Electronic supplementary information

1 Species confirmation and identification of the monitoring window.

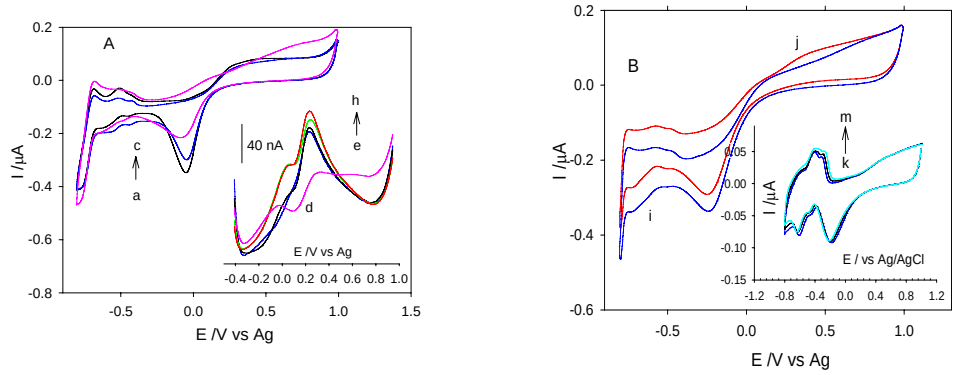

Fig.S1. Voltammetry study of glucose, antibiotics, H_2O_2 and LDH in PBS and KH solutions. (A) Cyclic voltammetry (CV) scan in 10 mM PBS-0.1 M NaCl, pH 7.4 (b, blue line), containing 5 mM glucose (a, black line), 0.1 mg mL^{-1} streptomycin-100 U mL^{-1} Penicillin (SP) (c, pink line). Inset A: (d-h) are square wave voltammograms of SP (d, pink line), PBS (e, blue line), 5 mM glucose (f, black line), 120 µM (g, green line) and 140 µM H_2O_2 (h, red line), respectively. (B) Cyclic voltammetry in KHGB (i, blue line) and in 100 µM H_2O_2 (j, red line). Flow rate 120 µL min^{-1}. Inset B: Cyclic voltammograms in KH (k, blue line) containing LDH 0.0476 U mL^{-1} (l, black line) and 0.19 U mL^{-1} (m, cyan line), respectively. All solutions were degassed with nitrogen. Scan conditions as given in the Experimental section.

Some constituents of KHGB buffer are redox active and likely to interfere with the electrochemical (EC) measurement of ROS. ESI Fig. S1 displays voltammograms of the individual species in PBS and KH solutions using Pt electrodes. The redox couples of hydrogen adsorption/desorption locate between -0.7 V and -0.4 V in cyclic voltammetry on Pt in PBS solution; corresponding to two pairs of redox peak at -0.52 V/-0.54 V and -0.41 V/-0.42 V (Fig. S1A (b)). The formation (at 0.7 V) and reduction (around -0.03 V) of platinum oxides on Pt surface occur. Oxidation currents (I_O) showed a slight increase in the presence of 5 mM glucose above 0.25 V (Fig. S1A (a)), correspondingly in SWV at the same potential (Fig. S1A (f)). The H_2O_2 oxidation current in SWV was confirmed at 0.25 V in PBS ((g) and (h), Fig. S1A inset) and in a flow chamber where the presence of H_2O_2 gave an increase from 0.2 V to 0.8 V (Fig. S1B, (i)–(j)).

The oxidation current for the two antibiotics increased from 0.45 V in CV (Fig. S1A (c)). In SWV, the oxidation current showed a sharp decrease around 0.2 V and then a rise from 0.5 V (exhibited Fig. S1A inset (d)); suggesting that the presence of antibiotics in buffer might decrease the sensitivity in EC measurement due to the lower current at 0.2 V. Cyclic voltammetry in LDH solution demonstrated only a slight current increase from -0.32 V to -0.4 V during the oxidation scan ((k)–(m) in Fig. S1B); this will not interfere with the oxidation current of H_2O_2 at 0.2 V in SWV and 0.4 V in CV. LDH was reported previously to have two anodic peaks at 0.07 V and 0.25 V (*vs* Ag/AgCl) on a glass carbon electrode (see reference 32 of the manuscript). In order to lessen the influence of the electrode process from Pt itself, the LDH and species from KHGB buffer, the monitoring window was located between -0.1 V to 1.0 V; the region most dependant on the concentration of H_2O_2 or total ROS concentration.

2 Table S1. Standarted deviation of currents in Fig. 4: polishing mode

Buffer	**E_S-Off O_2-CO_2 (0-30min)**	**E_S-on O_2-CO_2 (40-80 min)**	**E_S-on O_2-CO_2 (SWV) (40-80 min)**	**Insult E_S-off (90-125 min)**	**Insult method (%)**
KHGB	0.05873±0.0023 (line a)	0.05687±0.0062 (a)	0.0066 ± 0.0013 (e)	0.06022 ± 0.0011 (TX) (a) ± 0.0013 (N_2)	TX: <± 10% (CV,a); N_2: 6 % (CV, b), N_2: 20% (SWV, e)
KHG		0.05414±0.0085 (b)	0.03012± 0.0038 (d)	0.05697 ± 0.0021 (N_2), (b)	< 6% (CV); ~ 10% (SWV, d)
KH		0.060±0.0063 (c)			

Data are based on triplicate experiments. (a-e) correspond to the lables in Figure 4.

