

THE TREATMENT OF CELIAC DISEASE WITH THE
SPECIFIC CARBOHYDRATE DIET

REPORT ON 191 ADDITIONAL CASES

SIDNEY V. HAAS, M.D.

and

MERRILL P. HAAS, M.D.

New York, N. Y.

INTRODUCTION

In 1950, we reported on 603 cases of celiac disease treated by us in private practice. During the three-year period following that report, we observed 213 additional cases long enough and closely enough to draw further conclusions concerning the diagnosis, prognosis, treatment, and clinical course under therapy of this disease. Of these, 22 were still open and under active treatment when the data for this paper were compiled. The remaining 191 have been followed-up after discharge with sufficient care and over a sufficiently lengthy period of time to warrant evaluation of total progress and outcome. Neither the data nor the conclusions reported here will deal with 64 cases which were seen by us only a few times in consultation or 127 cases which remained under our direct treatment and observation so briefly that their consideration in a scientific report is unjustified.

DIAGNOSIS

Our studies of these 191 cases fortify the point that we have stressed elsewhere—that the diagnosis of celiac disease depends primarily upon a history of prolonged intermittent soft-loose, frequent, foul, and mucus-laden stools occurring in a child between the ages of six months and three years and occasionally in younger or older children. The tentative diagnosis is confirmed by the administration and subsequent withdrawal of the specific carbohydrate diet. That is, the patient is placed on the diet until his symptoms abate. He is then restored to his ordinary diet. If the original symptoms then recur, diagnosis of celiac disease is confirmed and the patient again placed on the therapeutic diet for the full course of treatment. We know of no laboratory procedure for the diagnosis of celiac disease. Complex and time-consuming tests for fecal fat and starch, gastrointestinal x-ray series, hematological studies, plotting of blood-sugar and Vitamin A tolerance curves, and analyses of duodenal enzymes may be useful when it becomes necessary to rule out conditions simulating celiac disease such as tuberculosis, intestinal parasites and fibrocystic disease of the pancreas.

One point of diagnosis that must be stressed is the age at which symptoms first occur. As our figures (Table I) show, the first symptoms usually manifest themselves between the ages of nine and ten months. There is, however, a sig-

nificant number of cases between birth and the first year out a diagnosis of celiac disease. It is interesting to note that our attention until the first few months to more than a year considerably longer than the specific carbohydrate diet.

One child had symptoms from birth. He came to our attention at the age of 10 months. The patients reported to us by other physicians for celiac disease

Birth	•••••
2 days-6 months	••
6 mos. plus-1 year	••
1 yr. plus-2 years	••
2 yrs. plus-4 years	••
Over 4 years	••
Total	••

While our data indicate that many cases of celiac disease are diagnosed as sufficient only after the age of 1 year, many others had been diagnosed before the age of 1 year. It is interesting to note that the fact that symptoms were elicited before the onset of the disease made about diagnosis of celiac disease. As our data indicate, the cases were more numerous than the great majority of cases did not show any gross malnutrition. In fact, 5 per cent of the cases had a weight at initial presentation that exceeded the upper limit of the normal weight range. It can be ruled out of consideration that the normal weight range at initial presentation of celiac disease unless the 10 per cent of nutrition as observed is an important diagnostic

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niBcant number of cases in which the onset of symptoms takes place anywhere between birth and the ages of three and four years, so it is inadvisable to rule out a diagnosis of celiac disease on the basis of any age factor by itself. It is interesting to note (Table II) that the vast majority of cases did not come to our attention until the symptoms had persisted for periods ranging from three months to more than two years. In 31 cases, the symptoms had persisted for considerably longer than two years before the patients were placed on the speciJic carbohydrate diet.

One child had suffered from celiac disease for more than eleven years before he came to our attention. It is interesting to note, further, that more than half the patients reported in this paper had been under the observation of one or more physicians for celiac disease before they were presented to us.

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TABLE I
AGE AT ONSET

Birth	—	35
2 days-6 months	29
6 mos.' plus-1 year	,.....	50
1 yr. plus-2 years	64
2 yrs. plus4 years		8
Over 4 years		5
Total		191

While our data (Table HI) shows that many of these patients had been diagnosed as suffering from celiac disease and had been treated on that basis, many others had been treated for allergy, simple diarrhea, and unspeciJied ailments. It is interesting to note further that, in most cases, careful questioning elicited the fact that there had been episodes of loose stools for brief periods before the onset of the more persistent diarrhea. A second pOint we wish to make about diagnosis concerns the state of nutrition of these children at initial presentation. As our figures (Table IV) show, the weights at first examination were not significantly below the means for the age groups. Only 24 per cent of the cases were more than one standard deviation below the mean. In other words, the great majority of cases of celiac disease seen by us in the New York area did not show any great degree of retardation in weight. As a matter of fact, 62 per cent of the cases were well within the normal weight range while 13.5 per cent exceeded the norm. This indicates that a diagnosis of celiac disease cannot be ruled out of consideration simply because a child is either within or above the normal weight range for his age. Even though we have observed that the weight at initial presentation is not particularly Significant in diagnosing celiac disease unless the loss is excessive, nevertheless we feel that the general state of nutrition as observed clinically and as determined by the estimates of parents is an important diagnOSTicguide. The state of a child's nutrition must be judged

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by estimating and evaluating such imponderable and intangible factors as tissue and muscle tone, hair and skin quality, brightness of the eyes, general strength and vigor, etc. Upon initial presentation, all of our cases, even those whose weights exceeded the norm by one standard deviation or more, showed clear signs of poor nutrition when evaluated on the basis of the factors mentioned above.

