

Figure S1. Callado-Pérez, Demers, Fassihi-Zakeri, Moore, Kleinfeld and Deschênes

Figure S1. Map of the receptive fields of trigeminal neurons located within and around spinal trigeminal subnucleus muralis, i.e., the transition zone between the interpolaris and caudalis subnuclei. Related to Figure 1. We recorded one map per animal with a continuous penetration of the glass electrode in the dorsal to ventral direction. A bolus of the fluorescent dye Chicago Sky Blue was injected by iontophoresis at the time of the first recording and at the end of the descent. Animals were perfused immediately after recording, and the brainstem was sectioned at 60 μm along the sagittal plane. Shown is the autofluorescence. Each yellow dot represents a neuron that was responsive to manual stimulation of the nasal or buccal epithelia.

(A-I) Section A is 3.4 mm relative to the midline; progressive sections are medial in steps of 125 μm such that section I is at 2.4 mm relative to the midline.

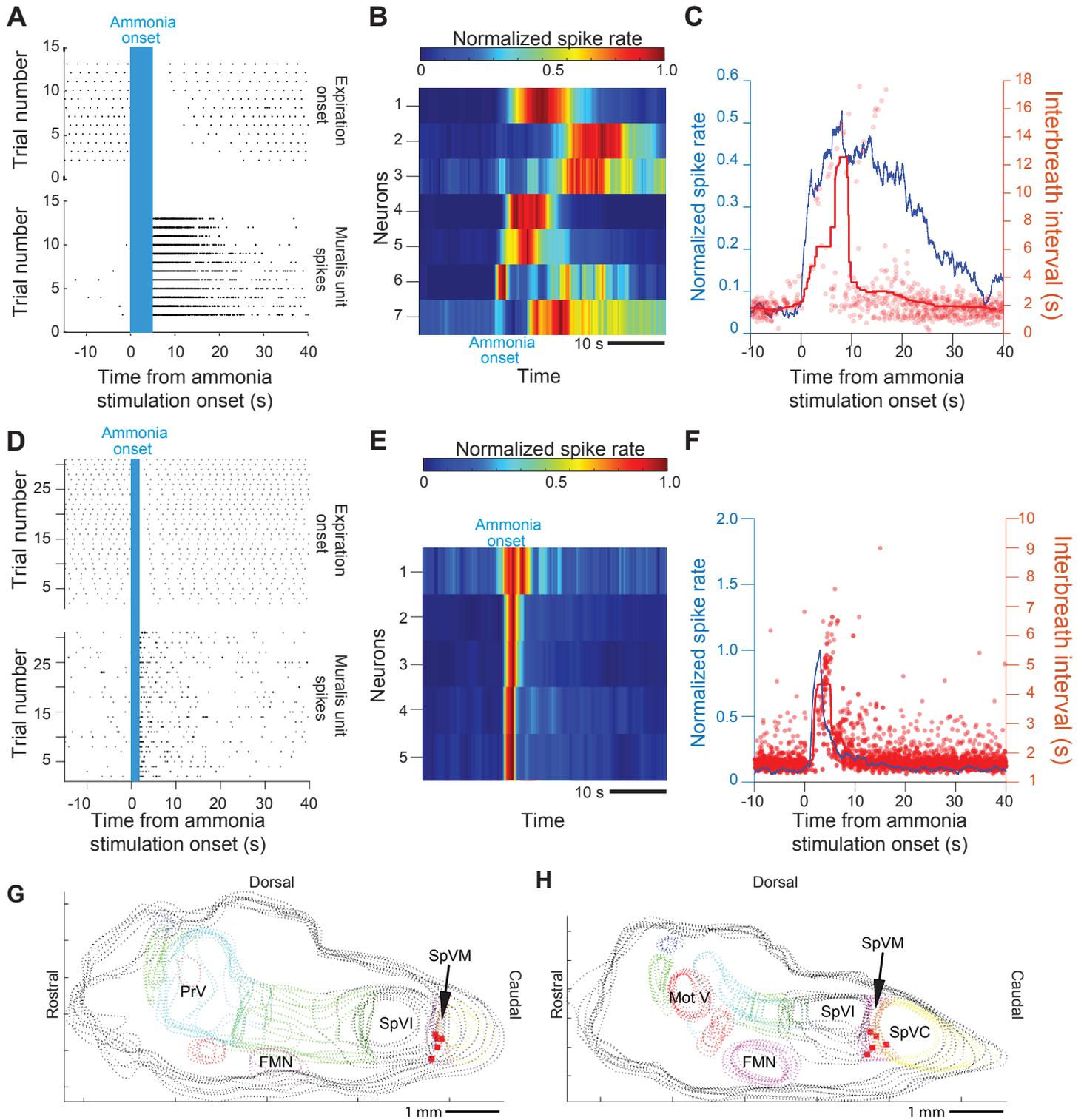


Figure S2. Callado-Pérez, Demers, Fassihi-Zakeri, Moore, Kleinfeld and Deschênes

Figure S2. Cells in SpVM respond to ammonia stimulation to the nasal mucosa. Related to Figure 1.

(A-C) Raster plots of the interval between breaths and the spike times of units in SpVM for a relatively long puff of ammonia. The representative upper raster plot in panel C shows the time intervals between expiration onset before, during, and after the ammonia puff. Note the arrest in respiration (apneic response) induced by ammonia. The representative lower raster plot in panel A shows the response of a SpVM cell before, during, and after the puff of ammonia. Panel B shows the spike rate for seven units, with the rate normalized to the minimum and maximum response for each unit. In panel C, we concurrently plot, first, the measured interbreath intervals for all trials, second, a curve using the “nearest neighbor” method to interpolate between measurements and smoothed by a 50 ms median filter, and third, the normalized interspike intervals measured as an average across all units and trials. Note that the interbreath interval begins to increase concurrent with the increase in spike rate.

