

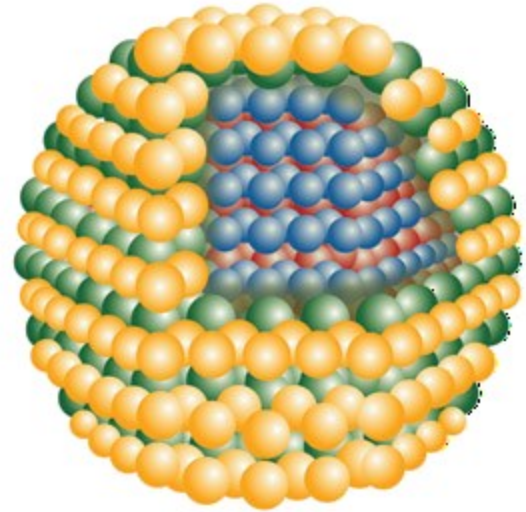
Name: Fluorescence Properties of Quantum Dots

Author: Kristýna Šmerková

Date: 15. 11. 2013

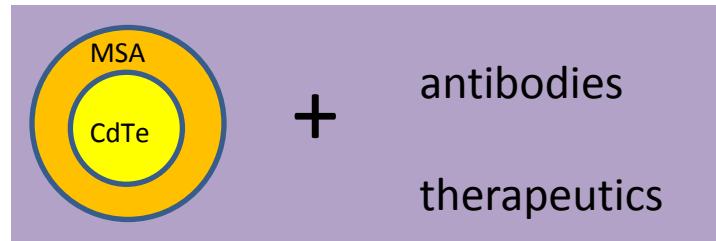
QDs

- Semiconductor nanoparticles (1 – 20 nm)
- Elements from II. - V. group of periodic table
- very good fluorescence properties
 - high quantum yields
 - big Stokes shifts
 - can be excited by a broad spectrum of wavelengths
 - emission spectra are narrow
 - resistant to photobleaching and chemical degradation
- new fluorescent materials - usable instead of organic dyes for biological labelling



QDs applications

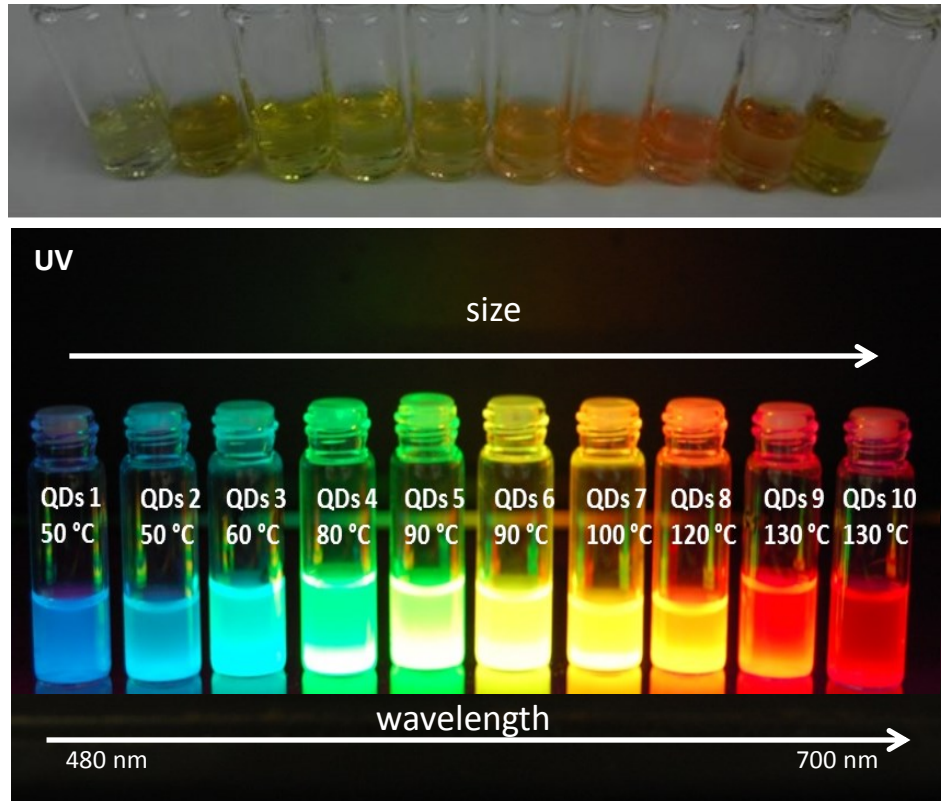
- Chemical modification stabilize the particles
 - thiol-group containing compounds
 - mercaptopropionic acid, glutathione, cysteine
- QDs do not have specific function → surface modifications