SPECIFIC CARBOHYDRATE DIET

All of the cases reported in this paper were treated by means of the specific carbohydrate diet which we have described in earlier publications. Reference to our data (Table V) shows that we were able to place 190 of the 191 patients reported in this paper on carbohydrates, other than those permitted in the therapeutic diet within 18 months after the start of treatment. Among these formerly forbidden carbohydrates were the starches and complex sugars contained in such foods as bread, potatoes, cookies and candies. One hundred

TABLE II

ONSET TO INMANON OF SPECIFIC CARBOHYDRATE DIET	
Under 3 months	28
3 mos. plus-6 mo.	33
6 mos. plu.-1 year	38
1 yr.-2 yr.	61
2 yrs.-3 yr.	10
3 yrs.-4 yr.	10
4 yr.-5 yrs.	3
5 yrs.-6 yrs.	3
6 yrs.-7 yrs.	4
8 yrs. and 8 mos.	1

seventy-five of these patients were permitted starches and sugars within 15 months after they had commenced the specific carbohydrate diet, The introduction of these carbohydrates to the diet is the point at which it is safe to assume that the patient is on the road to comparatively rapid recovery. Thereafter, we are able to introduce previously untolerated foods in rapid succession that our patients are allowed a completely unrestricted diet from 18 to 24 months after treatment has been started. Further reference to the figures (Table V) show that more than 81 per cent of our cases could take whole milk within 18 months after treatment had started and an additional 12 per cent could take whole milk within 24 months after they had been placed on the specific carbohydrate diet. The one case that took more than 18 months before he could take starch and sugar and more than 24 months before he could tolerate milk was a patient whose attendance at our office was extremely irregular and whose parents found it difficult to cooperate in managing the diet

Although the diet in earlier reports, we found One basic principle consistently: No food of appreciable amount was to be used in vegetable carbohydrate diet is As emphasized earlier, because clinical experience of celiac disease. conclusion that the specific carbohydrate carbohydrate portion. ant to all but monosaccharides exciting cause of the disease-sense-any carbohydrate. This includes disaccharides and starches.)

Although all fruits are the only safe fruit to eat, fruits have qualities that should be used judiciously when dieting. amount of banana glucose sugar they contain. synthetic sweeteners:

In addition to products that contain proteins in animal and fowl of any kind, products have the fat removed by the addition of inorganic any cheese in its initial of course pot cheese

Gelatine is given in desserts which contain and synthetic sweeteners.

Casec Milk:-

- Casec
- Water
- Whole Milk (not h.)

Mix the Casec with remainder of the cold mixture stirring constantly to a If necessary to sweeten.



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Although the details of the specific carbohydrate diet have been given in earlier reports, we feel that it is wise to discuss a few of the important features. One basic principle of the diet must be established finny and reiterated per- sistently: *No food may be ingested by the celiac patient that containS an appreciable amount of carbohydrate other than that found in fruits and to a lesser extent in vegetables, and in protein milk.* The basis of the specific carbohydrate diet is ripe banana and protein or calcium caseinate' milk. As embpazised earlier, the foods preSCribed in this diet have been selected because clinical experience has shown them to be effective in the treatment of celiac disease. From this empirical evidence, we have drawn the conclusion that the common denominator of all the foods permitted in the specific carbohydrate diet lies in the preponderance of monosaccharides in the carbohydrate portion. We believe that sufferers from celiac disease are intoler- ant to all bnt monosaccharides. It is our theory that polysaccharides act as the exciting canse of the diarrhea. The tenn, polysaccharides is used in its literal sense-any carbohydrate whose molecule contains more than six carbon atoms, This includes disaccharides such as sucrose, lactose, and maltose as well as dextrans and starches.

Although all fruits may he used later, banana is the most satisfactory and the only safe fruit to be used at the outset of treatment. Because various other fruits have qualities which tend to make them laxative, they must be employed ndiciously when diarrhea is still active. There need be no curtailment of the amount of banana given. Most canned fruits are forbidden because of the added sugar they contain. If cooked fruits are desired, they may be prepared with synthetic sweeteners by the family, but the initial product must be known.

In addition to protein milk and fruits, the specific carbohydrate diet may contain proteins in any form and fats in moderate quantities. Thus meat, fish, and fowl of any kind may be used, and it is not necessary or even desirable to have the fat removed. All cheese is satisfactory, unless it has been processed by the addition of ingredients to alter its composition. The diet may include any cheese in its initial form: Swiss, cheddar, American, munster, edam, and of course pot cheese.

Gelatine is given for dessert in this diet, but none of the prepared gelatine desserts which contain sugar. Desserts made from pure gelatine, fruit juice, and synthetic sweeteners are well tolerated. Honey, dates, and raisins may be

•Casec Milk:-

- Casec .. •.. .. •... .. •... .. •... .. •... .. •... .. •... .. •... .. •... .. •... .. 4 tablespoons
- Water 1 pint
- Whol. Milk (not homogenized) 1 pint

Mix the Casec with a little cold water (enough to form a smooth paste). pour in the remainder of the cold water. then pour in the milk, and bring the whole mixture while stirring constantly to a boil. then boil actively for one minute. Remove from fire. Let cool. If necessary to sweeten~ use one or two tablets of saccharin. (One gram).

used for confections, but some dates are packed in sugar syrup and these should be avoided.

