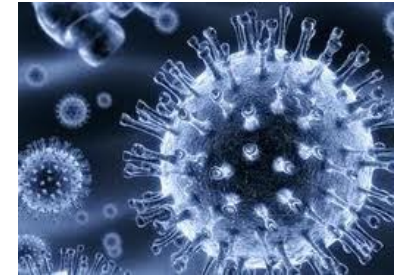


Název: Isolation and detection of hemagglutinine labeled by
CdTe and CdS quantum dots

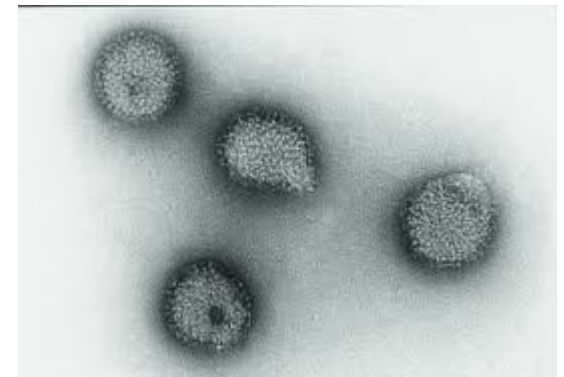
Školitel: Prof., Ing. René Kizek, PhD.

Datum: MVDr. Ludmila Krejčová

Content



- Points of interest and basics about influenza infection
- Preparation of hemagglutinin-quantum dots complexes
- Isolation of HA-QDs complexes using glycan modified MPs
- Electrochemical detection of HA-QDs complexes
- Conclusion



Influenza

- Infectious respiratory disease
- Mutational changes (common seasonal flu → pandemic)
- 100x higher than others (Ebola)

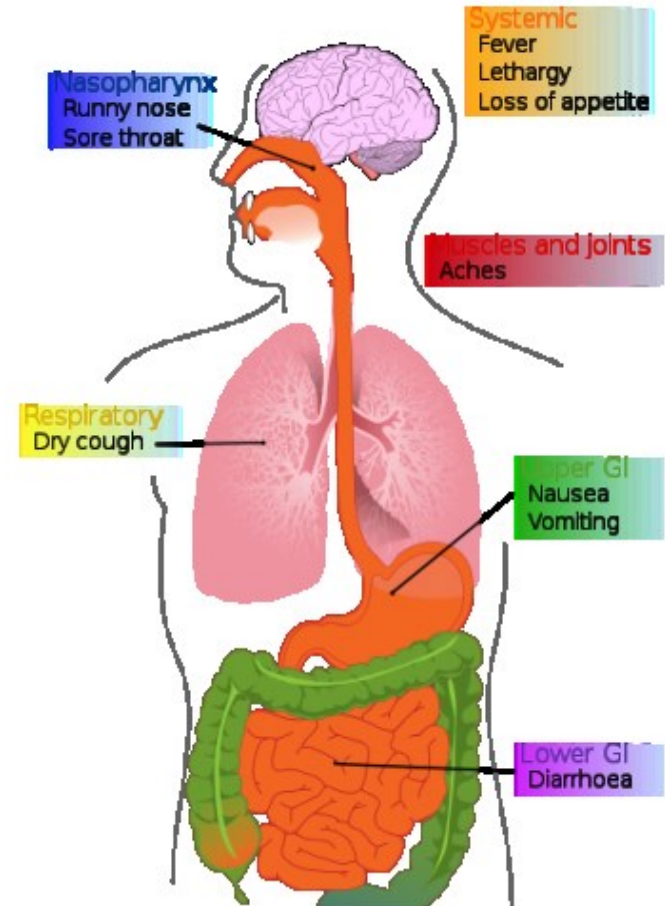
Prevention

- Vaccination (splitted virions of Influenza A, B)

