

Nutrition Review

Ingrid Glatthaar will be presenting a nutrition review for SA Family Practice at regular intervals. Comments or questions for discussion would be most welcome.



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Carbohydrate snacking

A new clue to the management of some obese patients?

Traditionally, treatment of obesity has always focussed on the restriction of energy intake, based on the belief that obese individuals simply consume more energy than they are able to dispose of. Patients are told to eliminate or restrict the intake of certain foods, and their protests that this leaves them with food cravings are usually ignored. Recent research findings¹ suggest that a subgroup of obese individuals may overeat because of craving for a specific macronutrient, carbohydrate, and that this may be mediated by a complex neurotransmitter (serotonin) feedback mechanism.

This suggestion comes from a pair of distinguished researchers, Richard and Judith Wurtman of the Massachusetts Institute of Technology, renowned for their investigations into the effects of nutrients on the brain and behaviour.^{2,3} Initial experiments on rats in the 1970s yielded the following observations:

- Carbohydrate-rich foods were found to stimulate tryptophan uptake by the brain, resulting in an increase in the synthesis and release of brain serotonin, while a protein-rich meal had no such effect.^{4,5,6}

- Carbohydrate intakes are regulated independently of protein and energy intakes, such that carbohydrate intakes are maintained at a constant proportion of total daily food intake, regardless of the composition of the diet provided.^{7,8}

- A drug which enhances serotonergic neurotransmission, d-1 fenfluramine, causes significant reduction in carbohydrate intake.^{7,8}
- A carbohydrate-rich pre-meal snack causes a significant reduction in carbohydrate intake at meals, compared with a snack of mixed composition.^{7,8}

The studies in feeding behaviour were then extended to a series of human experiments involving normal and obese adults. Initially it was possible to identify individuals with a carbohydrate craving by means of interviews, questionnaires and an 8-day diet record.⁹ Then an ingenious experiment was devised to study 23 institutionalized obese subjects who had free access to a snack vending machine attached to a microcomputer.¹⁰ From these studies it was indeed evident that the subjects investigated had the urge to consume high-carbohydrate between-meal snacks at a time of day which was specific for each individual. A subsequent double-blind trial demonstrated that d-1 fenfluramine

significantly reduced carbohydrate snacking, while a tryptophan supplement did so in 50% of subjects tested (tryptophan stimulates serotonin release).¹⁰

Finally, a third study¹ admitted 20 obese adults (established carbohydrate cravers) to the MIT Clinical Research Centre in order to record meal as well as snack eating patterns, and to test the effects of serotonin stimulation on these patterns. Meals containing a selection of isocaloric high-protein and high carbohydrate foods were served in a cafeteria, and snacks were available from a vending machine at all times between meals. D-1 fenfluramine (15mg) or a placebo was administered twice daily at 07h00 and at 16h00 for an eight day period in a double-blind crossover schedule. Two main findings emerged:

— there was a significant difference between the nutrient content of food choices made at mealtimes and as snacks: while the meals provided almost the same quantities of carbohydrate (120g) and protein (104g) on a daily basis, the snacks were almost entirely of the carbohydrate-rich kind

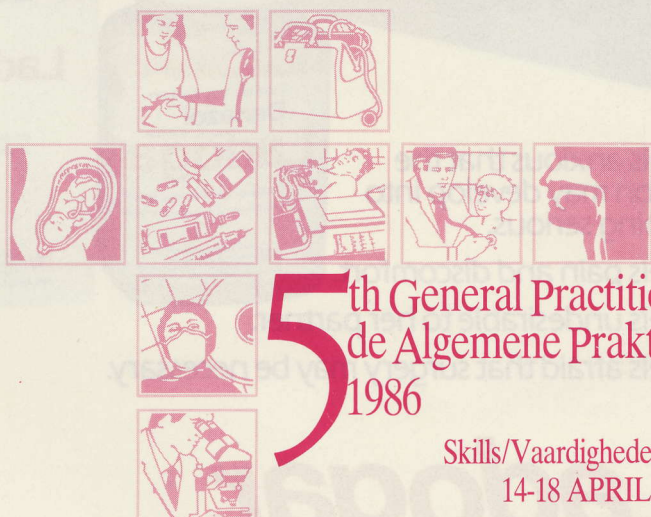
— D-1 fenfluramine had different effects on meal and snack food intakes: overall snack consumption was reduced by 41%, while meal consumption dropped by only 16%. Meal carbohydrate consumption, however, dropped by 23%, while meal protein decreased by only 10%

The authors suggest that carbohydrate craving, and snacking to relieve this, is controlled by a specific mechanism involving a need to stimulate serotonin release. This mechanism probably operates independently from those mechanisms involved with the regulation of nutritional balance. In conclusion, they recommend that practitioners treating obesity should try to identify individuals who are carbohydrate cravers, and then to either make allowances for carbohydrate-rich snacks within the energy limits of a reducing diet, or alternatively to consider the prescription of a serotonin stimulating drug.¹

Before finite recommendations can be made, the practical dietary implications of this research need to be tested on larger groups of appropriate subjects for longer periods, while the underlying mechanisms also require clarification. It appears from the above studies that neither carbohydrate snacking nor the serotoninergic drug in question have any significant effect on total energy intake. Nevertheless, it seems worthwhile to take cognizance of carbohydrate craving in obese subjects, and to find an effective means of counteracting it.

REFERENCES

1. Wurtman JJ. The involvement of brain serotonin in excessive carbohydrate snacking by obese carbohydrate cravers. *J Am Diet Assoc* 1984; 84: 1004-7.
2. Wurtman RJ, Wurtman JJ eds. Nutrition and the Brain. Volume 6. New York: Raven Press, 1984.
3. Wurtman RJ. Behavioural effects of nutrients. *Lancet* 1983; 1: 1145-7.
4. Fernstrom JD, Wurtman RJ. Brain serotonin content: increase following ingestion of carbohydrate diet. *Science* 1971; 174: 1023-5.
5. Fernstrom JD, Wurtman RJ. Brain serotonin content: physiological regulations by plasma neutral amino acids. *Science* 1972; 178: 414-6.
6. Fernstrom JD, Wurtman RJ, Hammarstrom-Wiklund B et al. Diurnal variations in plasma concentrations of tryptophan, tyrosine, and other neutral amino acids: effect of dietary protein intake. *Am J Clin Nutr* 1979; 32: 1912-22.
7. Wurtman JJ, Wurtman RJ. Fenfluramine and other serotoninergic drugs depress food intake and carbohydrate consumption while sparing protein consumption. *Curr Med Res Opin* 1979; 6: 28-31.
8. Wurtman JJ, Wurtman RJ. Drugs that enhance central serotoninergic transmission diminish elective carbohydrate consumption by rats. *Life Sci* 1979; 24: 895-904.
9. Wurtman JJ, Wurtman RJ. Suppression of carbohydrate consumption as snacks and at mealtime by d-1 fenfluramine or tryptophan. In: Garratini S, ed. Anorectic Agents: Mechanisms of Actions and of Tolerance. New York: Raven Press, 1981: 169-182.
10. Wurtman JJ, Wurtman RJ, Growdon JH et al. Carbohydrate craving in obese people: suppression by treatments affecting serotoninergic transmission. *Int J Eating Disorders* 1981; 1: 2-15.



5th General Practitioners' Congress
de Algemene Praktisynskongres
1986

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