evropský sociální fond v ČR
EVROPSKÁ UNIE
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY
OP Vzdělávání pro konkurenceschopnost
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Název: Molecular biology of influenza virus

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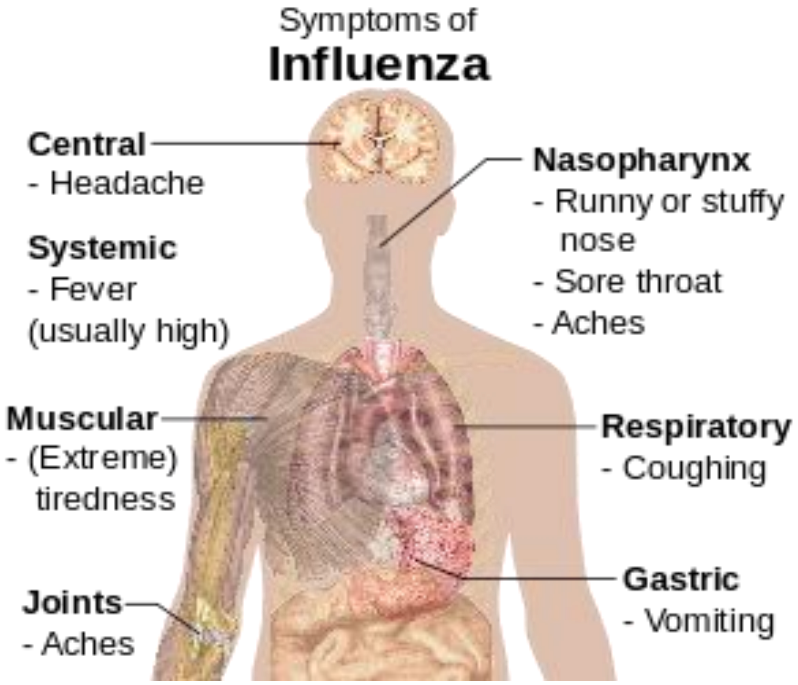
Název projektu: Mezinárodní spolupráce v oblasti "in vivo" zobrazovacích technik

Basics about Influenza



- An **infectious respiratory disease** of birds and mammals
- Transmitted by **droplet infection**
- **Incubation period 12-72 h**
- sneezing, coughing, fever, headache….

- **ss (-) RNA viruses, family Orthomyxoviridae**
- Three genera: Influenza A, B and C

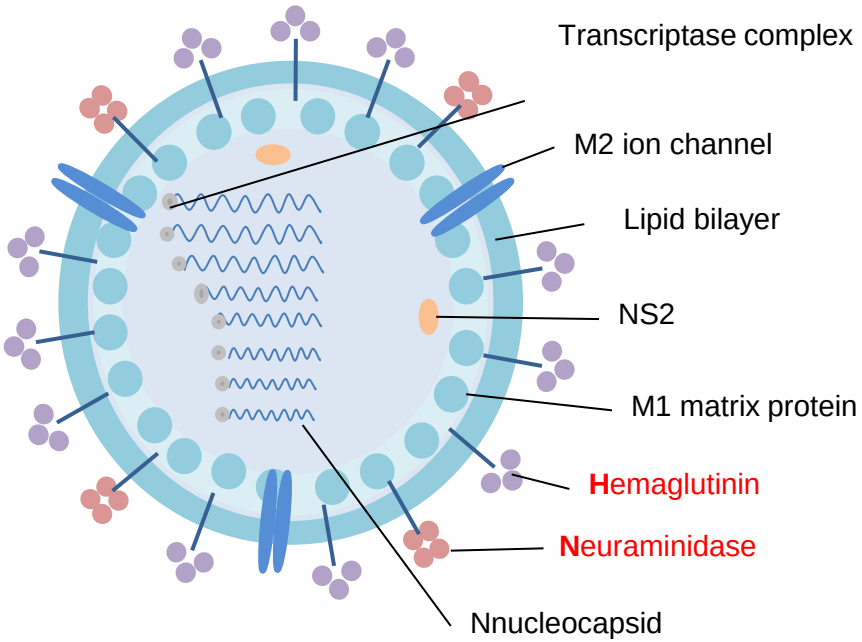
  (difference in structure, host range and virulence)

  type A: most virulent, cause epidemic and pandemic

  type B: cause epidemics only in human population

  type C: causes disease exceptionally

Structure of influenza virus



- **80-120 nm, spherical**

  (filamentous forms can ocure – type C)

- Envelope, surface structure (two antigens), core

  Genom: ss RNA is **segmented** (7 or 8 segments)

- Each segment encoded one or two proteins

- **11proteins** (influenza A+B):