(D,E) Raster plots of the interval between breaths and the spike times of units in SpVM for a relatively short puff of ammonia. Panels D and E follow the same form as panels A to C.

(F,G) Reconstruction of sagittal sections of the brainstem showing the location of the recording site for neurons responding to ammonia stimulation. Panel I shows sagittal sections located at 150 μm to 420 μm from the most lateral section of the brainstem. Panel J shows sagittal sections located at 450 μm to 720 μm from the most lateral section of the brainstem. Red dots represent recording sites. Additional abbreviations: FMN, facial motor nucleus; Mot V: trigeminal motor V nucleus; pink PrV: principle trigeminal sensory nucleus.

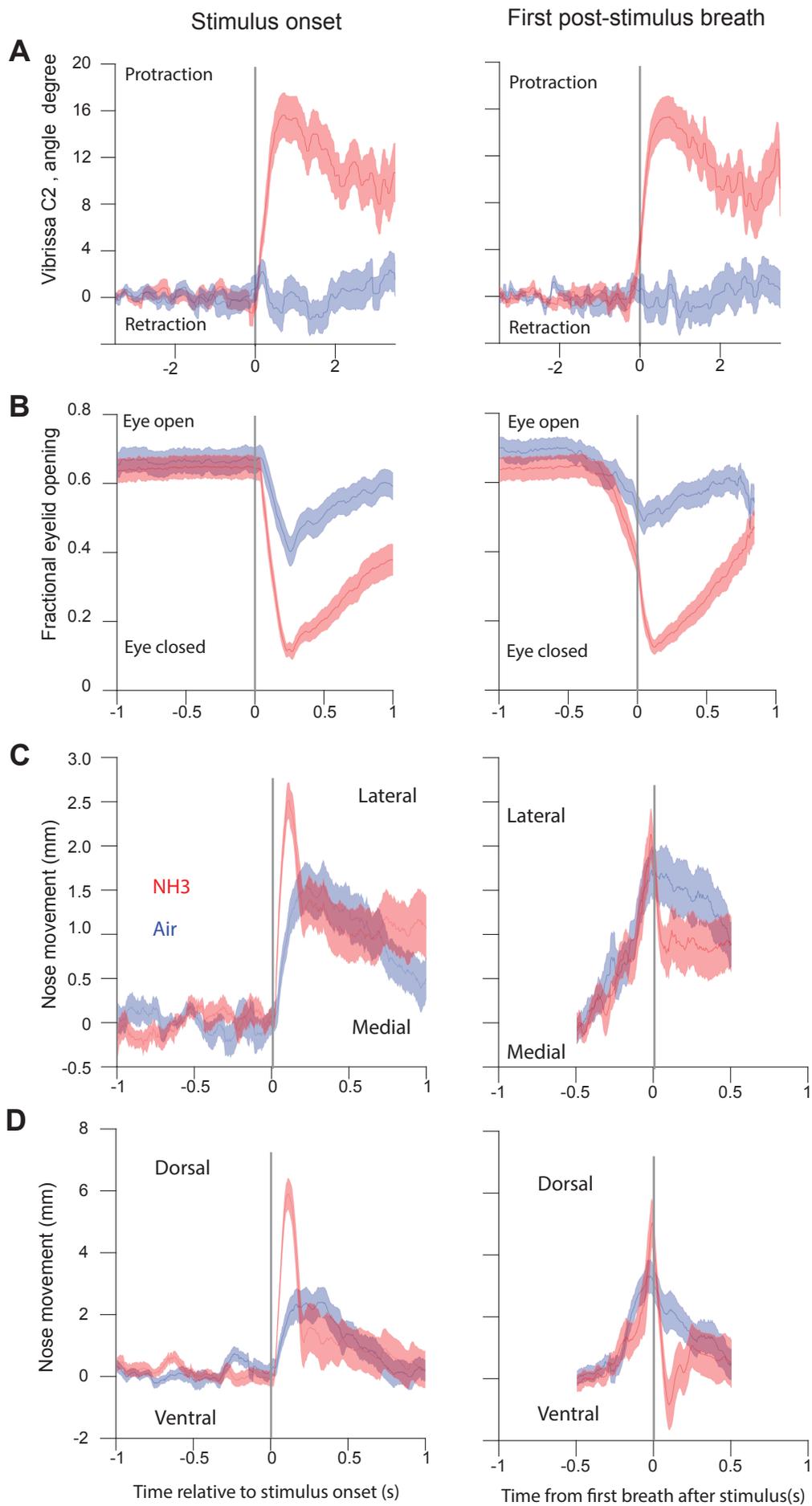


Figure S3. Callado-Pérez, Demers, Fassihi-Zakeri, Moore, Kleinfeld and Deschênes

Figure S3. Facial reactions induced by delivery of ammonia vapors to the right nostril of a head-restrained rat analyzed relative to the onset of the puff of ammonia and relative to the first breath after the puff. Related to Figure 3.

(A) Apneic reaction leading to vibrissa protraction.

(B) Apneic reaction leading to eyelid closure'

(C) Apneic reaction leading to lateral nose movement.

(D) Apneic reaction leading to dorsal nose movement.

Supplementary video 1. Facial expression in head-restrained rat upon delivery of ammonia.

The onset of stimulation is marked by the appearance of red-colored text on the upper right of the frame. The red circle marks the tracking of the nose.

Supplementary video 2. Facial expression in head-restrained rat upon delivery of air-puff, i.e., control trial.

The onset of air-puff stimulation is marked by the appearance of blue-colored text on the upper right of the frame. The red circle marks the tracking of the nose.