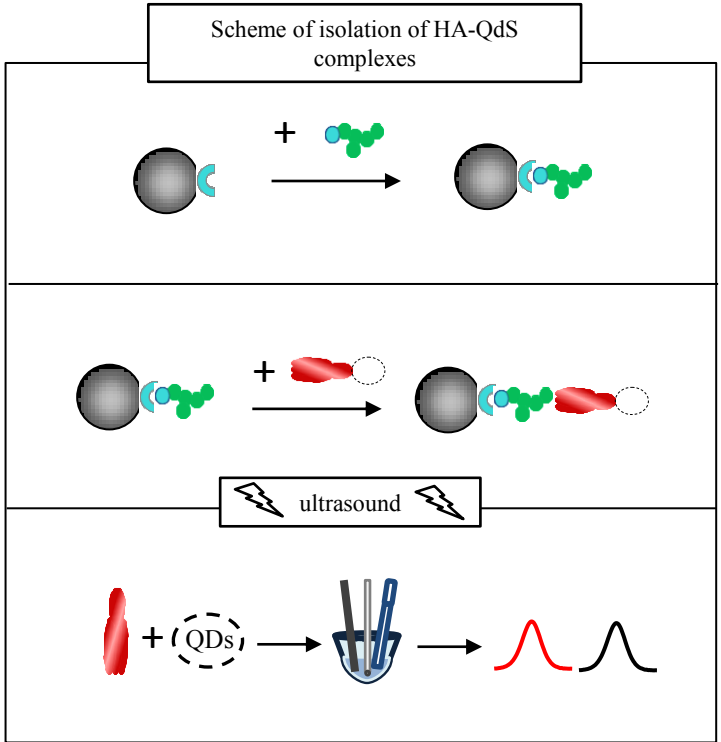
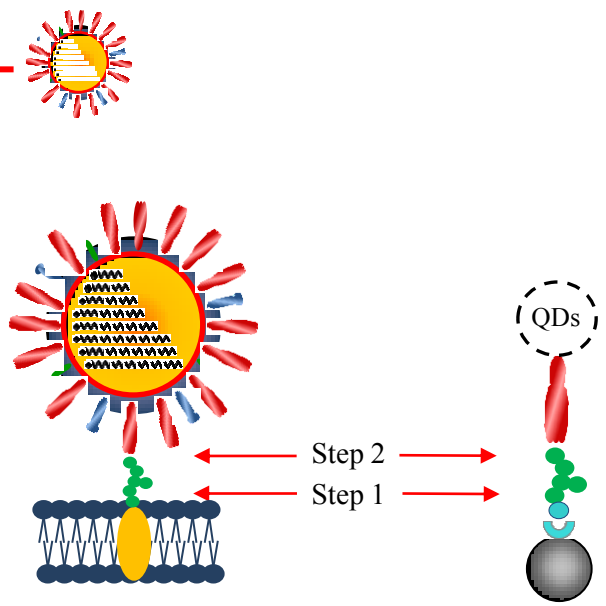
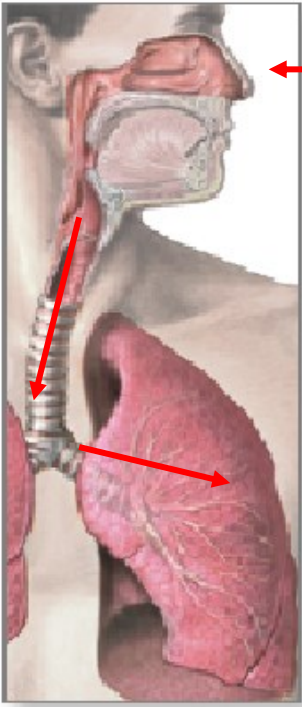
Therapy

- M2 blokckers (amantadine and rimantidine)
- Neuraminidase inhibitors (oseltamivir and zanamivir)

Symptoms of Influenza Infection



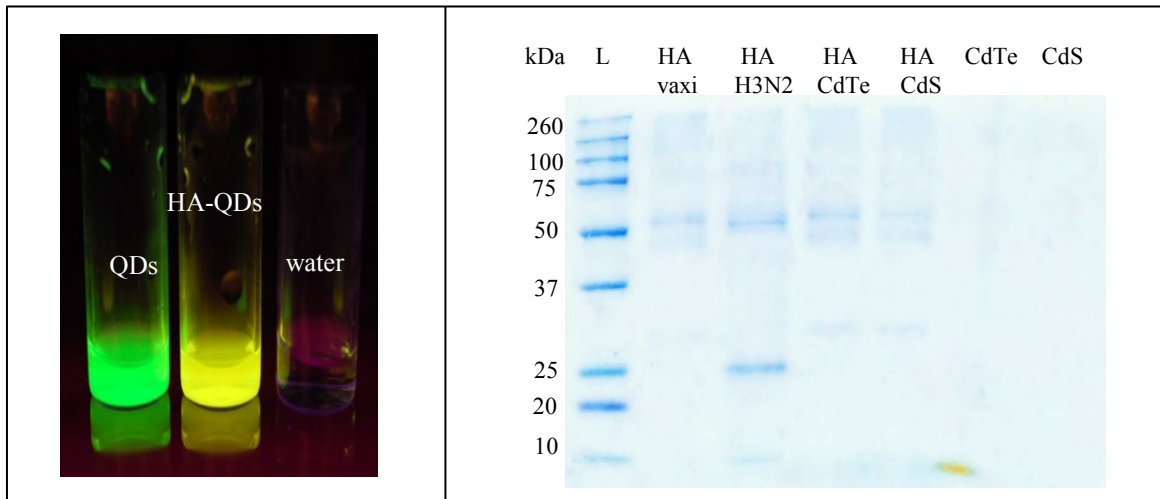
Isolation of influenza hemagglutinine (HA)



