

Electronic Supplementary Information

Subsecond detection of guanosine using fast-scan cyclic voltammetry

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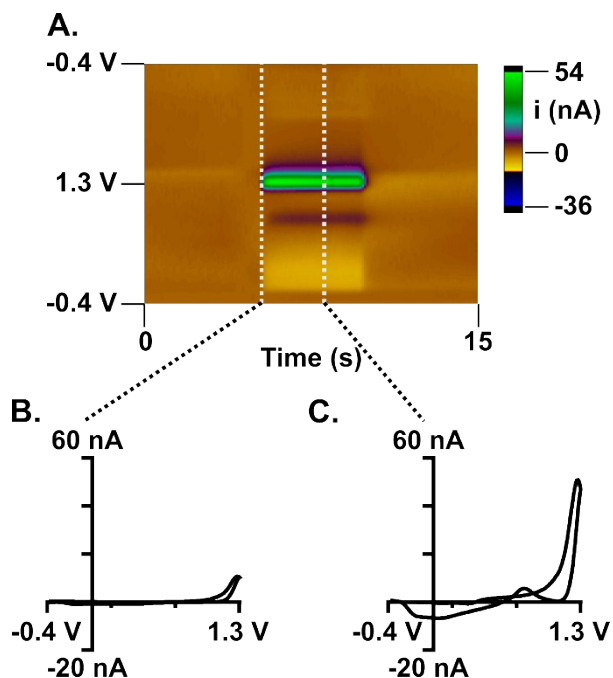


Figure S1: Guanosine undergoes two sequential oxidation steps. (A) False color plot with applied potential on the y-axis and time on the x-axis, with current (nA) depicted in false color. The current resulting from the formation of the primary and secondary oxidation products can be seen. (B) Cyclic voltammogram taken as soon as the analyte is introduced to the electrode (5.1 s, dotted trace). Only the primary peak is observed (formation of 8-oxoguanosine). (C) Cyclic voltammogram taken at 8 s (dotted trace). Both peaks are visible. This provides evidence that guanosine undergoes two separate oxidation steps, separated in time.

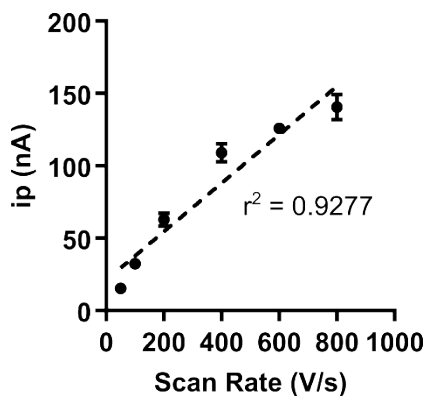


Figure S2: Adsorption-controlled plot for 5 μ M guanosine. The r^2 is smaller than the diffusion-controlled plot. This result indicates that diffusion is the rate-limiting reaction at the electrode. ($n = 4$)

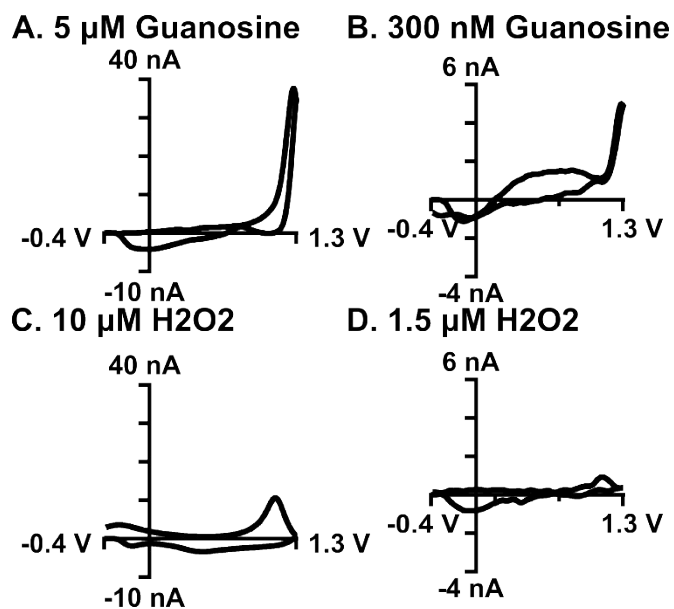


Figure S3. Carbon-fiber microelectrodes are on average 3-fold more selective for guanosine than hydrogen peroxide ($n = 3$) at both high concentrations and physiological concentrations. CVs of A) 5 μM guanosine and B) 300 nM guanosine compared to C) 10 μM hydrogen peroxide and D) 1.5 μM hydrogen peroxide.