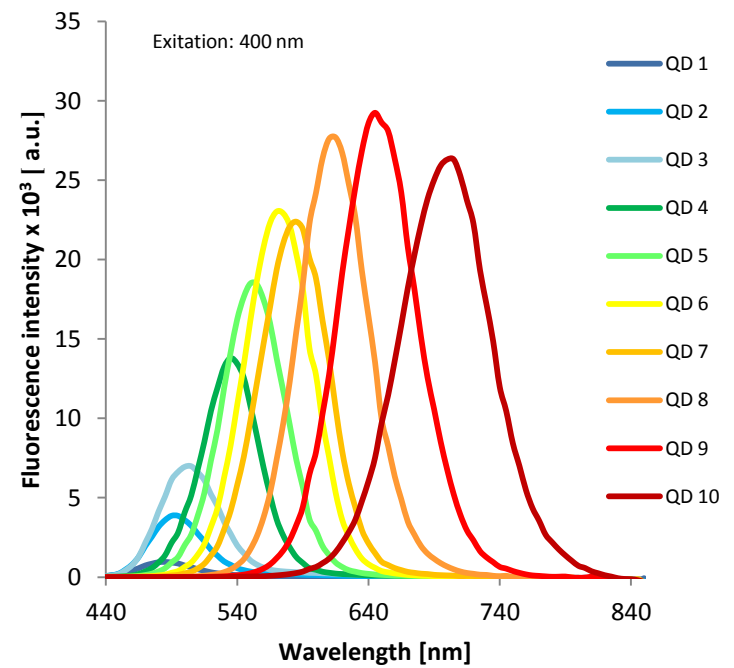
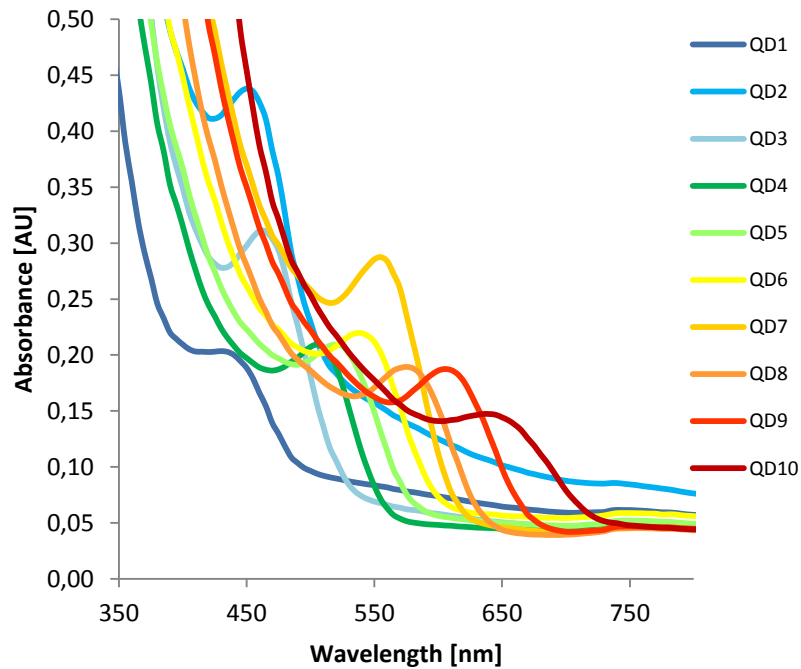
- **QDs applications are widespread**
 - tracing drug transport
 - in vivo imaging of biological processes (cancer cell proliferation)
 - monitoring of targeted drug delivery

