**Supplementary File 1.** Vglut2 positive innervations from central noradrenergic neurons to the brain nuclei important in breathing control

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| **Vglut2+ noradrenergic nuclei** | **Downstream target of Vglut2+ NA neurons** | **The role of the downstream target in breathing control** | **Reference** |
| **C1** | preBötzinger complex | Generate inspiratory rhythm | [Malheiros-Lima et al. (2018)](https://sciwheel.com/work/citation?ids=5607890&pre=&suf=&sa=0&dbf=1) |
| parafacial region (pFRG) | Regulate active expiration during chemosensory stimulation | [Malheiros-Lima et al. (2020)](https://sciwheel.com/work/citation?ids=8825854&pre=&suf=&sa=0&dbf=1) |
| Locus Coeruleus (LC) | Chemosensitive, regulate chemosensation | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1); [Holloway et al. (2013)](https://sciwheel.com/work/citation?ids=4233129&pre=&suf=&sa=0&dbf=1) |
| A5 | Inhibitory drive for chemosensation and respiratory rhythm | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1); [Malheiros-Lima et al. (2022)](https://sciwheel.com/work/citation?ids=12226944&pre=&suf=&sa=0&dbf=1) |
| A1, A2 | Modulate chemosensation, stabilize respiratory rhythm | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1); [Holloway et al. (2013)](https://sciwheel.com/work/citation?ids=4233129&pre=&suf=&sa=0&dbf=1) |
| Lateral parabrachial nucleus (PBN) | Regulate chemosensation and arousal | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Medullary raphe | Regulate chemosensation and expiration | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Nucleus of the solitary tract (NTS) | Receive input from the carotid bodies (a key center for O2 chemosensation) and other cardiopulmonary afferents | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Dorsal motor nucleus of the vagus | Control respiration rate, regulate airway tone and defense | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Dorsomedial hypothalamus (DMH)lateral hypothalamic area (LHA) | Modulate baseline respiration, chemosensation, arousal | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Paraventricular thalamic nucleus (PVT) | Regulate arousal | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| Paraventricular nucleus(PVN) | Modulate baseline respiration, respiratory response to hypoxia | [Abbott et al. (2013)](https://sciwheel.com/work/citation?ids=1601019&pre=&suf=&sa=0&dbf=1) |
| **Locus Coeruleus (LC)** | Lateral parabrachial nucleus | Regulate chemosensation and arousal | [Yang et al. (2021)](https://sciwheel.com/work/citation?ids=10322910&pre=&suf=&sa=0&dbf=1) |