

ulcerated mucosa. This is likely because antibodies to a wide range of foreign proteins are detectable in the serum of these patients. Possibly this inflammatory immune response to exogenous protein perpetuates chronic inflammation of areas in which the mucosa is breached by acute insults which would otherwise resolve spontaneously.

Elemental dietary treatment of acute exacerbations of Crohn's disease offers a therapeutically effective non-toxic alternative to conventional surgery and drugs. It merits serious consideration as the treatment of choice of acute Crohn's disease.

We thank Norwich Eaton Laboratories, the Wellcome Trust, and the Medical Research Council for financial support. We are grateful to Miss P Hulme, department of dietetics, for continuing help and advice; to Mr Charles Rossiter, of the division of computing and statistics, for statistical advice; and to Mrs M Moriarty for secretarial help.

References

- Ó'Moráin C, Segal AW, Levi AJ. Elemental diets in the treatment of acute Crohn's disease. *Br Med J* 1980;281:1173-5.
- Harvey RF, Bradshaw JM. A simple index of Crohn's disease activity. *Lancet* 1980;i:514.
- Summers RW, Switz DM, Sessions JT, et al. National cooperative Crohn's disease study. Results of drug treatment. *Gastroenterology* 1979;77:827-8.
- Van Hees PAM, Van Elteren PH, Van Lier HJJ, Van Jongeren JHM. Effect of sulphasalazine in patients with active Crohn's disease. A controlled double blind trial. In: Pena AS, Weterman IT, Booth CC, Strober W, eds. *Recent advances in Crohn's disease*. The Hague: Martinus Nijhoff, 1981:474-5.
- Best WR, Beckel JM, Singleton JW, Kern F. Development of a Crohn's disease activity index. *Gastroenterology* 1976;70:785-7.
- Burnham WR, Lennard Jones JE, Hecketsweiler P, Colin R, Geoffrey V. Oral BCG vaccine in Crohn's disease. *Gut* 1979;20:229-33.
- O'Donoghue DP, Dawson AM, Powell-Tuck J, et al. Azathioprine as a maintenance treatment for Crohn's disease. *Lancet* 1978;ii:955-7.
- Van Hees PAM, Van Elteren PH, Van Lier HJJ, Van Jongeren JHM. An index of inflammatory activity in patients with Crohn's disease. *Gut* 1980;21:279-86.
- André C, Descos L, Landais P, Fermanian J. Assessment of appropriate laboratory measurements to supplement the Crohn's disease activity index. *Gut* 1981;27:571-4.
- Fromm H, Gebel M, Schroeter U, Canzler H, Schmidt FW. Zur Behandlung des Morbus Crohn im akuten Stadium. *Dtsch Med Wochenschr* 1978;103:377-80.
- Segal AW, Levi AJ, Loewi G. Levamisole in the treatment of Crohn's disease. *Lancet* 1977;ii:382-4.
- Stephens RV, Randall HT. Use of a concentrated balanced liquid elemental diet for nutritional management of catabolic states. *Ann Surg* 1969;170:642-67.
- Voitk AJ, Echave V, Feller JH, Brown RA, Gurd FW. Experience with an elemental diet in the treatment of inflammatory bowel disease. Is this primary therapy? *Arch Surg* 1973;107:329-33.
- Rocchio MA, Char CJM, Randall HT. Use of a chemically defined diet in the management of patients with acute inflammatory bowel disease. *Am J Surg* 1974;124:469-75.
- Logan RF, Gillon J, Ferrington C, Ferguson A. Elemental diet reduces gastrointestinal protein loss in small bowel Crohn's disease. *Gut* 1981;22:383-7.
- Axelsson CK, Jarnum S. Assessment of the therapeutic value of an elemental diet in chronic inflammatory bowel disease. *Scand J Gastroenterol* 1977;12:89-95.
- Winitz M, Adams RF, Seedman DA, Davis PN, Jonko PN, Hamilton JA. Studies in metabolic nutrition employing chemically defined diets. ii. Effects on gut microflora population. *Am J Clin Nutr* 1970;23:546-59.
- Attebury HR, Sutter VL, Finegold SM. Effect of a partially chemically defined diet on human fecal flora. *Am J Clin Nutr* 1971;23:546-9.
- Koumans RKJ. Rvintervaartdieet en darmchirurgie. *Ned Tijdschr Geneeskde* 1972;116:1040-6.
- Crowther JS, Drasar BS, Goddard P, Hill MJ, Johnson K. The effect of chemically defined diet on the faecal flora and faecal steroid concentration. *Gut* 1973;14:790-3.
- Boumous G, Devroede GJ. Effects of an elemental diet on human fecal flora. *Gastroenterology* 1974;66:210-4.
- Ó'Moráin C. Studies on the pathogenesis and treatment of Crohn's disease. National University of Ireland, 1982. (MD thesis.)

