undelivered from a contracted pelvis, was not only wrong but a useless sacrifice of a human life, the mortality to mothers being far greater than that of a Porro or Cesarean section in skilled hands.

Kroenig has shown antepartum douches to be not only worthless but positively harmful. His experiments proved that the vagina is naturally sterile in as far as concerns infective bacteria, and that if douches were given in cases where the vagina had been inoculated with the streptococci and staphylococci, these germs were not destroyed by antiseptic douches, and it took the vaginal secretions from nineteen to thirty-six hours to destroy the microbes that, without the douche, would disappear in from eleven to twenty-four hours. A large percentage of the cases of puerperal fever are due, as is claimed, to unclean fingers and introduction of infected instruments. Douches may be used at the time of labor in women who have gonorrhea, with the sole idea of protecting the child's eyes, yet it is a more certain plan to rely on the prophylactic idea of dropping a drop of a 5-grain nitrate of silver solution into the infant's eyes immediately after birth.

The use of diphtheria antitoxin as a prophylactic and curative measure in this, the most dreaded disease of childhood, has passed beyond the experimental stage and is to-day almost universally used even by those who were not early converts to its certain virtues. The introduction of serotherapy in other channels up to this time is in the experimental stage, but I feel sure that in the near future other diseases, septic in character, will be successfully combated by this form of treatment.

The subject of most interest to the Section in the line of infective processes being puerperal fever, it has been shown that micro-organisms of seeming identity are capable of generating different poisons under modified surroundings. This being true, the last endeavors have been the use of immunizing and curative doses of the streptoserum in puerperal infection, this being obtained from animals infected by a number of different streptococci, as in the laboratory of Louvain, where animals are being injected with as many as five different varieties of septic micro-organisms—a species of shotgun bacterial prescription. In the Borough of Manhattan, N. Y., during the last year, there were 376 deaths from puerperal diseases. Thus it would seem that there is much yet to be done in the prevention and cure of this disease of the puerperal woman. In a late paper by Dr. S. S. Jones of New York City, he calls attention to the use of Credé's ointment of silver in puerperal sepsis. He says Credé uses a 15 per cent. ointment containing soluble uncombined metallic silver, using three grams for the initial inunction, about four grains of pure silver being absorbed into the system. In local processes the inunctions were made as far away from the seat of the disease as possible. He found that in acute and recent cases one inunction was usually sufficient to effect disinfection of the system in from twenty-four to thirty-six hours. Improvement was usually observed in ten hours; "indeed, it was so sudden as to astonish both physician and patient," says Dr. Jones.

"This silver salt occurs in small, hard pieces, having a greenish metallic luster, but when subjected to trituration it becomes pasty and assumes a yellowish tint." A 15 per cent. ointment is rubbed into the skin on the inner side of the thighs. It is presumed, in the management of these cases, that by the use of this salt all pus pockets in the pelvis are emptied by surgical methods, the treatment being reserved for purely simple septicemic cases. While this report is one very favorable in character, endorsing the use of the silver ointment, I feel that time and its further use will bring disappointment.

Original Articles.

A STUDY IN PERSPIRATION.*

ORIGINAL RESEARCH IN ONE HUNDRED AND THIRTEEN CASES.

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CHICAGO.

This paper deals with 113 individual analyses of human sweat, of normal and abnormal subjects It will be conceded that the study of sweat has been overlooked, and before we can fully appreciate all that pertains to it, it is essential that we familiarize ourselves with the composition of normal sweat, and how certain drugs modify its composition. I submit the following arrangement: 25 cases of passive, normal sweats; 22 cases of passive, normal, sodium salicylate sweats; 25 cases of passive, normal, pilocarpin sweats; 10 cases of passive, normal, acetanilid sweats; 7 cases of passive, normal, quinin sweats, and 24 miscellaneous sweats.

The chemic analysis is limited to the determination of reaction, specific gravity, total solids, organic and inorganic, urea and nitrogen. The quantitative analysis of phosphates, chlorids, etc., will be taken up at a later time.

A chemist can readily appreciate the difficulties one would encounter if all the ingredients of human sweat were to be isolated from a single specimen; because it would require a large quantity of sweat, which in many instances could be utilized for analyzing only one ingredient. The incentive for undertaking this work is based on the fact that we are constantly using the skin for eliminative purposes in many abnormal conditions, such as uremia, rheumatism, diabetes, neurasthenia, auto-intoxication, septicemia, etc., without having a well-defined knowledge about what the skin is eliminating in a given case under normal or abnormal conditions.

