Electronic Supplementary Information:

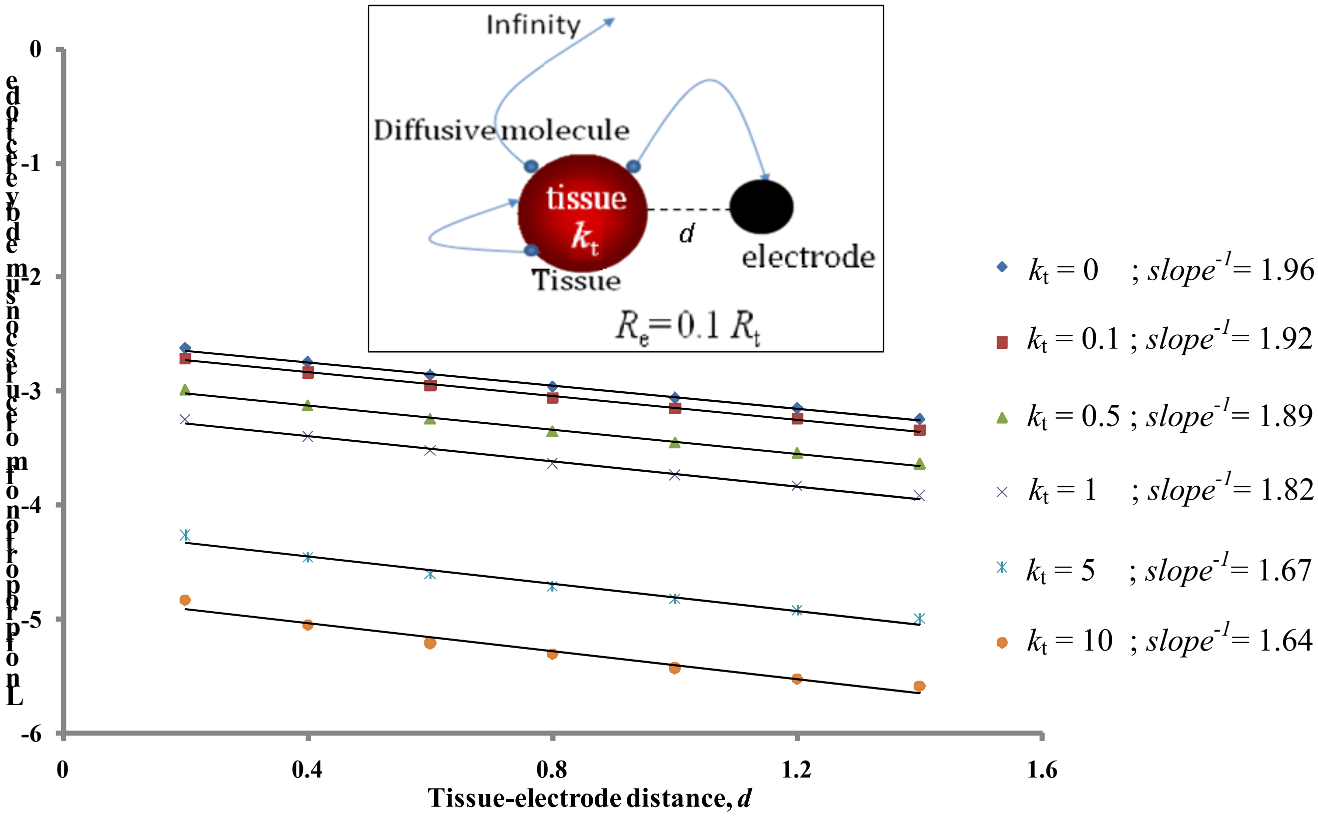
Justification for the difference in slope for different uptake rates

FIGURE LEGENDS

FIGURE S1

Results of a Brownian dynamics model [26-28] used to validate firstly that the slope of the curve fitting the measurements at different tissue-electrode distances changes as the uptake rate changes and secondly that the slope can be use to characterise the uptake rate. The Brownian dynamics simulation model solves the reaction-diffusion problem within a system that resembles the experimental set-up. In our model, molecules diffuse in a three-dimensional space with diffusion coefficient D relatively to the immobile tissue and electrode. The molecules are emitted by the tissue, and can either be removed by the tissue itself at given uptake rate, or consumed by the electrode or escape to infinity (see inset). For simplicity, we model the tissue and the electrode as spheres, with radii $R_e = 0.1R_t$. Simulations are run setting the diffusivity D and the tissue radius R_t to 1. All the other quantities are expressed in units relative to this choice. The results of the model resemble real experiments in which the three following conditions apply: the tissue emits at a constant zero-order rate; the uptake on the tissue can be described by a first-order reaction, $D\frac{\partial C}{\partial d} = k_t C$; the current measurements are taken at steady state. The figure reports the natural log of the fraction of molecules consumed by the electrode for different tissue uptake rate, k_t, and different tissue-electrode distances, d. For each value of the uptake rate, k_t, a linear function has been used to fit the results and the reciprocal of the slope, $slope^{-1}$, has been calculated. As the uptake rate, k_t, changes, $slope^{-1}$ changes. In particular, as k_t increases, $slope^{-1}$ decreases monotonically, in a way that there is a one-to-one relationship between the two quantities.

FIGURE S1


Infinity
Diffusive molecule
tissue
k_t
Tissue
d
electrode
$R_e = 0.1\ R_t$
0
-1
-2
-3
-4
-5
-6
0
0.4
0.8
1.2
1.6
Tissue-electrode distance, *d*
$k_t = 0$; $slope^{-1} = 1.96$
$k_t = 0.1$; $slope^{-1} = 1.92$
$k_t = 0.5$; $slope^{-1} = 1.89$
$k_t = 1$; $slope^{-1} = 1.82$
$k_t = 5$; $slope^{-1} = 1.67$
$k_t = 10$; $slope^{-1} = 1.64$