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Effect of Beta- and Alpha-Carotene Intake on Tumour Formation in the Intestines of APCMin/+ Mice

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Carotene-rich vegetables like carrots have been consistently associated with lowered cancer risk in observational studies⁽¹⁾. Beta-carotene, a phytochemical found in fruits and vegetables, is known for its antioxidant properties. In rodent trials, supplementation with carrot (containing both carotenes and polyacetylenes) significantly reduced tumour numbers in the APC^{Min/+} mouse model⁽²⁾. However, human intervention trials with pure beta-carotene showed more adverse effects than benefits⁽³⁾. This study aimed to investigate the impact of beta- and alpha-carotene supplementation (without polyacetylenes) on colorectal cancer using the APC^{Min/+} mouse model, which spontaneously develops intestinal tumours and an enlarged liver⁽⁴⁾.

APC^{Min/+} mice were fed either a daily supplement of 10mg/kg mouse of a polyacetylene-free extract from carrots containing a beta- and alpha-carotene mixture, in a dose corresponding to the beneficial carrot supplementation, or the control diet, with a very low beta-carotene content (providing approx. 0.02mg/kg mouse/day). The 8-week supplementation commenced at 5 weeks of age. Tumour quantification in the small intestines of APC^{Min/+} mice was performed by histology of the entire small intestine, with one slide per 0.3mm, using the H&E staining method and Imagescope software.

Supplementation with carotenes had no significant effect on the total number of tumours (≥ 0.5 mm), showing no discernible difference between the control (n = 6) (20.5, 95% CI [14.69, 26.31]) and treatment (n = 8) (24.5, [19.21, 29.79]) group (P = 0.237). However, the liver weight, in % of body weight, showed a significant 25% decrease in the treatment group (n = 7) (4.78 95% CI [4.45, 5.15]) compared to controls (6.42, [5.71, 7.13]) (P < 0.0003), reaching a level comparable with wildtype mice (4.48, [4.13, 4.83]).

These findings confirm the results from the human intervention trials by indicating that beta- and alpha-carotene do not confer any benefit for cancer prevention, while the decrease in liver weight suggests a potential beneficial effect on another aspect of liver health. Additional research is necessary to fully understand these relationships and uncover the underlying mechanisms behind these results. Specifically, beta- and alpha-carotene from carrots do **not** provide the reduction in tumour numbers in a mouse model of colon cancer found when feeding the corresponding dose of freeze-dried carrot. However, the carotenes significantly attenuate the liver enlargement also seen in this model.

References

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