# Electrochemical sensors exploiting innovative bioreceptors and biosensing strategies

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Abstract

The recent Covid-19 pandemic proved that easy to use devices providing prompt responses concerning the presence and possibly the concentration of specific nucleic acids and antibodies are badly needed. In this occasion, lateral flow devices took the opportunity on the fly to become popular even to the man in the street, whereas biosensors lost an incredible chance. To avoid this to happen again in future, innovation is needed in the biosensor field, starting from the improvement of the amplification strategies to the development of novel bioreceptors and biosensing strategies enhancing the selectivity towards the analytical target and reliability. We provide here a few examples concerning the use of the CRISPR/CAS systems for the detection of nucleic acids [1] as well as the use of programmable Y shaped DNA nanostructures to bind specific antibodies [2]. In the first case, an easy use, rapid and low cost detection system based on a label free ssDNA immobilized on a gold electrode exploited a Cas12a protein and electrochemical impedance spectroscopy to detect the DNA of elected bacterial pathogens (Figure 1, left). In the second case, a y-shaped nanostructure created by self-assembling of three engineered ssDNA was converted into a responsive bioreceptor by modifying the three strands with two recognition elements, two redox tag molecules, and a thiol group. The reduced mobility of the nanostructure upon the interaction with the target resulted in a decrease of the electrochemical signal quantitatively related to the target concentration (Figure 1, right).

**References**

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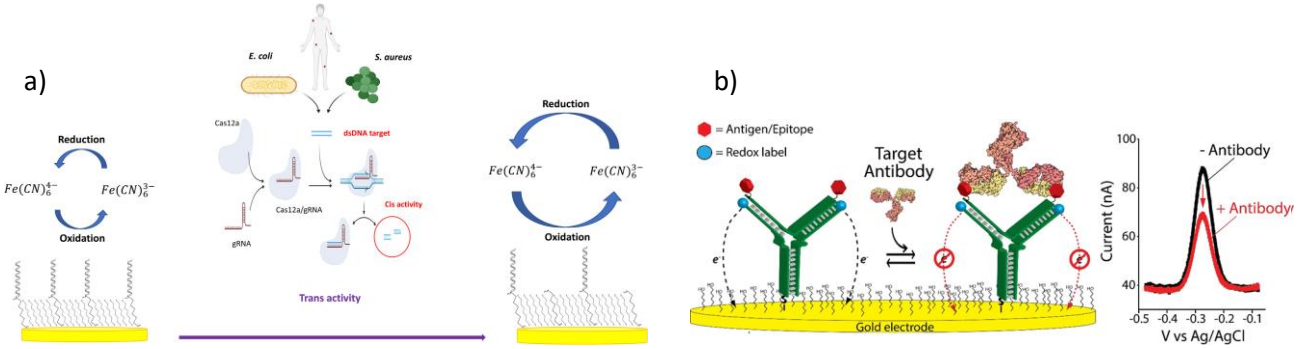


**Figure 1:** In the first example, the binding of the Cas12/gRNA system with the target DNA triggers the collateral activity of CAS 12, which cleaves the ssDNA on the electrode surface, improves the exchange of charges between the electrode and the solution and increases the electrochemical signal (a). In the second example, the binding of the target limits the mobility of the nanostructure and the exchange of charges with the electrode, decreasing the electrochemical signal (b).