Urinalysis has obtained a very important position; sweat analysis has been neglected and may play a more or less important part in the practice of medicine. Before proceeding with the analysis I will briefly review the history of perspiration as far as I have been able to obtain it from some of the literature now written.

Aliparido Noriggia is impressed by the similarity between sweat-glands and kidneys and the similarity between substances excreted by both, being more abundant in the urine. He kept a patient on a vegetable diet until the urine remained alkaline, then gave a bath and induced sweat by means of active exercise. The sweat so obtained gave an acid reaction; the urine, on the other hand, retained its alkalinity. Repeated experiments always gave the same results.

In the next trial a mule was fasted until the urine

*Read before the Chicago Society of Internal Medicine.

was acid and remained so; when sweated, the perspiration was alkaline. A sick horse was fed on an animal diet until urine remained acid; the sweat gave an alkaline reaction. He draws the conclusion that the sweat of herbivora is always alkaline, no matter what the reaction of the urine may be, and that the human sweat is always acid.

Dr. J. A. Wesener, who made all the chemic analyses for me, has observed some neutral reactions and once it was faintly alkaline; this in individuals, however, who had been sweated profusely once in forty-eight hours two or three times successively.

Dr. K. B. Hofmann, "Ueber Chromidrosis," found blue sweat which contained indigo; in several syphilitic females he found a magenta-red sweat under the axilla, which colored the linen an ochre yellow; treated with alkalies, it became red.

Duremberg and Peter found urea in sweat.

Trumpy and Luckinger, in Zurich, found normal sweat of acid reaction. That from cats' paws gave an alkaline reaction. Sweat from man was found alkaline if brought on by exercise; or if induced by pilocarpin, the reaction was always alkaline; however, if the skin was not thoroughly cleaned the reaction was acid, but soon became alkaline as the perspiration continued. They assume that the acidity is due at first to the sebum found in the sebaceous glands, which is washed out after prolonged sweating. (Here I would mention that I encountered material difficulty in properly interpreting the reaction with litmus paper, because it is not sensitive enough, and therefore submitted the question to Dr. Wesener in order to avoid error. I have already mentioned the fact that repeated sweating of one individual does apparently result in a neutral or faintly alkaline sweat.)

Turbini found jaborandi sweat acid even when the patient had been kept on a vegetable diet for one week.

Vulpian found the reaction of sweat from dogs' paws alkaline.

Turbini Anserinno found that jaborandi increases sweat at the ratio of 239 to 100. The reaction before and after was acid.

Stefano Copranica obtained 450 c.c. of sweat by means of a steam bath. Its specific gravity was 1005–1006. He found sulphur by the spectroscope, and creatinin by means of Weil's reaction.

Babesin found a red perspiration in the axilla, evidently due to ovoid bacteria which formed zoöglea masses. Treated with sulphuric acid it turns violet, and later violet-blue. Nitric acid causes the masses to change to a light yellow and then, when treated with alkalies, they assume their original color.

A. Kast writes about aromatic products in human sweat. The sweat of convalescents was collected in a bath tube. The fluid, after being chemically treated' gave the following results: .2422 gm. of normal sulphates, .022 gm. of aromatics. The internal administration of salol altered the proportion in sweat as compared to urine. Normally, the ratio of aromatic sulphates was about the same in sweat and urine. The ratio of inorganic salts of sweat, compared to the same of urine, was:

	Chlorids.	Phosphates.	Sulphates.
Sweat	1	.0015	.009
Urine	1	.132	.397

By distillation phenol and oxyacid were found.

Biusine found malic, succinic and benzoic acids in the sweat of herbivora.

C. Tichborne found uric acid in sweat after using a Turkish bath.

G. B. Gueriolo reports the sweat of smallpox, malaria, typhus fever and rheumatism toxic to rabbits.

A. Leblerc says that the white foam of horses' sweat contain urea, chlorids and a coagulate proteid or albumin.

Dr. Fred Smith found that horse sweat is not modified by pilocarpin; he also found albumin in horses' sweat.