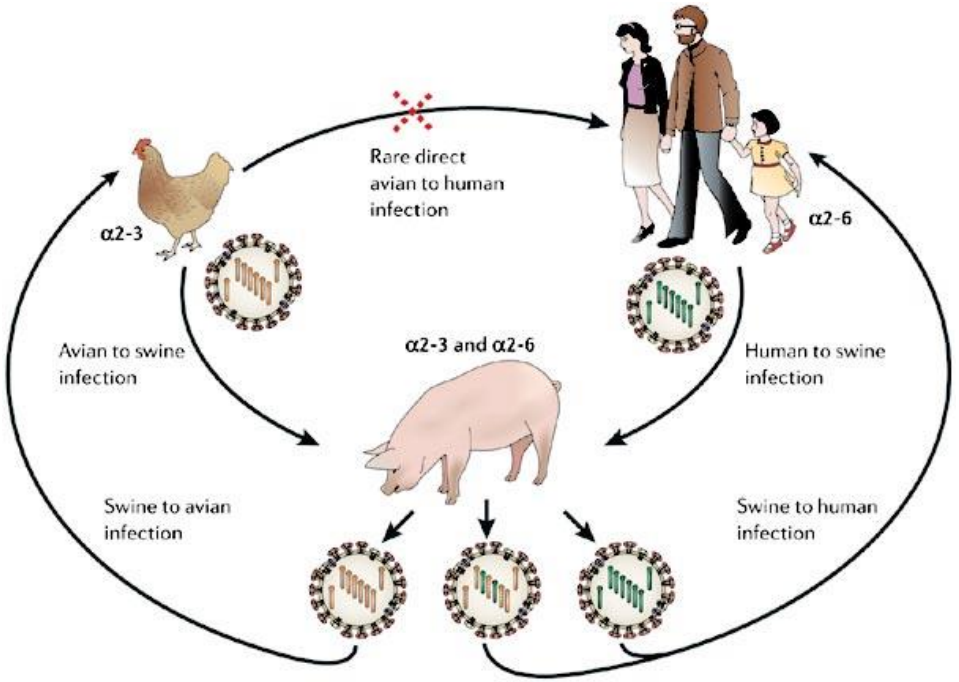
haemagglutinin (HA), neuraminidase (NA), nucleoprotein (NP), M1, M2, PA, PB1, PB1-F2, PB2, NS1and NS2 (non structural proteins)

Surface antigens

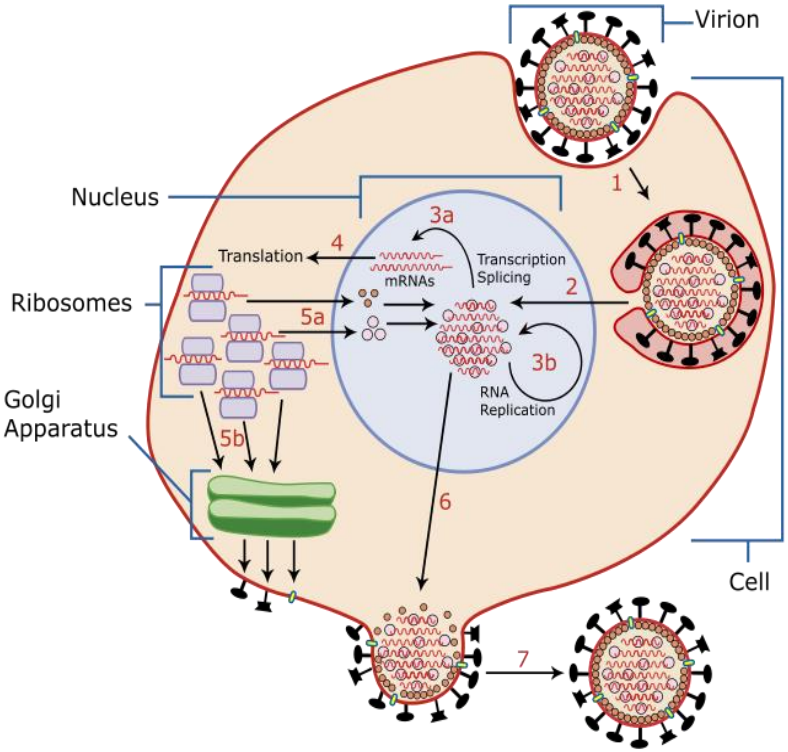
- HA and NA are the two large glycoproteins
- **HA** (trimer) – **entry of virus into host cell**
- **NA** (tetramer) – **release of new formed virions** (after replication)
- Subtyping of influenza type A

  - based on combinations of diffeent variants of HA(1-17) and NA(1-9)

- **In human population are common H1, H2, H3 and N1, N2**



Life cycle of influenza viruses



- Viruses can replicate only in living cells
- **HA** (virus) bind **sialic acid receptor** (host cell)
- HA is cleaved by a protease (lung surfactant)
- Import of the virus by **endocytosis**
- Enter the target **endosomes** for genome release
- **Release the viral RNA** and core proteins
- **Replication, transcription** (and splicing), **translation**
- Formation of **HA** and **NA on surface of host cell**
- Formation of core (**vRNA**) and **envelope**
- **NA** lyse bond between HA and sialic acid
- **Release of new formed virions** after replication

Preventive measures and therapy

Vaccine

- Only **one way to control** of influenza
- Vaccine is useable only one year (due to mutational changes)
- Each year two new vaccines (Northern and Southern hemispehere)
- In collaboration with **WHO** and **C**enters for **D**isease **C**ontrol and Prevention
- Predict which strains will circulate in the next year

Therapy

- **Antibiotics** - only for therpy of secondary infection (bacterial pnumonia)
- **Antivirotics** - neuraminidase inhibitors (NI) (Zanamivir, Oseltamivir)
  - M2 blockers (amantadine and Rimantidine)

NI - effective against influenza **A and B**

- different strains / different resistance
- new formed virions are incapable for release of new formed virion)

M2 blockers - block a viral ion channel (M2) and prevent the virus from infecting cells

- effective agains influenza A **not B**
- currently **increasing resistance** (H3N2 80%)

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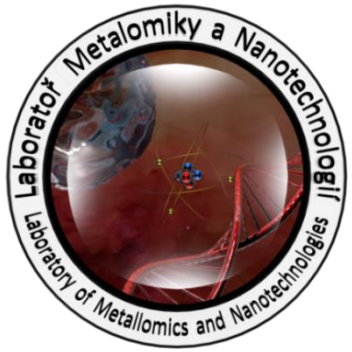
- All coleagues from Laboratory of Metallomics and nanatechnology

Děkuji za pozornost!



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