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JOINT EVENT

10<sup>th</sup> International Virology Summit

4<sup>th</sup> International Conference on Influenza & Zoonotic Diseases

July 02-04, 2018 | Vienna, Austria



## Jaroslav Turanek

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## Noninvasive mucosal vaccination: recombinant and mRNA vaccine formulation, delivery systems and molecular adjuvants

The aim of the workshop is to present the latest developments in the field of noninvasive mucosal vaccination. Selected speakers will cover topics like systems for mucosal vaccination, mucosal molecular adjuvants, mRNA constructs for vaccination, influenza virus pseudotypes, recombinant antigens and antigen formulations for mucosal delivery.

**Statement of the Problem:** Vaccination remains the principal way to control seasonal flue infections and is the most effective method of reducing influenza-associated morbidity and mortality. Mucosal vaccination represents non-invasive route for immunization having advantage in safety, efficacy and comfort for vaccinees, in general. At present, inactivated, live attenuated and recombinant vaccines for intradermal, intramuscular and intranasal application are licensed and in use.

**Methodology & Theoretical Orientation:** Advent of reverse vaccinology together with availability of recombinant technologies for economic massive production of recombinant antigens and mRNA constructs, new biocompatible nanomaterials and molecular adjuvants are prerequisites for successful development and commercialization of influenza vaccines. Especially mRNA-based influenza vaccines represent promising approach for rapid development of seasonal influenza vaccine. Recombinant antigens based on complex nanoparticles like VLP and virus pseudotypes, recombinant protein antigens derived from influenza virus and chimeric multiepitopic or fused complex protein antigens represent valuable tools for development of modern influenza vaccines. Beside intranasal vaccination, sublingual application of vaccines is of growing interest with respect to safety and induction of both systemic and generalized mucosal immune response. Development and application of new mucoadhesive formulations drives forward the development of mucosal vaccines. Great potential is hidden in the use of biocompatible nanomaterials. Polymeric and lipid based nanoparticles are available as carriers for construction of vaccination nanoparticles containing mRNA or recombinant protein antigens. New materials also facilitate a development and use of new technologies for vaccine production.



Scheme of sublingual vaccination

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#### **Recent Publications**

- Multi-layered nanofibrousmucoadhesive films for buccal and sublingual administration of drug-delivery and vaccination 1. nanoparticles - important step towards effective mucosal vaccines. By: Masek, Josef; Lubasova, Daniela; Lukac, Robert; et al. JOURNAL OF CONTROLLED RELEASE Volume: 249 Pages: 183-195 Published: MAR 10 2017
- 2. Induction of Broad-Based Immunity and Protective Efficacy by Self-amplifying mRNA Vaccines Encoding Influenza Virus Hemagglutinin By: Brazzoli, Michela; Magini, Diletta; Bonci, Alessandra; et al. JOURNAL OF VIROLOGY Volume: 90 Issue: 1 Pages: 332-344 Published: JAN 2016
- 3. The use of pseudotypes to study viruses, virus sero-epidemiology and vaccination By: Bentley, Emma M.; Mather, Stuart T.; Temperton, Nigel J. VACCINE Volume: 33 Issue: 26 Pages: 2955-2962 Published: JUN 12 2015
- Nonpyrogenic Molecular Adjuvants Based on norAbu-Muramyldipeptide and norAbu-Glucosaminyl Muramyldipeptide: 4. Synthesis, Molecular Mechanisms of Action, and Biological Activities in Vitro and in Vivo By: Effenberg, Roman; Knotigova, Pavlina Turanek; Zyka, Daniel; et al. JOURNAL OF MEDICINAL CHEMISTRY Volume: 60 Issue: 18 Pages: 7745-7763 Published: SEP 28 2017
- Nanodiamond enhances immune responses in mice against recombinant HA/H7N9 protein. By: Ngoc Bich Pham; Thuong 5. Thi Ho; Giang Thu Nguyen; et al. JOURNAL OF NANOBIOTECHNOLOGY Volume: 15 Article Number: 69 Published: OCT 5 2017.
- 6. Neuraminidase-based recombinant virus-like particles protect against lethal avian influenza A(H5N1) virus infection in ferrets By: Smith, Gale E.; Sun, Xiangjie; Bar, Yaohui; et al. VIROLOGY Volume: 509 Pages: 90-97 Published: SEP 2017.
- Addition of alpha Gal HyperAcute (TM) technology to recombinant avian influenza vaccines induces strong low-dose 7. antibody responses By: Chen, Wenlan Alex; Zhang, Jinjin; Hall, Katie M.; et al. PLOS ONE Volume: 12 Issue: 8 Article Number: e0182683 Published: AUG 7 2017.

#### **Biography**

Jaroslav Turanek has his expertise in nanotechnology focused on drug delivery systems based on liposomes for construction of self-assembled vaccination nanoparticles and molecular-based adjuvants. He is pioneering the technologies of nanofibre-based mucoadhesive films for noninvasive mucosal vaccination and "printed vaccine technology". Jaroslav Turánek has completed his PhD at the age of 27 years from Masaryk University Brno. He is the head of Department of Pharmacology and Immunotherapy, Veterinary Research Institute, Brno. He has published more than 75 papers on vaccines, drug targeting, anticancer and antimicrobial drugs in reputed journals. He is teaching immunology, biotechnology and immunochemistry at Masaryk University Brno and Technical univeersity Brno. He is president of Czech Society for Gene and Cell Therapy and Principal Investigator of vast multidisciplinar project OPVVV FIT "Pharmacology, Immunotherapy, nanoToxicology" focused on applicaton of complex nanotechnology and biotechnology approach for development of new modern vaccines and targeted drug delivery systems.

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