

Appetite is controlled by metabolic states and sensory inputs. We hypothesize that the odor representation of food is metabolic dependent and modulation of this circuit contributes to overeating.

Metabolic state dependence of olfactory cortex flavor representation during hedonic overeating

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INTRO

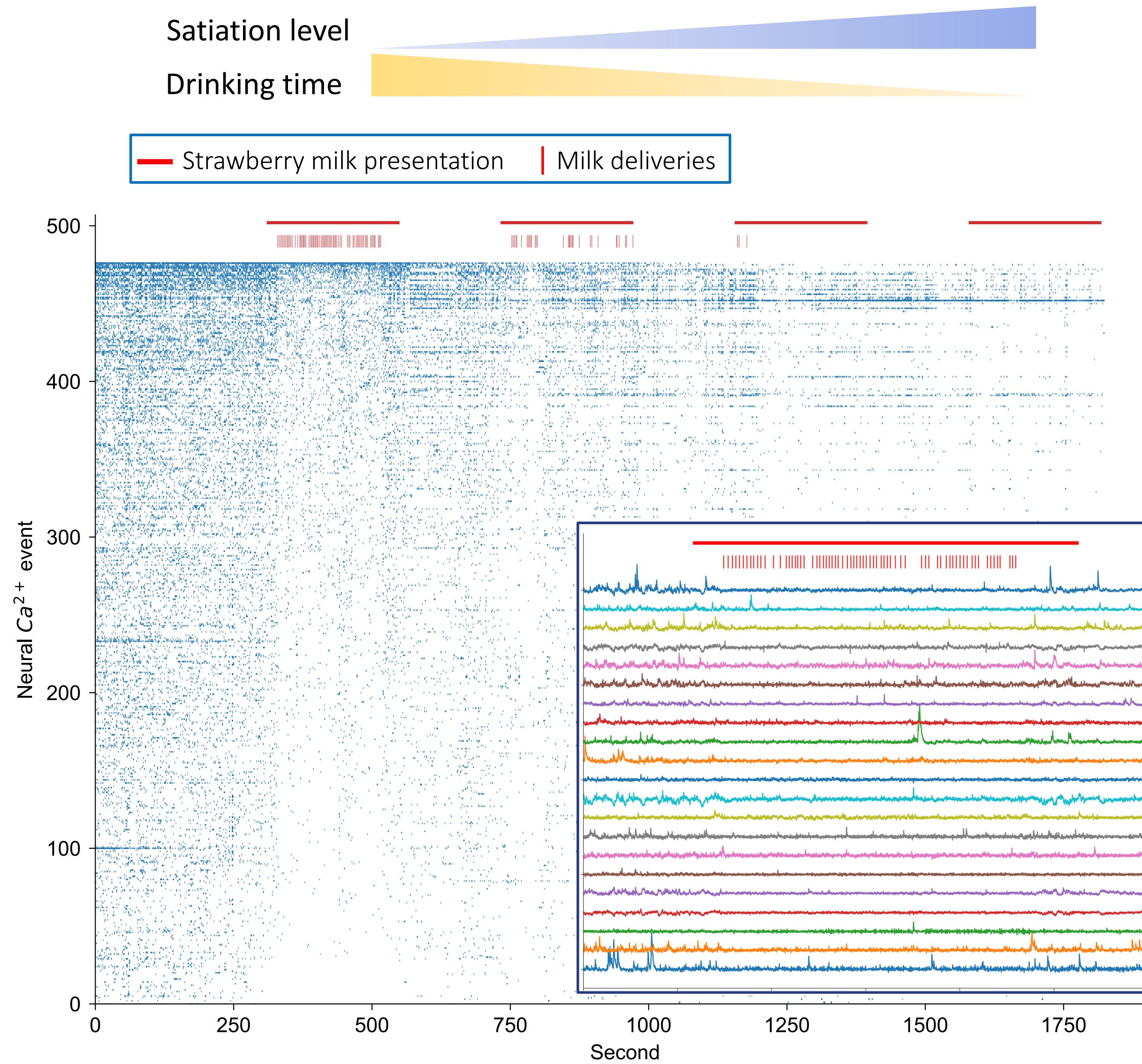
- Olfactory cortex modulates olfactory bulb activity upon fasting and leads to fasting-induced overeating^[1]
- We hypothesize that the representation of food smell in the olfactory cortex is metabolic state-dependent, and it contributes to appetite.

METHODS

1. Freely moving Ca^{2+} imaging in the piriform cortex
2. Repeatedly introduce flavored milk to mice to trigger satiation

EXP. DESIGN & RESULTS

Satiation paradigm



Example of neural activities of glutamatergic neurons ($n=477$, from one mouse) during feeding and upon satiation. Majority of the piriform excitatory neurons is suppressed during binge eating bout. Inset is a zoom-in example of 21 selected Ca^{2+} traces around the first binging bout.

ADDITIONAL RESULTS

- Cell footprints
- A scatter plot showing cell footprints in pixel space. The x-axis is 'x position in pixel' (0-250) and the y-axis is 'y position in pixel' (0-200). A color scale indicates the event rate from 0.2 (blue) to 1.0 (green). A legend indicates SNR levels: 50 (light blue), 100 (medium blue), 150 (dark blue), and 200 (black).
- Layer structure can be captured by using prism relay GRIN-lens
- Neural responses during eating
- A line graph showing the 'Fold change of event rate' for multiple neurons across different phases: Baseline, Milk 1, Break 1, Milk 2, Break 2, Milk 3, Break 3, and Milk 4. The y-axis ranges from 0 to 10. Most neurons show a peak in event rate during the first milk delivery (Milk 1) and a subsequent decrease during breaks.
- Neural responses in space
- A trajectory plot titled 'DSC7321190725 trajectory + neuron C376'. It shows a 2D space with axes ranging from 150 to 550. A network of yellow lines represents the movement of a neuron (C376) over time, with a color scale indicating the event rate from 0.0 (yellow) to 1.0 (dark purple).

REFERENCES

- [1] Soria-Gómez *et al.*, 2014



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