CC/NUMBER 10
MARCH 7, 1988

This Week's Citation Classic®

Jenkins D J A, Wolever T M S, Leeds A R, Gassull M A, Haisman P, Dilawari J, Goff D V, Metz G L & Alberti K G M M. Dietary fibres, fibre analogues, and glucose tolerance: importance of viscosity. *Brit. Med. J.* 1:1392-4, 1978.
[Dept. Regius Professor of Med., Radcliffe Infirmary, Oxford; Univ. Lab. Physiol., Oxford; MRC Unit, Dept. Gastroenterol. and Dept. Chemical Pathol., Central Middlesex Hosp., London; and Dept. Pathol. and Human Metab., Southampton General Hosp., England]

The study indicated that in healthy volunteers a wide range of fibers and fiber analogues added to glucose solutions reduced glycemia and insulinemia. The more viscous materials had the greatest effect, and the reductions in glycemia appeared to result from slower absorption rather than malabsorption, as judged by xylose absorption studies. [The *SCI*® indicates that this paper has been cited in over 310 publications.]

David J.A. Jenkins
Department of Nutritional Sciences
Faculty of Medicine
University of Toronto
Toronto, Ontario M5S 1A8
Canada

September 1, 1987

When the paper was written, it did not conform to accepted conventions: No grant application was first awarded on the basis of rigorous selection criteria (in fact, no grant application was ever written), and many authors were involved. The paper suffered many rejections from journals, and reprint requests came only months after its publication in the *British Medical Journal*. Its apparent success is therefore gratifying.

The studies were inspired by Denis Burkitt and Hugh Trowell, whose hypothesis suggested that a lack of dietary fiber related to many diseases, including diabetes, and they relied on observations of Alec Walker and D.G. Campbell in South Africa and Surgeon Captain Cleave of the British Navy. Sir Francis Avery Jones's enthusiasm in the early 1970s then gave rise to a team in his Department of Gastroenterology to investigate the many effects of fiber, an undertaking that was later strongly supported by Professor Richard Doll in Oxford. Avery Jones's department was linked with the Medical Research Council's Gastroenterology Unit, which was benevolently directed and administered by "Tom" Rowlands, who left researchers to their own devices. He shouldered the onerous bureaucracy that provided cash for basic needs, leaving clinical scientists free from writing grants, an epoch that sadly has passed.

The studies linked many centers, including both Oxford and Southampton, where George Alberti had a longstanding interest in fiber. However, within two years of completing the study, much of the group was scattered over four continents: Geoff Metz to Australia, Jang Dilawari to India, and Tom Wolever and I to Canada, for example.

Two main questions emerged in relation to dietary fiber and carbohydrate metabolism: How was postprandial glycemia flattened, and which were the best fibers? From our findings and simultaneous dialysis studies published only recently,[1] we speculated that fiber, by slowing both gastric emptying and small intestinal absorption, reduced postmeal glucose rises and that viscous fiber was most effective.

The relative importance of the two mechanisms is still debated. Impressive work on the process in humans has come from Nick Read's group at the University of Sheffield. They demonstrated the importance of viscosity in *in vitro* studies[2] and of the role of the reduced rate of absorption from the small intestine through perfusing the duodenum with glucose solutions ± guar.[3] They ascribed the action of fiber largely to its ability to impede glucose diffusion in the bulk phase.

Fiber studies are still topical. Fiber may explain part of the large differences in glycemic impact between foods. High-fiber diets may improve diabetic control. Diabetes associations advocate increased fiber intake (especially soluble fiber) since fiber-rich foods may give low glycemic responses.[4,5]

Statements from the National Institutes of Health, however, do not currently endorse therapeutic use of fiber or the treatment potential of differences in glycemic impact between foods.[6] Controversy remains and studies addressing these issues continue to be of interest.

1. **Jenkins D J A, Jenkins M J A, Wolever T M S, Taylor R H & Ghafari H.** Slow release carbohydrate: mechanism of action of viscous fibers. *J. Clin. Nutr. Gastroenterol.* 1:237-41, 1986.
2. **Edwards C A, Blackburn N A, Craigen L, Davison P, Tomlin J, Sugden K, Johnson I T & Read N W.** Viscosity of food gums determined in vitro related to their hypoglycemic actions. *Amer. J. Clin. Nutr.* 46:72-7, 1987.
3. **Blackburn N A, Redfern J S, Jarjis H, Holgate A M, Hanning I, Scarpello J H B, Johnson I T & Read N W.** The mechanism of action of guar gum in improving glucose tolerance in man. *Clin. Sci.* 66:329-36, 1984.
4. **Nutrition Sub-Committee of the British Diabetic Association's Medical Advisory Committee.** Dietary recommendations for diabetics for the 1980s—a policy statement by the British Diabetic Association. *Hum. Nutr.—Appl. Nutr.* 36A:378-94, 1982.
5. **American Diabetes Association.** Nutritional recommendations and principles for individuals with diabetes mellitus: 1986. *Diabetes Care* 10:126-32, 1987.
6. **Consensus Development Panel.** Diet and exercise in noninsulin-dependent diabetes mellitus. *National Institutes of Health Consensus Development Conference Statement* 6:1-7, 1986.

2-8