Synthesis of CdTe QDs

- CdTe QDs :
 - Cadmium (II) acetat $\text{Cd}(\text{OAc})_2$ + Mercapto Succinic Acid (MSA) + NH_3 + Na_2TeO_3 + NaBH_4 → microwave synthesis
 - Microwave heating conditions: max. 300 W, 20 minutes, temperature: 50 – 130 °C
- A wide range of different colour QDs can be syntetized



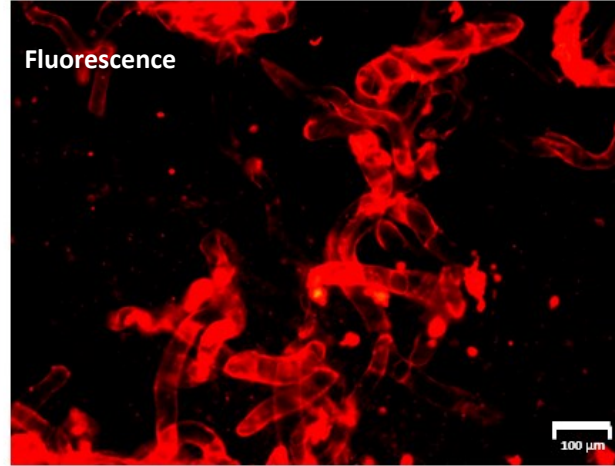
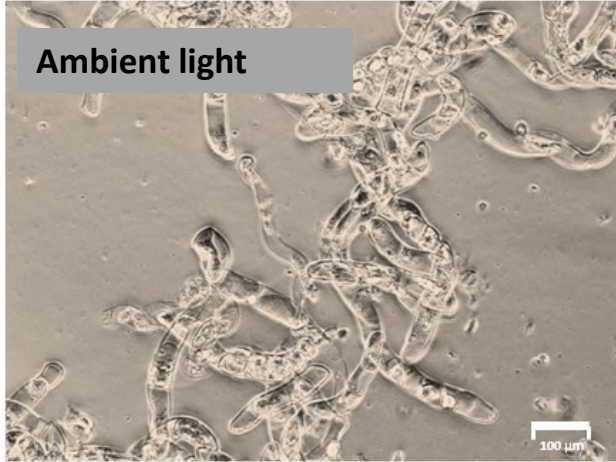
Fluorescence of QDs



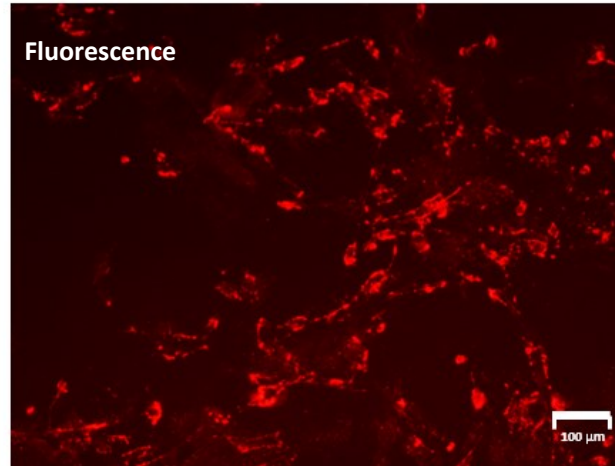
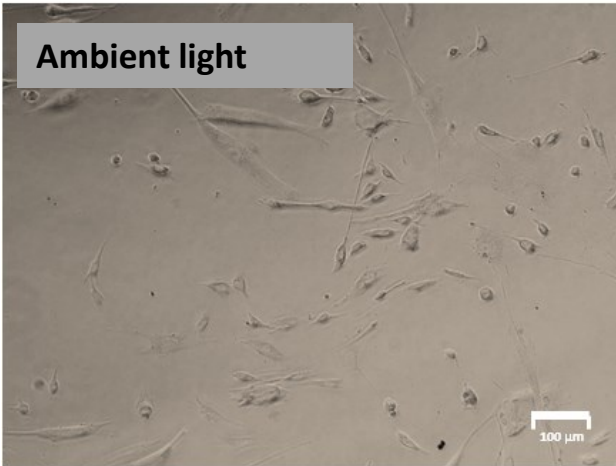
Cells