When brisk diarrhea is controlled, egg is added to the diet, and when the stools are formed and occur no more than two or three times daily, vegetables are given. The latter, however, must be added to the diet cautiously, one at a time, with a sufficient period between each new introduction to determine their effect. In some cases diarrhea recurs when vegetables are ingested, in which case their use must be postponed. In general, lettuce, tomato, string beans, squash, and carrots are well tolerated, Canned vegetables are not to be used unless sugar-free. Potatoes may not be used.

Fats in association with meats in the normal amounts, in the form of butter, and that existing in protein milk are well borne. Sour cream is usually tolerated. The only restriction on fats may come at the beginning of the diet, but when a full and well-rounded diet has been established, there need be no restrictions of fat beyond that usually exercised in the diet of healthy children.

With the inclusion of the foods mentioned, the specific carbohydrate diet is complete. Since it is full and well-balanced, it is continued for at least one year, supplemented by certain vitamins. Vitamins A and D should be administered, but cod liver oil is usually not well tolerated. Some of the newer preparations of aqueous soluble A and D are excellent substitutes. One of the preparations of B-complex, including folic acid, seems to be desirable. Since anemia is a regular concomitant of celiac disease, iron in some form is called for.

In prescribing this diet, it is almost more important to stress what is *not* fed than what is fed. Any cereal grain is strictly and absolutely forbidden, including corn, wheat, rye, or rice in any form, whether as bread, cake, toast, zwieback, crackers, cookies, or breakfast cereals. Potatoe is prohibited. Sugar is forbidden as sweetening or in the form of candy, pastries, breads, etc., as well as dextrans such as are found in corn syrups and lollipops. Whole milk, per se, is not allowed.

We realize, of course, that even in the specific carbohydrate diet, certain polysaccharides are present, such as the lactose in the protein milk and some sucrose in the fruits. It is quite possible, as a matter of fact, that a diet restricted to protein, fat, and carbohydrates solely in the form of glucose and levulose might achieve the desired results more quickly than they are achieved with the specific carbohydrate diet. We also realize, however, that we are dealing with children who derive pleasure and other emotional satisfactions as well as nutrition from their foods, and not with automatons or laboratory animals. Therefore, in treating sufferers from celiac disease, it has been felt necessary to strike a compromise between a normally palatable and acceptable diet and one in which the restriction of polysaccharides was total. The resulting specific carbohydrate diet represents this compromise. The fact must also be stressed that a diet cannot be constructed solely on the basis of ailments that must be

restricted-it must also, the diet is to provide children have been provided saccharides but when fat and protein intake, palatability, variety, a upon initial presentation diet had not been followed nutrition.

Dietary supplements, D, are valuable and have observed the improvement occasionally the mycins in occasionally employed, the patient has been so-called "virus intestinal" medications are immediate

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restricted-it must also be based on food elements which must be included if the diet is to provide optimum nutritive value. We have seen many cases where children have been placed on diets that succeed in eliminating all or most polysaccharides but which fail to provide for such necessary elements as adequate fat and protein intake, and which completely neglect sub important factors as palatability, variety, and appetite appeal. The state of nubition of sub children upon initial presentation to us was such as to make it quite clear that either the diet had not been followed, or, if followed, had not provided for even minimum nutrition.

Dietary supplements such as vitamin concentrates, especially Vitamins A and D, are valuable and advised. The use of such other supplementary medications, opium, kaolin, pectin, etc., is of little value. In many of our cases, we have observed the immediate effects of the sulfonamides, penicillin, and occasionally the mycins in causing a temporary cessation of the diarrhea. We have occasionally employed penicillin in the early stages of treatment, especially when the patient has been suffering from an upper respiratory infection or when so-called "virus intestinal grippe" was prevalent. Although the effects of these medications are immediate, however, they are merely transitory and do not,

TABLE III
TREATED FOR CELIAC DISEASE BY METHODS
OTHER THAN SPECIFIC CARBOHYDRATE DIET

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Not Slated				118
Total				191

in themselves, result in a permanent cessation of symptoms. We have seen many cases where such antibiotic therapy prescribed by other physicians has resulted in apparent cures only to be followed by recurrences after the medications have been withdrawn. For this reason, we feel that the antibiotics are of true value only in treating infections associated with celiac disease and not in treating the disease itself.

There is one group of drugs which has been found to be useful and which we recommend. These are the anticholinergic drugs. We have been accustomed to prescribe atropine sulfate, although some of the newer synthetic anticholinergic agents seem to be promising. We employ atropine in ascending small increment dosages to levels where symptoms are ameliorated or eliminated. Symptoms of enterospasm such as colicky pain or vomiting indicate the use of sub drugs.

SO-CALLED "GLUTEN FACTOR"

During the past few years, many investigations on the role of a so-called "gluten factor" in the cause and dietary treatment of celiac disease have been

reported in the Dutch and British literature. The burden of the conclusions drawn from these investigations is that there is some substance in the gluten fraction of wheat flour which produces the symptoms of celiac disease, and that, therefore, a diet completely free from this substance will result in the elimination of the symptoms. In clinical practice, this is achieved by removing all forms of wheat from the celiac patient's diet.

A recent contribution contains the following conclusions, which begin to substantiate our thesis that the offending substance or substances are in the carbohydrates. It would be a great contribution if it were possible to isolate the factor which clinically has been recognized for such a long time.

