraduates, 19 Graduate students and 10 Postdoctoral fellows in his laboratory at the University of Wisconsin-Madison. The results of his career at UW-Madison were shared through more than 50 articles in peer-reviewed journals.

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IMPROVING THE DURATION OF IMMUNITY FOR FMD VACCINES

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Chemically inactivated, oil adjuvanted foot and mouth disease (FMD) vaccines are a critical element in FMD control in developing countries. Although these vaccines are effective in pigs and ruminants, protective immunity is not reached quickly, is short-lived (~3 months) and is serotype and sometimes strain-specific. More appropriate vaccine strains that induce broader protection, together with identification of novel adjuvants that provide a greater duration of immunity and simplified methods to measure vaccine quality would make a significant contribution to FMD control and to livestock development in developing countries. Oil adjuvant vaccines induce variable T cell responses, whilst novel adjuvants can prime greater and more consistent T cell and humoral responses that may give longer duration of protection. In our CIDLID funded grant, we had selected eight new adjuvants as potent immune enhancers, including ligands for TLR receptors that enhanced Th1 priming in various human or animal vaccines. The aim was to supplement the oil component of the adjuvant with a novel immunostimulant that impacts on TLR or related signaling pathways. These eight new adjuvanted vaccines were tested in a pilot study in cattle at IIL, India. The four most efficacious ones (MPLA, Poly I: C, Abisco 300 and R848) were retested for Serotype A in a larger number of cattle at Pirbright, UK. The vaccinated cattle were challenged on 21 days post-vaccination. The most efficacious adjuvant, poly I: C, tested further in cattle for serotype O FMD vaccine for 7.5 months to assess its impact on the duration of immunity. The enhanced humoral and cellular responses were observed by incorporating poly I: C in FMD vaccine that increased the duration of immunity in comparison to the conventional oil adjuvant vaccine. Therefore, we conclude that there is a measurable T cell component to vaccine-induced protection in addition to humoral antibody component and strengthening this would improve efficacy and duration of immunity.

Biography

S Parida is trained as a Veterinarian and has completed his PhD in 1998 from TANUVAS, India and Postdoctoral studies from Institute for Animal Health, UK through Welcome Trust Travelling Research Fellowship. He is the Head of the Vaccine Differentiation group at the Pirbright Institute at UK since 2007 and additionally, he is a Jenner Investigator at the Oxford University and a Visiting Professor at Royal Veterinary College, UK. He has published more than 129 papers in reputed journals and has been serving as an Editorial Board Member of *PLOS One and Transboundary Emerging Diseases*.

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PLANT VIRUS NANOPARTICLES: NEW APPLICATIONS FOR DEVELOPING COUNTRIES

Kathleen Hefferon
Cornell University, USA

For over two decades now, plants have been explored for their potential to act as production Platforms for biopharmaceuticals such as vaccines and monoclonal antibodies. Without a doubt, the development of plant viruses as expression vectors for pharmaceutical production have played an integral role in the emergence of plants as inexpensive and facile systems for the generation of therapeutic proteins. More recently, plant viruses have been designed as non-toxic nanoparticles which can target a variety of cancers and thus empower the immune system to slow or even reverse tumor progression. The following presentation describes the employment of plant virus expression vectors for the treatment of some of the most challenging diseases known today. The presentation concludes with a projection of the multiple avenues by which virus nanoparticles could impact developing countries.

Biography

Kathleen Hefferon has received her PhD from the Department of Medical Biophysics, University of Toronto and completed her Postdoctoral Fellowship at Cornell University. She has published multiple research papers, chapters and reviews, and has written three books. She is the Fulbright Canada Research Chair of Global Food Security and has been a Visiting Professor at the University of Toronto over the past years. Her research interests include virus expression vectors, food security agricultural biotechnology and global health.

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STRATEGIES OF IMMUNOCASTRATION IN MAMMALS

Leonardo Saenz Iturriaga, Daniela Siel, Sonia Vidal, Mario Maino, Lisette Lapierre
Universidad de Chile, Chile

Immunocastration is an immunological strategy used to block the activity of gonadrotropin-releasing hormone (GnRH-I), thus allowing control of reproductive activity, fertility, physiological characteristics and sexual behavior in mammals. This process provides a more humanitarian alternative to classical methods of controlling sexual behavior in production animals such as surgical castration in male pigs and bulls, and can also be applied to pets or wild animals. However, the duration of the immune-contraction effect is limiting, which is a problem when long-term reproductive and population control are wanted. There are existing vaccine strategies that vary both in the design of the antigen and use of different adjuvants, which have proven to be effective in controlling reproductive activity for short or prolonged periods of time in different animal models. Using an immunocastration model based on a recombinant antigen, our laboratory has managed to induce a temporary blockage of GnRH-I, decreasing the production of sex hormones and blocking fertility, oogenesis and spermatogenesis, thus reducing sexual behavior in both male and female of different animal species. We found the duration and potency of the immunocastration effect is strongly linked to the adjuvant strategy used with correlations to fertility, gonadal function and hypothalamic GnRH-I expression in immunocastrated animals, making it a vital component for reproductive control and vaccine design.

Biography

Leonardo Sáenz Iturriaga is a Veterinary Doctor in Biomedical Sciences of the University of Chile. He is an Associate Professor of the Faculty of Veterinary and Animal Sciences of the University of Chile; Director of the Veterinary Vaccines Laboratory, an University Center. He is specialized in research and development of vaccines and adjuvants of new generation with the ultimate goal of transferring technologies to the veterinary industry. He has multiple articles and patents on recombinant and subunit veterinary vaccines.