P. Argutuisky found nitrogen in two specimens of sweat; one contained total N of .2475; the other total N of .2555.

L. Devoto obtained sweat by means of a hot-air bath, and by means of chemic processes found acetone in two cases of malaria, one case of typhoid fever and one case of diabetes. In 2000 c.c. of normal sweat, he always obtained a reaction for acetone.

Ernst Heuss says the reaction of normal sweat is acid, except when very profuse, it reacts alkaline or neutral.

F. Gaube found normal sweat acid, while that of horses, oxen, cats and pigs was found to be alkaline. He found urea and .425 per cent. of albumin in human sweat, also pepsin, diastase and other ferments; in horses, 15.6 per cent. of albumin.

Erich Harnack found in a case of rheumatism, total solids, 91 per cent., .24 per cent. of this being organic and .67 per cent. being inorganic; .52 per cent. NaCl or $K.H_2P_4$—.01 magnesium phosphate.—.06 H_2SO_4 .05 potassium. The urea represented one-half of the inorganic substance.

N. Nironowitsch, in reference to the excretion of medicinal substances, found that the sweat of syphilitics treated by mercury salts contained more mercury than the urine.

Charles Colombo says massage increases the amount of sweat, which, however, was poor in urea, potassium and acids, but rich in sodium chlorid. The reaction was alkaline.

G. B. Guerrolo injected sweat into the veins. Normal sweat was non-toxic; that of smallpox, typhoid fever, articular rheumatism, was very toxic; that of tetanus was non-toxic.

S. Arloing says dogs were susceptible, guinea-pigs and rabbits less affected; 10-15 c.c. of normal sweat, by intravenous injection, will usually kill a one-kilogram dog; 20-25 c.c. is necessary to kill a one-kilogram rabbit; 20 c.c., a one-kilogram guinea-pig.

Capitan and Grey found sweat collected under aseptic conditions to be non-toxic; 20-60 c.c., by intravenous injection into a rabbit, produced no action.

Arloing found the sweat of active exercise one-fourth more toxic than passive sweat. The variation of toxicity runs parallel with the toxicity of urine.

Naveozannis says there are many conflicting opinions in reference to toxicity. Guerrolo and Calitso injected 60-100 c.c. sweat without producing toxic symptoms.

Naveozannis found that 60 c.c. were fatal to a rabbit, death following in twenty-four hours. Two rabbits died within an hour. Smaller doses produced emaciation, lasting about four or five days. Immediately after the injection there was a slight rise in the temperature, and exhaustion; paresis of hind extremities, hemoglobinuria and hematuria. Post-mortem usually found kidneys and intestines congested. The sweat possesses slight antiseptic properties toward the bacillus pyocyaneus.