3 Evidence of adsorption of species from KH buffers

The potential effect of the species in KH and KHGB on Pt was studied (Fig. S2). Scanning in KH causes little effect to the voltammetric waveshape of N,N,N',N'-tetramethyl-p-phenylenediamine solutions (TMPD). In particular, there is no significant change in I_O at 0.58 V whilst the cathodic current at 0.058 V increased by about 18%. In KHGB, oxidation current I_O increased 4.4 % and 17.2% for the reduction current in average (n=3).

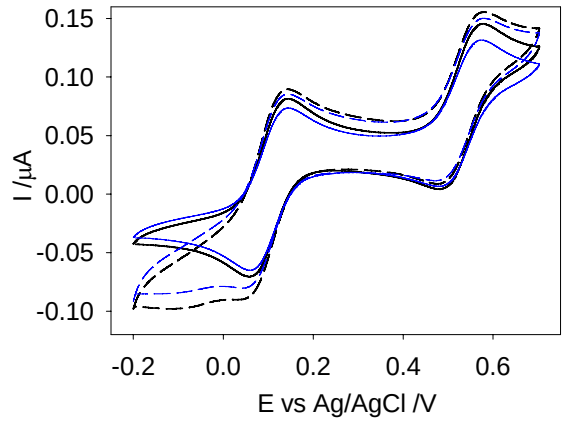

Fig. S2. Cyclic voltammetry of Pt electrode in TMPD. CV in 1mM TMPD-0.1 M KCl before (solid line) and after (dash line) 10 scans in blank KH (black) and KHGB (blue), respectively. Scan rate, 0.1 V s^{-1}.

4 Comparison of H_2O_2 from chemical assay and ROS by SWV and CV

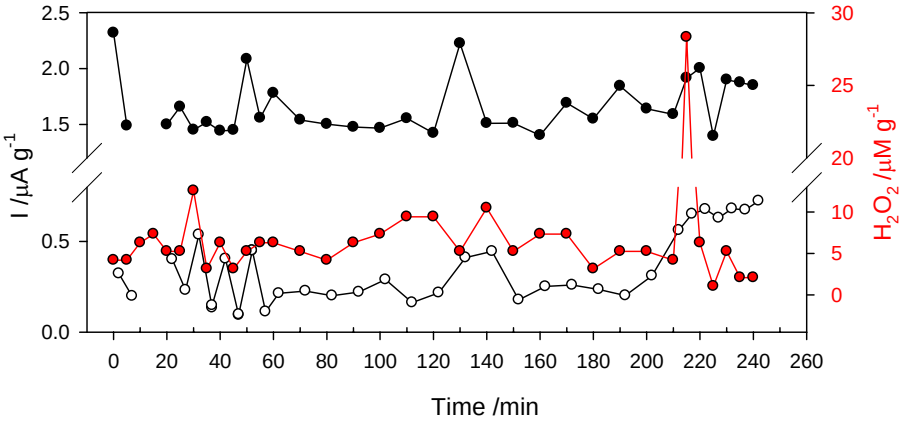

Fig. S3. Comparison of H_2O_2 and ROS by CV and SWV. H_2O_2 (red circles) from Amplex Red assay. ROS level measured by cyclic voltammetry (black circles), and square wave voltammetry (white circles). Others as in Fig. 5B. Scan conditions as given in the Experimental section.

5 Linear range study of the oxidation current with H_2O_2 concentration

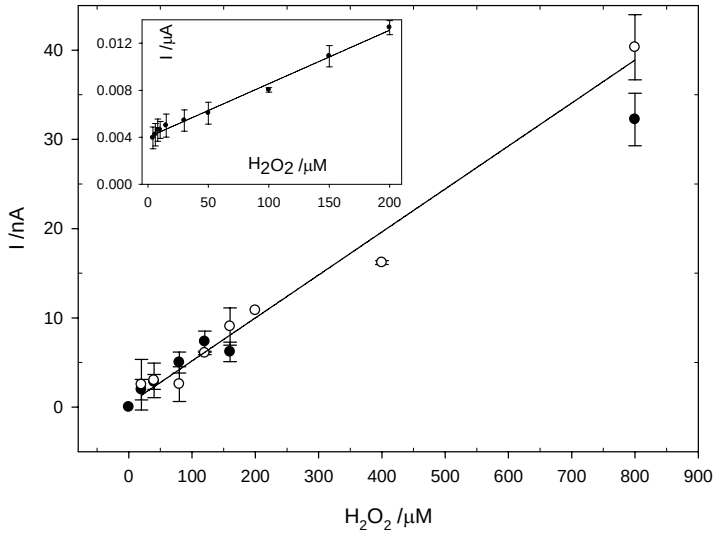

Fig. S4. Oxidation current in SWV with concentration of H_2O_2 measured in oxygenated (Solid circle), and N_2-saturated (white circle) KHGB. E_S-off between EC recording. Flow rate, 120 μL min^{-1}, 37 °C. SWV conditions as given in Experimental section. Inset: I = 0.004 + 4.55e-5 C; R^2=0.9931 when the concentration of H_2O_2 was in the range of 1 to 200 μM.