EFFECT OF A GLUTEN-FREE DIET IN IDIOPATHIC STEATORRHOEA

BY

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It is now well established that some children with defective fat absorption are affected unfavourably by the inclusion of wheat gluten in the diet. It seems, indeed, that there is in such cases an inherent abnormality in the gastro-intestinal tract which may not be sufficient in itself to disturb the assimilation of fat, and that the steatorrhoea may be gluten-induced.

The incidence of the "gluten-induced" type of steatorrhoea among young coeliacs is high. Ross *et al.* (1955) report that 28 out of 30 with the coeliac syndrome responded to a gluten-free diet. Since the condition is a chronic relapsing disorder which even in its less overt forms is capable of having a very adverse influence on growth and development (Gerrard *et al.*, 1955; Lindsay *et al.*, 1956), assessment of the value, and limitations, of the treatment is of obvious practical importance. It may also help to throw some light on the alimentary defect which exists in these patients.

The purpose of the present report is to describe the remarkable benefit achieved by a gluten-free diet in two adolescents with established steatorrhoea and in one woman of 40 in whom the diagnosis had been made eight years previously, but in whom the disease may have been present for a much longer time.

Case 1

A girl aged 13 had been a known coeliac for eight years when she was admitted to the medical unit with obvious malnutrition, a megaloblastic anaemia, gastric achlorhydria (histamine-responsive), and defective fat absorption (77% absorption over a 10-day period). The radiological appearances of the small intestine were typical of steatorrhoea and there was defective absorption of glucose given by mouth. Serum vitamin B₁₂ levels were normal (370 µg./ml.), but a folic acid excretion test indicated marked deficiency: plasma folic acid=0.24 µg./litre (1 mg. of folic acid given by mouth); plasma folic acid=0.88 µg./litre one hour later; five-hour urine folic acid=6.7 µg.

A gluten-free diet was begun on June 29, 1953; no other treatment was given. Under these conditions there was a reversion of erythropoiesis from the megaloblastic to the normoblastic type, but the blood picture remained unaltered (R.B.C., 3,870,000 per c.mm.; Hb, 65%) one month later. Folic acid (20 mg. a day) was given from July 30 to August 10 (in addition to the diet). No haematological improvement resulted. A further folic acid excretion test showed that the deficiency had been made good. In view of the presence of a dimorphic blood picture suggesting a defect in haemoglobinization, oral iron therapy was given from August 10 to September 1. It was without benefit, and iron-absorption tests indicated that this was due to defective absorption. Intravenous iron (900 mg.) was given from September 5. It was followed by a rise in blood values (to 4,900,000 per c.mm. and 80%) in 10 days.

The gluten-free diet was continued for 15 months, until September, 1954. The patient remained in excellent health and showed a weight increase of 26 lb. (11.8 kg.). The gluten-free diet was discontinued in September. In January, 1955, the general condition was normal; there were no symptoms, and there was no anaemia.

After about 15 months (January–February, 1956) on normal diet she developed pallor and languor, and was reinvestigated in the metabolic department of Professor A. C. Frazer in Birmingham, where she had taken up residence in the meantime. Relapse was shown to have occurred and she had again to be put on the gluten-free diet.

Case 2

A girl aged 15 had a history of intermittent diarrhoea, undue pallor, failure to thrive, and variable abdominal distension for about 10 years when she was admitted to the medical unit. At this time she was obviously underdeveloped—no secondary sex characteristics, height 4ft. 8 in. (142 cm.), weight 4 st. 10 lb. (30 kg.)—with obvious steatorrhoea confirmed by test (83% absorption of fat over a four-day period) and defective oral glucose absorption. The radiological appearances of the small bowel were suggestive of steatorrhoea and there was evidence of coeliac rickets. The blood picture was normal.

A gluten-free diet was begun on October 2, 1952; no other treatment was given. In six weeks lassitude had disappeared and weight increased by 25 lb. (11.3 kg.). The stools were normal in appearance. The patient was discharged from hospital to continue on the diet.

In April, 1953, her general health was excellent. Fat absorption was normal (96% and 97% in two separate test periods each of four days), but oral glucose absorption was still impaired. There was no anaemia. Radiological investigation of small-bowel function now revealed nothing abnormal.

