29th International Conference on

Vaccines and Immunization

March 19-20, 2018 | London, UK

Posters

Vidisha Minhas et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Contraceptive potential of *E. coli* expressed recombinant protein encompassing sperm associated protein and GnRH

Vidisha Minhas[1, 2], **Rita Singh**[2] and **Satish K Gupta**[1]
[1]National Institute of Immunology, India
[2]Department of Zoology-Delhi University, India

Statement of the Problem: Immunocontraception for wildlife management is taking on a new perspective, and many agencies charged with such management decisions are turning to fertility control as a potential humane solution. Contraceptive vaccines based on spermatozoa specific proteins aiming to interfere in sperm-egg interactions have been proposed as one of the strategies for controlling the population of various animal species. Various studies have established that spermatozoa are foreign to immune system of an animal, thus elicits a strong anti-sperm immune response. However, no sperm protein-based contraceptive vaccine has reached field application. In this direction, we have cloned, expressed and purified recombinant protein, bRNase-KK-Sp17$_c$-KK-TT-GnRH-GnRH (Sp17$_c$-GnRH$_2$) and evaluated its immunogenicity and contraceptive efficacy using different adjuvants.

Methodology & Theoretical Orientation: Recombinant protein, bRNase-KK-Sp17$_c$-KK-TT-GnRH-GnRH was cloned and expressed in BL21[DE3]pLysS *E. coli* cells. The recombinant protein was purified using Ni-NTA affinity chromatography. FVB/J mice were immunized with different combinations of adjuvants and sera were collected to evaluate the antibody titer. After immunization, female mice were put for mating with male mice and pups born per pregnant female were monitored carefully.

Results & Conclusion: Immunization of both male and female mice with Sp17$_c$-GnRH$_2$ following three injection schedules, led to high contraceptive efficacy. Interestingly, mating studies of female mice with the male mice wherein both were immunized with Sp17$_c$-GnRH$_2$ revealed complete failure of female mice to conceive. Male mice immunized with Sp17$_c$-GnRH$_2$ led to testicular atrophy and a significant decrease in the diameter and circumference of seminiferous tubules. Further, to reduce the no. of injections, when group of female FVB/J mice were immunized with Sp17$_c$-GnRH$_2$ and Squalene: Arlacel 'A' as an adjuvant, there was approximately 90% infertility. Inclusion of killed *Mycobacterium indicus pranii* in another group of female mice did not make much of a difference in case of immunogenicity. Although, there was also a significant increase in the immune response when female mice were immunized with the same antigen but along with a mixture of PCPP and alum as compared to the group immunized with only antigen and alum following a two injection schedule, but there was no significant increase in the contraceptive efficacy.

Biography

Vidisha Minhas is a PhD student at Delhi University. For the past five years, she has been working towards the production of recombinant proteins that has a role in fertilization. She is well versed with techniques like cloning, protein expression and purification, ELISA, indirect immunofluorescence, western blotting, etc. Along with her lab mates, she has cloned around 10 recombinant proteins and tested their immunogenicity and contraceptive efficacy in mice. Some of them have shown promising results and can be considered as potential candidates for development of contraceptive vaccine (CV) for managing wildlife population. She is also working on enhancing the efficacy of antigens by the use of immune potentiator and optimization of antigen delivery system.

vidisha.minhas@gmail.com

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Chuan Wang et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Linear doggybone™ DNA vaccine induces comparable immunological responses to conventional plasmid DNA vaccine via STING and independently of TLR9

Chuan Wang, Alex Allen, Lisa J Caproni, Christian H Ottensmeier and **Natalia Savelyeva**
University of Southampton, UK

DNA vaccines represent an attractive and potentially an effective modality to induce immunity against cancer. Recently a linear DNA with closed ends, the so-called doggybone DNA (dbDNA™), has been developed without the use of bacteria. The manufacturing relies on use of Phi29 DNA polymerase to amplify a plasmid template followed by protelomerase TelN to complete individual closed linear DNA. The final DNA product composes of the sequences encoding an antigen of interest, a promoter and a poly A tail, but lacks 'useless' bacterial sequences such as antibiotic resistance genes. We compared the ability of dbDNA™ vaccine with plasmid DNA vaccine with and without *in vivo* electroporation to induce adaptive immunity using clinically relevant onco-targets HPV16 E6 and E7. Despite the inability to trigger TLR9, dbDNA™ induced similar levels of Th1 CD4 and CD8 T cells as well as antibody immunity against the target antigens, with suppression of established TC-1 tumors. We demonstrated that dbDNA™ was able to activate innate immunity via STING, with induction of Th1-inducing cytokines and type I interferons. Collectively, dbDNA™ is a highly attractive novel DNA vaccine platform to induce anti-cancer immunity.

Biography

Chuan Wang has a strong interest in Tumor Immunology and Cancer Vaccines Development. He has completed his PhD in Cancer Immunology at University of Southampton in 2014. During his PhD, he was working on developing of a novel platform to induce T-cell responses against cancer, which was based on plant viral nanoparticles (PVP). He has identified several HLA-A2+ epitopes derived from novel cancer antigens. He is now working with Dr. Natalia Savelyeva and Prof. Gareth Thomas on development of novel vaccines for HPV negative head and neck cancer.

chuan.wang@soton.ac.uk

Notes:

Emmanuelle Billon-Denis et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

In vivo tracking of measles vaccine: Playing with new imaging tools

Emmanuelle Billon-Denis[1, 2], **Clarisse Vigne**[1], **Claude Ruffié**[2], **Frédéric Tangy**[2] and **Jean-Nicolas Tournier**[1, 2]
[1]Armed Forces Biomedical Research Institute, France
[2]Institut Pasteur-Unité Génomique Virale et Vaccination, France

Measles vaccine (MV) is a live attenuated virus derived from the Schwarz strain. This vaccine is very safe and effective; it also confers a strong and prolonged protection against measles infection. Using reverse genetic, it is very convenient viruses that accommodate long sequences coding for different proteins. Therefore, MV platform is currently used for the development of new vaccines against Chikungunya or Zika viruses with very promising results. Vaccination still remains an empiric process and there is a gap of knowledge between vaccine development and basic knowledge of immune response. To explore cellular and molecular processes involved during vaccination, we used MV platform to develop new imaging tools. We constructed fluorescent viruses to follow *in vivo* the infection and the host response after MV injection. Combining different fluorescence tools with bi-photonic microscopy, we were able to obtain *in vivo* images to identify the immune cells at the early stages of intra-muscular injection. In parallel, we also developed a new animal model for vaccinology based on crossing mice with subpopulation of immune cells fluorescently labeled and IFNAR mice (that are permissive for MV infection). In this model, by using bi-photonic microscopy we have developed dynamic imaging with a rapid identification and quantification of the cells involved in vaccine response.

Biography

Emmanuelle Billon-Denis has been working for more than ten years in the field of protein biochemistry, especially fluorescent proteins. She's interested in the development of new tools for in vivo imaging, especially to investigate host-pathogen responses. Using different types of microscopy, she's studying cellular processes involved in the response to infection. Now she's working for the development of new animal models adapted to the study of vaccine response in a dynamic context.

emmanuelle.billon-denis@defense.gouv.fr

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Vaccines and Immunization

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e-Posters

Vaccines Summit 2018

Franco Esquivel Teresa et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Outbreak of *Bordetella pertussis* and *Bordetella holmesii* in Mexicali, Baja California, México

Franco Esquivel Teresa, De la Paz Leal Carlos A and **Siqueiros Ramírez Ariana L.**
Institute of Public Health Services, Mexico

Introduction: *Bordetella pertussis* is a significant cause of morbidity and mortality in children under the age of one year. In Baja California, México, there has been a gradual increase in recent years, with a significant increase in 2016; in its first seven months the amount of confirmed cases was four times higher than the previous year, with a rate of approximately 1 case per 100,000 inhabitants.

