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The effect of unprocessed wheat bran on blood glucose and plasma immunoreactive insulin levels during oral glucose tolerance test in obese children

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Blood glucose and plasma immunoreactive insulin concentrations were measured during oral glucose tolerance test in 10 obese children. Oral glucose was given by itself or combined with 15 g unprocessed wheat bran. Bran significantly reduced the blood glucose and plasma immunoreactive insulin concentrations at 30 min of the tolerance test. It is concluded that supplementation of obese children's diet with unprocessed bran is advantageous.

The effect of dietary fibre on carbohydrate metabolism has widely been studied in adults. Most studies seem to agree that fibre or at least some types of it (guar, gum, tragacanth, pectin) lower the glucose level during glucose tolerance tests [4, 8] and after meals [3, 9, 10]. The results concerning the glucose-lowering effect of cellulose are, however, contradictory [2, 6, 8] and there is even less agreement on the influence of dietary fibre on plasma insulin levels. Some of the studies showed that lower blood glucose levels were accompanied by lower insulin levels [3, 4, 9] while others denied this [8, 10]. Such investigations have not yet been carried out in obese children. The purpose of the present study was to investigate the blood glucose and plasma insulin concentrations in obese children when unprocessed wheat bran was given at the beginning of a standard oral glucose tolerance test.

Patients and Methods

Oral glucose tolerance test (1.75 g/kg b.w.) was carried out in 10 obese children (4 girls and 6 boys) after 10—12 h fasting. Oral glucose was given by itself or combined with 15 g unprocessed wheat bran (21% cellulose, 26% hemicellulose, 3% pectin, 4% lignin). The most important data and anthropometric parameters of the children are shown in Table I. Capillary blood samples were obtained by fingerprick before and 30, 60, 90, 120 and 180 min after the consumption of wheat bran and/or glucose solution.

Blood glucose was measured with the orthotholuidine method, plasma immunoreactive insulin (IRI) with radioimmunoassay using the charcoal separation technique. Relative body weight and body fat were calculated as described earlier [7]. Normal range of blood glucose and plasma IRI were used as given by Guthrie et al [1]. The statistical significance between the means was evaluated with the paired *t*-test.

Results

Glucose tolerance was normal, mean blood glucose levels fell into the normal range (Fig. 1). Glucose-induced plasma IRI concentrations were above

TABLE I

Anthropometric values (M±SE) of the investigated children

Age, yr	Body weight, kg	Height, cm	Rel. body weight, percent	Body fat percent
12.04 ±0.61	63.39 ±3.46	151.2 ±3.31	148.4 ±5.04	38.59 ±1.92

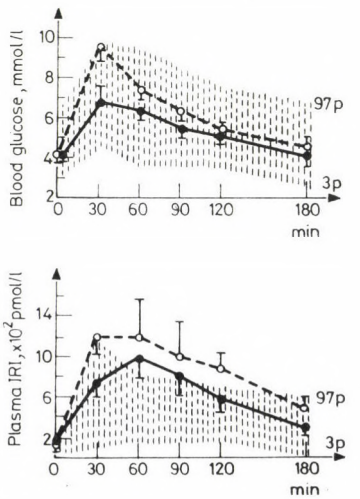

FIG. 1. Blood glucose and plasma immunoreactive insulin (IRI) concentrations in 10 obese children during oral glucose tolerance test with ——— and without – – – added bran. Vertical bars represent standard errors. An asterisk shows where the difference between the means is significant ($p < 0.02$). The range between the 3rd and 97th percentile of the distribution of normal values [1] is shown by the shaded area

the 97th percentile of the distribution of normal values. Unprocessed wheat bran significantly reduced blood glucose levels and plasma IRI concentration at 30 min, but all blood glucose and plasma IRI values tended to be lower when bran was consumed with glucose.

DISCUSSION

Wheat bran caused a moderate but significant decrease in blood glucose and plasma IRI concentration in the early phase of glucose tolerance test. Similar results were obtained in adults by Jenkins et al [4]. Bran possibly reduces or delays the absorption of glucose and this leads to a secondary decrease in IRI concentration. By reducing carbohydrate absorption wheat bran may help weight reduction. Hyperinsulinaemia is not a primary cause of obesity although it may play a role in the development of severe obesity [5]. Hypertriglyceridaemia, which is a frequent finding in childhood obesity [7], has also a bearing on hyperinsulinaemia.

Considering the above-mentioned facts the blood glucose and plasma IRI lowering effects of wheat bran seem to be advantageous in childhood obesity. In addition, volume for volume, fibre-rich foods provide less available energy than fibre-depleted foods. The increased bulk and low calorie density may be advantageous in reducing energy intake by displacing foods of high caloric density from the diet. However, before recommending the use of bran in the treatment of overweight children, the long-term effects of high fibre diet on carbohydrate and lipid metabolism have to be investigated.

References

1. Guthrie RA, Guthrie DW, Murthy DYN, Jackson RL, Lang J.: Standardization of oral glucose tolerance test and the criteria for diagnosis of chemical diabetes in children. Metabolism 22: 275, 1973
2. Jefferys DB: The effect of dietary fiber on the response to orally administered glucose. Proc Nutr Soc 33: 11A, 1974
3. Jenkins DJA, Leeds AR, Gassull MA, Cochet B, Alberti KGMM: Decrease in postprandial insulin and glucose concentrations by guar and pectin. Ann Intern Med 86: 20, 1977
4. Jenkis DJA, Wolever TMS, Leeds AR, Gassull MA, Haisman P, Dilawari J, Goff DV, Metz GL, Alberti KGMM: Dietary fibres, fibre analogues, and glucose tolerance: Importance of viscosity. Br Med J 1: 1392, 1978
5. Margules DL: Obesity and the development of the diffuse neuroendocrine system. Int J Obesity 4: 296, 1980
6. Miranda PA, Horwitz DL: High-fiber diets in the treatment of diabetes mellitus. Ann Intern Med 88: 482, 1978
7. Molnár D, Kardos M, Soltész Gy, Klujber L, Schmelczer M: Fasting biochemical parameters and their relationship to anthropometric measurements in childhood obesity Acta Paediatr Acad Sci Hung 22: 313, 1981
8. Monnier L, Pham TC, Aguirre L, Orsetti A, Mirouze J: Influence of indigestible fibres on glucose tolerance. Diabetes Care 1: 83, 1978
9. Potter JG, Coffman KP, Reid RL, Krall JM, Albrink MJ: Effect of test meals of varying dietary fiber content on plasma insulin and glucose response. Am J Clin Nutr 34: 328, 1981
10. Ray TK, Mansell KM, Knight LC, Malmund LS, Owen OE, Boden G: Long-term effects of dietary fiber on glucose tolerance and gastric emptying in noninsulin-dependent diabetic patients. Am J Clin Nutr 37: 376, 1983

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