THE PATHOLOGIC PHYSIOLOGY OF PELLAGRA

I. TABULATED CLINICAL AND PHYSIOLOGIC DATA

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Pellagra is almost unique among major diseases in the scarcity of accurate information concerning it. There is still uncertainty about its etiology; the nature of its pathologic lesion is obscure; the diagnosis in atypical cases is a mere matter of opinion; and there are no adequate criteria for cure or for prognosis. The pellagrin who remains ill for a prolonged period may be suffering from chronic pellagra or may be suffering from some mysterious sequel rather than the disease itself. Prognosis is based chiefly on mass statistics largely unmodified by the clinical features of the individual patient. Even the causes of death are little understood. Pellagrins frequently die unexpectedly when apparently convalescent. The treatment at present is highly unsatisfactory. More than 25 per cent of the pellagrins admitted to the New Orleans Charity Hospital die in the hospital, in spite of treatment along the most approved lines. The treatment is dietary and symptomatic. The dietary is based on inexact knowledge of the dietary fault to be overcome. The symptomatic treatment rests on imperfect knowledge of the disturbed physiology represented by the symptoms. Pellagra takes a variety of clinical forms, so that some writers have suggested that what is called pellagra is a mixture of diseases rather than an entity. If typical skin lesions are accepted as a *sine qua non* there can be little doubt that pellagra is a unique disease for there is hardly any lesion in medicine more distinctive clinically. Even with classic skin lesions the cases fall into sharply contrasting groups. The mechanisms which bring this about are quite mysterious. The studies upon which this and subsequent papers are based were undertaken with the belief that there was no better mode of attack on many of the

TABLE 1
Data relative to forty-two pellagrins analyzed in this and succeeding papers
(For significance of code designations, see footnote to table)

Case number	Race	Sex	Age	Interval	Skin lesions				Diarrhea		Glossitis	Vomiting	Psychoses	Neuritis	Gastric acidity	Edema	Fever	Weight		Red blood cell volume	Blood volume	Plasma volume	Volume packed red blood cells	Serum proteins			Calcium	Inorganic phosphorus	Chloride as NaCl	CO ₂ capacity plasma	Total base	Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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1	W.	M.	51	5	1	2	3	B	U	D	H	H	H	H	H	H	H	H	76	54.2	40.6	5,500	3,200	2,300	4.11	98.6	0.9	9.7	3.5	416	54		Chronic alcoholism. Esophageal pain																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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TABLE 1—Continued

