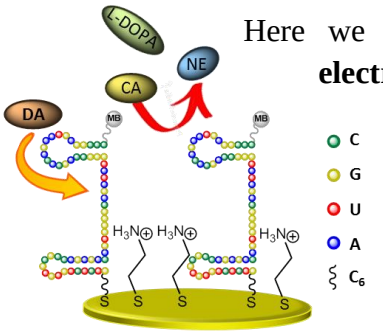
Highly Biospecific Self-assembled Aptasensors for Dopamine Analysis

Isabel Alvarez-Martos[1*] *and Elena E. Ferapontova*[1]

[1)] Interdisciplinary Nanoscience Center (Aarhus University). Gustav Wieds Vej, 14, 8000 Aarhus C, Denmark.
[*)] E-mail: martos@inano.au.dk

In order to investigate the role of small molecule neurotransmitters in the complex landscape of brain inter-neuronal communication, and ultimately, to relate this information to complex behavior and brain disorders, **chemically specific *in vivo* sensors** are required. That is particularly true in the electroanalysis of dopamine, which oxidation potential usually overlaps with other coexisting neurotransmitters and interfering species. To tackle the problem of low specificity, aptamers (*i.e.*, nucleic acid sequences able to specifically recognize and bind certain ligands) have been coupled with electrochemical detection. This approach has allowed sensitive, simple, and cost-effective electrochemical sensing of small molecules such as cocaine[1] or adenosine[2] by DNA-aptasensors and theophylline[3] or dopamine[4] by RNA-aptasensors.



Here we report a **highly biospecific self-assembled aptasensor for electroanalysis of dopamine**. Capture surfaces have been designed so that tethered RNA aptamer strands had enough conformational freedom for target binding beyond a dense monolayer of cysteamine to minimize nonspecific binding[5]. We have demonstrated that these surfaces selectively recognize dopamine in the presence of structurally related neurotransmitters, such as catechol, norepinephrine or L-DOPA, and such co-existing interferents as ascorbic and uric acid [4]. One of our main goals was to probe that even though RNA aptamer stability can be compromised in biological fluids by the ribonuclease digestion or chemical cleavage[6], binding to electrodes stabilize their structure, so that measurements can be performed in undiluted biological fluids (i.e., human serum and blood). Therefore, this sensing platform provides a reliable and specific methodology for *in vivo* screening of dopamine levels that could be used in drug-administered Parkinson's patients' blood plasma and serum. Ultimately, it will enable the development of miniaturized devices that will advance the understanding of neuronal circuits uncovering processes associated with cognition, emotion, learning and memory.

References.

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