Gluten-Free Diet

	Foods Allowed	Foods Forbidden
Bread	Gluten-free bread Gluten-free crisp bread	All other types of bread and crisp bread
Flour	Gluten-free flour, soya flour, potato flour, pea flour, rice flour, soya bran, rice bran	Wheat flour Rye flour Barley flour Wheat bran
Pasta	Gluten-free pasta	Ordinary pasta, e.g., ravioli, spaghetti, noodles, macaroni
Biscuits & Cakes	Gluten-free biscuits & cakes (made with gluten-free baking powder)	Ordinary cakes & biscuits
Breakfast cereals	Cornflakes Rice Krispies	Other breakfast cereals porridge oats
Other cereals	Rice, tapioca, sago, arrowroot, buckwheat, millet, maize	Barley, oatmeal, semolina
Meat	Fresh or frozen meat, including poultry, game, liver, sweetbreads, tripe, kidneys	Meat pies, meat cooked with flour, beef burgers, most sausages
Fish	Plain fresh fish, plain frozen fish, fish canned in plain oil	Fish with breadcrumbs or batter, fishcakes, fish in sauce
Eggs & Cheese	Eggs Plain cheese, cottage cheese, cream cheese, curd cheese	
Milk	Fresh, canned, dried or sterilized	
Cream & Fats	Fresh and canned cream, butter, oil, margarine, dripping, lard	
Soups & Sauces	Home-made soups and sauces (made with gluten-free thickening)	
Vegetables	Fresh or frozen, canned (in salt and water), plain dried	Potato croquettes

	Foods Allowed	Foods Forbidden
Fruits & Nuts	Canned fruit in syrup or natural juice, fresh or frozen fruits, nuts	Fruit pies
Beverages	Tea & coffee, fruit juice, fruit squash, "fizzy drinks"	Horlicks, Ovaltine, barley water
Miscellaneous	Sugar, glucose, boiled sweets, syrup, honey, jam, jelly, marmalade, molasses, treacle and gelatin	Sweets & chocolate containing "biscuits", e.g., Kit Kat, ice cream gateaux, ice cream wafers & corn
	Pure pepper and salt, pure mustard, and vinegar, pure herbs & spices, monosodium glutamate	Bisto, Oxo cubes
Alcohol	Wine, beers, spirits, liqueurs	Use care with real ales, home-brewed beers

How Strict a Gluten-Free Diet?

Compliance with a strict, 100 percent gluten-free diet is seldom possible, since even a gluten-free diet contains small amounts of gluten. Nevertheless, there is a feeling among physicians who treat celiac disease that their patients often cheat on their diets and eat items of gluten, having discovered that these have no immediate harmful side effects. Patient and physicians enact a well-worn script within the confines of the clinic whereby patients pretend to be sticking to a strict gluten-free diet although knowing that the doctor is well aware that they are not telling the truth.

In a recent survey conducted at our hospital of 102 teenage patients who had been told to adhere to a strict gluten-free diet, we found that approximately 50 percent were in fact eating gluten, and 9 percent, once their parents were out of the consulting room, admitted to eating a normal diet. Most of these patients were keeping to a strict gluten-free diet at home, but when out for lunch during school hours were visiting the local hamburger bars. Teenage patients often find it difficult to comply with the diet because of their life style. They also feel shy in admitting to their friends that they are on a special diet; boys in particular feel that they are the "odd one out".

Interestingly, we conducted a similar study in about 100 adults using a visual analogue scale for assessment of the strictness of their diet, and found very similar results. Most patients had previously experimented to discover whether small amounts of gluten upset them, and had gone on to eat more gluten. In view of this we have recently been giving patients a low-gluten diet prospectively, and have carefully followed their progress both clinically and by the use of biochemical and hematologic parameters as well as jejunal biopsies. For this research project our dietitian has listed items of food containing 2.5g of gluten, and patients can choose one item per day, rather like exchangeable portions in a

diabetic diet. Some patients have proved to be intolerant of this small amount of gluten, but most of our patients on 2.5g of gluten per day can lead normal healthy lives without the constraints of a very strict diet. We hope that in the future patients may be allowed items with a low gluten content, such as gravies or pie crusts, while avoiding items of high gluten content, such as bread. Although there is no doubt that a strict gluten-free is the optimal treatment for these patients, the actual amount of gluten that these patients can tolerate has never really been assessed. Whether a gluten-free diet protects against malignancy is discussed later. I always explain to each patient that malignancy may be a risk, but that in our present state of knowledge there is little evidence that small amounts of gluten are harmful.

