

**Calorie Control Council Response to Liu et al.**  
“Fructose Induces Transketolase Flux to Promote Pancreatic Cancer Growth”

Liu H, Huang D, McArthur DL, Boros LG, Nissen N, Heaney AP. Fructose induces transketolase flux to promote pancreatic cancer growth. *Cancer Res.* August 1, 2010; 70(15):6368.

Liu et al.<sup>1</sup> evaluated the results of an in-vitro assay they developed to measure the fasting serum fructose and glucose levels in a small sample of healthy subjects and patients with pancreatic cancer and other pancreatic disorders. The researchers reported an approximately two-fold higher serum fructose concentration in pancreatic cancer patients than in healthy subjects.

The authors are misleading readers when they link recent dietary increases in fructose and other added sugars to a variety of diseases, including obesity, diabetes and lipid abnormalities. Since 1970, energy intake from all sources has risen by 515 kcal/day (24%); intake of added sugars increased only 52 kcal/day, while flour/cereal products and added fats increased 193 and 231 kcal/day, respectively<sup>2</sup>. Obesity and attendant ailments are not uniquely a fructose or added sugars problem – we simply eat too much of everything. And because fructose and glucose are present in near-equal amounts (relative to each other) in caloric sweeteners and fruits/vegetables, the fructose to glucose ratio remained unchanged as added sugars intake increased.

The current study demonstrates only that fructose induces growth of already-cancerous cells; though the literature is inconclusive, the most recent study by Simon et al. does not support the hypothesis that dietary intake of carbohydrates, including fructose, is associated with increased risk of pancreatic cancer<sup>3</sup>. Though Liu et al. do not allege the latter; neither do they clarify this subtlety to those untrained to note the distinction, thereby fostering misunderstanding about this sugar.

Though fructose and glucose are shown in the study to proliferate test cells equally, the title and concluding advice focus only on fructose, leaving the impression that attention to fructose alone is sufficient to attenuate all cancer cell proliferation. While the biochemical mechanism of cell proliferation appears to differ between fructose and glucose, the fact remains that both invoke equivalent proliferation.

Additionally, the lack of a dose-response in induction rates over a thousand-fold-range of fructose concentrations is unexpected, yet the authors offer no comment or explanation.

The discussion section of the paper indicates the authors have uncritically accepted allegations circulating about fructose as fact. The researchers might better focus on their own work rather than promulgating the unconvincing argument of other authors.

## References

1. Liu H, Huang D, McArthur DL, Boros LG, Nissen N, Heaney AP. Fructose induces transketolase flux to promote pancreatic cancer growth. *Cancer Res* 2010; 70: 6368-76.
2. Buzby J, Wells HF. Loss-adjusted food availability spreadsheets: Average daily per capita calories from the U.S. food supply, adjusted for spoilage and other waste. In: USDA Economic Research Service, editor.: <http://www.ers.usda.gov/Data/FoodConsumption/FoodGuideSpreadsheets.htm#calories>; 2010.
3. Simon MS, Shikany JM, Neuhaus ML, et al. Glycemic index, glycemic load, and the risk of pancreatic cancer among postmenopausal women in the women's health initiative observational study and clinical trial. *Cancer Causes Control* 2010.