Long-Term Supplementation with Fruits and Vegetables Prolongs Lifespan and Reduces Tumor Incidence in Mice Fed a Western-Style High-Fat Diet

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Objectives: Epidemiological studies suggest that consumption of fruits and vegetables (FV) was negatively associated with the incidence of certain cancers and positively associated with life expectancy. To date, a causal relationship has not been demonstrated. The objectives of the current study were to investigate the effects of long-term FV supplementation on health- and life-span in normal weight and obese mice.

Methods: Male C57BL/6J mice (5-wk) were randomly assigned to one of four groups (60/group): low fat control (LF-C, 10% kcal fat), high fat control (HF-C, 45% kcal fat), and each with 15% of a unique mixture of FV (patent pending) (w/w) (LF-FV and HF-FV). All mice were euthanized when a group reached 50% mortality. Survival analysis was performed using log-rank (Mantel-Cox) test; a two-sided Fisher's exact test was performed to compare difference in tumor incidence.

Results: After 21 months of feeding, HF-C group was the first to reach 50% mortality. Further, a Kaplan-Meier survival curve demonstrated that, at termination, HF-C group had higher mortality (50.0%) compared to LF-C group (18.3%, $p = 0.0008$). Notably, HF-FV group had significantly lower mortality (23.3%) compared to HF-C mice ($p = 0.008$), and there was no significant difference in mortality between HF-FV and LF-C. Mortality was lower in LF-FV (11.7%) compared to LF-C (18.3%), although this difference was not statistically significant. Furthermore, tumor incidence in HF-C group (73.3%) was significantly higher than that in LF-C group (30.0%, $p < 0.0001$). HF-FV group had 23.3% lower tumor incidence compared to HF-C group ($p = 0.014$). There was no significant difference in tumor incidence between LF-C (30.0%) and LF-FV groups (31.7%).

Conclusions: Our findings provide the first causal evidence that long-term intake of a diet supplemented with a wide variety of fruits and vegetables could extend lifespan and decrease tumor incidence in mice fed a Western-style high-fat diet. These results provide a foundation for further investigation into the benefits of fruit and vegetable supplementation on aging and age-related disease.

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