INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Název: Electrochemical methods for HIV identification

Školitel: Zbyněk Heger

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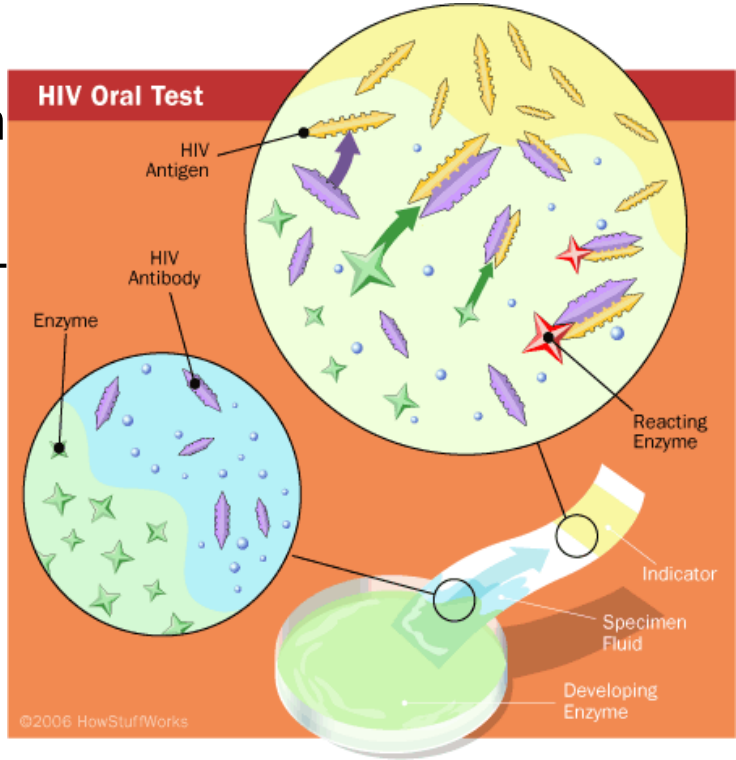
Reg.č.projektu: CZ.1.07/2.4.00/31.0023

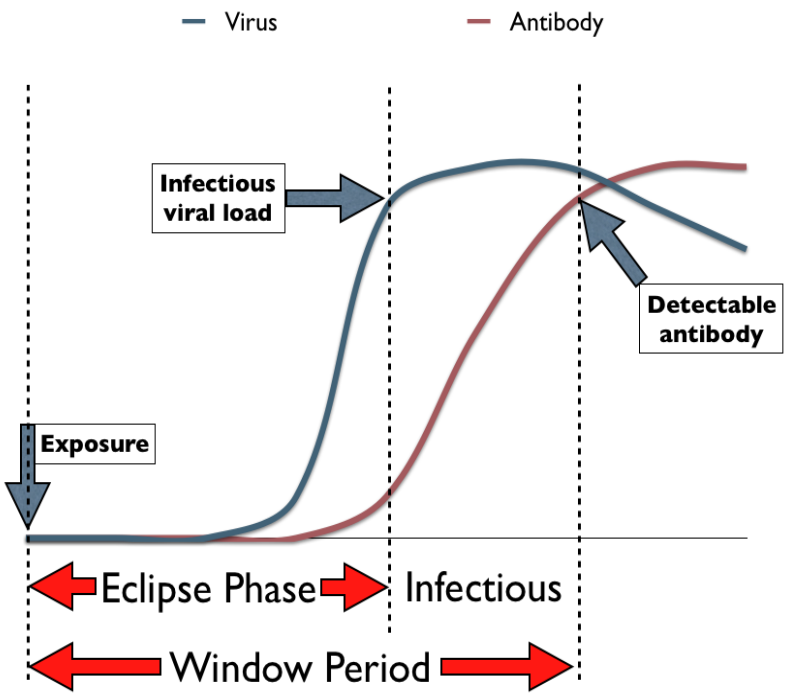
Název projektu: Partnerská síť centra excelentního bionanotechnologického výzkumu