Detection of Outbreak: A month old female with a case of coqueluchoide syndrome was detected in Hospital of Mexicali, with cough of eight days of evolution, in accesses, paroxysmal, spasmodic, cyanosis, also an antecedent of acute respiratory infection in previous 25 days, without previous vaccine due to age, the case presented a positive result for *Bordetella pertussis,* with four positive contacts to Bordetella, one for *B. pertussis* and three for *B. holmesii*, a peridomiciliary epidemiological siege was performed for the five confirmed cases, studying 26 exposed individuals, 17 of which were symptomatic, two more cases of *B. pertussis* and one of *B. holmesii* were confirmed.

Outbreak Characterization: An outbreak of seven cases of *Bordetella* was reported in a population of 26 exposed individuals, four were diagnosed with B. *pertussis*, three cases with *B. holmesii* with an attack rate of 27%, and a lethality of 14% when a casualty was recorded. 57% of the cases were female with *Bordetella pertussis* present in children under five years of age regardless of the antecedent vaccine and *Bordetella holmesii* alone in those over 16 years. Symptoms included cough on access in 57% of cases, paroxysmal cough in 43%, spasmodic cough in 43%, fever in 29%, coughing cough in 14%, conjunctival bleeding, rhinorrhea and sneezing in 14% each.

Analysis: Whooping cough is a priority disease that can cause significant outbreaks even in populations with optimal vaccination coverage. During the outbreak, two species of *Bordetella* could be identified, where the rate of attack of *Bordetella pertussis* in children under 5 years was 50%. Regarding the presented symptomatology, we found a 95% confidence interval with a P value of 0.0006, 57 times higher chance to present a respiratory picture due to *B. pertussis* when a cough on accesses was presented, 19 times higher than *B. pertussis* when there is a respiratory tract with spasmodic cough, and vaccination has a protective factor of almost 95% to suffer from B. *pertussis*, with a P value of 0.008.

Conclusion of the Outbreak: The transmission chain was stopped after the application of measures and treatment of the cases, the elevation of the odds ratio for whooping cough in the presence of access cough and spasmodic ratifies the sensitivity of the operational definitions used today. The presence of another *Bordetella* species, within the outbreak causing disease, did not have a significant impact on the lethality unlike the *pertussis* and, when not present in children under fifteen years of age, the frequency of severe symptoms was lower. The state of immunological vulnerability of the newborn makes the vaccination in pregnant women mandatory in order to give a degree of immunological protection to the newborn to prevent deaths from this disease.

Biography

Franco Esquivel Teresa is an indefatigable public health worker in Baja California, Mexico. She was responsible for the influenza monitoring unit in Mexicali, Baja California during the 2009 influenza epidemic; responsible for field brigades in the response to the outbreak of spotted fever in Mexicali, in 2009 and; responsible for epidemiological surveillance of emerging diseases in Baja California 2010-2015. Currently, she is the Coordinator of epidemiological surveillance of communicable diseases in Baja California.

Notes:

dra_francot@yahoo.com

María Trinidad Romero Salas et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Guillain-Barré outbreak study in Ensenada, Baja California, Mexico

María Trinidad Romero Salas, Franco Teresa, Francisco Arzate, Armida García, Alexandra Terríquez Chávez, Néstor Hernández and **Sonia Pérez**
Institute of Public Health Services, Mexico

Objective: Aim of this study is to identify the causal agent in the symptoms of Guillain-Barre in Ensenada, Baja California, and identify the factors associated with the increase of its presence in the city.

Methodology: An epidemiological study, risk inquiry and clinical assessment was carried to the each of the eleven reported cases of Guillain-Barré symptoms in the city of Ensenada from January to March 2017, an electromyography was carried out as well as the processing samples of serum, CSF fluids, feces, saliva, urine and blood in order to search for traces of Zika, saxitoxin, *Campylobacter*, and Enterovirus. A database and analysis of the clinical presentation was carried out.

Results: Three of the eleven cases showed positive traces of Zika virus (23%), five cases reported positive traces of *Campylobacter* (38%), one case showed positive, non-polio Enterovirus (7%) and none resulted in saxitoxin. The more common symptoms associated with limb paralysis were, muscle pain, arthralgia, abdominal pain and cephalalgia, as well as diarrhea in 60% of the cases, although the association between symptoms and the results, due to the number of cases, did not show a strong enough association. The cases with positive Zika were clinically differentiated from the rest given a longer recuperation process and continuation of muscle pains.

Conclusions: The *Campylobacter jejuni* was established in the main etiology for the outbreak as it is responsible of the exponential growth in the presence of the Guillain-Barré symptoms cases, coincidental with the proximity of sewage as well as the confirmation of the local circulation of the Zika virus in the State. Control measures were established in order to control the exposure to untreated wastewater and vector control.

Biography

María Trinidad Romero Salas graduated from the Autonomous University of Baja California, School of Medicine, Tijuana Campus, as General Practitioner. She get into the Secretary of Health in 2000 to the Department of Epidemiology. She is Responsible for the Epidemiological Surveillance Program for Vaccine-Preventable Diseases since 2000 at the Institute of Public Health Services of the Baja California State, in the Ensenada Sanitary Jurisdiction. (ISESALUD). She has done Diploma in Epidemiology by INSP (National Institute of Public Health February-June 2012) and in Epidemiology Applied by COLEF (College of the North Border April-August 2014). She has also done Epi Info course by COLEF the North Border April 2014. She has completed her masters from the Center for University Studies Xochicalco, Ensenada Campus, in Public Health, with terminology in Epidemiology

triny911@hotmail.com

Notes:

Alexandra Terríquez Chávez et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Comprehensive intervention project for the prevention and control of acute diarrhea and cholera in Ensenada, Baja California, Mexico

Alexandra Terríquez Chávez, Garcia Salas Armida, Romero Salas M Trinidad and **Franco Esquivel Teresa**
Institute of Public Health Services, Mexico

Introduction: In Ensenada, Baja California, unspecified acute gastroenteritis is the second cause of illness. In 2013 starts the sanitary threat due to climate change, conditioning a rise and prolongation of temperatures, causing meteorological and hydrological droughts, reflecting in 2014 an unusual 51% increase of acute diarrhea cases.

Objective: Aim of this study is to strengthen an organized social response in the city of Ensenada by means of the epidemiological units, monitor the behavior of diarrhea patients, identify the bacteriological causal agent, detect risk factors and ensure the modification of risk determiners designed of care, water use and food handling. The compiled information will be distributed to the scientific community.

Method: Situational diagnosis was conducted to identify the most vulnerable localities in Ensenada. Health brigades were trained comprised by a medic and/or nurse and a health promoter regarding prevention topics, diarrhea and cholera control to give an educational campaign in the most vulnerable population in 2014-2016.

Results: The investigation lasted from 2014 to 2016 with twelve pre-emptive operatives in the most vulnerable communities of Ensenada, lowering the diarrhea incidents by 28% compared to 2014 and 24% compared to 2015 to 2016. The propagation of toxigenic Vibrio cholerae no-01, *Vibrio fluvialis*, and *Vibrio parahaemolyticus* in the population was identified for the first time, thus the education and health promotion actions are focused in the population regarding these illness and the modification of the social determiners regarding health.