Number	Reaction	Spec. Grav.	Quantity	Total Solids	% Inorganic	% Organic	Total Nitrogen	Total Nitrogen Urea	Total Urea	% Solids	% Inorganic Solids	% Organic Solids	% Nitrogen	% Nitrogen Urea	% Urea
1	Acid	1.0065	60 c.c.	.78720	.41760	.36720	.04590	.03180	.06840	1.3120	.6960	.6120	.07650	.05300	.11400
2	"	1.0038	125 "	.94162	.44825	.49337 5	.08625	.05700	.11500	.7533	.3586	.3947	.06900	.04320	.09200
3	"	1.005	95 "	.90563	.38000	.27665	.06260	.03942	.08360	.9533	.4000	.5533	.06530	.04150	.08800
4	"	1.002	100 "	.57700	.23300	.34400	.04480	.03000	.06400	.5770	.2330	.3440	.04480	.03000	.06400
5	"	1.003	120 "	.92790	.42396	.50400	.08040	.05376	.11520	.7733	.3533	.4200	.06700	.04480	.09600
6	"	1.0034	120 "	.84792	.28800	.55992	.08811	.05376	.11520	.7066	.2400	.4666	.07093	.04480	.09600
7	Neutral	1.0046	600 "	5.71980	2.76000	2.95980	.34680	.22920	.48000	.9533	.4600	.4933	.05780	.03820	.08000
8	Acid	1.0045	120 "	2.31990	.38712	1.93284	.10200	.07872	.16800	1.9333	.3226	1.6107	.08500	.06560	.14000
9	"	1.007	140 "	1.56800	.79240	.77500	.10262	.06280	.13346	1.1200	.5660	.5540	.07330	.04486	.09533
10	"	1.003	240 "	1.22544	.63024	.59820	.12312	.06624	.14064	.5106	.2626	.2480	.05130	.02760	.05860
11	"	1.004	160 "	2.38928	.66128	1.72800	.10844	.08528	.18128	1.4933	.4133	1.0800	.07740	.05330	.11330
12	"	1.005	100 "	1.20660	.56660	.64000	.08120	.05520	.11730	1.2066	.5666	.6400	.08120	.05520	.11730
13	"	1.002	250 "	1.63325	.46000	1.17325	.14550	.09550	.23650	.6533	.1840	.4693	.05800	.03820	.09460
14	"	1.0067	170 "	2.15322	.57800	1.57522	.12376	.12016	.2346	1.2666	.3400	.9266	.07280	.06480	.13800
15	"	1.003	250 "	1.55650	.64000	.91650	.16325	.09675	.23650	.6226	.2560	.3666	.06530	.03872	.09460
16	"	1.0067	40 "	.44264	.23732	.24532	.01680	.01276	.02836	1.1066	.5933	.6133	.04200	.03190	.07140
17	"	1.0018	160 "	1.01896	.23248	.77648	.08656	.04416	.09376	.6306	.1453	.4853	.05410	.02760	.05860
18	"	1.0047	138 "	1.63680	.73636	.91963	.09014	.04278	.09642	1.2000	.5336	.6664	.06530	.03100	.07060
19	"	1.005	120 "	1.19520	.60000	.59520	Accident	.05808	.12312	.9960	.5200	.4960	Accident	.04840	.10260
20	"	1.004	360 "	3.75200	1.19988	1.75284	.27540	.10800	.22320	.8200	.3333	.4869	.07656	.03000	.06250
21	Neutral	1.0065	250 "	2.80000	1.51650	1.28350	.45278	.27675	.59225	1.1200	.6066	.5134	.18110	.11070	.23690
22	Acid	1.008	150 "	1.24990	.66970	.60000	.11900	.04110	.08925	.8466	.4466	.4000	.07460	.02740	.05950
23	"	1.0065	100 "	1.53330	.71330	.82000	.11200	.04440	.09660	1.5333	.7133	.8200	.11200	.04440	.09660
24	"	1.004	80 "	.61008	.15680	.43328	.05744	.05480	.11728	.7626	.1960	.5666	.07180	.06850	.14660
25	"	1.0078	95 "	1.26663	.52687	.74076	.05937	.05133	.10953	1.3333	.5546	.7787	.06250	.06250	.11530
				Sodium Bicarbonate Sweats of Normal Individuals.											
1	Acid	1.0024	150 c.c.	1.33650	.63390	.70110	.12600	.08820	.18630	.8910	.4226	.4674	.08400	.05880	.12420
2	Neutral	1.0025	160 c.c.	1.26928	.60800	.66128	.09400	.06112	.13072	.7933	.3800	.4133	.06250	.03820	.08170
				Splenic Myelogenic Leucaemia. Passive Sweats.											
1	Acid	1.0029	120 c.c.	.89112	.36792	.52320	.16632	.08712	.18552	.7426	.3066	.4360	.08860	.07260	.15460
2	"	1.0027	285 c.c.	.77840	.92340	.85500	.13074	.08835	.20691	.6240	.3240	.3000	.04570	.03100	.07260
				Catarrhal Jaundice Passive Sweat.											
1	Acid	1.005	165 c.c.	2.91489	.68789	2.44200	.17094	.10230	.21945	1.7666	.3866	1.4800	.10360	.06200	.13330
				Passive Sweat. Acute pleuritic Effusion											
1	Neutral	1.0023	210 c.c.	1.07793	.40026	.65667	.08232	.05733	.12306	.5133	.1906	.3127	.03920	.02730	.05860
2	Neutral	1.0824	255 "	1.34263	.53040	.81090	.09756	.07191	.15300	.5266	.2080	.3180	.03826	.02820	.06000
				Diabetes. Passive Sweat.											
1	Acid	1.002	200 c.c.	1.4800	.82000	.66000	.11560	.06906	.14772	.7400	.4100	.3300	.05780	.03453	.07386