Tobacco cells



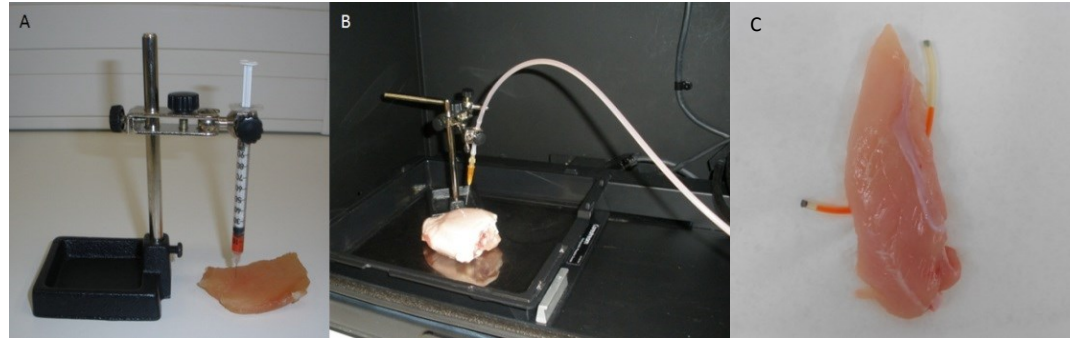
Human foreskin fibroblasts



Ex.640 nm/Em. 695 nm

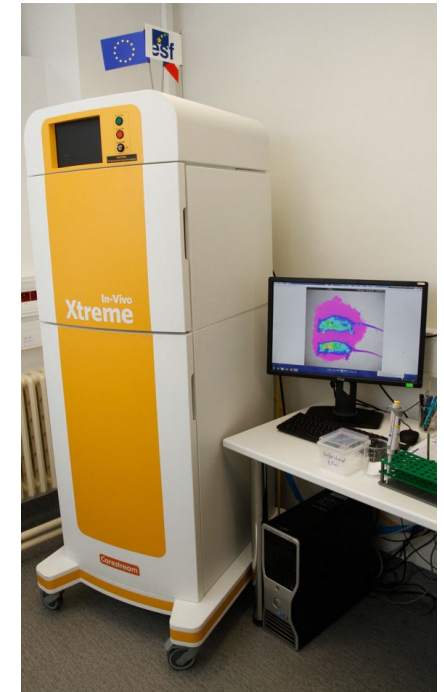
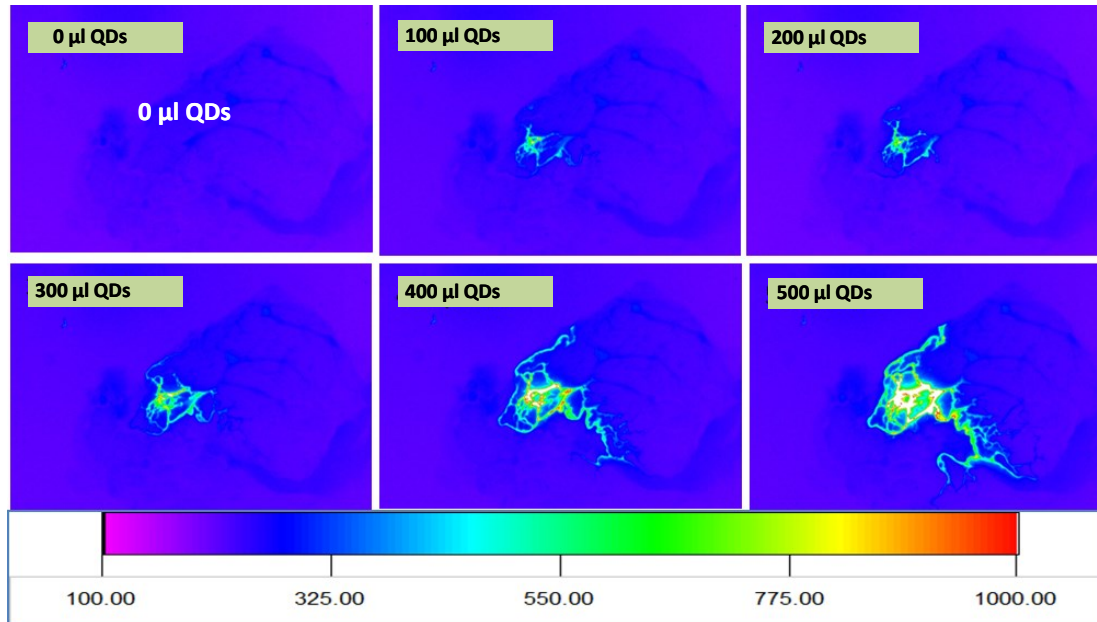
The application into the muscle tissue