Biography

Alexandra Terríquez Chávez is a General Practitioner, since 2012, she has been working for the Instituto de Servicios de Salud Pública of Baja California as responsible jurisdictional authority for the epidemiological monitoring of the acute diarrheal illness, cholera and epidemiological emergencies. She is a member of the medical association of Ensenada. She has experience in the diagnosis and multidisciplinary care of patients with gnathostomiasis in the community, and raising awareness of the illness in the scientific community.

dra.terriquez@gmail.com

Notes:

Franco Esquivel Teresa et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Morbidity and mortality analysis during the influenza season of 2013-2014, Baja California

Franco Esquivel Teresa, De la Paz Leal Carlos A, Siqueiros Ramírez Ariana L., Alexandra Terríquez Chávez
Institute of Public Health Services, Mexico

Introduction & Aim: Influenza is a respiratory disease that propagates with ease during the winter, in such a way that each year, according to WHO, affects from 10 to 20% of the global population resulting in 250 to 500 thousand deceases each year. Aim of this study is to identify the epidemiological clinical outlook of the cases and deceases related to influenza in Baja California, and export the relevant information to configure useful strategies.

Methodology: A descriptive analysis carried out on the information regarding influenza contained in the state databases was, of which universe is delimited in the reported case by the monitoring units of the different institutions; the proportions between the main variables of time, place and people were calculated, the cases and influenza deceases were georeferenced in the state in order to analyze its spatial distribution, then the information was registered in the Epi Info Software which allowed to carry out a bivariate analysis between the cases and associated factors.

Results: The temporal distribution shows a conglomerate in 74% of the cases from weeks 2 to 6, 2014, (Fig1), likewise the highest lethality was observed on the third week. In the bivariate analysis there was a trust interval of 95%, where: Influenza patients are four times more likely to suffer complications and become hospitalized compared with negative cases of influenza, of which have shown almost three times the lethality rate; the cases that presented a history of at least one vaccination in the last five years showed a 41% lower opportunity to give positive results on Influenza compared to the non-vaccinated samples; patients that were vaccinated against influenza in the 2013-2014 season had an odds ratio of 0.27 to contract influenza compared to the non-vaccinated patients in the same season; patients that showed any risk factor and were diagnosed with positive influenza, presented almost four times higher chances to die compared with patients with negative influenza results and; patients with active smoking habits presented a three times higher chance to die compared to nonsmokers.

Conclusions: The highest morbidity was presented in the 50 year age group, but the highest lethality rate was found in the 60 to 64 year age group. Vaccination demonstrated an important protection even if it was not the seasonal immunization. The most relevant comorbidity to suffer influenza and its unfavorable evolution was obesity and heart disease, although having any comorbidity significantly increased the risk of complications

Biography

Franco Esquivel Teresa is an indefatigable public health worker in Baja California, Mexico. She was responsible for the influenza monitoring unit in Mexicali, Baja California during the 2009 influenza epidemic; responsible for field brigades in the response to the outbreak of spotted fever in Mexicali, in 2009 and; responsible for epidemiological surveillance of emerging diseases in Baja California 2010-2015. Currently, she is the Coordinator of epidemiological surveillance of communicable diseases in Baja California.

dra_francot@yahoo.com

Notes:

Reim Sheikh Mohammed, J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Travel and edible vaccines

Reim Sheikh Mohammed
Microbiologist, Qatar

Travel vaccinations reduce your chances of acquiring the disease & protect yourself & others from potential health hazards. Your age, health, previous vaccinations, Booster Shots, travel Destination &Time of year you are travelling, all these elements help determine whether you need certain vaccinations more than others .there is no single vaccination schedule that fits all travelers. Vaccination offers good protection against many diseases. Edible vaccines offer cost-effective, easily administrable, storable & widely acceptable as bio friendly particularly in developing countries. Oral administration of edible vaccines proves to be promising agents for reducing the incidence of various diseases like hepatitis and diarrhea especially in the developing world, which face the problem of storing and administering vaccines. Edible vaccines are obtained by incorporating a particular gene of interest into the plant, which produces the desirable encoded protein. Edible vaccines are specific to provide mucosal activity along with systemic immunity. Over all the problems associated with traditional vaccines & prove to be best substitutes to traditional vaccines. More important food vaccines might save millions who now die for lack of access to traditional inoculants.

Biography

Reim Sheikh Mohammed is a Microbiologist, passionate about health & education. She has completed her B.Sc. from the University of Medical Science & Technology (UMST), Sudan in the year 2007. She was also awarded with the academy price for the best research project..

Reimsheikhmohd@gmail.com

Notes:

Anna C. R. Guimarães et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Performance of INCQS/Fiocruz's cell bank for quality control of viral vaccines used in the Brazilian immunization program

Anna C. R. Guimarães, Simone F. T. Bastos, Patricia S. Alves; Jarbas E. dos Santos, Renata F. de Carvalho, Rafael L. Ferreira and **e Marcelo L. L. Brandão**
Department of Imunology, INCQS/Fiocruz, Brazil

Vaccines are considered the most powerful tools to prevent diseases. They are distinguished from chemical pharmaceuticals because they derive from living organisms. The Cell Bank of the National Institute of Quality Control in Health from Oswaldo Cruz Foundation (INCQS/Fiocruz) maintains a collection of cell lines applied in biological assays for quality control of products subjected to Sanitary Surveillance in Brazil. Following the World Health Organization (WHO) recommendation, the potency test is carried out of many biological assay and its authenticity and absence of contamination are critical factors. To minimize contamination the Organization for Economic Co-operation and Development (OECD) has published good practice for the use of cell lines and strongly recommends the use of cell derived from recognized collections.

The aim of this work is to describe the Cell Bank performance in supply cells for potency assay for quality control of viral vaccines used in the Brazilian Immunization Program. The 8 different cell lines used in potency assay of viral vaccines were defrosted, amplified, and then trypsinized for the concentration adjustment for supply the laboratories that performed the potency assays. Sterility controls of the cell suspensions and culture medium were performed for all supplies. The data of potency assays of viral vaccines from the period 2007 to 2017 were collected from Harpya, the sample management system of INCQS/Fiocruz. During the evaluated period, 1,050 cell suspensions were supply to the laboratories that performed the analysis of 1,582 batches of viral vaccines, which were produced by 5 different manufacturers. Therefore, INCQS/Fiocruz namely his Cell Bank has a very important role in the Brazilian Immunization Program.

Biography

Anna C. R. Guimarães obtained her MSc in Sanitary Surveillance in 2014. She works at Immunology Division of INCQS/Fiocruz since 1995 and has extensive expertise at Cell Bank management, being part scientific papers and book chapters on cell culture procedures.

anna.guimaraes@incqs.fiocruz.br

Notes:

Christelle Fontaine et al., J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Comparison of the Th1 - mediated immunity induced by two anti- Leishmaniosis vaccines in dogs

Christelle Fontaine[1], Moreno J[2], Vouldoukis I[3], Senseby F[1], De Mari K[1], Gueguen S[1], Cuisinier A-M[1]
[1]Virbac, France
[2]Institute de Salud Carlos III, France
[3]UPMC-UMRS 945/EAST, France

Statement of the Problem: The protective immune response to Canine Leishmaniasis is mainly cell-mediated. Two European vaccines are commercialized to prevent the development of an active *Leishmania* infection in dogs. The study aimed to compare the cell-mediated orientation of the immune system induced by each vaccine.