In December, 1954, improvement was maintained. Her height had increased by 9 in. (23 cm.), weight by 5 st. (31.8 kg.). Normal puberty changes were present. There was no anaemia. The gluten-free diet was discontinued.

In October, 1955, her general health was excellent, her weight was still increasing, and she was asymptomatic. There was now no evidence of defective bone metabolism radiologically.

In April, 1956, though asymptomatic, she was found to have a hypochromic anaemia (Hb, 65%). She was readmitted for assessment and found to have relapsed (fat absorption 80%). She was given oral iron therapy and put again on the gluten-free diet.

Case 3

A married woman was found to have idiopathic steatorrhoea in 1947, when she was 32. At that time she had a megaloblastic anaemia associated with free hydrochloric acid in the gastric juice, pelvic deformity of typical osteomalacic type and some general skeletal decalcification, defective fat absorption (82% and 84% absorption on two separate four-day test periods), and an oral glucose-tolerance test of the "flat" variety. The anaemia responded at first to an oral liver preparation and later to folic acid.

She failed to attend for supervision following her discharge from hospital, and in 1952 was admitted to a hospital nearer her home, when she was found to be pregnant and severely anaemic. She was maintained fairly well thereafter on folic acid and iron therapy until 1954, when she began to suffer from malaise and lack of energy; and the occasional diffuse pains in the back and limbs from which she had suffered during the previous seven years became incapacitating. She was admitted to the medical unit for further investigation on February 6, 1955.

The salient features on examination were slight finger-clubbing and slight kyphotic deformity of the spine. Walking was almost impossible on account of pain in the legs, hips, and lumbar region.

Blood examination revealed a mild hypochromic anaemia (R.B.C., 4,000,000 per c.mm.; Hb, 68%), and bone-marrow examination showed that erythropoiesis was normoblastic. On radiological examination general skeletal decalcification was present and there was typical osteomalacic deformity of

the pelvis. The serum calcium was 4.6–4.8 mEq/l.; inorganic phosphorus, 3.2 mg./100 ml.; alkaline phosphatase, 3.3 Bodansky units.

A gluten-free diet was given from February 22. A course of parenteral iron therapy was also given for the anaemia, the response being satisfactory. She was discharged to attend as an out-patient on March 1. From this date onwards she felt much improved and the skeletal discomfort, which had previously been incapacitating, showed a very steady improvement. Her weight, which had been 5 st. 2 lb. (32.7 kg.) in February, 1955, rose by 10½ lb. (4.8 kg.) in the next three months, and when last seen on October 5, 1955, she had put on a total of 16 lb. (7.3 kg.); she felt very well and had been quite free of pain for over five months. Bowel function appeared normal and the stools were well formed and normal in colour. She was still adhering to her diet. X-ray examination of the skeleton on October 5 revealed that there was no evidence of decalcification in the pelvis or long bones. The serum calcium level was the highest so far recorded in her case—namely, 5.7 mEq/l.

Discussion

Case 1 is remarkable in that a proved folic acid deficiency which had been manifested clinically as megaloblastic erythropoiesis was rectified by withdrawal of gluten from the diet. The dimorphic anaemia was due not only to this avitaminosis but also to iron deficiency, which was almost certainly due to defective absorption. It is clear also that the dietary regime was ineffective in increasing iron absorption to a useful degree even in the presence of increased iron intake.

The second patient was not anaemic; the major manifestation of disordered metabolism was arrested development. The response to dietary treatment was an increase in height by 9 in. (23 cm.), and in weight by 5 st. (31.8 kg.) in 19 months. Glucose tolerance was unchanged by the treatment, but fat absorption returned to normal and the flocculation pattern previously present on intestinal radiological examination disappeared.

In Case 3 the major manifestation of alimentary defect was found in the skeleton, and the evidence indicated that this was of a progressive nature and on the point of immobilizing the patient completely. On several occasions in the previous eight years she had received supplements of calcium (as lactate and chloride) and vitamin D without benefit. After the starting of the gluten-free diet there was progressive symptomatic benefit. Not only did her general health improve, as evidenced by her feeling of well-being and her increase in weight, but her bone pain disappeared entirely; she was able to resume normal activities; and finally, 10 months later, radiological examination indicated that there was then no evidence of defective calcification in the skeleton.