- Injection
- Infusion
- Tube

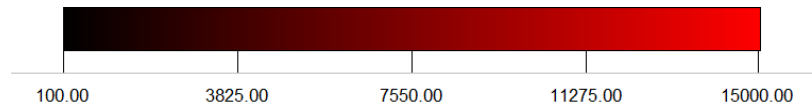
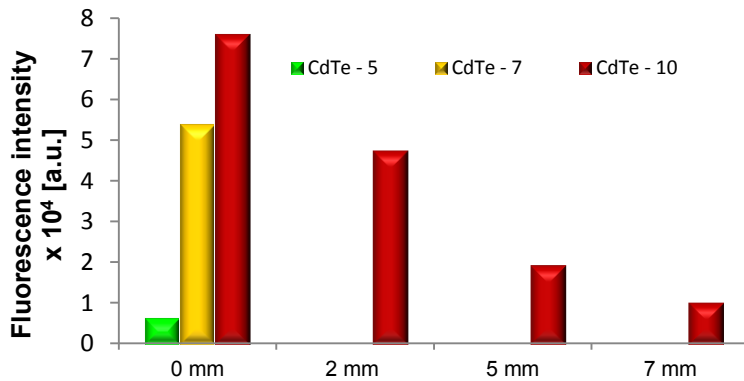
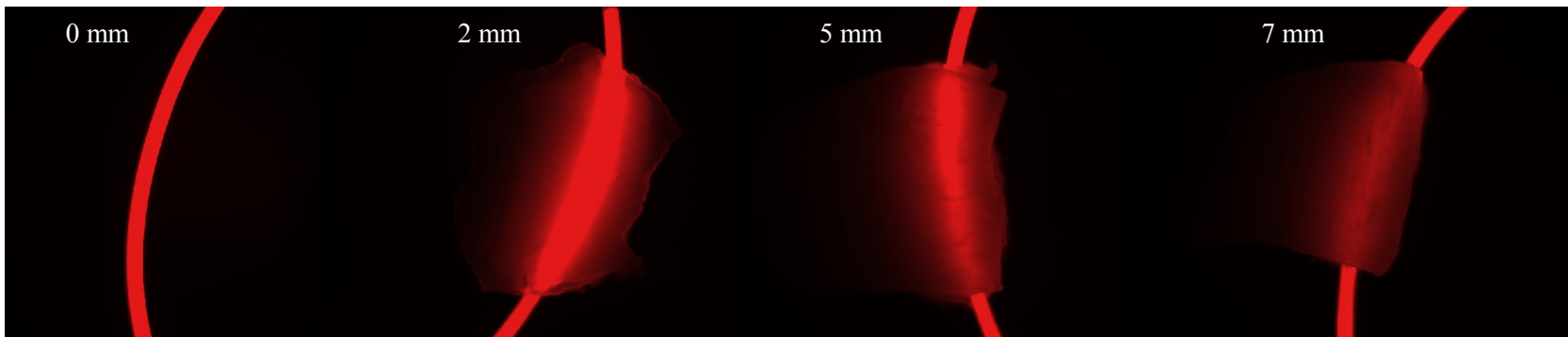
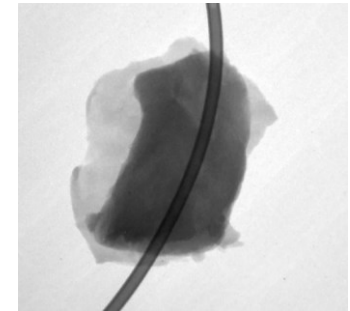