Methodology & Theoretical Orientation: Twenty-four *Leishmania* seronegative 6-months-old Beagle dogs were randomly vaccinated with 3 injections of a LiESP/QA-21 vaccine (CaniLeish™, Virbac, n=8) at D0, D21, D42, or vaccinated with 1 injection of the Q-protein recombinant vaccine (LetiFend™, Leti, n=8) at D42, or received one injection of PBS (negative control) at D42 (n=8). Blood samples were taken at D0, D42 and D49 to assess the canine macrophage leishmanicidal activity (CMLA): (index of parasitemia, Nitric Oxide derivates production, M1 /M2 macrophages ratio), key markers correlated with the Thl -profile of the immune response (cysteine/cysteine ratio) and the peripheral effective memory T-cells (TEM) presence. Skin biopsies were performed at the study end to assess the resident effective memory T-cell response (TREM).

Findings: A CMLA response was observed in 4/8 (50%) and 3/8 (40%) dogs after respectively the second and first injections of CaniLeish™ and LetiFend™ vaccines. However, a mature cell-mediated immune response against Canine Leishmaniosis (CMLA + activated TEM + activated TREM + cysteine/cysteine ratio) after the primary vaccination courses was observed for 8/8 (100%) dogs vaccinated with CaniLeish™ but 1/8 (13%) dog vaccinated with LetiFend™.

Conclusion & Significance: In this study, only CaniLeish™ vaccine elicited a mature cell-mediated immune response against canine leishmaniosis in all vaccinated dogs. In case of *Leishmania* infection, the presence of activated memory T-cells, especially at skin level, might induce an earlier specific re-activation of the immune system in dogs vaccinated with CaniLeish™ versus LetiFend™. Further investigations are required to confirm these findings and their implications in field conditions.

Biography

Christelle Fontaine is a Medical Manager, Companion animals at Virbac, France. She is involved in phase IV trials and collaboration with Universities and specialists across the World. She graduated from the French Veterinary School of Maison Alfort, in Paris in 2007.

christelle.fontaineevirbac.com

Notes:

29th International Conference on

Vaccines and Immunization

March 19-20, 2018 | London, UK

Accepted Abstracts

Vaccines Summit 2018

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Vaccines against infectious diseases

Ivana Haluskova Balter
French Immunology Society (SFI), France

A vaccine is a biological preparation that improves immunity to a particular microorganism. Accurate diagnostic and surveillance with better understanding of genetic and immunologic background of host specific response and pathogen evolution drives adapted vaccine research. AMR (antimicrobial) resistance is regarded nowadays as a major threat to global public health. The issue is receiving high-level political attention (G7 summit and upcoming G20 for first time). Pandemics, drug resistance and neglected diseases are framing health as a global security issue. WHO drawn up a list to promote research and development (R&D) of new antibiotics (27th Feb 2017) underlining gram-negative bacteria. Although initially omitted from the list, tuberculosis and latent tuberculosis represent still a major issue to tackle. XDR tuberculosis has evolved in several tuberculosis endemic countries to drug incurable or programmatically incurable tuberculosis. BCG vaccine successfully helped to interrupt transmission cycle and along with antibiotic discovery to decrease mortality. However, its efficacy remains controversial. HIV/AIDS has known link with tuberculosis but other risk factors have also emerged in recent years as important determinants of the TB epidemic, one of which is diabetes mellitus. Risk or new emerging and re-emerging pathogens originated from animals after having crossed the species barrier (e.g., Ebola) and re-appearance of old diseases like *pertussis*, measles and known limitations of drugs underline need for innovative vaccines as highly potent tool to tackle resistance and valuable alternative from long term perspective being clearly recognized as a major tool for public health.

ivankahhaluskova@gmail.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Vaccination against multiple infectious diseases: Is this in the best interests of public health?

Judy Wilyman
University of Wollongong, Australia

Vaccination is a medical intervention that comes with a risk for some people. When adopting a strategy to prevent infectious diseases it is important to choose the preventative measure that best addresses the causal mechanisms for the disease. In the expression of infectious diseases it is known that the pathogen alone does not cause disease: it is a combination of the pathogen, environment, and genetic factors that determines expression and severity of the disease. In 1960 Macfarlane Burnet, Nobel Prize laureate for immunology, stated that genetics, nutrition, psychological and environmental factors may play a more important role in resistance to disease than the assumed benefits of artificial immunity induced by vaccination. He considered that genetic deterioration of the population may be a consequence of universal mass vaccination and he postulated that in the long term vaccination may be against the best interests of the state. The current belief that much of the burden of infectious diseases can be alleviated if every child, in every geographical location, has access to multiple vaccines, does not consider the influence of genetics and environment on the health of populations. The historical record shows that deaths and illnesses to infectious diseases were significantly reduced by the mid-twentieth century due to public health reforms – prior to the introduction of most vaccines. Since 1990 there has been a 5-fold increase in chronic illness in children in developed countries and an exponential increase in autism that correlates directly with the expansion of government vaccination programs. Is this the genetic deterioration of the population that Macfarlane Burnet predicted in 1960? Many individuals are genetically predisposed to the chronic illnesses that are increasing in the population and governments do not use morbidity to assess outcomes of vaccination programs. Consequently the deterioration of the health of populations is not being associated with the increased use of vaccines. Macfarlane Burnet might be correct: the increased use of vaccines may not be in the best interests of public health or the state.

rjw915@uowmail.edu.au

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Solving inequity challenges in immunization by using 'Mission Indradhanush' approach in India

Bhupendra Tripathi
Bill & Melinda Gates Foundation, India

Statement of the Problem: Immunization is one of the most cost effective public health interventions and has been a major tool for reduction of India's under-5-mortality rate from 69 in 2008 to 45 in 2015. India's immunization program is one of the largest public health programs in the world. It targets 30 million pregnant women and 26 million infants through more than 9 million immunization sessions organized annually. Despite being a very effective public health tool, benefit of immunization is often limited by its suboptimal reach to community. It was estimated that even though immunization program has been in place since 1978 in country, only 65.2% children were getting fully immunized (RSOC 2013-14 data). To address this problem, special immunization campaign with the name of 'Mission Indradhanush {meaning rainbow}' was launched in 2014, with a target to reach full immunization coverage >90% by 2020. Because of these campaigns, the increase in full immunization coverage has accelerated at the rate of 6.7% per year since 2015.

Method: In spite of these campaigns, the progress is not uniform in all districts and certain areas, like urban slums not getting the required focus. Government of India decided to accelerate the full immunization coverage to 90% by 2018, instead of 2020 while providing special focus on urban areas and ensuring greater convergence with other ministries. To achieve the target in an accelerated mode, MoHFW has planned to implement 'Intensified Mission Indradhanush' in 118 districts, 17 urban areas and 52 districts of north-eastern states in Q4 2017.

Results: Intensive field monitoring will be done during these campaigns and detailed findings will be shared during the presentation.

bhupendra.tripathi@gatesfoundation.org

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Vaccination campaign in Jordan versus broken primary health care centers

Zeyad S Bataineh and Sameer Kofahi
King Hussein Medical Center, Jordan

Statement of the Problem: New cases of polio, measles and rubella began to appear in the Mediterranean region, including Jordan due to breakdown of primary health care system and a lot of children in Syria are definitely infected with these major diseases caused by the civil war. World Health Organization (WHO) adopted a vaccination campaigns in neighboring countries closed to Syria since 2-11-2013 to 21-11-2013 in order to control the spread of the disease through the reservoir (refugees) getaway from Syria to neighboring countries such as Jordan.