"1. A factor exists in wheat which is the cause of anorexia, vomiting, diarrhea and a large proportion of the fat elimination in patients with celiac disease. However this factor is not in the starch.

"2. Although anorexia, vomiting, diarrhea and steatorrhea are produced or exacerbated by the 'wheat factor' there is no quantitative relation between these symptoms.

"3. The 'wheat factor' has so far been encountered in wheat, rye and oats.

"4. It is possible and perhaps even probable that this factor will also be found in other foodstuffs which have not yet been tested.

"5. It is probable that the 'wheat factor' is active in other disturbances as well as celiac disease (indigenous sprue, some forms of subacute dyspepsia, and enteritis in infants and small children.

"6. The effect of the 'wheat factor' may be of importance for the recognition and understanding of nutritional and intestinal disturbances.

"7. In investigation of improvements produced by medication or vitamins in cases of celiac disease, the experimental setup must take into account the 'wheat factor' in order to avoid wrong conclusions."

An examination of Table I will show that more than 18 per cent of the cases reported in this paper had their first symptoms of celiac disease at birth, and an additional 15 per cent manifested their first symptoms between the ages of two days and six months. In other words, in a significant number of cases, the onset of the symptoms of celiac disease took place prior to the period of the feeding of solid foods. This fact, it seems to us, must cast some doubt upon the validity of the gluten-factor hypothesis. Another interesting fact leads us to question this theory. For a variety of reasons, including the frequent misconception of celiac disease as starch intolerance, it is common practice in New York City as well as in other parts of the United States to attempt a cure by prescribing a completely wheat-free and starch-free diet. Our experience has demonstrated that such diets, unless they also eliminate other polysaccharides aside from those in wheat and starch, do not succeed in removing the symptoms. Furthermore,

upon recovery by means in liberal quantity with,

In considering the fact about celiac disease the aspects of a stress syndrome single change in environment erratic and difficult to celiac disease will show stools if placed in a hospital less of the diet administration of cases who were doing recurrence of all symptoms mild upper respiratory infection tension in the home. The change on hospitalized cases and Dutch literature, since environment, intermittent

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upon recovery by means of the carbohydrate free diet at once, wheat is used in liberal quantity without ill-effect.

In considering the work of the British and Dutch investigators, another fact about celiac disease must be taken into account. This illness has many of the aspects of a stress syndrome that make its clinical course in relation to any single change in environment or other conditions over a short period of time erratic and difficult to evaluate. For example, even the most severe case of celiac disease will show improvement in appetite, weight, and condition of stools if placed in a hospital bed under conditions of minimum exertion, regardless of the diet administered. Conversely, the literature abounds with reports of cases who were doing well under proper dietary regimens and who showed recurrence of all symptoms as a result of such apparently minor stresses as mild upper respiratory infections, the eruption of teeth, or increased emotional tension in the home. Therefore, in evaluating the effects of any given dietary change on hospitalized cases of celiac disease such as are reported in the British and Dutch literature, such factors as ward routine, bed rest, change from home environment, intermittent mild infections, etc., must be considered.

TABLE IV
WEIGHT DEVIATIONS AT START OF SPECIFIC CARBOHYDRATE DIET
AND INCREMENT DEVIATIONS AFTER ONE YEAR OF TREATMENT

	Minus one or more Standard deviation	Plus or minus one Standard deviation	Plus 2 or more Standard deviation
At start	46	119	26
After one year	17	160	24

We feel, further, that day to day fat balance studies over comparatively short periods of time, such as are reported in the literature, do not contribute significantly to the evaluation of any given dietary regimen, because the course and treatment of celiac disease must be judged in terms of total effect on the patient over an extended period. It is not enough to place a diarrhea-wracked and severely undernourished and underweight child on a prescribed diet and to pronounce that diet successful and the patient cured. Simply because the diarrhea has stopped, there has been a gain in weight, and the laboratory tests have shown an improvement in fat balance. *We maintain that the criterion of successful treatment of celiac disease must be perfect nutrition and health with complete cessation of diarrhea within a period of 12 to 18 months after the initiation of therapy regardless of what foods are included in the diet thereafter.*

MANAGEMENT AND EVALUATION OF PROGRESS

Once a definite diagnosis has been made and the specific carbohydrate diet has been prescribed, the problem of management in celiac disease has just begun. This is true because the illness is not a simple physiological derangement

which can be quickly corrected. The correction of the slowly and chronically developing symptomatology must be expected to be correspondingly slow and protracted. Under proper treatment by means of the specific carbohydrate diet, however, improvement should be steady and progressive until all symptoms have been corrected and there is no recurrence of such symptoms even when the patient is taking a full normal diet. Specifically, this means that the chief symptom, diarrhea, cannot be expected to disappear within a few days after the initiation of treatment, although such rapid improvement may occur in

TABLE V

TIMS ELAPSED BETWEEN START OF SPECIFIC CARBOHYDRATE DIET
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	Starch and Sugar	Milk
Under 8 months	1	
8 months	1	
9 months	1	
10 months	2	
11 months	28	
12 months	85	6
13 months	30	12
14 months	15	27
15 months	12	44
16 months	2	35
17 months	3	26
18 months	10	13
19 months	.	5
20 months	.	8
21 months	1	4
22 months	.	4
23 months	.	3
24 months	.	8
more than 24 months	..	2
Totals	191	191

some cases. Our data (Table VI) show that in 38 per cent of the cases reported in this paper, the diarrhea was under control within one month after the inception of treatment. Of course, this rapid correction of the chief and most distressing symptom of celiac disease is desirable not only because it indicates satisfactory progress, but because of its beneficent psychological effect upon the patient and his family. The persistence of the diarrhea for longer periods ranging, in some cases, up to ten months, however, does not mean either that progress toward curing the disease is unsatisfactory or that the nutritional state

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of the patient is not improving. Conversely, the control of the diarrhea does not, by itself, indicate satisfactory progress. We have seen numerous cases where diarrhea has been checked by such means as the administration of antibiotics, rigorous limitation of food intake, etc., without any concomitant improvement in the patient's nutritional condition.