Follow-up

The continued follow-up of patients is important. After the initial diagnosis I usually see patients after 3 or 4 weeks to assess clinical problems and dietary compliance. Children are assessed on their weight and height percentile charts, and adults on their weight gain. Continuing assessment with blood tests to measure serum and red cell folate levels and serum alkaline phosphatase and albumin levels is made. Once the gluten-free diet is begun, a jejunal biopsy is usually performed at about 3 months, and then repeated either after 1 year or earlier if there are problems or if the biopsy has not "grown". The jejunal mucosa usually shows an increase in villus and enterocyte height, a decrease in intraepithelial lymphocyte count, and a decrease of inflammatory cells in the lamina propria. Once patients are clinically well and the jejunal mucosa has reverted toward a more normal pattern, I usually see them about once a year.

All patients diagnosed in childhood, and especially those under the age of 7 years, should have a gluten challenge to confirm the diagnosis. This is because a transient gluten intolerance can occur, for example, after gastroenteritis. A challenge can be performed in many ways, but the easiest for the patient is to undergo an initial jejunal biopsy before starting on a normal diet containing at least four slices of ordinary bread per day. A repeat biopsy can then be performed either when symptoms develop or at 3 months. In children and teenaged patients, abnormalities of the mucosa on gluten reintroduction often take a long time to appear. Originally it was suggested that these patients should be followed up for 4 years before the diagnosis is discounted, but recent evidence suggests that they may maintain a normal jejunal mucosa for up to 9 years before abnormalities return. In adults a gluten challenge is less necessary unless there has been an atypical presentation or unless the diagnosis has not been differentiated from tropical sprue or Giardiasis. Again, it can take the same form as that followed for children. A gluten challenge can also be performed by means of intubation studies in which different fractions of gluten are instilled directly into the duodenum; however, this requires a lot of the doctor's time and also involves measurements of finer parameters of mucosal damage produced by gluten.

Prognosis

The prognosis is excellent and most patients lead normal lives on a gluten-free diet. Even in patients who do not adhere to a very strict diet, very few abnormalities in hemotologic or biochemical parameters are found. Many years ago it was suggested that

children “grew out of their disease” after puberty, but this is not the case. All patients who have been correctly diagnosed have life-long celiac disease.

If the diagnosis is not made until after puberty, patients may give a history of delayed menarche, and a few may be short in stature. The rare patient with infertility may well become pregnant soon after the diet is started. Severely ill patients my have hepatic and neurologic abnormalities. The hepatic abnormality usually takes the form of a raised serum alkaline phosphatase level; this is common in grossly malnourished patients and improves on treatment. A liver biopsy may well show a fatty change. Neurologic abnormalities have also been described in extremely ill patients, and these include peripheral neuropathies, epileptiform attacks, paresthesia, Wernicke’s encephalopathy, and a central pontine demyelination that has been described in association with malabsorption. Once these abnormalities become established, they do not improve with gluten restriction.

Unresponsive Malabsorption Syndromes

These syndromes constitute a heterogeneous group of conditions having in common a flattened intestinal mucosa. On treatment with a gluten-free diet however, these patients fail to respond either clinically or histologically. The unresponsiveness has three main causes. First, and most common is noncompliance with a strict gluten-free diet; these patients often improve after the diet has been rechecked by a dietitian. Second, the original diagnosis may have been incorrect and here the histology and x-ray studies should be reviewed and the case carefully reevaluated. Third, a group of patients are “true non-responders”; for these the management is difficult and the prognosis often poor. The incidence of unresponsive patients has been reported as between 1- and 20 percent of all patients with a flattened mucosa. These figures are high because the reports of many tertiary referral centers are included. However, in our hands the incidence of true unresponsiveness is much nearer 2 percent.

