The DRAM, Vol. 6(1) – Drosophila study shows you have to be handsome to stay sober

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Animal models help scientists to understand human behavior and develop new drugs to treat pathologies. This week's DRAM reviews a study that examines an animal model of drinking behavior. Devineni and Hebertein (200) sought to determine if the drinking behavior of drosophila flies resembles human drinking behavior and if genetic mutations modify this behavior.

Method

- Investigators gave flies the opportunity to choose between ethanol-containing and nonethanol-containing food. Researchers calculated a preference index (PI) as (ethanol consumption – nonethanol consumption) / total consumption. The index ranged from -1 to 1, with positive numbers indicating preference for ethanol.
- Researchers measured the following
    - the basic preference of flies
    - the pattern of preference change across time and ethanol concentration shifts
    - the preference change after periods of starvation or ethanol deprivation
    - ethanol preference of different mutations.

Results

- At baseline, the flies consistently showed a statistically significant preference for the ethanol-containing food, even when the caloric ratio between ethanol and nonethanol food was balanced.
- The preference for ethanol-containing food increased for the first few days but leveled off after 4 – 5 days.
- The level of preference increased with larger ethanol dose concentration.
- Starved flies were willing to consume ethanol at levels sufficient to produce behavioral intoxication.

- After being deprived of ethanol for several days, flies quickly resumed ethanol consumption when given an opportunity.
- Previous testing of 27 different types of mutations by the researchers had found one mutant — *krasavietz* – or handsome in Russian – that exhibited a significantly lower preference for alcohol compared to the non-mutated controls. The "handsome" flies were studied in this experiment (see Figure). During the first two days the "handsome" flies showed no preference for alcohol, a behavior that was significantly different from controls who took to alcohol immediately.

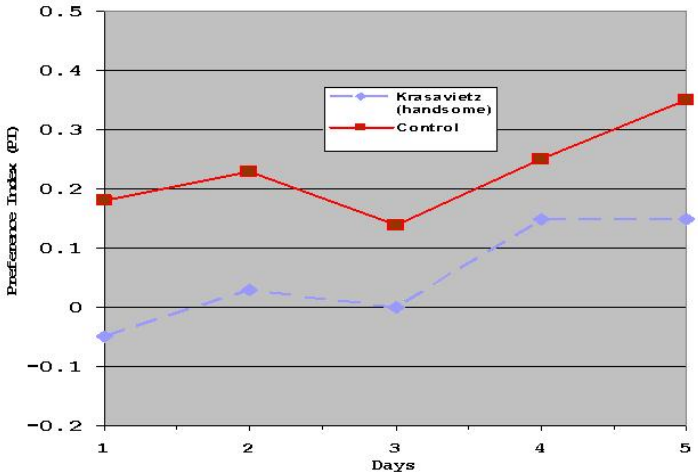

Figure. Five day ethanol preference for control group and mutant fly krasavietz (handsome). N = 25. Click image to enlarge.

Limitations

- No animal model provides a perfect analog to human alcohol consumption or alcoholism. For example, social and cultural factors influence human alcoholism, and these influences are difficult to create within animal studies.

Conclusions

This study indicates that drosophila's drinking behavior resembles human drinking patterns in many facets. Similar to humans, drosophila's initial preference to ethanol containing food is low and apt to vary, however gradually it increases and becomes consistent. Drosophila gradually are attracted to ethanol despite its aversive taste and intoxicating effect. One characteristic of human

alcohol dependence is relapse – a return to previous levels of alcohol consumption after a period of abstinence (Hunt, Barnett, & Branch, 1971). Flies also exhibit relapse-like behavior after ethanol deprivation. Devineni and Hebertein (2009) showed that a mutation, specific to a single gene, is related to low preference for ethanol. Identifying this and potentially other mutations help scientists to understand the potential molecular mechanisms underlying alcohol preference. No animal model can explain all facets of alcohol dependence among humans. However, a better scientific understanding of ethanol preference in both animals and humans may lead to the discovery of features common to a general reward pathway involved with addiction.

— Julia Braverman

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References

Devineni, A. V., & Hebertein, U. (2009). Preferential Ethanol Consumption in Drosophila Models Features of Addiction. *Current Biology, 19*, 2126-2132.

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