Circuits that encode and guide alcohol associated preference

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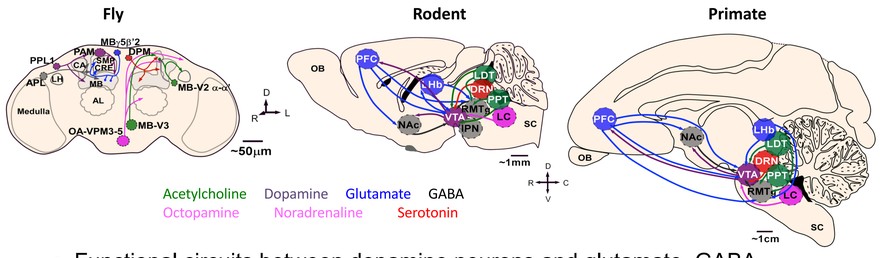
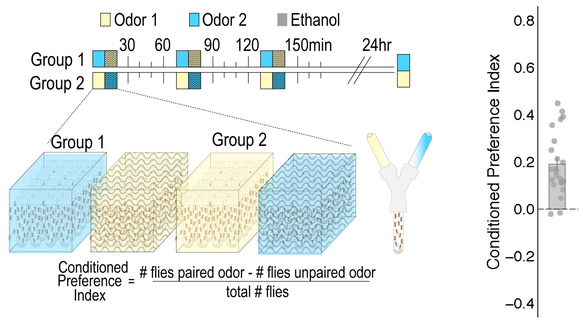
Drosophila neural circuits that mediate reward learning are similar to other species.



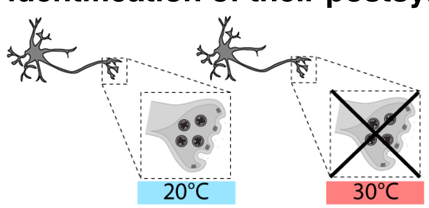
- Functional circuits between dopamine neurons and glutamate, GABA and acetylcholine neurons underlie responses to reward and punishment (Scaplen & Kaun 2016).
- The *Drosophila* Mushroom Body (MB), a central brain associative structure, is densely innervated and compartmentalized by dopaminergic input and glutamatergic, GABAergic and cholinergic output neurons (Aso et al. 2014).

Drosophila exhibit enduring preference for cues associated with alcohol intoxication.

- Flies will withstand 120V shock to reach alcohol associated cues (Kaun et al. 2011).
- Alcohol reward memories last up to 7 days and require the MB and dopamine (Kaun et al. 2011).

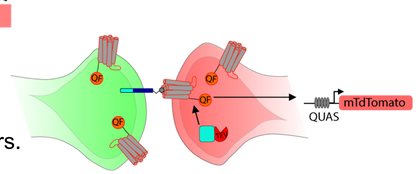


Neurogenetic tools allow for precise manipulation of individual neurons within a circuit and the identification of their postsynaptic partners.



Shibire^{ts} *(shi^{ts})* is a temperature sensitive dominant negative form of dynamin for inactivating neurotransmission

Trans-Tango uses an exogenous ligand (glucagon) and its receptor to reveal previously unknown postsynaptic partners.



The goal was to identify and map MB circuits required for alcohol reward memory. We hypothesized that alcohol reward acquisition and expression would be supported by different MB circuits.

