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CHLORIDE METABOLISM AND PLASMA AMINO ACID LEVELS IN PRIMARY ATYPICAL PNEUMONIA

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In pneumococcus pneumonia, a tendency to store excessive amounts of ingested salt and water during the acute stage and to excrete this excess following the crisis has been described by numerous observers (1 to 4). Another characteristic metabolic disturbance in this disease, noted by Farr *et al.* (5), is a depression of the plasma amino acid level, as measured by the ninhydrin technique (6), during the acute phase, with a rise to normal at the time of the crisis. In order to discover whether or not such disturbances occur in primary atypical pneumonia (7, 8) (so-called virus pneumonia, acute pneumonitis, etc.), chloride balances and plasma amino acid levels have been followed in 10 adult male patients, showing the common signs and symptoms of this disease.

METHODS

The patients were placed on measured salt diets as soon as possible after admission to this hospital. In 3 cases, the temperatures fell to normal before balance studies could be started, so that data only during the convalescent period were obtained. The remaining 7 cases were observed for from 2 to 13 days of their acute illness and from 3 to 7 days after their temperatures had fallen to normal. Four of these (Nos. 1, 2, 3, and 7) were allowed a salt intake as desired; in the remaining 3 (Nos. 4, 5, and 6), the intake was kept high by the addition of 3 grams of NaCl daily to the diet.

Daily urine chlorides were determined by Sendroy's method (9). Blood samples were drawn under oil on each patient at the beginning and at the end of the period of observation. Plasma amino acids were determined by a modification (10) of the original ninhydrin method used by Farr (5). Serum chlorides were determined on each patient by the method of Van Slyke and Sendroy

(11), and serum CO₂ content was estimated gasometrically (12).

RESULTS

The data are summarized in Table I, where average figures for daily temperature peaks, fluid intake, urine volume, and sodium chloride balances, during the acute and convalescent stages, are given, together with the serum chloride and CO₂ concentrations, the plasma amino acid level, and the body weight, measured at the beginning and end of the period of observation of each patient.

The 3 patients (Nos. 1, 2, and 3) who received less than 60 mM. (3.5 grams) of NaCl in their diet in the acute stage all excreted more in their urine than they took in. This chloride loss is reflected in the low serum chloride levels which were found in all cases, except No. 7, in the initial stage of the disease. During convalescence, the salt intake of these 3 patients increased but their urinary chloride either stayed at the same level or decreased sharply, with the result that there was a marked increase in chloride retention in convalescence. Simultaneously, their serum chloride concentrations rose. The 3 patients (Nos. 8, 9, and 10) observed only during the convalescent period also showed relatively high retention of chloride and gave no indication of an epicritical chloride or water diuresis. In the 3 patients (Nos. 4, 5, and 6) consuming more than 90 mM. (5.2 grams) of NaCl per day, the urinary chloride excretion during the acute stage remained below the intake but was not excessively depressed. In the convalescent stage, as the serum chloride concentration rose and more salt was diverted from extra-renal channels of excretion, skin, lungs, etc., to the kidneys, the urinary chloride rose to normal levels.

All of these patients, except No. 4, lost weight during the course of their illness and in none can

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TABLE I
Average daily sodium chloride balance and the serum chloride, CO₂, and plasma amino acid levels in primary atypical pneumonia

Patient number	Stage of disease	Number of days averaged	Daily average temperature peak	Weight	Fluid intake	Urine volume	Chloride intake	Urine chloride	Intake minus urinary output	Serum		Plasma amino acid nitrogen
										Chloride	CO ₂	
			° F.	kgm.	cc. per day		mM. per day			mM. per L.		mgm. per 100 cc.
1	acute conv.	3	103.1	58.5	2253	2280	21.2	26.6	- 5.4	98.8	28.6	4.15
		3	99.1	56.7	2196	2196	67.3	21.5	+45.8	100.0	32.7	
2	acute conv.	3	104.0	62.3	2526	1458	51.1	54.5	- 3.4	91.4	33.0	3.92
		7	99.5	54.5	2160	1140	88.2	4.5	+83.7	93.0		
3	acute conv.	13	101.9	74.4	2809	1596	55.4	55.9	- 0.5	97.3	26.5	3.68
		4	99.4	66.9	2312	1355	74.8	58.3	+16.5	103.9		
4	acute conv.	2	101.3	77.6	3598	2165	93.0	73.0	+20.1	97.7	30.5	3.80
		4	99.2	78.2		1995	130.5	122.4	+ 8.1	100.0	30.0	
5	acute conv.	4	103.3	61.0	2813	1720	101.2	54.9	+46.3	91.2	28.9	3.28
		4	99.1	54.2	2285	1436	120.8	96.5	+24.3	95.2	28.6	
6	acute conv.	8	102.2	85.7	3696	2363	107.4	78.8	+28.6	95.6	30.1	3.93
		5	99.9	82.3	2690	1849	140.1	135.3	+ 4.9	99.0		
7	acute conv.	8	102.0	67.0	2690	1038	63.1	50.3	+12.8	109.3	28.4	3.08
		7	99.8	61.2	2773	2093	121.1	116.5	+ 4.6	99.0		
8	acute conv.	1	104.6	70.6						93.3	31.0	3.88
		3	99.4	68.8	2380	2025	99.5	85.9	+13.6	96.2	31.7	
9	acute conv.	1	101.7	68.7								4.27
		2	99.6	67.7	2464	1705	106.6	49.6	+57.0	99.2	29.9	
10	acute conv.	1	102.2	72.7								4.30
		2	99.9	70.8	2548	1509	106.6	58.0	+48.6	99.5	29.8	

it be said that there was a significant storage of salt and water during their acute illness or a salt and water diuresis in convalescence, resembling that described in pneumococcus pneumonia.

Case No. 7 was the only one exhibiting any of the phenomena seen in pneumococcus pneumonia. Of his relatively low daily chloride intake of 63 mM. during his acute illness, the proportion excreted in the urine was less than on the much higher intake of 121 mM. in convalescence, and at the same time, his water output rose significantly in convalescence. He may be said, therefore, to have shown retention in the acute phase and a relative diuresis in convalescence. Unlike pneumococcus pneumonia, however, he had a high serum chloride level on admission which fell to normal during convalescence. It seems possible that his initial water retention was an attempt to restore a normal serum chloride level, resulting in an increase in total plasma volume which was subsequently reduced by the diuresis

during convalescence. Like all the other patients (except No. 4), he showed a net weight loss during the whole period of observation.

Data at hand indicate that the lower limit of the normal plasma amino acid nitrogen level, by the method used in these studies, is approximately 3.5 mgm. per 100 cc. None of the patients, therefore, with the exception again of No. 7 and possibly also of No. 5, showed a depression of the plasma amino acid level below normal. Three patients (Nos. 5, 7, and 8) showed a rise in their plasma amino acid level during convalescence, but patients Nos. 3 and 6 showed a drop. In this respect, again, primary atypical pneumonia does not resemble pneumococcus pneumonia.

CONCLUSION

In primary atypical pneumonia, unlike pneumococcus pneumonia, hypoaminoacidemia does not occur and there is no significant tendency to

retain salt and water in the acute stage or to excrete an excess in convalescence.

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