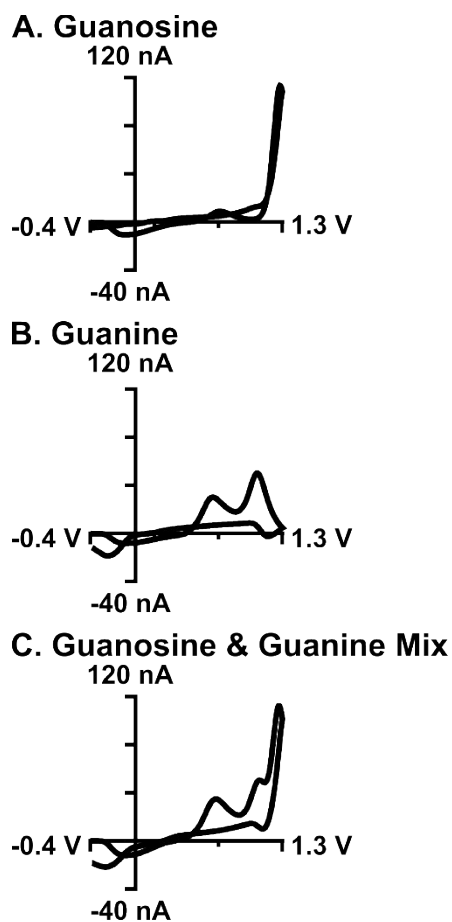


Figure S4: Detection of guanosine and guanine in a mixture using FSCV. Example Cyclic voltammograms for (A) 5 μM guanosine and (B) 5 μM guanine. (C) Cyclic voltammogram for a mixture of guanosine and guanine, both 5 μM . The primary oxidation peaks for guanosine (1.3 V) and guanine (1.0 V) are close in potential, but guanosine oxidizes at the switching potential and has a higher affinity for the electrode, showing increased current. Guanine's oxidation peak is still somewhat visible even within a mixture, however guanosine's secondary peak overlaps with guanine's secondary peak (0.8 V). This indicates that guanosine and guanine may be co-detected when in equal concentrations.

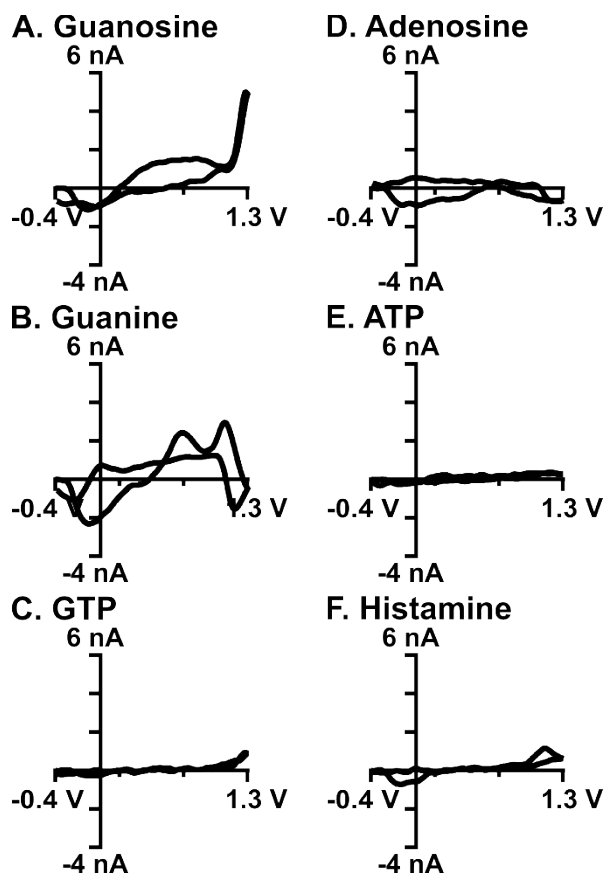


Figure S5. Cyclic voltammograms for guanosine and common biological interferents at low physiological concentrations. CVs shown are 300 nM each of (A) guanosine, (B) guanine, (C) GTP, (D) adenosine, (E) ATP, and (F) histamine. The cyclic voltammograms show selectivity of the optimized waveform for guanosine over the other analytes, even at nanomolar concentration.

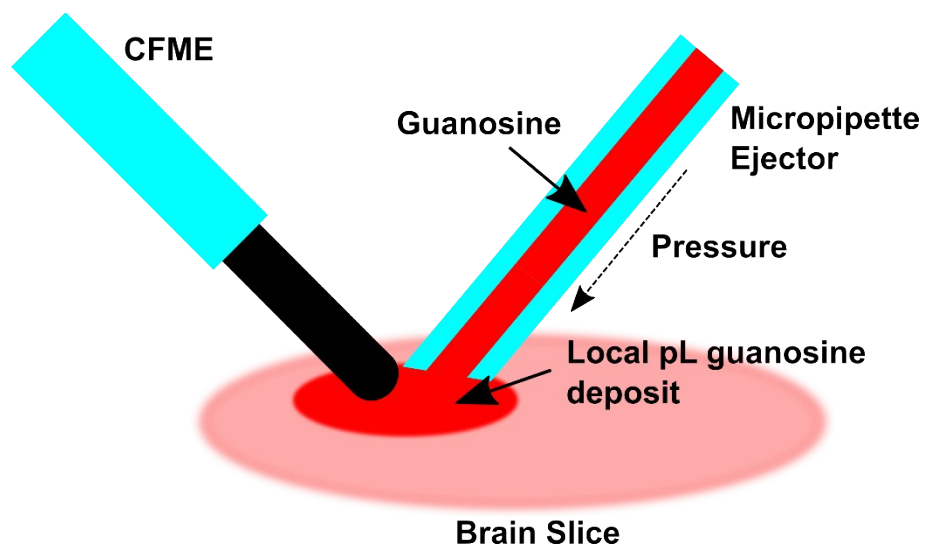


Figure S6. Schematic of the picospritzer experiment. 50 μM guanosine is locally applied to the tissue using a micropipette backfilled with guanosine. Local application is done by a short, 800 ms application with 10 psi to deposit pL volumes of analyte. The working microelectrode is positioned approximately 100 μm away while the waveform is applied for detection.