DR. W. E. DARNALL, Atlantic City: Dr. Zinke's case is exceptional. Ordinary one would have expected his patient to have had much pain and discomfort. What became of the pelvic varicosities which he did not remove, it is hard to say. Dr. Carstens says he does not find these veins except with other gross pathologic lesions. Perhaps if he looked for them more carefully he would find them. I think we surgeons, particularly, get into the habit of neglecting clinical symptoms and depending too largely on what we can palpate, while the clinical symptoms are relegated to a remote corner of our diagnostic brain. I have a feeling that Dr. Miller is right about the complicating conditions being a result rather than a cause of varicose veins, but of course this is rather hard to prove. My experience coincides with his that the patient refers the pain to the ovary and is so firmly convinced that she has ovarian trouble that she will ask for an examination, and if the examiner tells her her ovaries are all right she will often go to some one else, feeling that from the pain she suffers she must have some affection of the ovary which the first physician could not discover. Varicose veins can rarely be palpated and then only in the standing position, but the diagnosis can be made from a careful study of the history and the clinical symptoms.

NOTES ON CASES OF SPRUE INVALIDED FROM THE TROPICS; WILL IT BECOME ENDEMIC HERE?*

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It has been shown by Price¹ that of the missionaries sent into tropical countries, a large percentage have to be invalided home; from India 46 per cent., from China 51.5 per cent., from Africa 79 per cent. The rate invalided home for sprue is available only from Central and Southern China, being 2.5 per cent. of those sent home from the former region and 4.5 per cent. from the latter. Harford,² a former physician to the Church Missionary Society (England), states that he regards bowel disorders as the most important cause of invaliding, and specifically mentions sprue as a common and serious cause.

To come nearer home, sprue is widely prevalent in Porto Rico,³ which is being invaded at present by Americans in large numbers.⁴ As people suffering with sprue are constantly returning to this country from the tropics, the profession will have to consider this disease both from a clinical and a public health point of view. Inasmuch as many eminent students⁵ of tropical medicine consider sprue communicable and even infectious, it may very possibly become endemic in the Southern states. The comparatively recent introduction of pellagra into this country and its subsequent very rapid spread in the South, should be a warning to us to study our neighbors' diseases as well as our own.

The present observations are based on three cases of sprue from Porto Rico, two from China and one

native case which was in all probability sprue; but, since the latter case passed from observation, it could not be studied at length. The clinical picture of sprue consists chiefly of gastro-intestinal symptoms—stomatitis, flatulence with great distention, diarrhea with large, pale, frothy, acid stools, atrophy of the intestinal mucous membrane with diminution in size of the liver and secondary anemia with loss of weight and strength; the course of the disease is chronic with a marked tendency to relapse.

The sprue stomatitis consists in a red, bald appearance of the tip and edges of the tongue, sometimes nearly all of it being involved. Aphthous ulcers are common. The edges and tip of the tongue become sensitive and the patient often complains of a burning, prickling sensation, even while the tongue is still apparently normal.

The diarrhea starts gradually; is of the early morning type until the case has progressed so far that bowel movements continue throughout the day. Straining and tenesmus are not common, but generally there is moderate pain and discomfort before stool and at other times from the passage of large amounts of gas along the bowel. The large gas production, combined with the atrophy of the intestinal wall and the thinning and weakening of the abdominal muscles, allow great distention, which is uniform over the whole abdomen and which remains constantly present.

The stools are the most characteristic part of the picture. Their bulk is great. The odor is very disagreeable. They may be watery or of the consistency of molasses, are putty-colored and have a strongly acid reaction. The fecal matter is intimately impregnated with fine bubbles of gas causing the stool to resemble ordinary apple-float very much in appearance, except for the color. Microscopically, the lack of fat digestion is striking; the numerous fat droplets may show a ring of varying thickness of fatty acid needles around the periphery, indicating that a slight amount of fat cleavage has taken place, but there seems to have been very little saponification. After the ingestion of meat, many meat fibers appear in the feces. Schmidt's hydrobilirubin test was very weakly positive in our cases.

The loss of flesh and strength may determine death from exhaustion. The blood shows a secondary anemia.

REPORTS OF CASES

CASE 1 (W. A. 616).—A white man, American, aged 25, single, teacher, was referred by Dr. W. A. Glines of San Juan, Porto Rico, in September, 1911. He had been in the island five years. Family and past history were unimportant. The present trouble started in 1909, as sore mouth and diarrhea, following grip and tonsillitis. His weight dropped from 145 pounds to 100 pounds, and he became so weak and emaciated that he returned to New York state in August, 1910. By March, 1911, he had improved somewhat, had gained 14 pounds and returned to Porto Rico.

