

Effects of High-Sucrose Diet on Yorkie-Induced Tumorigenesis and Developmental Timing in *D. melanogaster* and Implications for Dietary Sugar in Human Cancer

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Q1 - Research Question



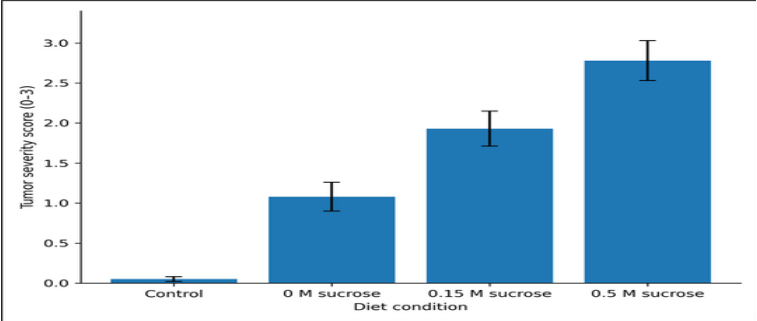
- **RQ:** To what extent does **high-sucrose diet exposure during organismal development** affect **Yorkie-induced tumorigenesis and developmental timing?**
- **Problem:** Sugary diets have been suggested to increase cancer incidence, yet the link between the two has not been fully explored.
- **Hypothesis:** Increasing concentrations of sucrose in fly media will increase Yorkie activation in developing eyes, while also slowing development.

Analysis:

- Tumor phenotype scoring
- Developmental timing (egg to pupae)
- Phenotypic scores distributed and averaged

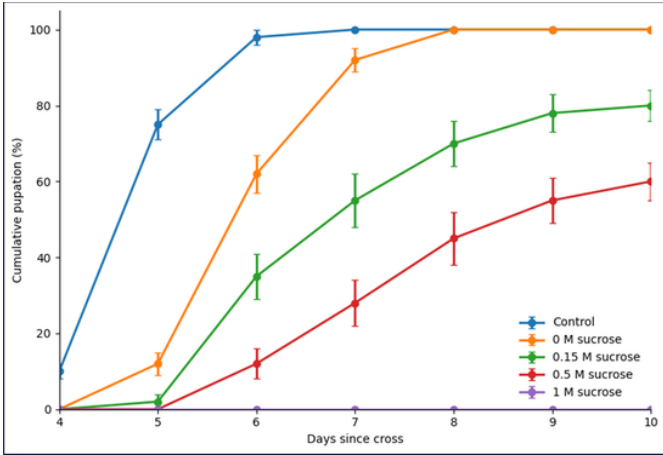
Key Findings

- Increased sucrose → delayed development
- Increased sucrose → higher tumor severity
- 1M sucrose → lethal (no pupation)

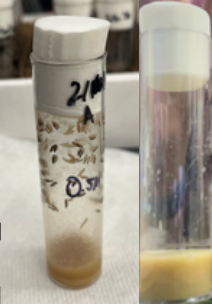


Q3 - Data Analysis & Results

Diet condition	Final pupation (%)	Day of 50% pupation	Mean tumor score ± SD	Dominant phenotype
Control	100	-5	0.05 ± 0.03	Score 0 (Normal)
0 M sucrose	100	-6	1.08 ± 0.18	Score 1 (Mild)
0.15 M sucrose	80	-7	1.93 ± 0.22	Score 2 (Moderate)
0.5 M sucrose	60	-8-9	2.78 ± 0.25	Score 3 (Severe)
1 M sucrose	0	-	-	No pupation observed



Q2 - Methodology



- **Genetic Crosses:**
 - **Control:** GMR-GAL4 (8) ♀ x OR5 (5) ♂
 - **Experimental Group A:** UAS-Yki[3SA] (8) ♀ x GMR-GAL4 (5) ♂
 - **Experimental Group B:** GMR-GAL4 (8) ♀ x UAS-Yki[3SA] (5) ♂
- **Food & Diet:** Raised on Semi-Defined Food (SDF) w/ increasing concentrations of additional sucrose (check IV)
- **IV:** Increasing concentrations of additional sucrose (0, 0.15M, 0.5M, 1M)
- **DV:** Tumor Phenotype (Yki overactivation) & Developmental Time
- **Controls:** Base recipe (BDSC SDF), Temp (25°C), fly density, food volume
- Adults transferred to new vials every 24 hrs for 4 synced broods; pupae dissected and counted daily to measure developmental rates.



Q4- Interpretation & Conclusions

- Results **demonstrate a gene-environment interaction** where dietary sucrose directly modulates oncogene-driven tumorigenesis, likely by enhancing growth signaling and amplifying Yorkie-induced tissue overgrowth.
- Because Hippo/Yorkie is conserved with human YAP/TAZ signaling (**implicated in millions of cancer cases annually**), these findings suggest **dietary environments may influence cancer progression severity in humans**, highlighting metabolic factors as potentially modifiable disease variables.
- **Future Work:** GFP-based reporters to **quantify** Yorkie pathway activity and establish a direct mechanistic link between dietary sucrose and oncogene-driven tumor progression.