Objective: This study aims at control, prevention and eradication of polio, measles and rubella.

Method: A vaccination campaign for these major diseases (polio, measles and rubella) in the period from 2-11 to 21-11-2013 was carried out through the Ministry of Health Jordan (MOH), Royal Medical Services (RMS), United Nations Relief and Works Agency (UNRWA) and Non-Governmental Organizations (NGOs) health centers across the Jordan. Target population: The campaign targets the vaccination children against polio for the age group of one day to five years, while the targeted immunization with vaccine of measles and rubella for the age group of 6 months to 20 years for all Jordanians and non-Jordanians residing on the land of the Kingdom regardless of taking them to these vaccines earlier in the campaign.

Result: Total number of children and young people within the age group of the day and until the age of 20 years had vaccination 2,500000, among of those 56500 vaccinate by RMS as well as about 46000 measles and rubella, 10500 polio vaccines.

Conclusion: High vaccination coverage as well as a huge number of people from under the age 20 years, they attended Ministry of Health, Royal Medical Services, UNRWA, and non-governmental organizations health care center in Jordan to get vaccination.

Zeyad7620@yahoo.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Ethical principles for infectious disease eradication

Olga Kubar, Maina A Bichurina and Natalya I Pomanenkova
St. Petersburg Pasteur Institute, Russia

Eradication of infectious diseases is the great example multi-disciplinarian activity in global level, where the complex of epidemiology, virology, sociology and ethics plays the principal role for achievement the expected result. The formation of an algorithm of ethical principles necessary to ensure the success in the global policy of infectious diseases eradication has been the main reason of analysis the specific role of ethics in the process of elimination of infections by vaccination in the various stages of the global process: planning, organizing, conducting, monitoring and tracking the process of eradication. In the first stage connected with choosing the infection to be eliminated, the priority tasks include: the availability of objective knowledge about the anthropoid nature of the disease and the guarantee of the absence of mutation of the virus, the availability of an effective and safe vaccine, and an adequate surveillance system for the infection. Socio-political prerequisites for the elimination of infection should be the opportunity and readiness of the international community for concerted efforts on a global scale. Understanding these goals allows for establishing significant ethical characteristics of this stage, which primarily relate to reliability, honesty and non-engagement in scientific approaches. Among the ethical components that play an important role at the level of individual responsibility, it is necessary to note the personal decency, conscientiousness, caution and exactingness of the persons responsible for the assessment and interpretation of scientific information. To ensure comprehensive consideration of existing hypotheses, their critical evaluation and the argumentation of the forecast, it is necessary to follow ethical principles of openness, pluralism and independence of ethical valuation. The choice of the optimal vaccine preparation and the possibility of its universal use should be based on ethical principles of overcoming conflict of interests, altruism, equitable distribution of the burden and benefits. The ethical format of the socio-political and economic aspects of the eradication program consists of following the principles of international solidarity, social responsibility, and respect for cultural, historical and socio-religious diversity. The important role of all of universal ethical principles has been indicated and confirmed during the regional/national activity in the frame of WHO program for eradication of poliomyelitis, measles, and rubella.

okubar@list.ru

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

First characterization of immunogenic conjugates of Vi negative *Salmonella typhi* O-specific polysaccharides with rEPA protein for vaccine development

Muhammad Salman[1, 2, 4], F St Michael[1], A Ali[2], A Jabbar[5], C Cairns[1], A C Hayes[1], M Rahman[2], M Iqbal[2], A Haque[3] and **A D Cox[1]**
[1]National Research Council, Canada
[2]National Institute for Biotechnology, Faisalabad, Pakistan
[3]University of Faisalabad, Pakistan
[4]Abasyn University, Pakistan
[5]Mirpur University of Science & Technology, Pakistan

Efficacious typhoid vaccines for young children will significantly reduce the disease burden in developing world. The Vi polysaccharide based conjugate vaccines (Vi-rEPA) against *Salmonella typhi* Vi positive strains has shown high efficacy but may be ineffective against Vi negative *S. typhi*. In this study, for the first time, we report the synthesis and evaluation of polysaccharide-protein conjugates of Vi negative *S. typhi* as potential vaccine candidates. Four different conjugates were synthesized using recombinant ExoProtein A of *Pseudomonas aeruginosa* (rEPA) and human serum albumin (HSA) as the carrier proteins, using either direct reductive amination or an intermediate linker molecule, adipic acid dihydrazide (ADH). Upon injection into mice, a significantly higher antibody titer was observed in mice administrated with conjugate-1 (OSP-HSA) (P=0.0001) and conjugate 2 (OSP-rEPA) (P≤0.0001) as compared to OSP alone. In contrast, the antibody titer elicited by conjugate 3 (OSPADH-HSA) and conjugate 4 (OSPADH-rEPA) were insignificant (P=0.1684 and P=0.3794, respectively). We conclude that reductive amination is the superior method to prepare the *S. typhi* OSP glycoconjugate. Moreover, rEPA was a better carrier protein than HSA. Thus, OSP-rEPA conjugate seems to be efficacious typhoid vaccines candidate, it may be evaluated further and recommended for the clinical trials.

s.amazai@yahoo.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Vaccination – the key strategy of the global eradication of poliomyelitis

Natalia Romanenkova, Natalia Romanenkova, Maina Bichurina and Nadezhda Rozaeva
St. Petersburg Pasteur Institute, Russia

Key strategies of poliomyelitis eradication are: sensitive surveillance of acute flaccid paralysis (AFP) with obligatory laboratory investigation of each case of paralysis; maintenance of vaccine coverage against poliomyelitis among children at 95% level; organization of mass campaigns of vaccination-national immunization days in polio endemic countries among children under five years in two rounds per year; organization of national/subnational immunization days in case of indigenous circulation of wild poliovirus after importation among age groups in which polio cases were revealed. Poliomyelitis has been eradicated in the major part of the world, but surveillance must be continued because wild polioviruses can be imported and circulated in polio free countries in case of low vaccine coverage of population. Re-emergence of poliomyelitis can compromise the global polio eradication initiative in the post-certification period. The goal of surveillance is to evaluate the circulation of imported wild polioviruses and vaccine-derived polioviruses with nucleotide substitutions. The detection of these pathogenic strains is based on the analysis of poliovirus strains isolated in the course of AFP surveillance using virological and molecular methods. The ongoing risk of importation of wild polioviruses into polio-free countries remains till poliomyelitis is eradicated. In 2010, an important outbreak of poliomyelitis caused by imported wild poliovirus occurred in Tajikistan which had previously been polio free. Sequencing of the VP1 region of virus revealed that the causative agent of the outbreak in Tajikistan was closely related to wild type 1 poliovirus previously isolated in India. The same poliovirus was also isolated from poliomyelitis cases and healthy children among the migrants who arrived from Tajikistan in Russia. The spread of imported wild poliovirus in Tajikistan was possible because of immunization gap when the vaccine coverage had dramatically decreased. Our study showed that the percentage of migrants' children who were seronegative to three types of polioviruses was 30 times higher than it was among resident children in the North-West of Russia. The systematic control of adequate polio vaccination is indispensable in order to prevent transmission of imported wild polioviruses in polio free countries and to achieve WHO goal of the global eradication of poliomyelitis.