Present condition shows weight 95 pounds, temperature 97, systolic blood-pressure 94 mm. Hg. Patient very weak, thin, anemic, with edema of the ankles and with harsh, dry skin. Physical examination negative. Blood shows severe secondary anemia; normal differential count; no plasmodia; urine normal; feces liquid, acid, frothy, composed largely of fats and fatty acids.

He had at various times been on buttermilk, meat, whole milk, no starch diets, etc., and for the past several months has been living on artificially soured whole milk. He complains of numbness of any part of the body, especially the hands and feet, and of crawling sensations, from the scalp down, and of cramps in the legs.

* Read before the Section on Practice of Medicine at the Sixty-Fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914.

1. Price, G. B.: Brit. Med. Jour., Nov. 15, 1913, p. 1293.

2. Harford, C. F.: Brit. Med. Jour., Nov. 15, 1913, p. 1297.

3. Ashford, B. K.: Am. Jour. Trop. Dis., 1913, i, 146.

4. Census figures give 2303 in year 1910.

5. Manson, Bahr, Begg, etc.

and says he cannot think about anything except something to eat. Tongue is sensitive with a raw tip; abdominal distention great. One stool is passed at 2 a. m. always, from three to four before midday, and from two to three between midday and midnight. He sleeps from 9 p. m. to 2 a. m. but rarely after the 2 a. m. stool.

The patient was put to bed on a milk and grape diet. Sodium bicarbonate enemas were tried but found too exhausting. Several attempts to feed raw eggs convinced us that proteins were harmful at that time. After two weeks in bed he suddenly collapsed, developing an acidosis with air-hunger and acetonuria, and was thought to be dying. Alkali was given by rectum, and after the acidosis subsided enough milk and lactose lemonade were given to supply 1,000 calories daily. The abdominal distention and discomfort were so extreme that we determined to give monosaccharids instead of disaccharids. The only available monosaccharid at the time was glucose from the candy-maker's shop, so this was fed in lemonade, tea, grape-juice and milk. Later, almost raw liver and pancreas soups were added. The patient was discharged from the hospital in November and by February, 1912, had reached 127 pounds. There has been no return of the trouble since.

CASE 2 (W. A. 1071).—A white, American woman, aged 42, married, housewife, came to us from Porto Rico in September, 1913. Family history was unimportant. The patient had lived in Porto Rico since 1909. She had had acute rheumatic fever at age of 12, followed by chorea, and later had quinsy; has had joint pains either with or without fever and swelling, severe enough to put her in bed, off and on, for the past thirty years, except when living in the far south, Key West, or San Juan. Present trouble began in February, 1911, with a feeling of fatigue and weakness. Within a month the diarrhea started. The gums and lips became sore in May, 1911, and she lost weight. She took six weeks' milk and rest cure and was well again by July. The second attack started in February, 1912, with laziness, sore tongue and gums and later diarrhea of the early morning type, starting at 2 a. m. and subsiding by noon. She reached twenty stools a day with such abdominal distention that she could not wear some of her clothes. She dragged along in and out of bed until March, 1913, when she became too weak to feed herself and weighed less than 100 pounds. She was out of bed again in June. Since January, 1913, she has taken nothing but milk, except for three weeks in July when she tried a meat diet but without benefit. In March, 1913, she took the yellow santonin treatment until she "saw yellow" and vomited; she was unable to take more than 1 grain every second day; she has taken occasional doses ever since. Present weight is 129 pounds, which is only 15 pounds below her normal weight. Every two hours she is taking a pint of milk up to four quarts a day. Physical examination negative except for the tonsils, which are large and matted down by adhesions from both pillars. Blood shows moderate secondary anemia, normal differential count, no plasmodia. Urine is negative. While the case was under observation, worry or fatigue would precipitate diarrhea with the typical acid, frothy, fatty stools; at other times the bowels were normal. At first the patient was put to bed on a milk and monosaccharid diet of grapes, honey and bananas. After a few weeks toast, baked apples and potatoes were added, and later cereals, eggs and cheese. By the middle of November she could be up all day, weighed 135 pounds, was taking solid food three or four times a day instead of milk eight times and her menstrual cycle, which had shortened to three weeks, again became normal. She was advised to visit in the United States until perfectly strong again, but intense homesickness with the difficulty in leading a regular life while visiting from place to place, soon counterbalanced the benefit of a northern latitude, and she returned to Porto Rico in March. The excitement of homecoming precipitated diarrhea again.