Having initially excluded compliance as a cause of nonresponsiveness, it is important to rule out other causes of flattened mucosal lesion, as shown in Table 1. Patients with tropical sprue give a history of recent or remote travel to an affected area, and in these the histologic lesion is usually partial villous atrophy, which is present throughout the whole length of the small bowel. Giardia labmlia should be excluded on jejunal biopsies and stool examinations. A few patients with the Zollinger-Ellison syndrome may have a flattened jejunal mucosa owing to the effects of hyperacidity on the small bowel. F Finally, there is the possibility that a patient may have developed small bowel ulceration or a malignancy, such as a lymphoma or carcinoma, in addition to the celiac disease.

In a small group, despite a strict gluten-free diet, the clinical and morphologic abnormalities do not improve. These patients may benefit from a short course of prednisolone, starting with 45 gm per day. Originally it was thought that this unresponsive group had peculiar histologic abnormalities such as a layer of collagen below the basement membrane’ subsequent studies have shown that, although this may well be present in patients with unresponsive celiac disease, collagen is also seen in patients who respond adequately.

Patients who continue to lose weight, have persistent low sodium and low albumin levels, have severe steatorrhea and diarrhea, and are generally very ill should have a repeat small bowel follow-through or a small bowel enema to exclude ulceration of the jejunum and

stricture formation. This is a rare condition, and opinion is still divided as to whether these patients in fact have an underlying lymphoma.

Having ruled out ulceration and, if possible, lymphoma, in a very ill patient with a presumed diagnosis of celiac disease, I usually commence with prednisolone 45 mg per day, and reduce this to a maintenance dose of 10 to 15 mg. A few of these patients improve and are eventually weaned off steroids. IN the very rare patient who still does not responds, we have over the years prescribed azathioprine in addition to steroids, and have found that with this combination patients have eventually improved. If neither of these measures is successful, we have tried taking patients off all antigens in foods and prescribed an enteral diet. In the severely ill, total parenteral nutrition may eventually be required, but in these patients treatment is usually unsuccessful.

Some patients my have bacterial overgrowth; if this is proved either by a breath test or by direct intubation studies, it is worthwhile trying a broad-spectrum antibiotic. Pancreatic insufficiency has also been found in a small number of patients. This generally is not a severe problem, but about 4 percent of these patients may require pancreatic supplements. However, once the mucosa has grown, the intraluminal stimulus for pancreatic secretion returns.

Malignancy

Over the years evidence has accumulated that patients with celiac disease are more at risk for developing lymphomas and carcinomas. In recent nationwide study in the United Kingdom, 259 histologically confirmed malignancies were found in 235 patients with histologically proven celiac disease. A total of 133 of those with malignant lymphomas had a predominant histologic type of malignant histocytosis, with the common site of the lesion being in the small intestine.

Patients with celiac disease also have a greatly increased risk for development of small intestinal adenocarcinoma. Among 116 invasive nonlymphomatous malignancies, there were 19 small intestinal adenocarcinomas; this compares with an expected incidence of 0.2 from the National Cancer Register, adjusted for age and sex. Surprisingly, there appears to be an increased incidence of carcinoma, particularly of the esophagus; the reason is unknown. A lymphoma or a carcinoma should be suspected in any patient with celiac disease who fails to respond to a strict gluten-free diet, or in a previously well patient who suddenly deteriorates despite the diet. These patients continue to lose weight and have diarrhea, steatorrhea, and hypoalbuminemia. They are often anemic and may well present with continuous abdominal pain, bleeding, perforation, or (very rarely) bowel obstruction. The diagnosis is often difficult; but computed tomographic (CT) scanning of the abdomen has been of some help. (Occasional uncomplicated patients with celiac disease will have reversible lymphadenopathy on CT.) These patients may need surgery, radiotherapy, or chemotherapy, depending on the type of tumor and its site; the prognosis is usually grim.

Dermatitis Herpetiformis

Patients with this subepidermal blistering skin eruption also have an associated gluten-sensitive enteropathy. I have usually followed the practice of biopsying most patients with dermatitis herpetiformis, although patients very rarely present with gross malabsorption.

It has been shown that if sufficient biopsies are taken and the correct measurements made, most of these patients show an abnormal jejunal mucosa. If the mucosa is flat and the skin lesion difficult to control, a gluten-free diet will help the skin lesion as well as the GI abnormalities. However, a gluten-free diet may well take a mean of 3.5 years before its effect on the skin is determined. Usually the skin lesion is treated with dapsone, which itself has no effect on the enteropathy.