Occasionally, there is a recurrence of loose stools after the initial severe diarrhea has been brought under control. When this occurs, an explanation must be sought in two possibilities: a lapse in the specific carbohydrate diet or an infection such as an overt upper respiratory infection, a so-called "intestinal grippe" in which upper respiratory involvement may be minimal, etc. In the first case, reinstatement of the strict diet will again bring the diarrhea under control. In the second case, the condition will be corrected when the infection subsides.

We have observed that the most outstanding and, frequently, the earliest and most dramatic signs of improvement in the child suffering from celiac

HYDRATE DIET

LX Milk

~3.r

TABLE VI

	CONSTITUENTS OF DIETS TO INTRODUCTION OF SPECIFIC CARBOHYDRATE DIET	
6		
12		
21	Wheat'	109
44	Potato. .	52
35	Sugarl	94
20	Milk!	123
13	Banana	57
5	-includes bread, cereal, spaghetti, pasta, etc.	
8	tincludes candy, fello, sugared froits, etc.	
4	indud .. hypro,Mul Soy, plain and skimmed milk, goat', milk, buttermilk. etc.	

disease takes place in the area of behavior. All students of celiac disease have emphasized the fact that a cardinal symptom of the illness is irritability expressed in every manner of capricious and almost uncontrollable behavior. Within a week or two after the initiation of therapy, the patient is less irritable, more cooperative, more pleasant, and happier. In many instances, parents have reported dramatic improvement in behavior within a few days after the beginning of the specific carbohydrate diet. In other cases, especially where the patient is an only child and there is little basis for comparison, the parents have not initially reported any behavior symptoms. Within a few weeks, however, they remark that the present happy and pleasant condition of their child now convinces them that there had been behavior difficulties prior to the institution of treatment. In this connection, a return to irritable behavior after the condition has been rectified has occasionally been the clue to the discovery of some lapse in the diet or to some hidden infection, When these conditions have been corrected, behavior again improves.

nt of the cases reported e month after the incep- the chief and most dis- mly because it indicates Psychological effect upon urhea for longer periods oes not mean either that that the nutritional state

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Most important in evaluating the progress of treatment, is the observation of the nutritional progress of the patient at frequent intervals. This is done in three ways. First, is the obvious method of charting growth as indicated by height and weight figures. As we have pointed out, however, this method by itself may be misleading, since a patient may exceed the norms and still be in relatively poor nutritional condition. Second, is the parent's appraisal of improvement in strength, endurance, fatigability, appearance, behavior, and general physical condition. Third, and most important, is the clinical judgment and appraisal of certain intangible and imponderable factors and impressions which converge to convey to the experienced and perceptive physician a total picture of the child. If progress is satisfactory, the skin should be soft, smooth, silky, elastic, and of good color. The carriage should be erect, and the muscles, especially in the abdominal and facial regions, firm, well-developed, and of adequate power. A striking example of this is the reduction in size of the distended abdomen after good muscle tone has been maintained for a sufficient length of time. Although it is difficult to describe the factors and impressions that contribute to the clinical judgment, all practicing physicians are familiar with them. The important criterion in evaluating progress in this respect is not so much the rate of improvement as it is the steadiness and continuing nature of the improvement.

"CELIAC CRISIS"

Many investigators refer to the so-called 'celiac crisis'. Most recently, di Sant Agnese reported that crises occurred in more than 60 per cent of a series of patients studied at Babies Hospital. Such episodes are said to take place in severe cases, especially among younger children during the early stages of treatment. According to the reports, such crises occur when a parenteral infection or some other cause precipitates an intense watery diarrhea. Within a few days, this results in such severe dehydration and electrolytic imbalance that hospitalization and intravenous feeding become necessary. Although such incidents prior to consultation with us have been reported by parents, we have never experienced such a crisis with severe dehydration or with electrolytic imbalance in any patient who has been treated with the specific carbohydrate diet. We have not seen such crises even though, in some of our cases, a parenteral infection has precipitated a diarrhea of as many as eight to ten watery stools a day for a few successive days. The only possible explanation we can offer for the discrepancy between our experience and the experience of some other investigators is that the specific carbohydrate diet reduces the intestinal irritation to a point where the superimposed irritation caused by the parenteral infection no longer produces excessive stress.