Number	Reaction	Sp. Gr.	Quantity	Grams Solids	Grams Inorganic	Grams Organic	Grams Nitrogen	Grams Nitrogen as Urea	Grams Urea	% Solids	% Inorganic Solids	% Organic Solids	% Nitrogen	% Nitrogen as Urea	% Urea
1	Neutral	1.0050	100 cc.	1.06800	.50080	.45720	.05600	Accident	Accident	1.0680	.5008	.4372	.05600	Accident	Accident
2	Acid	1.0035	75 "	.57780	.19980	.37800	.04200	.03885	.08295	.7704	.2664	.5040	.05600	.05180	.11060
3	"	1.0069	100 "	1.46960	1.46960	.75360	.05264	.03400	.07280	1.4696	.7536	.7160	.05264	.03400	.07280
4	"	1.0079	80 "	1.04960	.58944	.44016	.05510	.03232	.06688	1.3120	.7368	.5752	.06888	.04040	.08360
5	"	1.0074	70 "	.84560	.46480	.38080	.04200	Accident	Accident	1.2080	.6640	.5440	.06000	accident	accident
6	"	1.0045	100 "	.65484	.30000	.35480	.05130	.03000	.06400	.6548	.3000	.3548	.05130	.03000	.06400
7	Neutral	1.0075	84 "	1.27411	.67934	.59472	.07656	.03628	.07761	1.5168	.8088	.7080	.08400	.04320	.09240
8	Acid	1.0020	180 "	.86976	.39168	.47808	.07761	.05601	.11088	.4832	.2176	.2656	.04312	.03112	.06160
9	"	1.0030	190 "	1.22664	.54720	.67944	.07748	.05601	.11856	.6456	.2880	.3576	.03920	.02948	.06240
10	"	1.0020	105 "	.60900	.24465	.36435	.04515	.02898	.06090	.5800	.2330	.3470	.04300	.02760	.05800
11	"	1.0040	105 "	1.56150	.61500	.94650	.10500	.05700	.12000	1.0410	.4100	.6310	.07000	.03800	.08000
12	"	1.0050	120 "	1.13520	.60000	.53520	.07200	.04300	.09192	.9460	.5000	.4460	.06000	.03600	.07660
13	"	1.0020	180 "	1.17108	.58788	.58320	.07560	.04320	.09234	.6506	.3266	.3240	.04200	.02400	.05130
14	"	1.0034	100 "	1.30000	.53200	.76800	.05600	.02813	.06133	1.3000	.5320	.7680	.05600	.02813	.06133
15	"	1.0024	80 "	.60000	.25600	.34400	.04560	.03304	.07040	.7500	.3200	.4300	.05700	.04130	.08800
16	"	1.0045	75 "	.78300	.43500	.30000	.03360	.02070	.04350	.9800	.5800	.4000	.04480	.02760	.05800
17	"	1.0038	150 "	1.05000	.54900	.50100	.06990	.04140	.08700	.7000	.3660	.3340	.04660	.02760	.05800
18	"	1.0034	115 "	.77395	.35995	.41400	.04830	.02875	.06210	.6730	.3130	.3600	.04200	.02530	.05400
19	"	1.0052	115 "	1.29000	.66895	.55005	.06819	.05175	.11040	1.0600	.5730	.4870	.05930	.04500	.09600
20	"	1.0034	145 "	1.34357	.64757	.69600	.05814	.04495	.09570	.9266	.4460	.4800	.04010	.03100	.06600
21	"	1.0056	120 "	1.40760	.72000	.68760	.06840	.04320	.08796	1.1730	.6000	.5730	.05700	.03600	.07330
22	"	1.0057	120 "	1.47120	.80400	.66720	.07836	.05376	.11520	1.2260	.6700	.5560	.06530	.04480	.09600