Fluorescence intensity of QDs in the tissue depends on:

- **the concentration and the solvent**
- the volume
- the depth



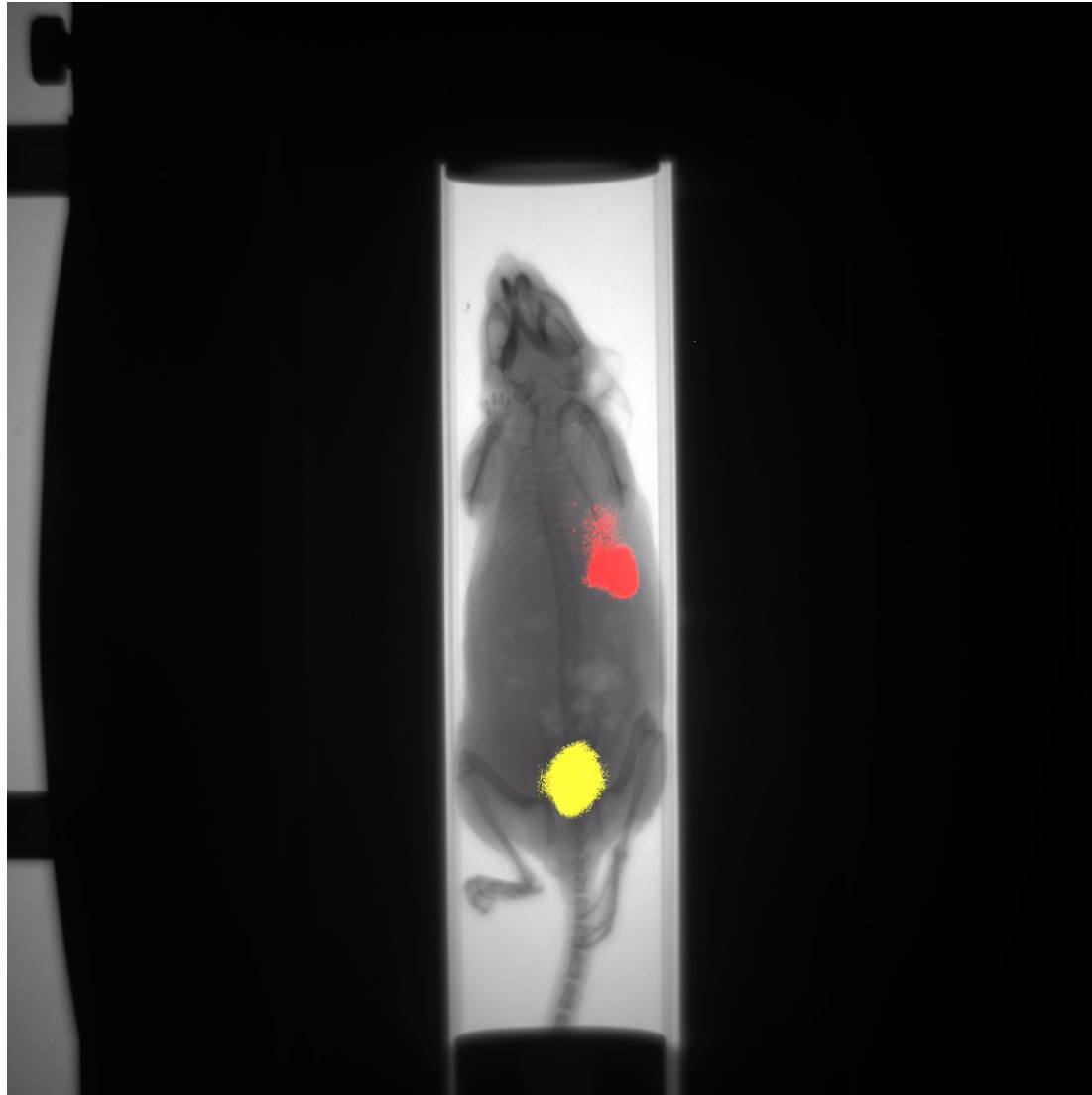
Muscle tissue – determination of the depth