CASE 3 (H. B. H. 20).—A white woman, aged 32, married, never been out of North Carolina, was

seen in July, 1913. Her father had died four years previously of pneumonia superimposed on chronic pellagra. Past history was unimportant. Present trouble started in February, 1913, with a diarrhea which at first consisted of from four to five stools daily, but which, in spite of medication, soon increased to ten or twelve stools daily. The diarrhea started about a month before expected confinement, which occurred several weeks early. An intense burning in the mouth and esophagus was present. She grew steadily worse, and when seen in July, had stomatitis, burning in the esophagus, extreme flatulence, and a diarrhea of from fourteen to twenty stools daily, beginning in the early morning and lasting throughout the day until about 6 p. m., after which she was not troubled until the next morning. The diarrhea was painless and the stools were of a pale yellow, or putty color, very frothy and expelled with a great accompaniment of gas; they had never contained blood. The patient had lost considerable flesh and was much weakened. Examination of chest and extremities was negative. The abdomen was tightly distended with gas, puffed out like a small balloon, and gave a doughy sensation on palpation. The superficial veins were dilated. No skin symptoms have ever been present. The blood showed hemoglobin 65 per cent., red cells 3,200,000; white cells 8,000; smear showed some poikilocytosis, red cells otherwise normal; no plasmodia. Sputum and urine were negative. Feces show a very offensive, voluminous, nearly white acid stool, frothy from the intimate admixture of fine gas bubbles. Microscopic examination showed no ova, no protozoa, many fat droplets and fatty acid crystals, with some splitting of the periphery of the fat droplets.

The patient was immediately sent to the mountains for the remainder of the hot season. At first, following a careful diet, the improvement was marked. As she improved, however, she became careless in diet and grew worse again. Becoming despondent over this she returned home and placed herself in the hands of my colleague, Dr. Duncan, who advises me that at present she is much improved, having gained greatly in weight and strength. He states that his treatment consisted of a diet of milk and fruits, and that the only medicine to which he could ascribe any beneficial results was iron, given over a long period.

CASE 4 (H. B. H. 25).—A white woman, American, aged 38, married, housewife, was referred by Dr. J. T. Burrus of High Point in August, 1913. Family history was negative; past history negative until the patient went to Porto Rico as a missionary in 1904. Within a few months she contracted malaria, which proved so severe she was forced to return to the States. She continued to have one chill a month for a time but finally recovered entirely and returned to Porto Rico in 1906, where she remained until 1909. During these three years she enjoyed good health. The present illness began in May, 1912, three years after she had left the tropics. The first symptoms were slight diarrhea, from three to four stools daily, with some flatulence and stomatitis.

In spite of constant treatment the patient had grown steadily worse during the past eighteen months until, when seen, she weighed only 75 pounds. There was no subcutaneous fat; the dry, harsh skin was drawn tightly over the bony prominences. Mucous membranes were pale, skin muddy, eyeballs prominent from loss of orbital fat, hair lusterless, mouth and tongue the seat of subacute stomatitis. The pharynx and esophagus were not involved; chest and extremities negative; vision and reflexes normal. The abdomen was tensely distended, with thin walls and dilated superficial veins, everywhere tympanitic, and liver dulness obscured; doughy sensation on palpation. Pulse was 80, temperature 98, systolic blood-pressure 94 mm. Hg. Stools from eight to twelve daily, beginning between 12:30 a. m. and 2 a. m., and continuing until noon, with several in the late afternoon. At this time the patient was spending all of her time out of doors on a cot, or walking for short distances; in spite of this full exposure to sunlight there had never been any erythema on the exposed parts. Blood

showed hemoglobin 60 per cent., red cells 3,000,000, white cells 4,600, normal differential count, no plasmodia. Urine was normal. Stools large, acid, frothy, putty-colored, no parasites, no occult blood, Schmidt test positive. Microscopically, undigested food, fat droplets, and fatty acid crystals made up the picture.

The patient was put on a milk and monosaccharid diet, without any medication, and a month later eggs, cereals, baked apples, potatoes, butter, and white meat added. She was permitted to go home under observation in September, and finally discharged in December. At this time she weighed 136 pounds, had a systolic blood-pressure of 119 mm. Hg, felt perfectly well and was having one or two stools a day.