23	"	1.0040	95 "	.88407	.28880	.59527	.07448	.04750	.10003	.9306	.3040	.6260	.07840	.05000	.10530
24	"	1.0037	65 "	.46739	.20540	.26650	.03029	.01794	.03807	.7206	.3160	.4100	.04660	.02760	.05860
25	"	1.0040	105 "	.75600	.30765	.44835	.08032	.05439	.11613	.7200	.2930	.4270	.07650	.05180	.11060
					Passive Sweats of Nephritis.										
1	Acid	1.0048	95 cc.	.72715	.50350	.44374	.06203	.04360	.04747	.9970	.5300	.4670	.06530	.04800	.10260
2	"	1.0049	150 "	1.38990	.76995	.61995	.08115	.06225	.13200	.9260	.5130	.4130	.05410	.04150	.08800
3	"	1.0054	90 "	.87957	.40770	.47187	.05517	.04977	.10800	.9773	.4530	.5243	.06130	.05530	.12000
4	"	1.0055	360 "	4.72788	1.08000	3.64788	.03536	.86688	1.82376	1.3133	.3000	1.0133	.28760	.24080	.50660
5	"	1.0062	250 "	4.46825	.80000	2.16825	.56000	.47700	1.04250	1.1873	.3200	.8673	.22400	.19480	.41700
6	"	1.0054	120 "	1.50072	.46360	1.03512	.26752	.21072	.45000	1.2506	.3880	.8626	.21460	.17560	.37500
7	"	1.0057	171 "	1.59056	.55626	1.04429	.31122	.22845	.48871	.9360	.3253	.6107	.18200	.13360	.28580
					Passive Sweats of Acute & Chronic Rheumatism, taking Sodium Salicylate.										
1 chronic	acid	1.0030	45 c.c.	.49977	.21645	.28332	.03987	.01935	.05460	1.1106	.4810	.6296	.08860	.04300	.12000
2 acute	"	1.0080	50 "	.88565	.37000	.51665	.08305	.05785	.11000	1.7733	.7400	1.0333	.16610	.10370	.22000
3 "	alkaline	1.0038	900 "	7.24770	3.80340	3.44430	.52920	.41410	.89370	.8052	.4226	.3827	.05880	.04600	.09930
4 "	acid	1.0036	440 "	2.58104	1.32000	1.21704	.18480	.13420	.28732	.5866	.3000	.2866	.04200	.03050	.06530
5 "	"	1.0068	250 "	3.66650	1.16650	2.50000	.67650	.59950	1.28300	1.4666	.4666	1.0000	.27060	.23980	.51320
6 "	"	1.0020	360 "	2.30400	.99828	1.30572	.20160	.14688	.31428	.6400	.2773	.3627	.05600	.04080	.08730
					Passive Sweats of Post-Malarial Anaemia and Leukaemia.										
1	Acid	1.0037	100 c.c.	.89300	.45000	.44300	.0570	.03960	.08460	.8730	.4500	.4430	.05780	.03960	.08460
2	Neutral	1.0030	130 "	1.01049	.53209	.47840	.06552	.05112	.10946	.7773	.4093	.3680	.05040	.03933	.08420
3	Acid	1.0023	180 "	1.26000	.54000	.72000	.08064	.05562	.11916	.7000	.3000	.4000	.04480	.03090	.06620
4	Neutral	1.0028	240 "	.77462	.83184	.49608	.07152	.05084	.10800	.5533	.3466	.2067	.02980	.02160	.04500
5	"	1.0039	125 "	1.08750	.45500	.63250	.07000	.05050	.10912	.8700	.3640	.5060	.05600	.04040	.08730