(Accepted 29 March 1984)

Body content of selenium in coeliac disease

LESLEY J HINKS, KAREN D INWARDS, BARBARA LLOYD, BARBARA E CLAYTON

Abstract

Concentrations of selenium in whole blood, plasma, and leucocytes were determined in 16 patients with coeliac disease confirmed by biopsy and 32 controls. All the patients were clinically well and receiving gluten free diets. The concentrations of selenium were significantly lower in the leucocytes, blood, and plasma of patients compared with controls, probably indicating a decrease in the body content of selenium.

A high incidence of malignancy in coeliac disease has been reported. As a protective role for selenium against

cancer has been postulated, the importance of this unexpected observation of lowered tissue concentrations of selenium requires further investigation.

Introduction

A low body content of selenium has been suggested in association with several chronic diseases in man. Studies with selenium-75 have indicated that the duodenum is the main site for absorption of selenium. In untreated coeliac disease the mucosa of the small intestine is abnormal, the duodenum and jejunum being most severely affected. The purpose of this study was to assess the body content of selenium in a group of patients with coeliac disease by determining concentrations in leucocytes, plasma, and whole blood.

Subjects and methods

We studied 16 patients aged 23-71 (mean 50.6) years who all had coeliac disease. The mean duration of the disease from diagnosis was 7.7 (range 2-19) years. All the patients were clinically well and receiving gluten free diets.

Leucocytes were separated with a dextran sedimentation technique.¹

University Department of Chemical Pathology and Human Metabolism, Faculty of Medicine, University of Southampton, Southampton General Hospital, Southampton SO9 4XY

LESLEY J HINKS, FIMLS, senior medical laboratory scientific officer
KAREN D INWARDS, fourth year medical student
BARBARA LLOYD, FIMLS, senior chief medical laboratory scientific officer
BARBARA E CLAYTON, FRCP, FRCPATH, professor of chemical pathology and human metabolism

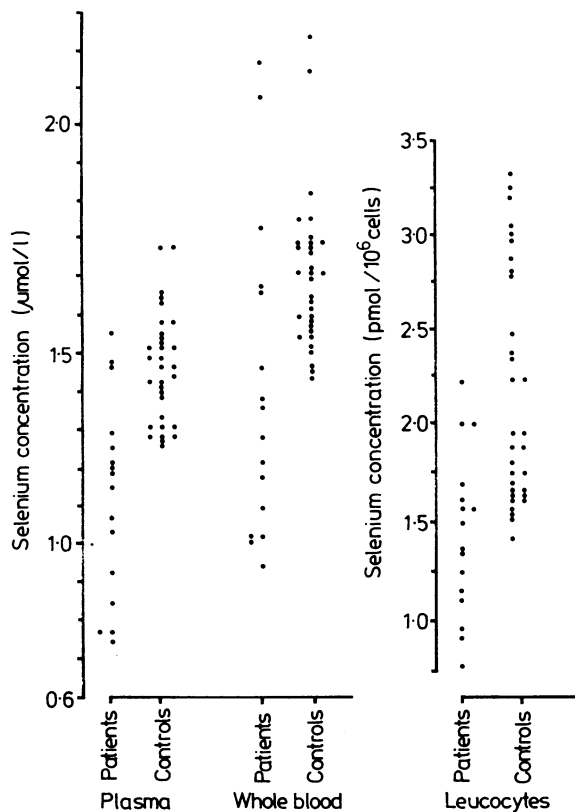
Correspondence to: Miss L J Hinks.

Cells were then digested with nitric acid. The white cells, plasma, and whole blood were analysed for selenium concentrations, using hydride generation and atomic absorption spectrophotometry.

Each patient was matched for age and sex with two healthy control subjects whose body content of selenium had been measured previously. The age range of these controls was 21-74 (mean 49.5) years. The findings from the two groups were compared with a paired *t* test. Regression analysis was done with a Commodore Pet computer (2060 series).

Results

The figure shows a scattergram of selenium concentrations in the patients with coeliac disease and the controls. Concentrations of selenium were significantly lower in the plasma ($p < 0.001$), leucocytes ($p < 0.001$), and whole blood ($p < 0.01$) of the patients with coeliac disease compared with the controls. There was also a significant



Scattergram of selenium concentrations in whole blood, plasma, and leucocytes in patients and controls.