STRESS AND THE AUTONOMIC NERVOUS SYSTEM

Though peripheral to the main problem, two aspects of celiac disease have engaged our attention. These are the factors of stress and of the role of the

autonomic nervous system involvement suffering from celiac

We have been to the outstanding dietary management, with increased diarrhea severe involvements pain such as is associated and irritating emotions called our attention each visit to the document of normal daily examination procedure diarrhea. We have

TIME ELAPSED

Within one month	
1-2 months	.
2-5 months	.
6-10 months	..
11-14 months	...
Formed at start	..
Total	..

may result in a cessation with its attendant complete acceptance result in the elimination in accord with the cortisone in relief also interesting to the recurrence of the condition cause a renewal longer the child has to react to stress since effect is accomplished, intestinal irritation promotes a nutrition more effectively, r

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SYSTEM
i of celiac disease have
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autonomic nervous system. Although the degree of stress and autonomic nervous system involvement may vary from case to case, they are present in all patients suffering from celiac disease.

We have been particularly interested in observing the relationship of stress to the outstanding symptom of the illness, diarrhea. Regardless of the type of dietary management, certain stress situations seem to be consistently associated with increased diarrhea. Among such stress factors are infections ranging from severe involvements of the upper respiratory tract to furunculosis, prolonged pain such as is associated with teething, unusual or excessive physical exertion, and irritating emotional situations at home or elsewhere. One mother, for example, called our attention to the fact that her child had a soft, foul stool on the day of each visit to the doctor's office. Apparently, the combination of travel, disarrangement of normal daily routine, introduction to an unusual environment, and the examination procedure itself set up a stress situation which precipitated the diarrhea. We have observed, conversely, that the removal of a stress situation

TABLE VII

TIME ELAPSED FROM INITIATION OF SPECIFIC CARBOHYDRATE DIET TO CONTROL OF DIARRHEA

Within one month	73
1-2 months ,	11
2-5 months	58
6-10 months	24
11-14 months ,	5
Formed at start	14
Total	191

may result in a cessation of the diarrhea. Such changes as removal to a hospital with its attendant bed rest and ward routine, the subsidence of teething, or the complete acceptance and integration of a new Sibling in the home frequently result in the elimination of diarrhea. These clinical observations seem to be in accord with the findings of Adlersberg and his co-workers on the effects of cortisone in relieving the symptoms of sprue in adults. In this connection, it is also interesting to observe that, just as the withdrawal of cortisone resulted in the recurrence of the sprue symptoms, so does the restoration of the stress situation cause a renewal of the diarrhea. It is important to note, however, that the longer the child has been on the specific carbohydrate diet, the less likely he is to react to stress situations with episodes of diarrhea. Whether this beneficial effect is accomplished because the specific carbohydrate diet withholds additional intestinal irritants in the form of polysaccharides or because the diet promotes a nutritional state in which the body is able to combat the stress forces more effectively, remains to be determined.

Certain facts have led us to conclude that there is an important relationship between celiac disease and the autonomic nervous system. As can be observed in Table VIII, a large number of our cases show family histories of hypercholinergic activity manifested in such complaints as nervous stomach, diarrhea under tension, duodenal ulcers, etc., in parents, grandparents, and siblings. Many of our celiac patients, themselves, reveal an early history of hypercholinergia as shown by spitting, vomiting, or colic during the neonatal period. Furthermore, in many active cases of celiac disease, there are direct signs of a hypercholinergic state. Some of these are vomiting, abdominal cramps, excessive secretion of the mucosa of the bowel, and skin capillary changes resulting in pallor or rapidly changing mottling of the skin. In view of the fact that cholinergic blocking agents, notably atropine, are extremely beneficial in relieving many of the symptoms listed above, especially vomiting and abdominal cramps, one is led to speculate on the possible relationships between celiac disease and stress, the autonomic nervous system, and adrenal function.

PSYCHOLOGICAL CONSIDERATIONS

The earliest and all succeeding literature on celiac disease stressed the behavior disturbance in these cases, calling attention to the unhappy faces, the extreme irritability, the desire to remain undisturbed and not be touched, hyperesthesia, anorexia, more rarely bulimia, and numerous other aberrations of conduct. Through the years, this phase of the disease has attracted the attention of observers and has been given a prominent place in the symptomatology.

As long ago as 1923, Hablutzel-Weber stressed the role of psychological factors in celiac disease. Since then, many investigators, notably Schiff, have also discussed this matter. In one of our earlier publications, we considered the psychosomatic aspects of celiac disease in some detail. A recent report by Prugh, which emphasizes the effect of the mother's personality on the child suffering from celiac disease, however, makes it desirable to review and reconsider the psychological aspects of this illness.

There is no doubt that there are psychological relationships in celiac disease as well as in most other diseases. Such factors as parental anxiety, personal and environmental tensions, sibling rivalries, etc., may have some influence in exacerbating the basic symptoms. Our clinical experience has shown that the alleviation of these psychotraumatic conditions may result in transitory amelioration of these symptoms. Celiac disease, however, involves a basic physiological disorder, which usually can be permanently corrected only by strict dietary control, and to treat this illness by psychological methods exclusively will, at best, be only temporarily successful.