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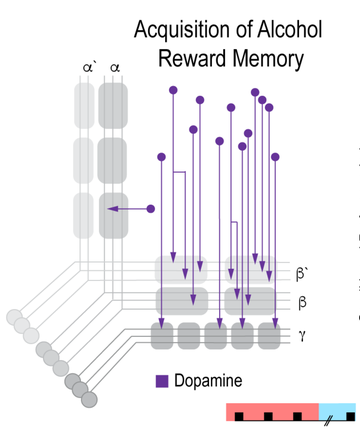
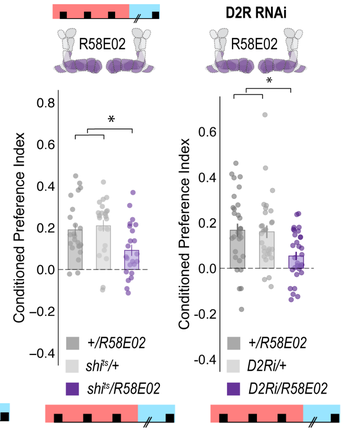
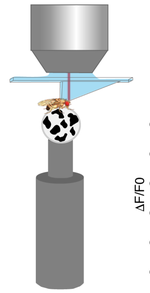
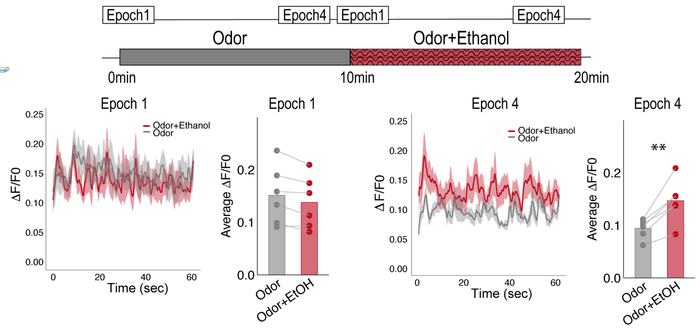
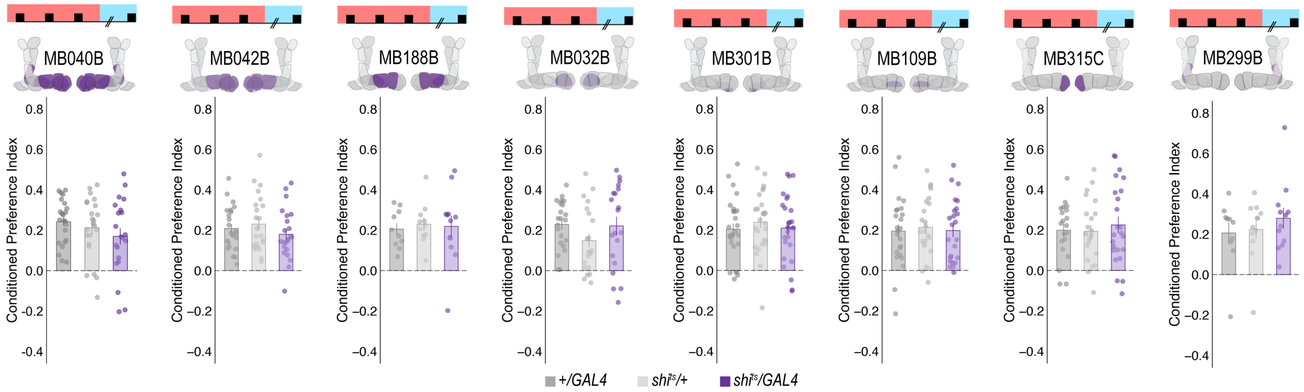
Acquisition of alcohol reward requires activity from a population of dopaminergic neurons.



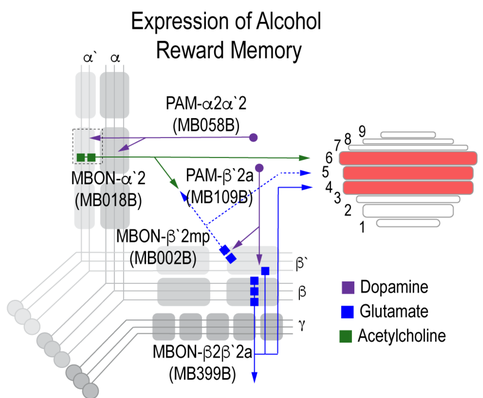


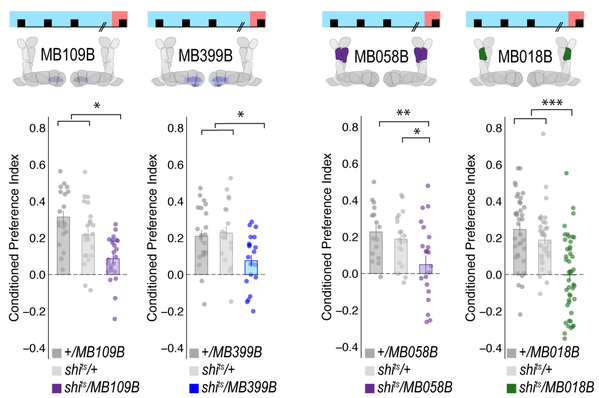


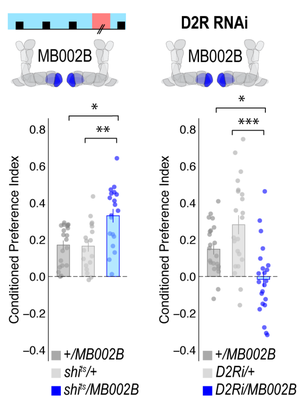




Expression of alcohol reward requires a remarkably complex multi level circuit of dopaminergic, glutamatergic, and cholinergic neurons, which converges within and outside the MB.



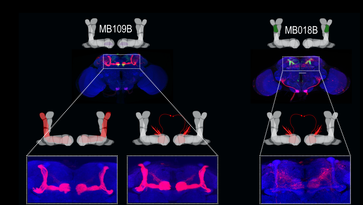




Conclusions

- Alcohol reward memory require population level dopamine modulation that increases with prolonged alcohol exposure.
- The expression of memories requires two discrete microcircuits within the vertical and horizontal lobes.
- Microcircuits converge on a glutamate neuron important for consolidation and dorsal layers of the Fan Shaped Body (FSB).
- Within identified reward circuits that span across brain regions we can now layer molecular questions about how receptors change within this circuit with experience.

Alcohol reward microcircuits converge onto β`2mp MBON which is important for consolidation.



Outputs of alcohol reward microcircuits converge onto the dorsal FSB.