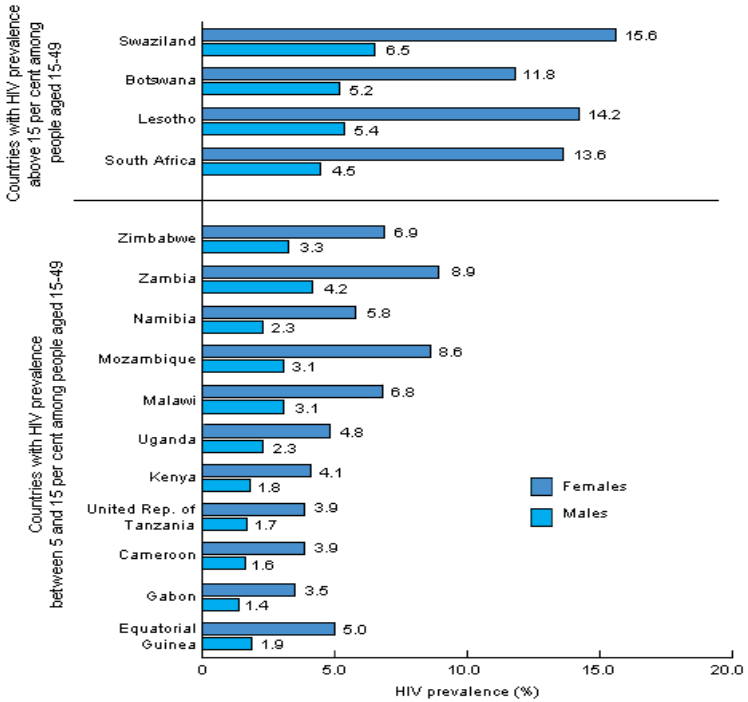
Standard diagnostic methods

- **ELISA** – HIV antibodies, specifity > 99%
- **WESTERN BLOT** – HIV proteins (gp120, p17, gp41) antibodies, specifity 97.8%
- **PLASMA VIRAL LOAD** – HIV RNA isolation (plasma), sensitivity 20 – 50 molecules per mL of plasma
- **FLOW CYTOMETRY** – CD4+ T-lymphocytes



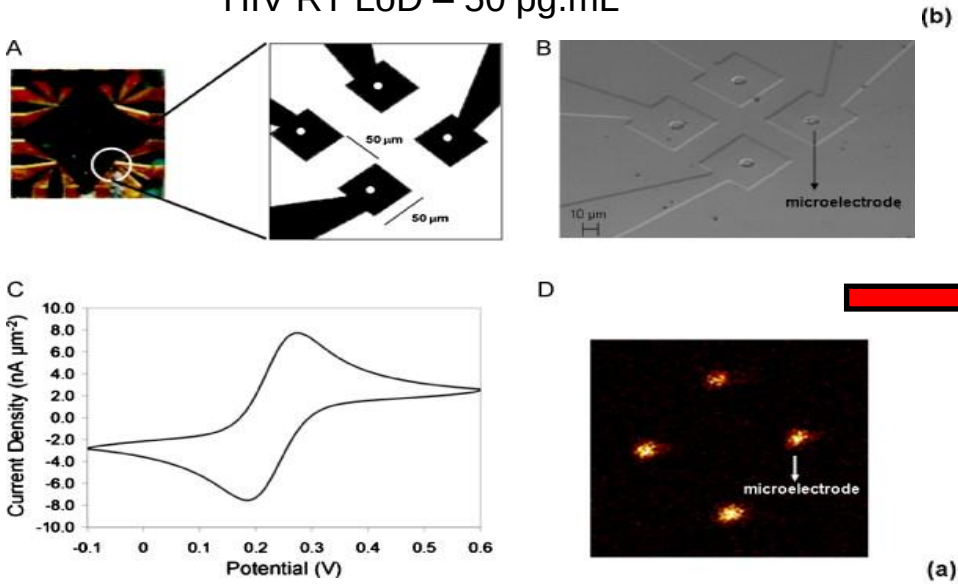
- Window period
- Low – cost, rapid, non - invasive diagnosis
- Developing countries – rapid alternatives of ELISA