Prugh's report is based on studies of 14 celiac patients and their mothers. His basic conclusion is that the mothers showed rigidity of personality, marked anxiety, and a tendency toward over-cleanliness. Prugh maintains, further, that

there is "a consistent part of each of the arising as a result of therefore, that this "disturbance disease. Since our cases manifested their first symptoms be cast upon this implied disease is such as to

Celiac dis.,....	'	...
Digestive	disturbance	
Allergies
Unknown		'
Nervous stomach		.
Diarrhea		.
Asthma		.
Cancer	--"	..
Diabetes		..
Colic		.
Hypertension
Ulcer		.
Nervous or Spastic	0	
Colitis		j
Gallbladder disorder		.
Constipation		.
Hernia		.
Rheumatic fever,		
Headaches		.
Arthritis		..
Heart disease		.
Epilepsy		.

in the mothers of patients is a chronic and foul disease. These are frequently given demands upon the mother. Usually expect them

We have been studying patients a somatopsychology. we feel that the physi

an important relation- system. As can be ob- w family histories of ; as nervous stomach, grandparents, and sib- early history of hyper- 'g the neonatal period. ere are direct signs of ninal cramps, excessive y changes resulting in If the fact that cholin- beneficial in relieving IDd abdominal cramps, 'een celiac disease and n.

lisease stressed the be- he nnhappy faces, the not be touched, hyper- her aberrations of con- :racted the attention of nptomatology .

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nships in celiac disease I anxiety, personal and .ve some influence in :e has shown that the :in transitory ameliora- s a basic physiological only by strict dietary xis exclusively will, at

onts and their mothers. of personality, marked maintains) further, that

there is "a consistent though nonspecific type of emotional disturbance on the part of each of the children, antedating the onset of clinical symptomatology and arising as a result of the disturbed mother-child relationship." He implies, therefore, that this "disturbed mother-child relationship" is a primary cause of celiac disease. Since our data (Table I) show that a considerable percentage of cases manifested their first symptoms at birth or very soon thereafter, some doubt must be cast upon this implication. We feel, on the other hand, that the nature of this disease is such as to provoke just such personality defects as Prugh describes

TABLE VIII
FAMILY HISTORY

Celiac disease	31
Digestive disturbances	24
Allergies	31
Unknown	65
Nervous stomach	21
Diarrhea	12
Asthma	16
Canoer	16
Diabetes	28
CoI1c	2
Hypertension	11
Ulcer	11
Nervous or Spastic Colon.....	3
CoUtis	2
Gallbladder disorder	2
Constlp"t1on	2
Hernia	1
Rheumatic fever, rhenmatic heart	5
Headaches	2
Arthrltis	2
Heart disease	2
Epilepsy	1

in the mothers of patients. Inasmuch as the outstanding symptom of the disease is a chronic and foul diarrhea, and inasmuch as uncertain and prolonged prognoses are frequently given and even satisfactory dietary treatment involves severe demands upon the mother's patience, endurance, and ingenuity, we would normally expect them to be disturbed.

We have been strongly impressed by the fact that the celiac patient exemplifies a somatopsycological rather than a psychosomatic relationship. That is, we feel that the physiological aspects of the illness are the primary cause of the

emotional and behavioral disturbances rather than the converse. The personality of the child who is suffering from celiac disease is largely determined by his nutritional state, and the latter is directly dependent on the diet which he receives. In the early stages of almost all our cases, there was some degree of irritability which was expressed in such ways as aggression, withdrawal, capricious behavior, temper tantrums, etc. Often the parents have complained of these personality problems and they have frequently been apparent to us at the first consultation. In such cases, there was a rapid improvement of personality within a few weeks after initiation of treatment by means of the specific carbohydrate diet. Parents usually reported that the temper tantrums stopped, the child became more cooperative and tractable, and there was a general improvement in personality and behavior within a short time after treatment had started. In a few outstanding cases, it was clear to us that the parents had become emotionally disturbed as a result of their children's disease. Some of them could not refrain from tears when they described the symptoms during the first consultation. In such cases, the improved nutritional and psychological state of the patients was soon reflected in a similar improvement in the psychological state of the parents. We do not intend to minimize the role of psychological factors in determining the course of celiac disease, nor have we overlooked the possibility that the tensions involved in handling a sick child may bring to the surface latent personality problems in the parents. We do, however, feel that the correction of the nutritional disorder is basic and primary to the improvement of the personality. There are a few families in which guidance and psychological support is necessary even after the patient has been cured of celiac disease, but this is common in the treatment of all diseases in the practice of pediatrics.

The typical psychological picture of the celiac sufferer is such a common and pronounced symptom that it should be considered in making a diagnosis. Furthermore, the relationship between improved nutrition and improved personality is so consistent that it can be used as a guide toward judging progress. When a child who has been doing well on the specific carbohydrate diet suddenly becomes irritable again, it is advisable to make careful inquiries as to whether or not the diet is being strictly maintained. This method can be of great help in enabling the physician to check on the degree of cooperation he is getting from the parents.

Parents frequently express the fear that rigid adherence to the specific carbohydrate diet may cause frustrations and personality problems in their children. They point out that the celiac sufferer may resent the fact that he is deprived of the bread, cake, and candy which his siblings and friends enjoy. Our experience has shown that the rigidity of the diet, when the child is sensibly handled by parent and physician alike, does not create behavioral and emotional difficulties. In the first place, the dietary restrictions, unlike those that must be imposed in some diseases, are temporary. In the second place, it has been possible to help mothers to provide a satisfying and varied diet which

includes carbohydrates. Far from injurious, we find that the specific diet is better integrated. In a study of cured patients to date, the usual problem of constipation is

To summarize, the child with celiac disease is usually the slightest amounts of the specific carbohydrate diet. We have learned, furthermore, that the adverse personality symptoms are not due to the specific carbohydrate diet.

Various definitions

depending on the objectives. Some pronounce a permanent diarrhea leading to only occasional bouts. It has been achieved when the diet must be continued indefinitely. We feel that the objective is a child with a personality, complete absence of diarrhea over short periods, and any recurrence of symptoms are achieved after a month of these objectives has been cured.