Case number	Race	Sex	Age	Interval	Skin lesions				Diarrhea		Glossitis	Vomiting	Psychoses	Neuritis	Gastric acidity	Edema	Fever	Weight		Red blood cell volume		Blood volume		Plasma volume	Volume packed red blood cells	Serum proteins			Calcium	Inorganic phosphorus	Chloride as NaCl	CO ₂ capacity plasma	Total base	Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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22	C. F.	11	—	12	2	3	D	12	2	1	0	D	0	—	0	0	43	27.2	28.0	—	—	—	2.22	3.05	5.27	8.5	5.2	432	53	118	Died 1 hour later		
23	C. M.	10	—	16	3	3	D	4	2	1	0	0	0	0	0	0	35	24.1	30.1	12.570	1.770	770	2.81	2.11	4.92	8.4	5.3	464	51	123	Improved		
			10				U		0	0	0	0	0	0	0	0		24.1	31.1	12.580	1.750	800	2.84	2.03	4.87	11.9	6.7	512	63				
24	C. F.	34	—	5	3	1	H	12	3	0	0	D	0	A	0	0	61	48.7	25.2	4.240	3.090	1,120	2.12	3.28	5.40	8.5	3.8	568	53	154	Stricture of rectum		
			5				H		3	0	1	D	0		0	0		48.7	28.9	3.960	2,790	1,140	3.11	3.26	6.37	9.6	5.7	544	29	153	Discharged unimproved		
25	W. F.	16	—	12	5	1	H	4	1	0	0	0	0	A	0	0	56	36.3	34.5	2.860	1,830	990	4.82	2.20	7.02	11.4	5.7		53			Pyralism. Diarrhea had stopped 3 months before admission	
			7				H		0	0	0	0	1		0	0		36.8	30.6	2.640	1,810	810	4.04	2.13	6.17	10.76	6.2	614	57				
			11				H		0	0	0	0	1		0	0		37.2	32.5	3.130	2,110	1,000	4.16	2.17	6.33	11.0	3.4	604	50				
			7				H		0	0	0	0	1		0	0		37.5	33.8	2.600	1,700	880	4.14	2.15	6.29	11.1	4.8	590	60				Clinically stationary
			8				H		0	0	0	0	1		0	0		37.6	36.1	2.950	1,870	1,060	4.10	2.27	6.37	11.6	5.6	600	56				
26	W. F.	23	—	6	2	1	H	0	0	1	0	0	0	A	0	0	54	44.8	31.8	3.500	2,350	1,110	3.16	1.59	4.75	10.2	4.7	611				Third annual attack. Was edematous 5 days ago. Improved	
27	C. F.	39	—	4	2	2	DU	0	0	1	0	0	1	A	0	1	56	36.3	25.2	2,800	2,060	710	3.89	2.42	6.31	10.6	4.4	558	60				
			9				D		1	0	0	0	1		0	0		34.0	28.6	2,230	1,570	640	3.93	2.93	6.86	11.9	5.4	578	54				
			9				H		0	0	0	0	2		0	0		33.3	32.2	2,780	1,860	890	3.65	2.49	6.14	10.6	6.3	584	59				
			8				H		1	0	0	0	3		0	0		34.0	34.5	2,810	1,810	970	3.72	2.63	6.35	11.3	5.8	560	52				
			12				H		0	0	0	0	2		1	0		33.2	38.5	3,340	2,040	1,280	3.43	2.30	5.73	10.8	5.4	540	57				
			14				H		0	0	0	0	1		1	0		34.1	38.6	3,130	1,900	1,210	3.47	1.95	5.43	11.1	5.2	500	60	143			
			12				H		0	0	0	0	1		0	0		34.9	39.9	3,380	2,010	1,350	3.74	2.00	5.74	11.3	5.4	540	66	157			Improved
28	W. F.	26	—	5	2	1	H	0	0	2	0	0	0	—	1	0	53	37.2	33.3	3,260	1,770	830	3.41	3.44	6.85	10.2	4.2	584	62				Stricture of rectum; recto-vaginal fistula. Unimproved
29	W. M.	36	—	4	2	1	E	0	0	1	0	0	0	A	0	0	67	52.2	36.0	4,940	3,110	1,780	4.03	2.32	6.35	11.8	3.2	620	58				
			7				E		0	0	0	0	0		0	0		52.7	35.5	4,550	2,890	1,610	3.91	2.37	6.28	11.8	3.4	540	55				Unimproved
30	W. M.	44	—	6	3	1	E	0	0	1	2	0	0	—	0	0	75	78.5	49.8	8,780	4,330	4,380	4.19	2.32	6.51	11.1	3.5	651	52				Unimproved
31	C. M.	53	—	1	1	1	E	0	0	0	0	0	0	A	0	0	70	59.0	43.4	5,580	3,150	2,420	3.60	3.01	6.61	9.8	3.4	492	53				Luetic heart disease
			10				D		0	0	0	D	0		0	0		58.1	41.6	5,680	3,220	2,420	2.90	2.88	5.80	9.1	3.2	600	47				Died suddenly 3 days later