Conversion: SI to traditional units—Selenium: 1 $\mu\text{mol/l} \approx 7.9 \mu\text{g}/100 \text{ ml}$.

correlation between selenium concentrations in plasma and leucocytes ($p < 0.001$, $r = 0.75$) and selenium concentrations in whole blood and leucocytes ($p < 0.001$, $r = 0.76$).

Discussion

The concentrations of selenium in the leucocytes as well as in the whole blood and plasma were significantly lower in patients than controls, probably indicating a decrease in the body content of selenium. Selenium is a component of glutathione peroxidase, an enzyme responsible for preventing the accumulation of free radicals and lipid peroxides, which have the potential to damage cell membranes. Reduced concentrations of selenium in the blood have been reported in patients with various malignancies, in particular gastrointestinal cancers.² An increased incidence of carcinoma of the oesophagus, jejunum, other parts of the gastrointestinal tract, and, indeed, other parts of the body have been reported in coeliac disease.³ Although most patients show an appreciable improvement when taking a gluten free diet, there is no convincing evidence that the treatment is effective in preventing malignant complications.⁴ A low intake of selenium may increase the risk of malignancy, and some experimental studies in animals and epidemiological studies in man support this.

Reduced concentrations of selenium in whole blood, plasma, and leucocytes might develop in several ways. Firstly, the gluten free diet might contain a reduced amount of selenium compared with a normal diet, and, secondly, there might be malabsorption of selenium even when the patient is clinically well. Coeliac disease is probably due to an immunological reaction directed against gluten or one of its components.⁵ Perhaps the traces of gluten that are present in most of the diets are sufficient to damage the mechanism for the absorption of selenium. The importance of our findings are being studied further.

We are grateful to the physicians who allowed us to investigate their patients. We thank Mr D Machin for his statistical advice and Miss L Snow for typing the manuscript.

References

- Hinks LJ, Colmsee M, Delves HT. Determination of zinc and copper in isolated leucocytes. *Analyst* 1982;107:927-33.
- Willett WC, Polk BF, Morris JS, et al. Prediagnostic serum selenium and risk of cancer. *Lancet* 1983;i:130-4.
- Collins SM, Hamilton JD, Lewis TD, Luafer I. Small-bowel malabsorption and gastrointestinal malignancy. *Radiology* 1978;126:603-9.
- Homes GKT, Stokes PL, Sorahan TM, Prior P, Waterhouse JAH, Cooke WT. Coeliac disease, gluten-free diet, and malignancy. *Gut* 1976;17:612-9.
- Marsh MN. Immunocytes, enterocytes and the lamina propria: an immunopathological framework of coeliac disease. *J R Coll Physicians Lond* 1983;17:205-12.

(Accepted 5 March 1984)

ONE HUNDRED YEARS AGO Having been acquitted of the charge of indecent cremation of the body of his dead infant, Mr. Price accomplished his object on March 14th. He fixed three hurdles on a hill, then piled half a ton of coal within the triangle thus formed, and upon a pair of large iron grates he placed a box containing the body of the child, wrapped in napkins. Petroleum was thrown over the coals, and this served to make the pile a mass of fire as soon as ignition took place. Mr. Price was present during the process, and chanted an ancient sacred song in the presence of a number of spectators. All the materials used in the cremation of his son were half a ton of coals, a gallon of paraffin oil, and sixpenny-worth of wood, the total cost being only 8s. 2d. Every vestige of the infant's body was burnt, and the breeze carried away the ashes. The fire was so fierce that it melted the iron of the grate on which the body was deposited. He now announces his intention of erecting a crematorium at Llantrissant, where he desires

that he himself and all his family shall be cremated. Persons who intend that their corpses should be consumed on the funereal pyre, or whose executors wish the remains to be so disposed of, will be accorded the requisite facilities. It appears that Mr. Price has received a large number of letters of approval from London, the continent of Europe, and India. Although many will disagree with the Welsh surgeon in matters of detail, he deserves a considerable amount of sympathy for having carried out what he believed to be the right way of disposing of his child's remains in the face of strong social prejudices. The advocates of cremation will do well to bear in mind that all the judges on the English bench may not agree with Mr. Justice Stephen's decision in favour of the practice; and further legal opinion on the subject will be advisable if many persons desire to carry out cremation as an established practice, and therefore on a large scale. (*British Medical Journal* 1884; i:624.)