Some pediatricians say they are six or seven years old. If true, and the fact tends to cast doubt upon it, the diet is completely unnecessary. It is common to impose a short-term rigid diet for 12 to 18 months when the patient's symptoms are relieved on the specific carbohydrate

verse. The personality is largely determined by his diet. The diet which he receives to some degree of irritability, withdrawal, capriciousness, and he complained of these symptoms, present to us at the first onset of personality within the specific carbohydrate diet stopped, the child became generally improved in behavior. In a child who had become emotionally unstable, they could not refrain from the first consultation. In the state of the patients was the usual state of the parents.

Factors in determining the possibility that the child has a latent personality. It is the correction of the diet and the support of the personality. Psychological support is necessary, but this is common to all cases.

Criteria are such a common factor in making a diagnosis. The child's condition and improved performance are judged progress. The specific carbohydrate diet and careful inquiries as to the results of this method can be of great degree of cooperation he

adherence to the specific diet, problems in their children, the fact that he is happy and his friends enjoy. The child is content, when the child is not, do not create behavioral and emotional reactions, unlike those that are in the second place, it has a varied and diet which

includes carbohydrate-free cakes, candies, and other sweets despite the restrictions. Far from injuring the personalities of children suffering from celiac disease, we find that the specific carbohydrate diet helps them to become happier and better integrated. In connection with this, it is interesting to note the reaction of cured patients to candy even after they are permitted a full and unrestricted diet. Most of these children eat so little candy that their parents do not have the usual problem of confining the consumption of sweets to a reasonable limit.

To summarize, we have learned that the personality pattern of the child with celiac disease is directly dependent upon strict adherence to the diet. If the slightest amounts of starches or polysaccharides other than those permitted in the specific carbohydrate diet are either deliberately or inadvertently introduced, the child will be irritable, relatively unhappy, and poorly adjusted. When the diet is carefully supervised, the child will be happy, pleasant, and tractable. We have learned, furthermore, that there are neither temporary nor permanent adverse personality sequelae as a result of strict adherence to the specific carbohydrate diet.

CURE

Various definitions of cure in celiac disease have been promulgated, each depending on the objectives that the individual investigator hopes to achieve. Some pronounce a patient cured when he no longer suffers from intractable diarrhea leading to dehydration and death. Others are satisfied if a child has only occasional bouts of diarrhea. Yet others feel that the optimum goal has been achieved when diarrhea is controlled by diet even though the special diet must be continued indefinitely and though lapses result in recurrence of symptoms. We feel that none of these constitute the cure of celiac disease. Our objective is a child who shows excellent nutrition, an adequate and happy personality, complete absence of stool abnormality without even temporary diarrhea over short periods, and who can eat a completely unrestricted diet without any recurrence of symptoms. All of the above should be achieved and usually are achieved after a maximum period of 18 months of treatment. Only when all of these objectives have been attained do we consider a celiac patient to have been cured.

Some pediatricians claim that children "outgrow" celiac disease by the time they are six or seven years old without any treatment whatsoever. Even if this were true, and the fact that we have had a number of patients in their pre-teens tends to cast doubt upon this assumption. Such a period of suffering while waiting is completely unnecessary. We feel that it is far better to prescribe a rigid diet for 12 to 18 months and thus to achieve a complete cure, rather than to impose a short-term rigid diet which must, of necessity, be reimposed periodically when the patient's symptoms recur while on a normal diet. In other words, if the specific carbohydrate diet is followed for a period of from 12 to 18 months with-

out any lapses whatsoever, then the physician can confidently predict that the patient will be able to return to a full and nonnal diet without any recurrence of symptoms and without any necessity for any return to dietary restrictions'

In the large majority of our cases, the nutritional state has become excellent between six and nine months after the start of treatment. It is, however, our practice to continue our patients on the specific carbohydrate diet for a minimum of 12 months. Then starches and sugars are added. If there are no adverse results, the diet is slowly extended until it is normal. If the addition of carbohydrates causes a return of the symptoms, the therapeutic diet is reinstated for an additional three to six months. In only one of the cases reported in this paper were we forced to continue a patient on the diet beyond 18 months, and this was caused by lack of parental cooperation both in maintaining the diet and in bringing the child in for regular examination and evaluation. The other 190 patients tolerated starch and sugar without any recurrence of symptoms within 18 months after initiation of therapy. Examination of Table V will show that 175 of these children were given starch within 15 months after starting treatment, and 118 were on starch after 12 months of treatment with the specific carbohydrate diet.

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-In spite of which an adult celiac disease, the condition is irreversible and although cure results from a carbohydrate specific diet, relapses will occur through the years requiring several weeks or months of dieting to overcome it.

Gastrointestinal enterology has not deserved. There are of gastroenterology, intestinal disease. As the basic and in the

The cause of the as for instance corol less interest in the profession every year support of medical

Whereas gastr' distress, pain and s makes this aspect affected wage ear nance Company in J as a cause of siclm, rank among the im . approximately half active form. It has' population will be disorders accountel per 100,000 popul'

Peptic ulcer is If we assume that can calculate that 7. mate is much too), roll of 2,125 men, g of which 45 per cen lost from respirator

Malignant grow people in 1952 in T time, most of these means early diagn' this is his field, and, sums given annual work on early dia; gastrointestinal can