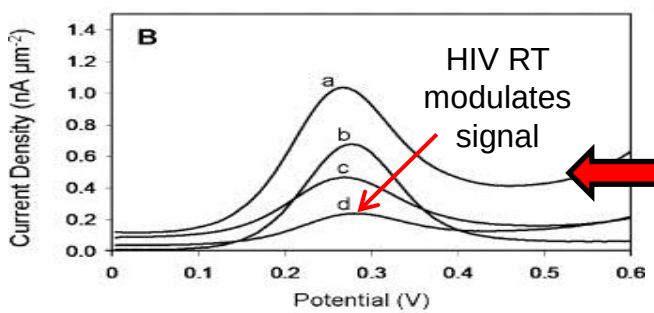


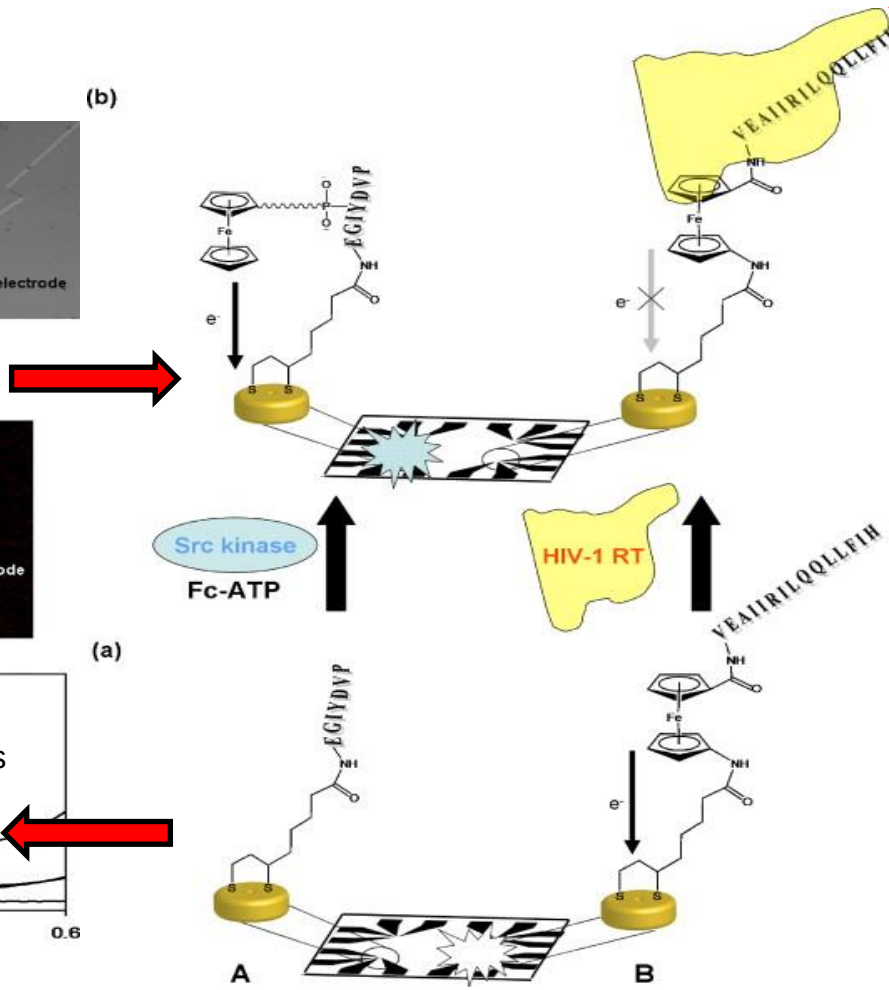


HIV RT chip

HIV RT LoD – 50 pg.mL^{-1}



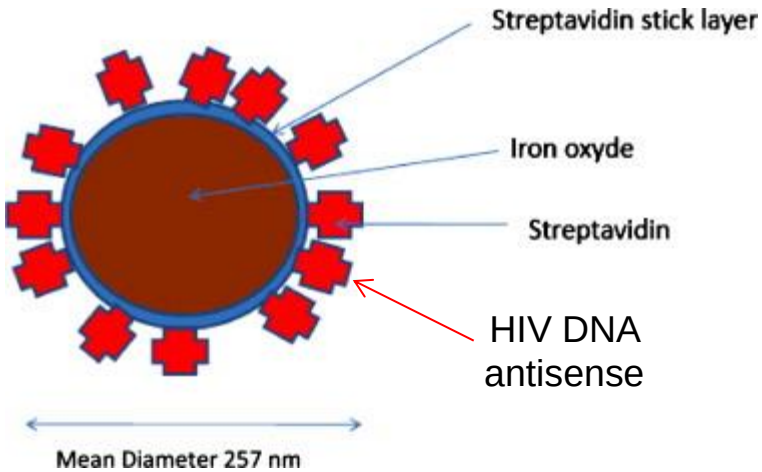


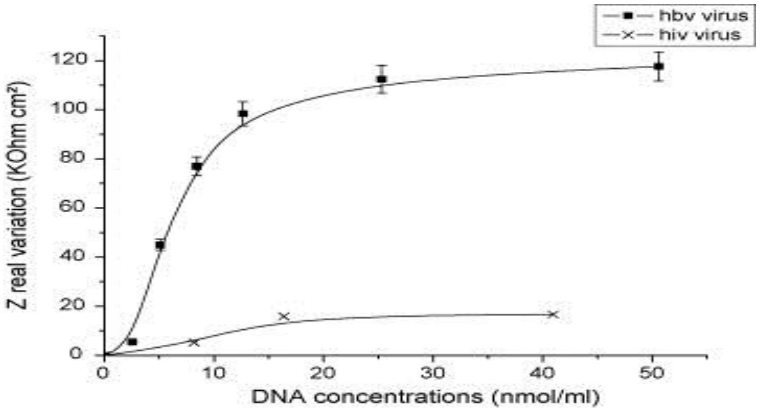


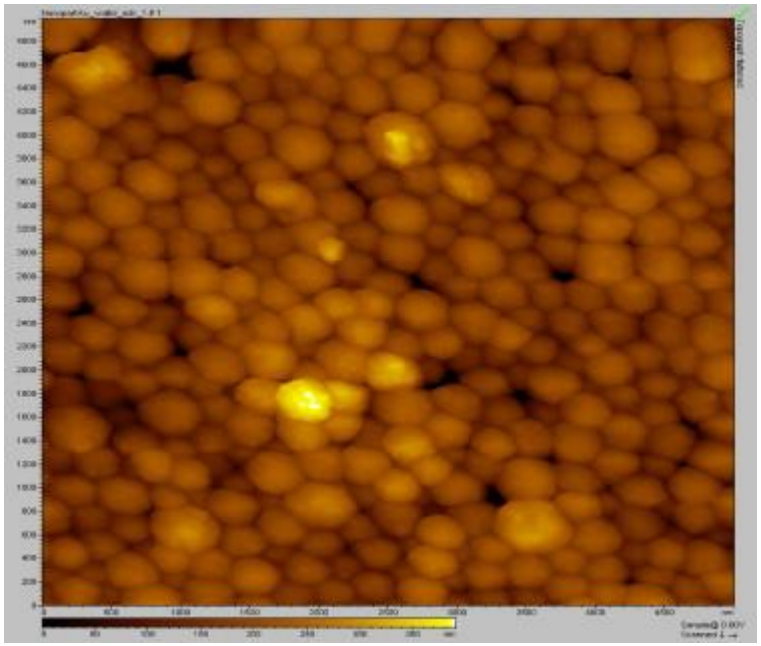
Martic *et al.*: On chip electrochemical detection of sarcoma protein kinase and HIV-1 reverse transcriptase. *Talanta*. 2011.

HIV DNA biosensor

HIV DNA LoD – 5 nmol.mL^{-1}





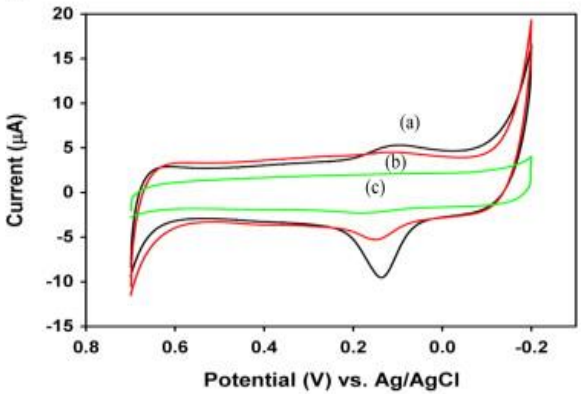


Hassen *et al.*: An impedimetric DNA sensor based on functionalized magnetic nanoparticles for HIV and HBV detection. *Sensors and Actuators B: Chemical*. 2008.