poliospb@nr3854.spb.edu

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Tangential flow filtration for the recovery of acellular *pertussis* vaccine components

Rakesh Kumar
Serum Institute of India Ltd., India

The commercial preparation of acellular *pertussis* vaccine depends on the effective recovery and purification of antigens *pertussis* toxin (PT), filamentous agglutinin (FHA) and pertactin (PRN) from *Bordetella pertussis* fermentation. This study describes the recovery of antigens using an open channel 0.45 micron tangential flow filtration module with optimization of process parameters of transmembrane pressure, cross flow and flux. Under the optimized conditions, greater than 98% recovery of PT and FHA was obtained.

rakesh.kumar@seruminstitute.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Remote results of using a new approach to the prevention of condylomata acuminata (anogenital warts)

Mikhail Petrovich Kostinov[1, 2], **A V Zhestkov**[3], **Yu V Tezikov**[3], **I S Lipatov**[3] and **A D Protasov**[3]
[1]Mechnikov Research Institute of Vaccines and Sera, Russia
[2]I.M. Sechenov First Moscow State Medical University, Russia
[3]Samara State Medical University, Russia

Statement of the Problem: Condylomata acuminata (anogenital warts) are the manifestation of infection mostly sexually transmitted and caused by human papilloma viruses (HPV) of low oncogenic risk types, namely, HPV types 6 and 11. These HPV types tend to cause self-limiting infection but more often the infection becomes recurrent due to virus persistence. One of the new ways of solving this problem is the use of imiquimod, an immune response modifier, and HPV quadrivalent recombinant vaccine aiming at eliciting immune response against HPV types 6, 11, 16 and 18.

Aim: The study aims at evaluating the efficacy of combined administration of imiquimod 5% crème and human papillomavirus (HPV) quadrivalent recombinant vaccine in order to achieve a long-term clinical remission in patients with chronic HPV infection manifested in condylomata acuminata (CA) of the anogenital area.

Methodology & Theoretical Orientation: The study enrolled 36 subjects aged 26.4 (4.1) years (including 22 men) with one to five CA of the anogenital area. Study participants were vaccinated with human papillomavirus quadrivalent recombinant vaccine using a 0-2-6 month regimen with concomitant administration of imiquimod 5% crème applied three times per week for not more than 16 weeks. Patients were monitored over three years.

Findings: Complete disappearance of CA was observed in 34 out of 36 subjects (94.4%) after one year from the start of treatment. Two patients having CA of the anogenital area after one year of combination treatment underwent a successful course of treatment with Solcoderm (one patient for one year three months and the other for one year four months) that resulted in complete disappearance of CA. Within the three years period no recurrence of CA of the anogenital area has been observed.

Conclusion & Significance: Vaccination with human papillomavirus quadrivalent recombinant vaccine along with concomitant use of imiquimod 5% crème enables to achieve a long-term clinical remission in patients with chronic HPV infection manifesting in condylomata acuminata of the anogenital area, in at least 94.4% of patients followed up for three years.

monolit.96@mail.ru

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Designing multivalent immunogen for vaccine optimization

Catherine H Schein
Institute for Human Infections and Immunity-University of Texas Medical Branch, USA

Databases now contain thousands of sequences for emerging pathogens. High definition structures have been determined for many of their proteins and even whole viruses. The current challenge is to incorporate this information into the design of 21st century vaccines, which can provide better protection against rapidly evolving pathogens. Conventional vaccines begin by modifying a single strain or combining several wild type strains. The starting point is often a historical isolate, which may have been passaged multiple times in different labs. We have developed methods to extract the information in large multiple sequence alignments to design reference sequences for viral families, and immunogen to protect against many different viruses. First, a PCP-consensus sequence that is most similar in its physical chemical properties to all the sequences in an alignment is chosen. This sequence can then be modified by altering the regions of maximum variability, and known epitopes, to obtain a stable protein that can generate protective antibodies against many different related pathogens. The PCP consensus sequence for a group of proteins (e.g., for each dengue serotype) provides a rational reference that can be used to select the naturally occurring strain that is closest to the mean for the family. This study will show how the method can be used to produce a tetravalent antigen against all four dengue strains and to define the common properties of enterovirus VPgs and allergenic proteins.

chschein@utmb.edu

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Direct evidence for role of anti-saliva antibodies against salivary gland homogenate of P. argentipes in modulation of protective Th1-immune response against Leishmania donovani

Shyam Narayan
Rajendra Memorial Research Institute of Medical, India

Currently the main concerns regarding control of visceral leishmaniasis (VL) caused by L. donovani are immunosuppression, relating toxicity of antileishmanial drug and little development in appropriate vaccine and vector (P. argentipes) control. Reports available from ex vivo studies reflect significance of vector salivary gland homogenate (SGH) in reverting immunosuppression of infected VL subjects and as such the immunogenic nature of SGH can be a strategy to modulate immune system and antileishmanial function to enable immune response to control the disease. Several related studies also identified a better utility of vector anti-saliva antibodies in achieving such effects by an adoptive transfer approach instead of direct stimulation with SGH protein. However, conclusive evidences on VL cases are far beyond satisfactory to suggest role of SGH into modulation of host immune response in VL subjects in India. This study was undertaken to make comparison on change in cytokines (TH1 and TH2) response pattern and antileishmanial macrophage (Mϕ) function following stimulation of their PBMCs with SGH protein derived from P. argentipes sand fly vector for VL or anti SGH antibodies raised in rabbit. This study reports for the first time that L. donovani sensitized healthy subject demonstrates an up-regulated interferon-γ (TH1) and down regulated interleukin-10 (TH2) production following stimulation of their PBMCs by P. argentipes anti-saliva antibodies accompanied with an improvement in antileishmanial Mϕ function for nitric oxide (NO) production. Subsequent experiments suggest that P. argentipes based anti-SGH antibodies when used to stimulate LD infected PBMCs in healthy subjects resulted in better clearance of Leishmania amastigotes load compare to SGH protein. Possibly the immunogenic components of anti-saliva an antibody maintains the level of protective cytokine (INF-γ) and seems to restrict the infection by host protection by vector saliva.

drshyamnarayan@rediffmail.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Barriers to universal immunization coverage in Sub Saharan Africa (SSA)

Edison Arwanire Mworozi[1, 2] and **Joseph Rujumba**[2]
[1]Mulago National Referral Hospital, Uganda
[2]College of Health Sciences Makerere University, Uganda

Vaccination is a cornerstone of any program that aims at reducing morbidity and mortality due to preventable diseases and is a cost-effective intervention. Despite efforts to reduce child mortality about 10 million children under five years of age die annually the majority from developing countries, SSA inclusive. Thus, vaccine preventable diseases continue to be an important public health problem in SSA. It is estimated that vaccines prevent more than 2.5 million child deaths annually and that fully vaccinated children by nine months of age suffer lesser related morbidity and mortality. Immunization is key to attaining Sustainable Development Goal (SDG 3) aiming at reducing under-five mortality to less than 25/1000 live birth by 2030. Globally attaining universal childhood vaccination remains a major challenge particularly in reaching the most vulnerable in SSA. Despite availability of effective vaccines, immunization coverage remains low in SSA due to various factors including: inadequate & poorly motivated health workers (HWs), inadequate immunization knowledge and skills by HWS, multiple languages, low education levels of caretakers, cultural and religious beliefs, poor access to health facilities, poor social economic status, political instability and displacement, mobile populations, negative messaging and anti-vaccine lobby, inadequate funding, inadequate social mobilization and concerns about vaccine safety. Achieving universal immunization coverage and SDG 3, in SSA calls for multiple strategies including multi-sectoral collaboration and partnerships, training of HWs, universal education, improved infrastructure, addressing cultural and religious beliefs, ensuring political stability, improved social mobilization and vaccine safety communication and adequate health financing in general and immunization in particular.

emworozi@gmail.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Anti-parvovirus antibody and its relation to clinical and paraclinical parameters in PICU children (2015-16)

Fariba Shirvani, Feresteh Arbasian and Kimia Seifi
Pediatrics Infectious Diseases Research Center, Iran

Background: Acute parvovirus infection may cause different complications and comorbidity in PICU patients. This study is conducted on PICU patients to identify the effect of parvovirus infection on death, Hb, WBC count, and liver function tests in children admitted to Mofid Children Hospital (Sep 2015-Sep 2016).

