Plasmons as sensor for biomolecules

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We have developed an alternative to dye labeling for single molecule experiments: we utilize plasmonic gold nanoparticles to detect single unlabeled proteins with high temporal resolution (ms to µs). This allows for monitoring the dynamic evolution of DNA hybridization or protein binding. The technique resolves equilibrium coverage fluctuations, opening a window into Brownian dynamics of unlabeled macromolecules. Therefore, our method enables the study of DNA or protein folding dynamics, protein adsorption processes, and kinetics as well as non-equilibrium soft matter dynamics on the single molecule level without need for labelling [1]. Recently we also used this technique to monitor the dynamics of molecules inside of the body by implanting nanoparticle doped hydrogels under the skin of hairless rats. [2,3]

References

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[2] 'Implantable Sensors Based on Gold Nanoparticles for Continuous Long-Term Concentration Monitoring in the Body', Katharina Käfer, Katja Krüger, Felix Schlapp, Hüseyin Uzun, Bastian Flietel, Axel Heimann, Thies Schröder, Oliver Kempski and Carsten Sönnichsen. Nano Lett. 2021,21, 7, 3325–3330 (DOI: 10.1021/acs.nanolett.1c00887)

[3] 'Integrating Nanosensors into Macroporous Hydrogels for Implantation', Katja Buder, Katharina Kaefer, Bastian Flietel, Hüseyin Uzun, Thies Schroeder, and Carsten Sönnichsen. ACS Appl. Bio Mater. 2022, 5, 2, 465–470 (DOI: 10.1021/acsabm.1c01290)

Figures

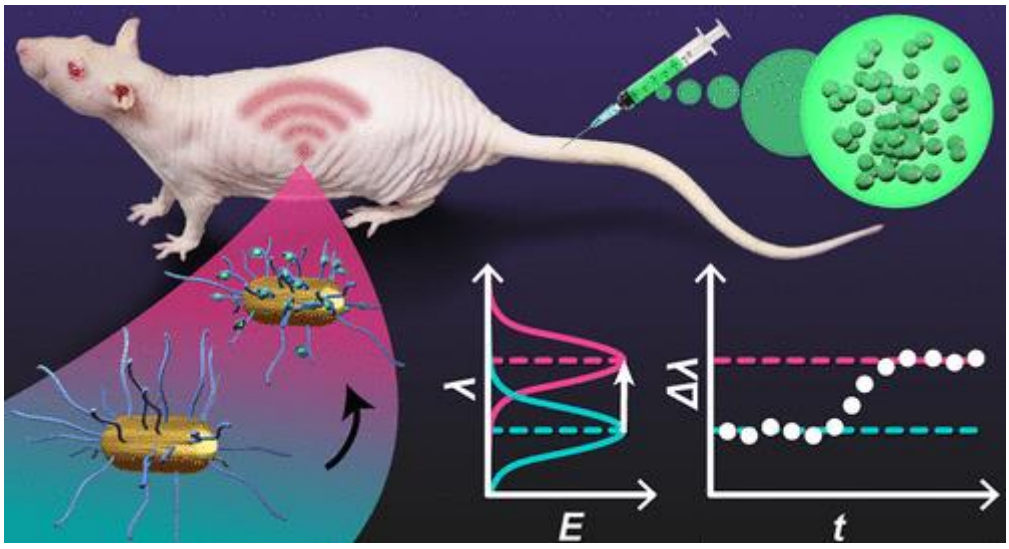

Figure 1: Implantable sensors continuously transmit information on vital values or biomarker concentrations in bodily fluids, enabling physicians to survey disease progression and monitor therapeutic success.