NIR

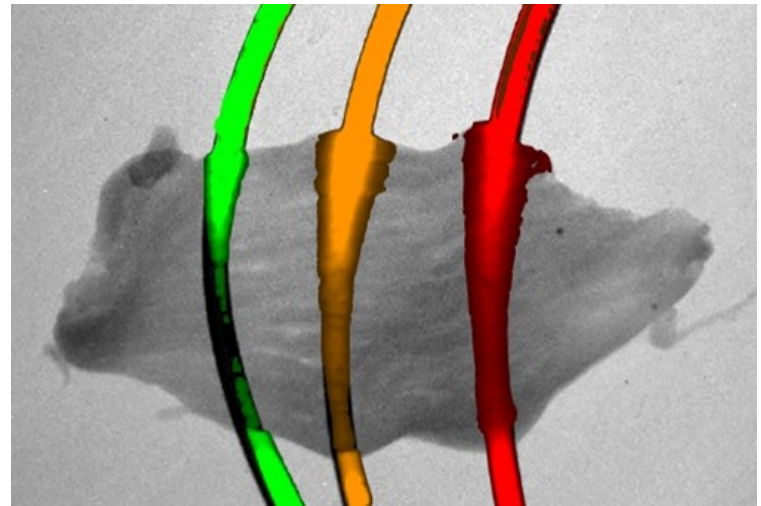
- ↓ autofluorescence
- ↑ penetration

QDs in live animal



Conclusion

- QDs have great fluorescence properties
- Cover almost the whole spectral range
- QDs can be used in biological labelling instead of organic dyes
- QDs can be used for visualisation



Future plans...

- Surface functionalization of QDs by antibodies to ensure targeted transport to the specific site
- Finally, conjugation of the complex with drugs/genes

- Ing. Iva Blažková
- Mgr. Dagmar Chudobová
- Doc. RNDr. Pavel Kopel, Ph.D.
- Mgr. Markéta Vaculovičová, Ph.D.
- Doc. RNDr. Vojtěch Adam, Ph.D.
- Prof. Ing. René Kizek, Ph.D.



Financial support by IGA TP1/2013 is highly acknowledged.





INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Thank you for your attention.

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

Název projektu: Partnerská síť centra excelentního bionanotechnologického výzkumu