In the treatment of sprue a great number of remedies have been recommended, such as potassium chlorate with morphin and bismuth,⁶ powdered cuttlefish bone,⁷ colloidal silver,⁸ phenyl salicylate (salol), betanaphthol, mercuric chlorid, cyllin, izal (cresol preparations), acetozone and ipecacuanha.⁹ A few years ago Begg¹⁰ brought forward yellow santonin as a specific remedy, but Rogers, Manson and Castellani, working in India, have all failed to confirm Begg's results, and Ashford¹¹ working in Porto Rico, says, "Santonin, therefore, if it has any such specific action as that intimated by Begg, does not seem to be superior to a carefully supervised diet, especially a milk diet."

Rest in bed is obviously essential. The use of any drug as a specific is at present purely empirical. Moderate use of alkali seems rational. In severe cases the exclusive meat diet, or exclusive whole milk diet seems to us irrational. The fruit diet is simply a monosaccharid diet, and this in conjunction with skimmed milk seems to us to be the best diet to use in severe cases. The advent of cold weather, particularly cold nights, has apparently been of greater benefit to our patients than any other single factor. We know that the best treatment for pellagra is removal to the mountains during the hot months, and for the same reasons we think that in active cases of sprue the patients should not attempt to remain in the tide-water or piedmont regions during June, July or August.

Stuart,¹² Burnet,¹³ Jackson¹⁴ and others,¹⁵ maintain that sprue and pellagra are the same disease, or in other words that sprue is "pellagra sine pellagra." While our experience with sprue is very limited, our experience with pellagra has been considerable, and we see no reason to confuse these two diseases. They have in common sore mouth, diarrhea, secondary anemia, loss of flesh and strength. Sprue has none of the nervous, skin, uterine, vaginal and rectal symptoms of pellagra, while pellagra is not characterized by the distention, and usually not by the early morning type of diarrhea found in sprue. The stools in the two diseases are totally different; the pellagra stool is large and liquid but composed of food remains hurried through the intestinal canal; the intimate admixture of fine bubbles of gas, the intense acidity and the characteristic picture of partially split fats are entirely wanting. We have elsewhere warned

against the diagnosis of pellagra on the grounds of sore mouth and diarrhea.¹⁶

SUMMARY

Cases of sprue are constantly sifting back into this country and should be recognized and treated as such. Sprue should not be confused with pellagra. Rest in bed, a monosaccharid and skimmed milk diet and cold weather seem to be the most important factors in the treatment. Sprue may very possibly be or become endemic in the Southern states.

ABSTRACT OF DISCUSSION

DR. ROGER S. MORRIS, Clifton Springs, N. Y.: Did Drs. Hiatt and Allen make gastric analyses in their cases or not? The diarrhea which the patients had is described as a morning diarrhea, and it occurs to me that this may have been associated with conditions in the stomach.

DR. H. B. HIATT, High Point, N. C.: We made gastric analyses in all cases and nothing in particular was obtained from them. Sometimes we met achlorhydria and sometimes the conditions were normal. The morning diarrhea we considered to be the result of the low blood-pressure. The object of reporting the cases was to call attention to this subject and to utter a warning. If sprue should become endemic in the South its spread might be as rapid and the disease become as common as pellagra.

THE BLOOD IN ACIDOSIS FROM THE QUANTITATIVE POINT OF VIEW*

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ST. LOUIS

Although the elimination of acetone bodies, found in the urine in various conditions, has been thoroughly investigated, we still lack reliable information as to the extent to which these substances may accumulate in human blood and tissues during life. Diminished alkalinity of the blood, such as may occur in acidosis, is a condition unfavorable to diuresis, so that it is quite possible to have only a moderately high excretion of acetone bodies in the urine of a patient who may exhibit symptoms of severe acid intoxication. It is in such cases that an analysis of the blood should yield data of diagnostic and prognostic value.

By a method, which is described elsewhere,¹ it is possible to determine acetone, aceto-acetic acid and beta-oxybutyric acid in small amounts of blood drawn directly from a vein. From 2 c.c. to 5 c.c. of blood is sufficient, and the analysis may be carried out in about the same time as is required for an analysis of the urine for the same constituents. When analyzed according to this method, normal blood from man, dog, pig and beef is found to contain less than 1.5 mg. of gross aceto-acetic acid (acetone preformed, plus aceto-acetic acid), and less than 4 mg. of oxybutyric acid per 100 gm. of blood, all results being expressed in terms of acetone.

A number of pathologic conditions associated with acidosis have been studied, including light and severe diabetes, febrile conditions of childhood, postoperative acidosis and experimental phloridzin and pancreatic diabetes in dogs. In all these conditions the acetone

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