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DAY 2

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NOVEL VACCINES AGAINST *STREPTOCOCCUS AGALACTIAE* INFECTION

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Introduction: *Streptococcus agalactiae* (group B streptococcus–GBS) is a severe human pathogen causing diseases in newborns and elderlies. This makes GBS infection an important medical and social problem requiting vaccine prophylactics. Presently, there are couple vaccine candidates in testing. However, there are no GBS vaccines in the market. Present work describes the results of several variants of GBS vaccines based on recombinant surface expressed proteins.

Materials & Methods: Recombinant GBS proteins were obtained after cloning of the gene fragments encoding for the immunogenic epitopes of the surface expressed proteins and expressing them in the *E.coli*. Recombinant chimeric vaccines were generated after chemical synthesis of DNA molecules encoding for several immunogenic epitopes belonging to different proteins. Artificial DNA was cloned in the *E.coli* expression vectors with the following isolation of recombinant chimeric proteins. Life vaccines were developed after incorporation of the streptococcal DNA into the probiotic strains chromosome. Immunogenicity and protectiveness were tested on various mice models. Antibody levels were tested by ELISA.

Results & Conclusion: We have developed several streptococcal vaccine candidates based on different approach–making the mixture of recombinant proteins or making recombinant chimeric vaccines consisting from several immunogenic surface proteins epitopes artificially assembled in one protein molecule. These GBS vaccines against S. agalactiae had been tested on several experimental models which proved their immunogenicity and are protective. This approach had been expanded for making new life vaccines for mucosal immunization with expression of streptococcal vaccine antigens by the probiotic bacteria as delivery vehicles. These probiotic vaccines had been also shown to be immunogenic and protective. The future of practical implication of novel streptococcal vaccine candidates is discussed.

Biography

Alexander Suvorov, MD, has completed his PhD in Biochemistry in the Institute of Experimental Medicine, Russia and Postdoctoral studies from Minnesota and Oklahoma Universities. He is the Head of the Department of Molecular Microbiology in the Institute of Experimental Medicine, Saint-Petersburg Russia; Head and Professor of the Faculty of Fundamental Medicine in Saint-Petersburg State University. He has published more than 100 papers in reputed journals and has been serving as an Editorial Board Member of several Russian and International Journals. Recently, he became a Corresponding Member of Russian Academy of Science.

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SUCCESSIVE INTRODUCTION OF FOUR NEW VACCINES IN RWANDA: HIGH COVERAGE AND RAPID SCALE UP OF RWANDA'S EXPANDED IMMUNIZATION PROGRAM FROM 2009 TO 2013

Maurice Gatera[1], Sunil Bhatt[2], Fidele Ngabo[3], Mathilde Utamuliza[1], Hassan Sibomana[1], Corine Karema[1], Cathy Mugeni[3], Cameron T Nutt[4], Sabin Nsanzimana[1], Claire M Wagner[5] and Agnes Binagwaho[2,3,6]

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As the pace of vaccine uptake accelerates globally, also access to vaccines in many of the poorest countries has risen dramatically in recent years with improvements in health care delivery systems, the advantage of new funding, monitoring and evaluation mechanisms, and increased global connectivity partnerships with multilateral organizations including the World Health Organization (WHO), GAVI Alliance and UNICEF to launch and bolster nationally-owned and managed immunization programs significantly accelerated progress towards meeting the international targets for child survival. There is a need to document low-income country experiences with vaccine introductions. Over the course of five years, the government of Rwanda rolled out vaccines against pneumococcal, human papillomavirus, rotavirus, and measles and rubella, achieving over 90% coverage for each. To carry out these rollouts, Rwanda's Ministry of Health engaged in careful review of disease burden information and extensive, cross-sectorial planning at least one year before introducing each vaccine. Rwanda's local leaders, development partners, civil society organizations and widespread community health worker network were mobilized to support communication efforts. Community health workers were also used to confirm target population size. Support from GAVI/Alliance, UNICEF and WHO was used in combination with government funds to promote country ownership and collaboration. Vaccination was also combined with additional community-based health interventions which make uptake at higher immunization coverage for each. Other countries considering rapid consecutive or simultaneous rollouts of new vaccines may consider lessons from Rwanda's experience while tailoring the strategies used to local context.

Biography

Maurice Gatera is an Epidemiologist; he has worked as Director of the Vaccine Preventable Diseases Division of the Rwanda Ministry of Health, responsible for overseeing and coordinating all immunizations in Rwanda. He has supervised the rollout of pneumococcal conjugate vaccine, human papillomavirus vaccine, rotavirus vaccine, and measles and rubella vaccine. He has been also a Member of the GAVI Alliance (formerly the Global Alliance for Vaccines and Immunisation) Global Accelerated Vaccine Initiative HPV subteam. Prior to his position with the vaccine preventable diseases division, he was an Intelligence Surveillance Officer of Vaccine Preventable Diseases in Rwanda Ministry of Health, where he implemented an acute flaccid paralysis surveillance system, measles surveillance system, MN tetanus surveillance, pediatric bacterial meningitis surveillance, congenital rubella syndrome surveillance. He has extensive experience in leadership, research, program implementation, and monitoring and evaluation, having worked in immunization programs for 11 years. He has earned one Degree in Population Studies and another one in Public Health. He also received a Certificate in Vaccinology from the Regional Institute of Public Health in Ouidah, Benin. He has recently performed advanced course of vaccinology at Geneva University. He has a Masters' in field Epidemiology and Laboratory from National University of Rwanda. He is currently a PhD candidate. He has published more than 8 papers in reputed journals and has been serving as an Editorial Member.

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