Materials & Methods: 66 admitted children in Mofid Children Hospital PICU were selected. Epidemiologic data of age and sex and basic disease and anti-parvovirus IgG and IgM antibody and death, Hb, WBC count, AST AND ALT were gathered in questionnaire and data analysis was performed by SPSS 21 Software.

Results: Age range of children was 1-156 month, mean age was 36.5±41.3 months. Basic disease of children was GI in 13 cases, respiratory tract illnesses 14 cases, urinary tract diseases six cases, nervous system diseases three cases, hematology and oncology seven cases and other diseases in three cases. Quantitative results of IgG and IgM were analyzed. There was no significant relationship between IgG and IgM with Hb and WBC count. ALT more than 12.5 IU was more significant in IgM positive cases and AST more than 67IU was more significant in IgG positive cases. IgM positivity had significant relationship with death prevalence.

Conclusion: Parvovirus serologic antibody can be an important measurement in PICU admitted children since it can be associated with anemia, neutropenia and LFT tests.

shirvani@sbmu.ac.ir

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Pore-forming proteins (PFPs) from a sea anemone encapsulated into liposomes are able to enhance an antigen specific cytotoxic T lymphocytes response

María Eliana Lanio[1], Rady Laborde[1], Yoelys Cruz-Leal[1], Carlos Alvarez[1], Fabiola Pazos[1], María C Luzardo[1], Audry Fernández[2], Circe Mesa[2], Ieda Longo-Maugéri[3], Catherin V Nogueira[4], Daniel Grubaugha[4], Michael N Starnbarch[4], Darren Higgins[4] and **Luis E Fernández[2]**

[1]University of Havana, Cuba
[2]Center for Molecular Immunology, Cuba
[3]Federal University of São Paulo, Brazil
[4]Harvard Medical School, USA

Sticholysins I and II (StI/II, Sts) are two PFPs produced by the sea anemone Stichodactyla helianthus, exhibiting a preference for sphingomyelin-containing membranes. Different strategies employing bacterial PFPs have been used to improve the antigen-specific cytotoxic T CD8$^+$ lymphocytes (CTLs) response. Furthermore, liposomes have been used as adjuvants due to their ability to improve antigen uptake by antigen presenting cells. We studied the enhancement of CTLs response by liposomes co-encapsulating Sts with ovalbumin as model antigen (Lp/OVA/Sts). C67BL/6 mice were immunized twice with Lp/OVA/Sts or Lp/OVA without Sts. SIINFEKL-specific B3Z CD8$^+$ T and OVA-expressing EG-7 tumor cells were used to measure the antigen cross-presentation *in vitro* and antitumor activity *in vivo*, respectively. Lp/OVA/StII induced an OVA-specific CD8$^+$ T-cell expansion superior to that observed with Lp/OVA and *in vitro* significantly enhanced activation of the SIINFEKL-specific B3Z CD8$^+$ T cells as a consequence of antigen cross-presentation by macrophages, but not by dendritic cells. Interestingly, Lp/OVA/StII-induced activation was inhibited by lysosomes proteases inhibitors, but not proteasome inhibitor indicating that StII induces antigen cross-presentation by vacuolar pathway. The formulations Lp/OVA/Sts enhanced the OVA-specific CTLs response *in vivo* in comparison with Lp/OVA and also conferred a higher protection to mice challenged with OVA-expressing tumor cells. Additionally, CTLs activity induced by Lp/OVA/StII was independent of CD4+ T-cells, while anti-tumor response was strongly affected by CD8$^+$ T-cells depletion. Interestingly, free-Sts were able to induce activation of DCs and it was dependent of TLR-4 and MyD88, suggesting that the effect of these proteins on the cellular immune response could be beyond their pore-forming ability. The antigen-specific CTLs immune response enhanced by immunization of wild type mice with Lp/OVA/StII was significant reduced in TLR-4 knockout mice. Our results suggest the potentialities of Sts encapsulated into liposomes as adjuvant for enhancing effective CTLs mediated immune responses.

mlanio@fbio.uh.cu

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Serotype distribution of Streptococcus pneumoniae in invasive disease and nasopharyngeal carriages pre-vaccine introduction in Cuba

María Eugenia Toledo-Romaní[1], Gilda Toraño[1], Laura M Rodriguez Noda[2], Isabel Luis Gonzálvez[2] and Nivaldo Linares-Pérez[2]
[1]Tropical Medicine Institute "Pedro Kourí", Cuba
[2]Finlay Vaccine Institute, Cuba

Background & Aim: Cuba has a new heptavalent PCV under advanced clinical development and its introduction in children 1-5 years old is scheduled in 2018. We report the results of serotyping and antibiotic susceptibility testing performed on isolates from invasive pneumococcal (IPD) and nasopharyngeal (NP) carriages in Cuban hospitalized children, pre-vaccine introduction.

Methods: A total of 353 isolates from IPD and 80 from the nasopharynx of hospitalized children ≤5 year old with clinical pneumonia were recovered prospectively during 2013-2016. Typing of isolates was done using capsular swelling method with the Pneumo test reagent set. Antimicrobial susceptibility was determined following CLSI methods.

Results: The higher proportion of isolation from IPD was collected in children among 12-59 year old (annual average 30.2; range 20.0-40.4); 85.8% of them belonged to the follow seven serotypes, in order of frequency: 14, 19A, 6A, 19F, 6B, 3 and 23F. Serotypes 6B, 6A, 19F y 23F were associated to antimicrobial resistance: penicillin (16.7%), ceftriaxone (3.15%), macrolides (62.7%), trimethoprim-sulfamethoxazole (40.3%) and chloramphenicol (7.4%). The proportion of NP colonization in hospitalized children was 13.76% and the serotype and resistance profile was similar to the pattern of IPD isolates, but 19A was the predominant (25%) and 100% of β-lactamase susceptibility was demonstrated. Non vaccine serotypes represent 23.7% of all isolation from nasopharynx.

Conclusions: Our data predict more than 50% coverage of the circulating S. pneumoniae in Cuba with the new heptavalent conjugate vaccine and could be useful for evaluating the serotype distribution in support of their introduction.

mariaeugenia@ipk.sld.cu

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

How old is vaccine hesitancy?

