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A small molecule with a big effect: microRNA-34a selectively regulates Dorsal Raphè inhibitory transmission in response to stressful environmental stimuli.

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Background: (max 50 words)

The Dorsal Raphè Nucleus (DRN) is a major source of serotonergic projections to brain-wide targets. It is involved in the encoding of positive and negative valence stimuli, including stressful events, but the circuits, or the specific cell types, involved in these responses have not been elucidated.

Methods and Results: (max 100 words)

In the present study, we tested the hypothesis that expression of a specific micro-RNA, miR-34a, modulates activity of neurons in the DRN of mice exposed to motivationally salient conditions. By combining in situ hybridization (ISH), miRNAscope ISH and immunofluorescence, we show that miR-34a is selectively expressed in ventrolateral DRN GABAergic neurons. Moreover, we report that this microRNA has a selective functional role in the regulation of inhibitory transmission. Specifically, miR-34a regulates DRN GABAergic activity and behavior in response to aversive, but not rewarding, experiences.

Conclusions and Significance: (max 50 words)

These data support a role of miR-34a in regulating GABAergic neurotransmitter activity and behavior in a context-dependent manner, and suggest that microRNAs could represent a functional signature of specific neuronal subpopulations with valence-specific activity in the brain.

Keywords: (max 5)

Stress, microRNA, behavior, GABAergic synaptic transmission

References: (max 5 relevant references from the Authors in the following format:

full authors list, title, year, journal, vol.: pages)

D. Ielpo, S.M. Guzzo, G.F. Porcheddu, M.T. Teresa Viscomi, C. Catale, I. Reverte, S. Cabib, C. Cifani, G. Antonucci, R. Ventura, L. Lo Iacono, C. Marchetti* and D. Andolina*, *GABAergic miR-34a regulates Dorsal Raphè inhibitory transmission in response to aversive, but not rewarding, stimuli*. Proc Natl Acad Sci USA. 2023 Aug 8;120(32):e2301730120. doi: 10.1073/pnas.2301730120