

tract in animals and especially in man. For this reason we are of the opinion that the compound is unsuited as a volatile anesthetic in man.

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The Serum Potassium in Two Cases of Sprue.

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Studies of sprue and allied conditions in recent years have shown that many elements of the diet are poorly absorbed or poorly utilized. The dietary constituents chiefly emphasized have been fat, carbohydrate, protein, calcium, phosphorus, and vitamins A, D, K, and parts of the B-complex. In some instances the defective absorption of a particular element of the diet is reflected in serum values lower than normal. This is notably true for calcium. To our knowledge no previous investigation of the values of serum potassium in sprue-like syndromes has been carried out. We have recently observed 2 cases of sprue in which the serum potassium was found to be at extraordinarily pathological levels. The blood chemical findings in these 2 patients at the time of admission to the hospital are the subject of this report. Determinations of the serum potassium were carried out by the method described by Harrison and Darrow.¹

Case 1 was a 53-year-old Spaniard who complained of diarrhea, a sore tongue and extreme weakness for 3 weeks prior to his hospital admission. He was markedly emaciated, weighing only 37 kg (81.4 lbs), and gave the appearance of having been ill much longer than his history would indicate. His tongue was smooth and reddened. He was having 5 or 6 loose bowel movements a day, and the stools were found to contain excessive amounts of fat. The oral glucose tolerance test showed a low curve. He had achlorhydria and a severe, macrocytic, hyperchromic

anemia. The blood chemical values are shown in Table I. It will be noted that the serum potassium level was 1.1 meq/L (4.3 mg/100 cc), as compared with the normal range of approximately 4.1 meq/L (16 mg/100 cc) to 5.6 meq/L (22 mg/100 cc).

Case 2 was a 44-year-old Greek woman, whose symptoms of sprue were later attributed to lymphosarcoma of the intestine and mesenteric lymph nodes. She had, during this time, 3 to 8 bulky, frothy, foul-smelling stools daily. She had had a moderate anemia which had responded somewhat to treatment with liver and transfusions, without general improvement. During her entire illness she had complained of weakness, which on admission was so severe that she could not feed herself or sit up unaided. The patient was emaciated, weighing 40 kg (88 lbs), and was extremely weak, although no true paralysis was present. She had a marked steatorrhea. The oral glucose tolerance test showed a low curve. The Chvostek and Trousseau signs were positive. The blood chemical values are shown in Table I. On admission the serum potassium was 1.3 meq/L (5.1 mg/100 cc) and 5 days later was even lower, 1.1 meq/L (4.3 mg/100 cc).

These values for the serum potassium, 1.1 and 1.3 meq/L are almost, if not quite unique. Abnormally low levels have been reported previously in several different clinical conditions. First, and most commonly, low serum potassium has been encountered in familial periodic paralysis. It was first reported by Biernard and Daniels² who found a level of

¹ Harrison, H. E., and Darrow, D. C., *J. Biol. Chem.*, 1937, **121**, 631.

² Biernard, A., and Daniels, A. P., *Brain*, 1934, **57**, 91.

TABLE I.
Blood Chemical Values in Two Cases of Sprue.

	Date	Serum K meq/L	Serum K mg/100 cc	Serum Ca mg/100 cc	Serum P mg/100 cc	Serum Na meq/L	Serum Protein g/100 cc
Case 1	4/1/41	1.1	4.3			138.0	5.2
	4/3	1.6	6.2	6.1	1.1	139.0	
Case 2	7/23	1.3	5.1	4.8	2.2	139.8	5.0
	7/28	1.1	4.3		1.9		

13.38 mg % (3.4 meq/L) in one patient during an attack of paralysis. The association has been repeatedly confirmed by many observers. So far as we know the lowest level of serum potassium previously recorded in the disease was noted by Allott and McArdle³ who gave epinephrine subcutaneously to a patient with familial periodic paralysis and precipitated an attack. Coincident with the paralysis there was a fall in the serum potassium level to slightly over 5 mg/100 cc (1.3 meq/L). The same authors also noted a marked diminution in serum potassium in normal individuals after epinephrine was given in repeated doses. Harrop and Benedict⁴ reported low levels of the serum potassium in diabetics who were receiving insulin therapy, the lowest level being 8.5 mg/100 cc (2.2 meq/L). Ferrebee, Ragan, Atchley, and Loeb⁵ reported a case of Addison's disease under treatment with desoxycorticosterone in

which the serum potassium fell as low as 2.9 meq/L (11.3 mg/100 cc).

In view of many observations in animals on the physiological effects of changes in the potassium ion concentration in tissues one would expect symptoms of great severity in these conditions where serum potassium levels were so low. Both of our patients were extremely ill at the time these findings were noted. Both exhibited generalized muscular weakness, which in the second patient was so severe that she could not sit up unaided and was unable to raise her arms from the bed. It seems not unlikely that in part this weakness may have been related to the changes in the serum potassium and that it might have been still more profound had not the effects of the low serum potassium been modified by the associated low serum calcium. It is perhaps worthy of note that spasticity of the muscles which might have been expected with low serum calcium values was not present in either case.

Summary. Two cases of sprue are reported in which the values of the serum potassium were found to be at low levels, 1.1 meq/L to 1.6 meq/L, before the institution of treatment.

³ Allott, E. N., and McArdle, B., *Clinical Science*, 1937-38, **3**, 229.

⁴ Harrop, G. A., Jr., and Benedict, E. M., *J. Biol. Chem.*, 1924, **59**, 683.

⁵ Ferrebee, J. W., Ragan, C., Atchley, D. W., and Loeb, R. F., *J. A. M. A.*, 1939, **113**, 1725.