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Fate of excess carotenoids fed to Wistar rats and ICR mice

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Excessive intake of carotenoid bearing foods may lead to hypercarotenaemia, in young infants and children. There is evidence that excessive carotenoid intake may not lead to the development of this clinical feature in all infants. The objective of this study was to attempt to induce hypercarotenaemia in Wistar rats and ICR mice and trace the fate of these excess carotenoids in each experimental model. Wistar rats (n=20) and ICR mice (n=28 - both 3 weeks old) were used for this study. Rats and mice were divided into test and control groups of equal mean weights. The controls were fed with standard rat/mice pellets while the test group was fed with freeze-dried carrot incorporated standard rat/mice feed and boiled carrot with butter (isocaloric diets). After 1 and 2.5 months, the rats were anesthetized and blood drawn for the analysis of major carotenoids, their metabolites and vitamin A. After 2.5 months all animals were euthanized and their liver and adipose tissue collected. The digesta collected from rats were freezed dried, homogenized and extracted into the HPLC mobile phase (MP) consisting of acetonitrile: methanol: THF (58:35:7). The same procedure was repeated for the livers of test and control rats and mice. The adipose tissue from around the kidney was saponified using methanolic KOH and then extracted into petroleum ether (PE). The PE fraction was evaporated using a stream of nitrogen and re-dissolved in a volume of 200 µL of MP and injected into HPLC. Faeces were freezed dried and then extracted into MP and subjected to HPLC to obtain the chromatograms. Fractions of faeces were extracted into $CHCl_3$ and then subjected to TLC. Major carotenoids or metabolites were not detected in serum or any other tissue and in digesta that was tested. After a month a significant difference was observed in vitamin A levels between the test and control groups of rats ($p<0.001$). However after 2.5 months the vitamin A levels in both rats and mice ($p =0.15$ and $p= 0.18$, respectively) test and control groups were not significantly different. In both studies the test group faeces had high amounts of α and β carotenoids while such peaks were not seen in the controls. The two animal studies indicated that neither Wistar rats nor ICR mice develop hypercarotenaemia. The presence of high amounts of carotenoids in faeces and the change in vitamin A in blood with time (high to normal) indicate that there is a control exerted during absorption of carotenoids. This control and normal catabolism of carotenoids may be the reason that some children/ infants do not have hyper-carotenaemia even if they are fed high carotenoid bearing foods.

Keywords: Carotenoids, Hypercarotenaemia, Vitamin A

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