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LETTER TO THE EDITOR

Dear Sir,

Refined sugar intake and the risk of gastric cancer

We have shown that sugar added to coffee and other hot beverages (as a measure of taste for sugar) was an indicator of increased risk of colorectal cancer, with relative risks of the order of 2 for colon and 1.5 for rectum at the highest level of sugar intake, on the basis of 2 case-control studies of more than 3,500 cases of colorectal cancer and more than 6,800 controls conducted in northern Italy (La Vecchia et al.,1993; Franceschi et al., 1997).

There are several indications that carbohydrates, including refined starches and oligosaccharides, are related to gastric cancer risk from studies conducted in Israel (Modan et al., 1974), Japan (Hoshiyama and Sasaba, 1992) and Spain (Ramón et al., 1993). We decided, therefore, to consider the issue of taste for sugar and gastric cancer risk, using data from a study of gastric cancer conducted between 1985 and 1997 in the Greater Milan Area (La Vecchia et al., 1994).

Briefly, 769 cases of incident, histologically confirmed gastric cancer (469 males, 300 females; median age: 61 years) and 2,081 non-neoplastic controls (1,220 males, 861 females; median age: 55 years) were interviewed in a network including major teaching and general hospitals in the Greater Milan Area. Forty-seven percent of controls were admitted for traumatic conditions, 20% for non-traumatic orthopedic diseases, 19% for acute surgical conditions and 14% for miscellaneous other diseases. Less than 5% of subjects approached for interview refused to participate.

A structured questionnaire was used to obtain information on sociodemographic factors, personal characteristics and lifestyle habits, a problem-oriented medical history and frequency of consumption of 29 indicator foods. An additional question related to "taste for sugar" and to the number of spoonfuls of sugar added to coffee, tea and other hot beverages. Odds ratios (OR) and the corresponding 95% confidence intervals (CI) (Breslow and Day, 1980) were derived from multiple logistic regression models, including terms for sex, age, area of residence, education, daily number of hot beverages and estimated total energy intake.

Table I presents the distribution of gastric cancer cases and controls according to taste for sugar, and the corresponding multivariate ORs. In comparison with subjects adding no sugar to their beverages, the ORs were 1.2 for those adding a total of 1 or 2 spoonfuls daily, 1.4 for those adding 3 or 4 and 2.1 for those adding 5 or more spoonfuls, and the trend in risk was significant. The continuous OR per spoonful was 1.07 (95% CI 1.04–1.11). The association was consistent in strata of sex

and age, and was not explained by identified potential confounding factors, information or selection bias. In particular, no association emerged with intake of coffee and other hot beverages.

Sugar has a rapid digestive rate and therefore causes glycemic overload and corresponding increases in blood insulin and insulin-like growth factor-1 (IGF-1), which is a growth factor and a mutagen of tumor cell growth in vitro (Giovannucci, 1995). Alternatively, refined sugar is a source of empty calories providing no micronutrients and other potentially favorable substances (La Vecchia et al., 1994), and a high intake of refined sugar may simply be an indicator of a poor diet in this Italian population, and possibly of other unfavorable lifestyle indicators. High sugar intake has been related to the risk of cancers of the small intestine (Wu et al., 1997), colorectum (La Vecchia et al., 1993; Bostick et al., 1994; Slattery et al., 1997) and pancreas (Bueno de Mesquita et al., 1990).

Whatever the interpretations and the explanations given, the association observed in our study is of interest for our knowledge of the process of gastric carcinogenesis and, if confirmed, might have relevant preventive implications.

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TABLE I – DISTRIBUTION OF 769 CASES OF GASTRIC CANCER AND 2,081 CONTROLS ACCORDING TO SUGAR ADDED
TO HOT BEVERAGES AND CORRESPONDING ORs AND 95% CIs: MILAN, ITALY, 1985–1997

	Gastric cancer		Controls		OR (95% CI)
	Number	%	Number	%	
Sugar, number of spoonfuls					
0	144	18.7	506	24.3	1[2]
1–2	218	28.3	555	26.7	1.19 (0.92–1.54)
3–4	190	24.7	539	25.9	1.42 (1.05–1.91)
≥5	216	28.1	476	22.9	2.07 (1.47–2.92)
Unknown	1	0.1	5	0.2	—
χ^2 trend					15.94*

[1]Estimates from multiple logistic regression equations, including terms for sex, age, area of residence, education, number of hot beverages and total energy intake.–[2]Reference category.–*$p < 0.001$.

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