Gordana Pelčić
University of Rijeka, Croatia

During the last decades the phenomenon of vaccine hesitancy has emerged over the purpose and essence of preventive vaccine programs in the global world. It seems that public health discussions and concerns are focused on defending the vaccination issue rather than exploring the justified need for vaccine programs in the 21st century. Vaccine hesitancy issue is not the product of the 21st century; it has accompanied vaccination throughout the history for more than three centuries. The definition of vaccine hesitancy is not unique and stabile, its understanding differs among the scientists and public according to the period of time, social, political and cultural circumstances of certain territory. Although the history of inoculation or the avanguard of vaccination did not start with Edward Jenner (it started long ago among African tribes), his work is well documented and available to the research and shows us that his work was accompanied with a negative connotation in that period of time. The vaccine hesitancy safely has survived throughout the history from the 18th century to the 21st century, from the smallpox inoculation to the MMR vaccine in the 20th century to the HPV hesitancy in the 21st century. Alongside with the first vaccination laws, in different parts of the world, anti-vaccination movements and vaccination hesitancy developed. Throughout the history the vaccination was used in the sense of biological welfare for the humankind and in the sense of biological warfare for the humankind too. Conspiracy theories are the cause of large vaccine hesitancy. In this paper, we will explore the history of vaccine hesitancy in different periods of time and in different countries.

gordana.pelcic@medri.uniri.hr

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Novel vaccine delivery strategies in mobile fishing communities: An oral cholera vaccination campaign around Lake Chilwa, Malawi

Maurice M'bang'ombe
Ministry of Health – Epidemiology Unit, Malawi

Background: Malawi is prone to cholera, particularly area of Lake Chilwa, home to nearly 750,000 people living around Lake Chilwa, which include mobile fishermen. To preempt future outbreaks, which occur during fishing season, the Ministry of Health (MOH), in collaboration with partners planned a preventive mass-vaccination campaign, targeting 80,000 people with a two-dose oral cholera vaccine. While preparations for vaccination campaigns were underway, Malawi started registering cholera cases on the Lake Chilwa. 670 cases were reported. In response to outbreak, MOH with partners adapted plans and conducted a reactive vaccination campaign to control outbreak. As fishermen are thought to be key players in cholera transmission, novel off-label strategies were used to deliver the vaccine.

Methods: MOH requested 160,000 OCV doses from WHO to vaccinate the affected population. The first round was done from 16-20 February, 2016, and was delivered through fixed and mobile vaccination posts. For those living in floating homes, the second dose was provided at the same as the first along with instructions on how and when to consume the dose. A second round was conducted from 8-10 March and mobile and fixed point vaccination stations were used in the communities around the shore. On the islands, due to limited access, vaccine was provided to the head of each household with enough for all individuals one year and older to take at home within 24-hours. The head of household was provided instruction on how to take the vaccine.

Results: Overall, all 80,000 doses were used in first round, and 60,240 of the doses were used in the second-dose round. The vaccine was accepted by all the communities. We found that in highly mobile populations, self-administration of the second dose, whether by providing it at the same time as the first dose, or providing to heads of households, may be a useful strategy to ensure high coverage.

Conclusion: This has highlighted the first large-scale OCV mass campaign conducted in the mobile population of fishermen. The novel second strategies used for delivering the second dose of OCV proved feasible and acceptable by hard to reach mobile fishermen communities but more work needs to be done to assess the effectiveness of two-doses delivered in this manner, this provides practical lessons for local adaption of OCV strategies in Malawi and beyond.

mbangombe@yahoo.com

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Changes on nasopharyngeal colonization associated to pneumococcal vaccination in Cuban children: follow up two years after clinical trial enrollment

Ninaldo Linares-Perez[1], Meiby Rodriguez[1], Mayelín Mirabal[1], Beatriz Paredes[1], Darielys Santana[1], Dagmar García-Rivera[1], Yury Valdés-Balbin[1], V Vérez-Bencomo[1], Maria F Casanova[3], Dunia Chávez[3] and **Maria E Toledo-Romaní[2]**

[1]Finlay Vaccine Institute, Havana, Cuba
[2]Tropical Medicine Institute "Pedro Kourí", Cuba
[3]University Pediatric Hospital "Paquito González Cueto", Cuba

Background & Aim: The impact of evaluation on pneumococcal NP carriages is included as part of the evaluation strategy of the new Cuban pneumococcal vaccine candidate (PCV7-T). We measure the changes associated to pneumococcal vaccination (one and two years after) in preschool children included in a randomized and currently still blinded control trial.

Methods: 555 from 1135 children 1-5 year old were randomly selected for evaluation one-year after vaccination with PCV7-T or PREVNAR13® (control). 443 of the total, equally randomly selected, were evaluated after two years. Nasopharyngeal swabs were collected according to established protocols. Prevalence NP colonization global and by serotype was estimated. Individual and family risk factors were explored. Vaccination effectiveness was estimated using preventable fraction.

Results: Global prevalence of NP colonization in children 1-5 y/o was reduced (32.3% to 9.0%; p<0.00) and due the seven common vaccine serotypes drop (15.6% to 2.2%; p<0.00) one-year post vaccination. After two-years, the prevalence for non-vaccine serotype increases (3.2% to 10.1%; p<0.00). Before immunization and one-year after, serotypes 19F, 6A, 23F and 19A were the most frequently isolated. After two-years a significant increase of 15B, 15C and 4 was detected. Day care attendance was identified as the main determinant (p=0.00) of NP colonization (OR 3.8; CI 1.3-16.3). The preventable fraction of NP vaccine type serotypes in vaccinated was 85.9% after one-year and 81.41 after two-year.

Conclusion: Preliminary estimation of effectiveness of pneumococcal vaccination in Cuba supports the decision-making to vaccinate preschool children to impact the burden of NP colonization at population level.

nlinares@finlay.edu.cu

J Vaccines Vaccin 2018, Volume 9
DOI: 10.4172/2157-7560-C1-063

Analysis of the effects of individual and community level factors on childhood immunization in Malawi

Peter Austin Morton Ntenda, Kun-Yang Chuang, Fentanesh Nibret Tiruneh and Ying-Chih Chuang
Taipei Medical University, Taiwan

Background & Aim: Empirical evidence regarding the relationship between childhood immunization and individual- and community-level factors in low-income countries has received little attention. We compared the trends and the effects of a wide range of individual- and community-level socioeconomic factors on the likelihood of a child being immunized between 2004 and 2010 in Malawi.

Methods: We used data from the 2004 and 2010 Malawi Demographic and Health Survey and applied generalized estimating logistic regression equation to analyze data respectively on 2042 and 3496 children aged 12–23 months. We compared the relationship between individual- and community-level socioeconomic factors and a child's vaccination status for four basic vaccines recommended by the World Health Organization: bacillus Calmette-Guérin (BCG) vaccine, diphtheria-tetanus-*pertussis* (DPT3) vaccine, oral polio vaccine (OPV3), and measles-containing vaccine 1 (MCV1).

Results: The trends of vaccination had a similar pattern in 2004 and 2010. The coverage of the four vaccinations was highest for BCG and lowest for OPV3 and complete immunization was higher in 2010. The multivariate analyses show that mother's low education, having one or none antenatal visits, having no immunization card, having immunization card but not seen, residing in poor households, and living in central region were the most significant factors associated with decreased odds of achieving vaccination coverage and complete vaccination in both 2004 and 2010. However, maternal education was more likely to be associated with children's immunization in 2010, while the geographical region was more likely to be associated with children's immunization in 2004.

Conclusions: There were marked improvements in the national immunization coverage from 2004 to 2010. In order to achieve complete immunization, to further enhance the national immunization coverage as well as to lessen the gaps and disparities in childhood vaccination in Malawi, policy makers should design interventions based on the factors addressed in this study.

peterantenda@yahoo.com