Labelling of vaccine HA by QDs (CdTe and CdS)

- Vaxigrip®
- inactivated and split virions
- strands: Influenza A H1N1 and H3N2, influenza B
- Strains was propagated in fertilised hens' eggs

- Vaxigrip® mixed with a QDs solutions (CdS or CdTe)
- the volume of solution was reduced to 100 µl (Amicon Ultra 3k)
- sample was diluted to 1 ml by ACS water, used for measurements



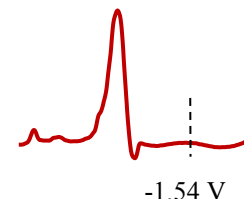
Electrochemical detection of isolated complex HA-Cd QDs



Detection of HA

- AdTS DPV was used
- Brdicka bufer was used as the bacground electrolyte
- Parameters were folows:

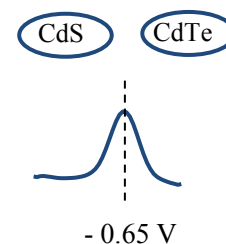
purge time 30 s, initial potential -0.7 V; end potential -1.8 V; potential step 0.002 V; amplitude 0.025 V.

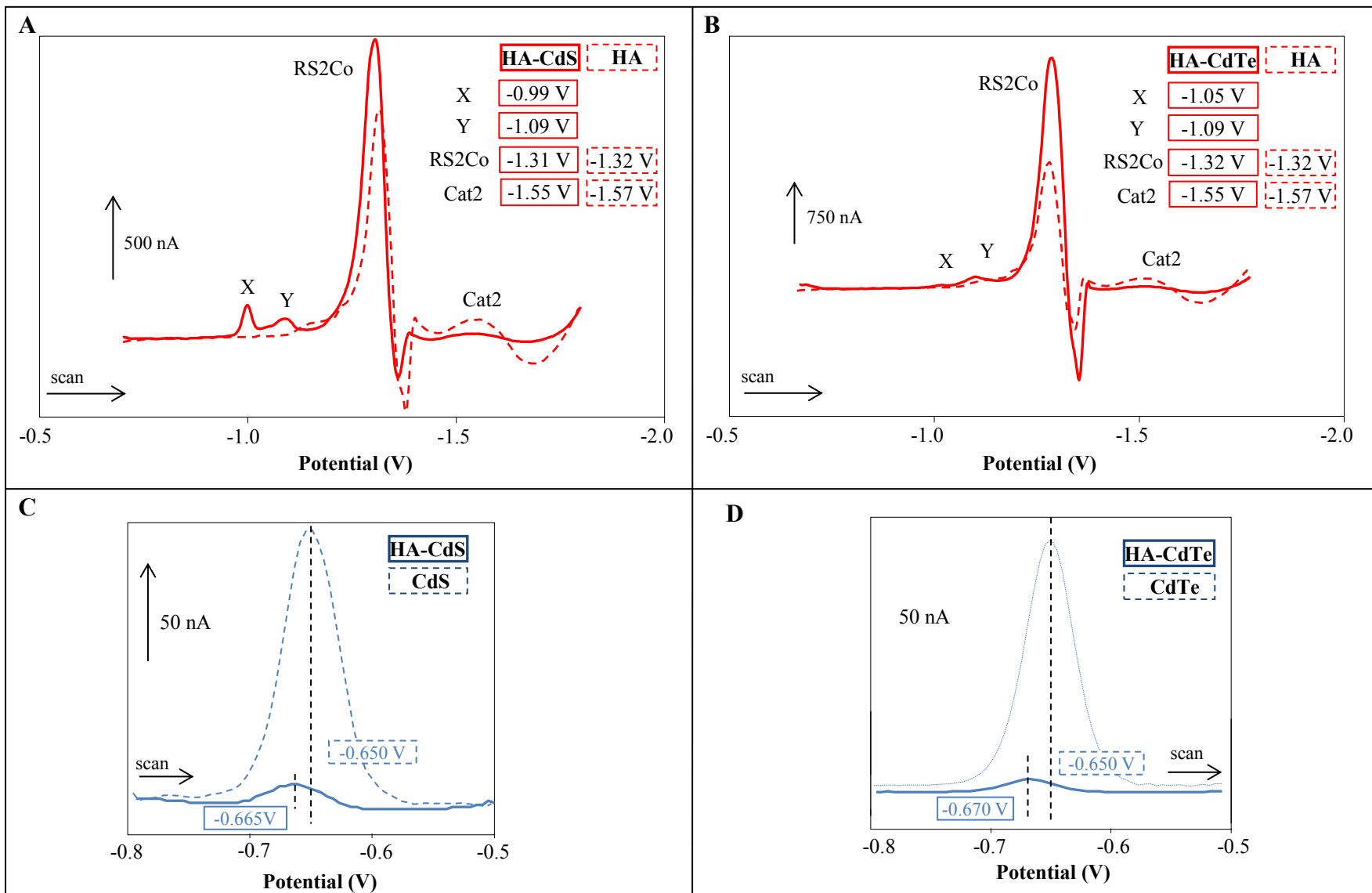


Detection of Cd (from CdTe and CdS QDs)

- ASV DPV was used
- Aceate buffer pH 5.0 was used as the bacground electrolyte
- Parameters were folows:

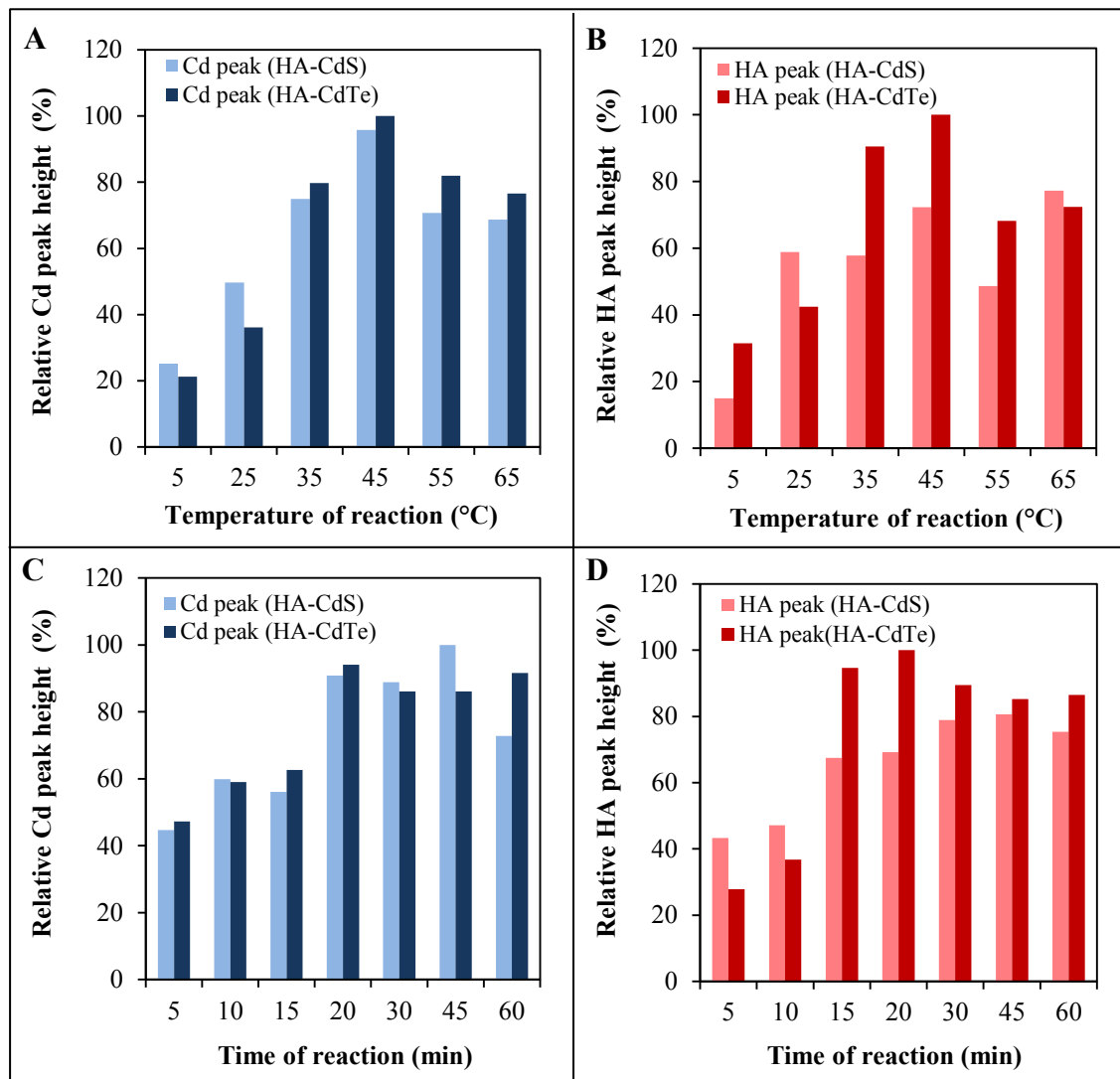
initial potential -0.8 V; end potential -0.5 V ; deposition potential -0.8 V ; equilibration time 5 s; modulation time 0.06 s; time interval 0.2 s; potential step 0.002 V; modulation amplitude 0.025 V.