PASSIVE SALICYLATE OF SODIUM SWEATS OF NORMAL INDIVIDUALS.

Number	Reaction	Spec. Grav.	Quantity	Total Solids	% Inorganic	% Organic	% Nitrogen	% Total Nitrogen Urea	% Urea	% Solids	% Inorganic	% Organic	% Nitrogen	% Nitrogen, Urea	% Urea
1	Acid	1.0084	100 c.c.	1.68260	.84260	84000	.08306	.03950	.08453	1.6826	.8426	.8400	.08306	.03950	.08453
2	"	1.0074	85 "	1.24550	.54400	.70150	.10548	.06630	.14212	1.4653	.6400	.8253	.12410	.07800	.16720
3	"	1.0056	132 "	1.01019	.42839	.5808	.15753	.05021	.10956	.7653	.3253	.4400	.11480	.03880	.08330
4	Neutral	1.004	720 "	3.25672	3.07152	2.27520	.26856	.13752	.29520	.7426	.7266	.3160	.03730	.01910	.04100
5	"	1.004	750 "	4.63950	2.88975	1.74975	.27975	.20100	.43050	.6186	.3853	.2333	.03730	.02680	.05740
6	"	1.0046	750 "	5.04975	2.89950	3.05025	.32250	.26325	.56325	.7933	.3866	.4067	.04300	.03510	.07510
7	Acid	1.0036	440 "	4.78104	1.32000	1.26004	.18480	.13420	.28732	.3866	.3000	.2866	.04200	.03050	.06530
8	"	1.003	430 "	2.49400	1.20400	1.29000	.16051	.11180	.23994	.5800	.2800	.3000	.03733	.02600	.05580
9	"	1.0038	360 "	2.53872	1.50696	1.03212	.15588	.11520	.24696	.7052	.4186	.2867	.04330	.03200	.06860
10	"	1.008	460 "	2.60636	1.34918	1.25718	.20608	.13156	.27600	.5666	.2933	.2733	.04480	.02860	.06000
11	"	1.0039	180 "	1.50588	.80388	.70308	.06714	.12628	.05634	.8366	.4466	.3906	.03730	.01460	.03130
12	"	1.0043	190 "	1.73767	.68647	1.04120	.12160	.08160	.17860	.8096	.3613	.5480	.06400	.04400	.09400
13	"	1.004	175 "	1.50727	.92855	.57872	.08155	.05950	.12825	.8613	.5306	.3307	.0466	.03400	.07190
14	"	1.002	177 "	1.34980	.63252	.71508	.11331	.08248	.17576	.7626	.3586	.4040	.06346	.04660	.09930
15	Neutral	1.0016	400 "	2.20800	1.13040	1.07760	.17920	.14584	.31200	.5520	.2826	.2694	.04480	.03446	.07800
16	"	1.003	90 "	.79794	.36000	.43794	.06534	.04437	.09486	.8866	.4000	.4866	.07260	.04930	.10540
17	"	1.004	120 "	1.27992	.59832	.68160	.10632	.07872	.16800	1.0666	.4986	.5680	.08860	.06560	.14000
18	"	1.003	175 "	1.42327	.80500	.61827	.08982	.06125	.13400	.8133	.4600	.3533	.05133	.03500	.07486
19	Acid	1.002	210 "	1.07793	.57240	.56553	.09786	.06124	.13230	.5133	.2440	.2693	.04660	.02940	.06300
20	Neutral	1.002	445 "	2.01718	1.21618	.80100	.13706	.10413	.22339	.4533	.2733	.1800	.03080	.02340	.05020
21	"	1.0023	160 "	1.31840	.62168	.69872	.11040	.04160	.14576	.8240	.3873	.4367	.06900	.04160	.09110
22	"	1.0038	170 "	1.26922	.63682	.63240	.06341	.02600	.09469	.7466	.3746	.3220	.03730	.02600	.05570
				Passive Acetanilid Sweats of Normal Individuals.											
1	Neutral	1.002	145 c.c.	.87000	.50938	.36051	.05388	.03378	.07250	.6000	.3513	.2487	.03730	.02330	.05000
2	"	1.0025	175 "	1.33000	.75827	.38120	.07350	.04478	.07647	.7600	.4333	.3269	.04200	.02370	.04370
3	Acid	1.004	110 "	.81400	.55286	.26114	.05126	.03773	.08063	.7400	.5026	.2374	.04600	.03430	.07330
4	Neutral	1.0025	125 "	.84162	.48125	.35750	.04425	.03625	.06825	.6733	.3873	.2860	.03540	.02530	.05460
5	"	1.0024	130 "	.92729	.52000	.40729	.05213	.03601	.07709	.7133	.4000	.3133	.0401	.02770	.05930
6	"	1.002	180 "	1.15434	.63000	.52434	.07740	.04932	.10566	.6413	.3500	.2913	.0430	.02740	.05870
7	"	1.004	120 "	1.17600	.62400	.55200	.07200	.05976	.11040	.9800	.5200	.4600	.06000	.04980	.09200
8	"	1.0043	90 "	.99000	.47997	.51003	.05796	.02880	.06201	1.1000	.5333	.5667	.06440	.03200	.06890
9	"	1.0026	100 "	.57060	.32000	.25060	.04200	.02950	.06320	.5706	.3200	.2506	.04200	.02950	.06320
10	Acid	1.001	120 "	.60392	.30072	.40320	.07500	.04716	.10152	.5866	.2506	.3360	.06250	.03930	.08460
				Sulphate of Quinine. Passive Sweats of Normal Individuals.											
1	Neutral	1.004	200 c.c.	1.42660	.80000	.62660	.09332	.05520	.11720	.7133	.4000	.3133	.04666	.02760	.05860
2	"	1.002	160 "	.94928	.59728	.35200	.06560	.03936	.08416	.5933	.3733	.2200	.04100	.02460	.05260
3	"	1.003	180 "	1.49994	.77994	.72000	.10476	.03888	.08280	.8333	.4333	.4000	.03820	.02160	.04600
4	"	1.0025	200 "	.90660	.48000	.42660	.07460	.04000	.08310	.4533	.2400	.2133	.03730	.02000	.04310
5	"	1.0025	320 "	2.29536	1.42080	.87456	.13760	.08352	.17888	.7173	.4440	.2733	.04300	.02610	.05590
6	Acid	1.0049	180 "	2.00394	1.08000	.92394	.10800	.06408	.13716	1.1133	.6000	.5133	.06000	.03560	.07620
7	Neutral	1.001	200 "	1.06660	.51460	.45200	.08020	.06000	.12000	.5333	.2573	.2760	.04010	.03000	.06000

