Supplementary Information

Quantitative Mass Spectrometry Imaging of Small-Molecule Neurotransmitters in Rat Brain Tissue Sections using Nanospray Desorption Electrospray Ionization

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**Fig. S-1** – Averaged mass spectra from rat brain tissue zoomed in at m/z corresponding to internal standards. The column to the left shows spectra recorded using a nano-DESI solvent with 10 nM ACh-D9, 2µM GABA-D2 and 10 µM Glu-D3 in 80% MeOH on rat brain tissue. The column to the right shows spectra recorded using a nano-DESI solvent consisting of 90% MeOH on rat brain tissue. A minimum of 20 spectra were averaged a) Detection of [ACh-D9]+, b) m/z corresponding to [ACh-D9]+, c) detection of [GABA-D2+H]+, d) m/z corresponding to [GABA-D2+H]+, e) detection of [Glu-D3+Na]+, f) m/z corresponding to [Glu-D3+Na]+.
Fig. S-2 – Normalized ion images of Acetylcholine (ACh), γ-aminobutyric acid (GABA) and glutamate (Glu) in rat brain tissue sections from three nano-DESI MSI experiments. Column 1 shows ion images from experiment 1, column 2 shows ion images from experiment 2, and column 3 shows ion images from experiment 3. a-c) [ACh]$^+$, d-f) [GABA+$H$]$^+$, g-i) [GABA+$Na$]$^+$, j-l) [GABA+$K$]$^+$, m-o) [Glu+$Na$]$^+$, p-r) [Glu+$K$]$^+$. Scale bar: 5 mm. The signal intensity of the ion images scale from dark to bright.
Fig. S-3 – Localized extraction of acetylcholine ([ACh+H]^+) , γ-aminobutyric acid ([GABA+H]^+) and glutamate ([Glu+Na]^+) from white matter (blue diamonds) and grey matter (red squares) on a rat brain tissue section. The y-axis shows the relative intensity between the analyte and the total ion count (TIC) and the x-axis shows the time point for data acquisition. (n=6 for each data point)
Fig. S-4 – Change in response of GABA and its deuterated standard GABA-D2 at varying salt concentrations. a) Relative responses of \([\text{GABA}+\text{K}]^+ / [\text{GABA}+\text{H}]^+\) (blue diamonds) and \([\text{GABA-D2}+\text{K}]^+ / [\text{GABA-D2}+\text{H}]^+\) (black cross) at varying concentrations of KCl and b) Relative responses of \([\text{GABA}+\text{Na}]^+ / [\text{GABA}+\text{H}]^+\) (blue diamonds) and \([\text{GABA-D2}+\text{Na}]^+ / [\text{GABA-D2}+\text{H}]^+\) (black cross) at varying concentrations of NaCl. Data for each point was averaged over 1 min.
Figure S-5 – Change in response of Glutamate and its deuterated standard Glutamate-D3 at varying salt concentrations. a) Relative responses of [Glutamate+K]^+/[Glutamate+H]^+ (blue diamonds) and [Glutamate-D3+K]^+/[Glutamate-D3+H]^+ (black cross) at varying concentrations of KCl and b) Relative responses of [Glutamate+Na]^+/[Glutamate+H]^+ (blue diamonds) and [Glutamate-D9+Na]^+/[Glutamate-D3+H]^+ (black cross) at varying concentrations of NaCl. Data for each data point was averaged over 1 min.