TABLE 1—Concluded

Case number	Race	Sex	Age yrs. days	Interval	Skin lesions				Diarrhea		Glossitis	Vomiting	Psychoses	Neuritis	Gastric acidity	Edema	Weight		Red blood cell volume	Blood volume	Plasma volume	Volume packed red blood cells	Serum proteins			Calcium mgm per 100 cc.	Inorganic phosphorus mgm per 100 cc.	Chloride as NaCl mgm per 100 cc.	CO ₂ capacity plasma vol. per 100 cent	Total base	Remarks		
					Duration	Extent	Severity	Present state	Duration	Severity							Ideal	Present															
32	C.	F.	25	—	12	4	1	DE	0	0	2	0	0	0	0	A	0	1	59	38.1	135.0	2,790	1,780	980	3.24	2.06	5.30	10.9	4.1	552	46	144	Recurrent skin lesions
			13	13	HD	1	0	0	0	0	0	0	0	0	0	0	0	0	36.3	34.7	3,390	2,190	1,175	3.30	1.69	4.99	10.3	3.8	532	47	152		
			11	11	H	0	0	0	0	0	0	0	0	0	0	0	0	0	37.2	38.0	3,520	3,140	1,340	3.99	1.58	5.57	11.9	3.4	552	53	154		
			13	13	H	0	0	0	1	0	0	0	0	0	0	0	0	0	38.1	32.2	3,300	2,150	1,030	3.93	1.59	5.52	11.0	3.8	570	54	139	Improved	
			15	15	H	0	0	0	1	0	0	0	0	0	0	0	0	0	39.9	31.7	3,200	2,440	1,050	3.26	1.74	5.00	10.4	3.6	560	54	139	Stricture of rectum. Probable previous mild annual attacks	
33	C.	F.	39	—	4	4	1	D	0	0	0	0	0	0	A	0	0	70	62.5	31.8	2,400	2,860	1,350	2.97	4.60	5.57	11.8	3.2	538	51	60	Improved	
			14	14	H	0	0	0	0	0	0	0	0	0	0	0	0	0	59.9	31.0	1,500	3,520	1,600	2.83	4.85	7.68	10.8	4.4	562	54	146	Chronic alcoholism. Deserted	
			13	13	H	0	0	0	0	0	0	0	0	0	0	0	0	0	59.4	32.2	4,630	3,100	1,490	2.73	5.11	7.84	6.0	3.9	570	60	146	Returned with additional lesions	
			13	13	H	0	0	0	0	0	0	0	0	0	0	0	0	0	60.3	29.6	5,200	3,620	1,540	2.63	4.18	6.80	11.1	4.7	552	60	146	Slight improvement	
			29	—	4	2	1	E	0	0	0	0	0	0	2	A	0	1	53	46.3	30.4	3,470	1,720	1,680	5.46	2.14	7.50	11.3	4.9	51	51	146	Stricture of rectum. Recurrent skin lesions
34	W.	M.	29	—	4	2	1	E	0	0	0	0	0	0	2	A	0	1	53	46.3	30.4	3,470	1,720	1,680	5.46	2.14	7.50	11.3	4.9	51	51	146	Improved
			60	60	HD	0	0	0	0	0	0	0	0	0	2	A	0	0	44.4	45.2	0.3	2,000	1,520	1,680	3.96	1.72	5.68	11.4	4.1	512	49	138	Chronic alcoholism. Deserted
			14	14	H	0	0	0	0	0	0	0	0	0	0	0	0	0	39.3	47.9	3,770	1,950	1,800	4.01	1.62	5.64	11.0	4.7	536	54	138	Returned with additional lesions	
			14	14	H	0	0	0	0	0	0	0	0	0	0	0	0	0	38.5	46.9	2,690	1,400	1,260	3.51	1.83	5.34	14.3	4.3	530	55	143	Slight improvement	
			14	14	H	0	0	0	0	0	0	0	0	0	0	0	0	0	37.6	42.2	—	—	—	3.28	1.46	4.17	11.1	4.5	574	54	161	Stricture of rectum. Recurrent skin lesions	
35	C.	F.	30	—	12	3	1-3	DU	0	0	1	0	0	0	H	0	0	60	52.0	22.3	3,630	2,820	810	3.37	2.26	5.63	11.9	4.2	530	56	144	Improved	
			14	14	HU	0	0	0	0	0	0	0	0	0	0	0	0	0	50.9	22.5	3,570	2,740	810	3.38	2.50	5.88	10.1	4.4	588	57	144	Recurrent skin lesions	
			13	13	HD	0	0	0	0	0	0	0	0	0	0	0	0	0	55.1	22.7	4,100	3,160	930	3.22	2.50	5.72	9.2	3.8	600	49	155		
			14	14	H	0	0	0	0	0	0	0	0	0	0	0	0	0	58.6	25.0	4,350	3,250	1,090	3.14	2.71	5.85	10.4	4.5	550	54	155		
			23	—	10	3	1-3	DU	3	1	3	0	D	0	A	0	2	56	44.5	19.6	3,810	3,060	750	1.71	3.80	5.57	7.4	2.6	356	57	123	Recurrent skin lesions. Died 28 hours later	