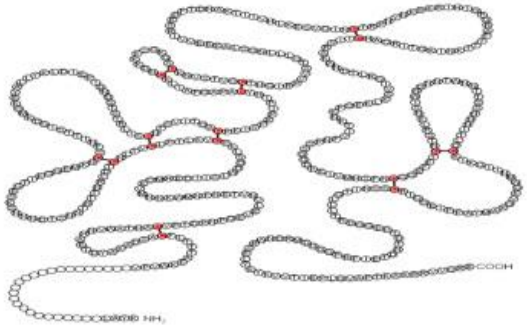
gp120 biosensor

HIV LoD – 600 fg.mL^{-1}

A



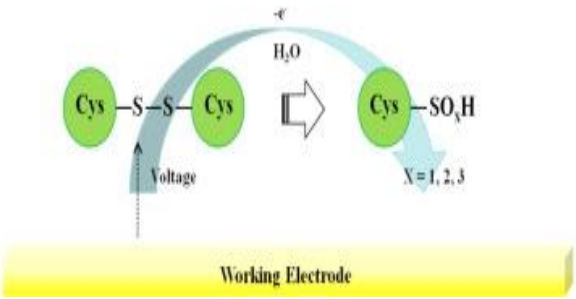
B



C

Amino acids	Structural groups	Electrochemical activity
Cystine	Sulfur containing amino acids	Active
Phe,Tyr	Aromatic amino acids	None
Gly, Val, Leu,Ile, Glu, Pro, Ala	Aliphatic amino acids	None
Lys, Arg, Gln, Asn, His	Amide containing amino acids	None
Ser, Thr	Hydroxyl containing amino acids	None