A+B Comparison of real voltammograms of HA in HA-QDs complex (solid line) and vaxi HA itself (dashed line) measured by DPV (brdicka reaction). **(A)** HA-CdS and **(B)** HA-CdTe. For all measurements was used AdT DPV.

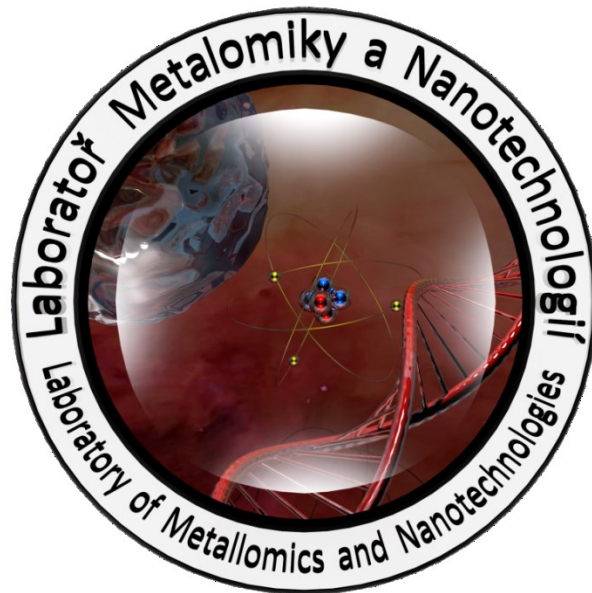
C+D Comparison of real voltammograms of Cd in HA-QDs complex (solid line) and QDs itself (dashed line) measured by ASV DPV. **(C)** HA-CdS and **(D)** HA-CdTe. For Cd peak determination was used ASV DPV.



Effect of temperature (A+B) and time (C+D) on interaction between HA-QDs complex and MPs modified by glycan. The efficiency was observed using electrochemical analysis of Cd peak (A+C) and HA peak (B+D). Dependence of relative Cd peak height on temperature (A) and time (C) of reaction was described. All measurements of Cd peak were provided by ASV DPV. Dependence of relative HA peak height on temperature (B) and time (D) of reaction was described. For all measurements of HA peak was used AdT DPV. Red colour was used for hemagglutinine, blue colour was used for cadmium. Light shade of individual colour (HA-CdS complex), dark shade of individual (HA-CdTe complex).

Conclusion

- Method for isolation and detection of influenza haemagglutinine was designed
- Two different QDs (CdTe and CdS)were fabricated and influenza HA was labelled by them
- Complex HA-Cd QDs was isolated by glycan conjugated MPs
- Isolated complex was detected by two different voltammetry methods



Acknowledgements

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Děkuji Vám za pozornost

Reg.č.projektu: CZ.1.07/2.4.00/31.0023

Název projektu: Partnerská síť centra excelentního bionanotechnologického výzkumu