37	W. F.	50	—	8	3	1	H	1	2	0	0	0	0	A	0	0	63	52.2 34.0 3.440 2.110 1.320 4.222 2.41	58	142	Mild hypothyroidism. Discharged unchanged. Third annual attack
38	C. F.	32	—	12	3	1	HE	0	0	0	0	0	0	—	0	0	62	66.7 40.8 5.090 2.970 1.980 3.152 2.09	55	137	Recurrent skin lesions. Recto-vaginal fistula
		13					HD	0	0	0	0	0	0	0	0	0			56		
		14					H	0	0	0	0	0	0	0	0	0			582	60	
		15					H	0	0	0	0	0	0	0	0	0			522	55	142
39	C. F.	22	—	4	3	2	D	1	1	0	0	0	0	A	0	0	57	62.2 35.7 4.740 3.050 1.690 3.662 2.97	64	139	Previous attack 7 years ago
		16					H	0	0	0	0	0	0	0	0	0			570	55	
		13					H	0	0	0	0	0	0	0	0	0			534	57	154
40	C. F.	28	—	4	5	2	DB	0	0	1	0	0	0	A	0	1	58	53.3 32.8 4.430 2.930 1.450 3.682 2.14	49	141	Recurrent skin lesions
		10					U	2	2	0	0	0	0	0	0	0	2	53.1 28.7 4.970 3.520 1.420 3.163 2.07	53	592	
		5					U	2	2	0	0	D	—	0	0	3	51.5 30.6 4.640 3.220 1.420 3.232 2.72	39	135	Died 17 hours later	
41	C. F.	32	—	2	2	1	E	3	0	1	0	0	0	A	0	0	60	45.7 35.8 3.740 1.980 1.120 3.712 2.42	59	530	
		9					DU	0	0	0	0	0	0	0	0	0			580	59	
		14					D	0	0	0	0	0	0	0	0	0			540	58	150
42	W. F.	30	—	2	4	2	ED	0	0	1	0	0	?	0	0	56	38.7 34.1 3.740 2.450 1.270 3.402 2.09	55	149	Chronic alcoholism Unimproved	

Skin lesions: Duration: Time in weeks since appearance of skin lesions of present attack. In a number of cases before skin lesions were healed fresh ones appeared. These are referred to as recurrent skin lesions. They are considered as being a part of the same attack of pellagra as the unhealed lesions. Figures in this column do not refer to the time of appearance of recurrent lesions.

Extent: Figures in this column indicate roughly the surface area involved. The areas referred to are those most commonly involved, their equivalents in extent elsewhere is occasionally substituted.

1 = parts of hands only. 2 = entire surface of hands exclusive of palms. 3 = hands and forearms or elbows. 4 = hands and feet. 5 = hands and feet plus other extensive areas.

Severity: Terminology that of burns: 1 = first degree. 2 = second degree. 3 = third degree. Third degree pellagra lesions on healing do not cause contracture but the skin is far from normal.

State: Condition of lesions at the time of study. B = bullae. U = ulceration. E = erythema. D = desquamation. H = healed.

Diarrhea: Duration: Weeks after onset.

Severity: 1 = 3 to 6 times a day. 2 = 7 to 10 times. 3 = 11 or more times a day.

Glossitis: 1 = mild diffuse redness. 2 = marked diffuse injection with pain. 3 = marked injection plus areas of ulceration. 4 = bald tongue due to atrophy of papillae.

Vomiting: 0 = absent. 1 = occasional. 2 = 3 to 5 times daily.

Psychosis: D = delirium. C = coma. S = suicidal depression.

Neuritis: Symptoms of peripheral neuritis in legs but with exaggerated knee jerks. 1 = mild, chiefly subjective. 2 = moderate. 3 = severe bedridden. — = information not available.

Gastric acidity: A = absence of free hydrochloric acid. N = normal acidity. H = hyp acidity. — = information not available.

Edema: Pitting edema: 1 = just demonstrable. 2 = moderate in degree and distribution. 3 = anasarca.

Fever: 1 = temperatures up to 101.5°F. 2 = more than 101.5°F but less than 103°F. 3 = temperatures higher than 103°F.

Blood volume: The figures in italics are estimated values obtained by comparing the hematocrit at that particular time with the hematocrit of the preceding or following study. The calculation is based on the assumption that the volume of circulating blood cells is unchanged from one occasion to the next.