D



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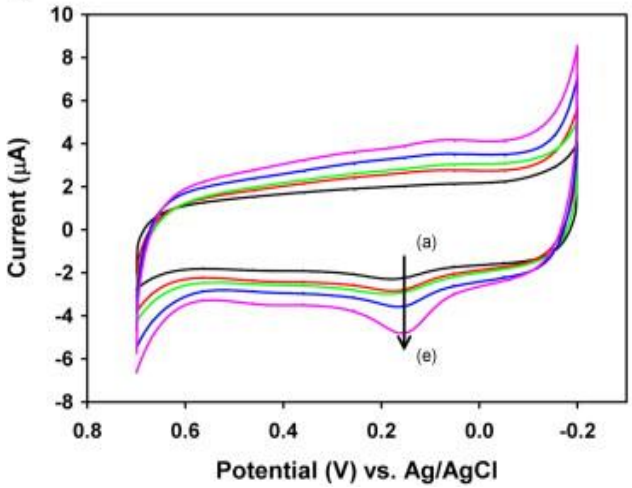
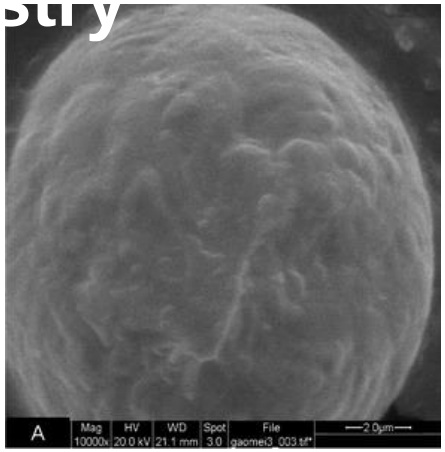
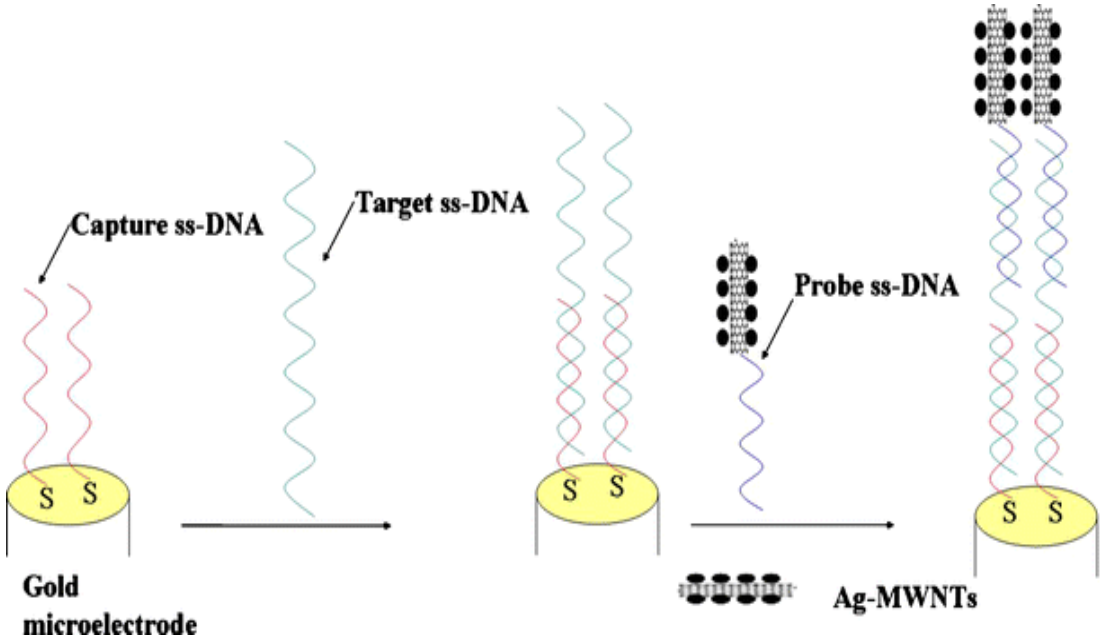


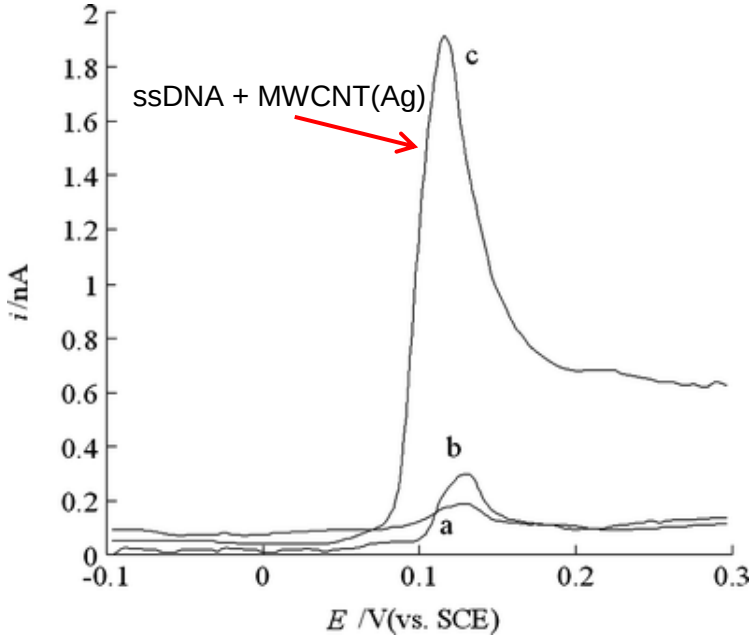
Lee *et al.*: Electrochemical sensor based on direct electron transfer of HIV-1 Virus at Au nanoparticle modified ITO electrode. *Biosensors and Bioelectronics*. 2013.

Hybridization electrochemical assay

HIV ssDNA LoD – 0.5 pM







Wang *et al.*: Ultratrace voltammetric method for the detection of DNA sequence related to human immunodeficiency virus type 1. *Michrochimica Acta*. 2010.

ACKNOWLEDGMENTS

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INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Thank you for attention!

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

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