The response to withdrawal of gluten from diet has been employed as a basis for the classification of cases of defective fat absorption (Frazer, 1955). The "gluten-induced" type can now be separated from the others. The main benefit is the very practical one of treatment, but the basic significance of the gluten effect is not understood. Furthermore, the limitations of the aetiological entity which includes gluten-induced steatorrhoea are uncertain. Presumably there is an inherent defect which does not directly affect fat absorption. It may nevertheless be associated with defective glucose absorption (Cases 1 and 2, above; Ross *et al.*, 1955) and also perhaps with iron absorption. The evidence on the latter is, however, incomplete. Badenoch and Callender (1954) have demonstrated that in the untreated case absorption of iron from the intestine is reduced; and in Case 2 there was evidence of defective absorption even when the patient had been on a gluten-free diet for three months. Ross *et al.* (1955) found that the diet alone was insufficient to correct hypochromic anaemia in coeliacs, but thought that this might be due to deficient body stores.

It is difficult to assess instances of folic acid deficiency in idiopathic steatorrhoea, but it is probably high (Girdwood, 1956); in Case 1 the deficiency was decidedly improved by excluding gluten from the diet. Whether it is induced or merely aggravated by the gluten is uncertain.

Of more immediate and practical importance is the demonstration once again of the great value of the exclusion of gluten from the diet in cases of idiopathic steatorrhoea. It should be tried in all cases irrespective of age and of the nature or duration of symptoms.

Finally, it is in accordance with the observations of others (Frazer, 1955) that relapse ultimately occurred on resumption of a normal diet, even after two years' restriction of gluten. Whether the restriction will require to be permanently imposed has not yet been demonstrated, but it seems very probable that it will be so.

Summary

The beneficial effects of the exclusion of gluten from the diet in three patients with idiopathic steatorrhoea are reported. Two of the patients were adolescents in whom the defect had existed since early childhood. The third was an adult in whom the disorder had probably existed for many years. The major disturbances in these patients were folic acid deficiency and iron deficiency (one); severe retardation of general development and puberty changes, and coeliac rickets (one); and skeletal decalcification (one—adult).

The exclusion of gluten from the diet was sufficient to correct the defect in fat absorption and also the other disturbances, with the exception of the iron deficiency, which was shown to be due to non-"gluten-induced" iron-absorption defect. The two adolescents showed "flat" oral glucose-tolerance curves which were not influenced by the exclusion of gluten.

The dietary regime in Cases 1 and 2 was imposed for 15 and 24 months respectively. In both cases features attributable to relapse appeared 15 months after a normal diet was resumed, and at this stage defective absorption of fat was shown again to be present.

The significance of these findings is briefly discussed.

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REFERENCES

- Badenoch, J., and Callender, S. T. (1954). *Blood*, 9, 123.
- Frazer, A. C. (1955). *British Medical Journal*, 2, 805.
- Gerrard, J. W., Ross, C. A. C., Astley, R., French, J. M., and Smellie, J. M. (1955). *Quart. J. Med.*, 24, 23.
- Girdwood, R. H. (1956). *Ibid.*, 25, 87.
- Lindsay, M. K. M., Nordin, B. E. C., and Norman, A. P. (1956). *British Medical Journal*, 1, 14.
- Ross, C. A. C., Frazer, A. C., French, J. M., Gerard, J. W., Sammons, H. G., and Smellie, J. M. (1955). *Lancet*, 1, 1087.

The World Health Organization has issued a report entitled "Role of Hospitals in Programmes of Community Health Protection." This is the first report of the Expert Committee on Organization of Medical Care, and appears as No. 122 in the Technical Report Series. The report considers the role of a general hospital, and its relationship to the community it serves; the functions of a hospital both towards cure and prevention of disease; and the use of a hospital as a teaching and research unit. The geographical position of hospitals, together with their administration and organization are also discussed. The report is available, price 1s. 9d. net, from Her Majesty's Stationery Office, P.O. Box 569, London, S.E.1.