Weight: Given in kilograms. Ideal weights are those given by the tables of the Medico-Actuary Mortality Investigations (5) for sex, age, and height.

problems of pellagra than the accumulation of more exact knowledge of the disturbed physiology.

All patients studied were in-patients of Charity Hospital, and all had typical skin lesions of pellagra together with other evidences of the disease.

Detailed methods will be presented as indicated in subsequent papers of this series.

The first study was usually made one or two days after admission to the hospital, and with few exceptions the blood volume was determined each time blood was taken for chemical study. The studies were repeated, provided the patients remained sufficiently long under observation, at intervals of from 5 to 15 days. All patients were given during their stay in the hospital a special "pellagra diet." This diet has a daily caloric value of 2500 to 3500 calories, contains more than 100 grams of protein, a part of which is liver or sweetbread, and contains an abundance of green leafy vegetables and 500 cc. buttermilk. It is given to patients with diarrhea in bland form, and, when necessary, a liquid diet of similar caloric value was given by gavage. Routinely there was included for the vitamin content 30 cc. of fresh brewer's yeast three times a day, 150 cc. of orange or lemon juice daily and in addition some of the patients received 4 cc. of cod liver oil three times a day. The nurses usually took especial interest in their pellagrins and in their nutrition and fluid intake.

No particular effort was made to influence by treatment the derangements of physiology revealed in these studies. Therapeutic studies are to be made later. In the present studies pellagra was observed under what has been considered an excellent regimen.

The detailed clinical information, the blood volumes, and the results of chemical studies are shown for 42 cases in table 1.

The pellagrins which we have studied made a fairly representative group. The proportion of severe cases of pellagra is much greater in hospital than in general practice, but mild forms of the disease are also present.

In subsequent articles (1, 2, 3, 4) detailed procedures will be presented and the results of the physiologic investigations analyzed and discussed.

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SUMMARY OF CLINICAL DATA

Detailed clinical data obtained from a study of 42 pellagrins are recorded in one table which also includes the results of determinations of circulating blood volume, serum albumin and globulin, serum calcium and inorganic phosphorus, of plasma chlorides, of carbon dioxide combining power, and of serum total base.

The group of patients consisted of 6 white men, 9 white women, 9 negro men, 16 negro women, and 2 negro children. Twenty were less than 30 years old and 36 were less than 50.

Thirteen patients, 31 per cent, died in the hospital.

Thirty-nine had had no previous attacks of pellagra; 3 had had attacks 1 to 7 years previously.

Eleven patients of the group had other diseases: Syphilis, 5, two with heart disease; stricture of the rectum, 4; active gonorrhea, 1; intestinal tuberculosis, 1.

Fifty-nine per cent of the patients were more than 20 per cent underweight and 35 per cent more than 30 per cent underweight, and 10 per cent were overweight.

Eight patients showed edema.

The skin lesions at the time of the first study showed erythema in 26, 62 per cent; 9 of the 26 showed recurrent lesions in the presence of older unhealed lesions.

Vomiting was a serious problem in 2 patients.

Glossitis was present in 26, 62 per cent; diarrhea in 25, 60 per cent.

Gastric analysis was done in 34 and achylia found in 29, 60 per cent, of the entire group; hypoacidity in 3, and a normal acidity in 2 patients.

Seven patients were delirious, 2 were comatose and 1 suicidal; a total of 10, 24 per cent, with psychoses.

Six patients showed evidences of peripheral neuritis.

BIBLIOGRAPHY

1. Turner, Roy H. with Virginia Blanchard, J. Clin. Invest., 1931, x, 71. The Pathologic Physiology of Pellagra. II. The Serum Albumin and Globulin.
2. Turner, Roy H. with Virginia Blanchard, J. Clin. Invest., 1931, x, 87. The Pathologic Physiology of Pellagra. III. The Serum Calcium and Phosphorus, with Especial Reference to Nervous Symptoms.
3. Turner, Roy H. with Virginia Blanchard, J. Clin. Invest., 1931, x, 99. The Pathologic Physiology of Pellagra. IV. Serum Electrolytes and Acid-Base Equilibrium.
4. Turner, Roy H., J. Clin. Invest., 1931, x, 000. The Pathologic Physiology of Pellagra. V. The Circulating Blood Volume.
5. Davenport, C. B., Carnegie Institute, Washington, Publication 329, 1923. Body Build and its Inheritance.