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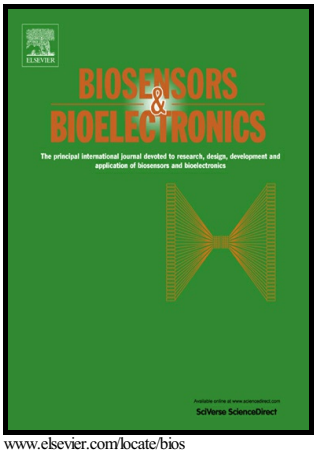

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Electrochemical detection of tobramycin based on enzymes-assisted dual signal amplification by using a novel truncated aptamer with high affinity

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Abstract

An aptamer with the length of only 15 nucleotides specific for tobramycin was obtained through rationally designed truncation from a previously reported long sequence. The structural and binding properties of the aptamer were characterized. The dissociation constant (K_d) was determined to be 42.12 nM, indicating high affinity of the aptamer for tobramycin. Then an electrochemical sensor based on this aptamer was developed, which employed an enzymes-assisted dual signal amplification cycle through target recycling and strand-displacement DNA polymerization. A hairpin probe containing the aptamer sequence was designed and used to start the production cycle of a short ssDNA fragment in the presence of tobramycin, with the help of phi29 DNA polymerase and nicking endonuclease Nt.AlwI. The ssDNA fragment was captured by a signal transduction probe modified on gold electrode to form a triple-helix structure. With the help of $[Ru(NH_3)_6]^{3+}$, a