Johnel found crystals of urea on the skin of nephritics.

Calitso says the organic secretions of epileptics possess toxins. He states that the toxins are stored up in the blood and can be removed by sweating. The sweat is very toxic and causes convulsions. While 100 c.c. of normal sweat will not kill, 18 c.c. of epileptic sweat does. The toxicity during the prodroma is much increased and later gradually diminishes. At other intervals it is normal.

It will be noticed that the question of sweat toxicity is far from answered. Indeed, it is surrounded by many conditions that stamp toxic experiments with more or less doubt. Among the more important are such as individual animal susceptibility; intravenous injection of a fluid which invariably has an acid reaction, into the alkaline blood; accidental introduction of micro-organisms into the circulation, or body; the effect of sterilization on the toxins in sweat; the difficulty encountered in differentiating between the symptoms of fright and shock and those peculiar to the injection of sweat.

I have made a limited number of experiments with reference to toxic effect which I will cite later.

The following method was adopted to procure normal sweat, without loss by evaporation, and as free as possible from skin impurities. The skin was thoroughly cleansed with alcohol and ether; soap was not used, for apparent reasons. The next step consisted in enveloping the body with sterilized gauze; over this an oilcloth was secured, completely covering the body, leaving only the head exposed; thus prepared, the subject was exposed to dry heat of a temperature not exceeding 120 F., for from one to two hours, or till it became apparent that the heat was becoming unbearable. We noticed a great difference between the numerous individuals; some responded freely at once; others, only after the third exposure; also in many instances the thin individual bore more exposure than the robust. When the point of toleration had been reached, the soaked gauze was quickly removed and submitted to pressure; in this way we obtained from three ounces to thirty-two ounces of sweat.

The individuals used for sweating were all of a normal type, on full diet, and while they, in some instances, were convalescents from mild, acute, local lesions, they were not classed as normal until completely well. Furthermore, urinalysis will not be considered in connection with sweat in this paper.

My object simply consists in adding more knowledge relative to the physiology of the skin, with more or less bearing on therapeutics and clinic facts.

The following table gives the highest and lowest percentage of ingredients of each series of sweats:

		Per cent. Solids.	Per cent. Inorganic solids.	Per cent. Organic Solids.	Per cent. Nitrogen.	Per cent. Nitrogen urea.	Per cent. urea.
Normal	Highest.	1.5168	.8088	.7080	.08400	.04320	.09240
	Lowest.	.4832	.2176	.2656	.04312	.03112	.06160
Sod. salicylate	Highest.	1.6826	.8426	.8400	.08306	.03950	.08463
	Lowest.	.4533	.2733	.1800	.03080	.02340	.05020
Pilocarpin	Highest.	1.9333	.3226	1.6107	.08500	.06560	.14000
	Lowest.	.5106	.2626	.2480	.05130	.02760	.06860
Quinin	Highest.	1.1133	.6000	.5133	.06000	.03560	.07620
	Lowest.	.4533	.2400	.2133	.03730	.02000	.04310
Acetanilid	Highest.	1.1000	.5333	.5667	.06440	.03200	.06890
	Lowest.	.5706	.3200	.2506	.04200	.02950	.06320
Nephritis	Highest.	1.3133	.3000	1.0133	.28760	.24080	.50660
	Lowest.	.9260	.5130	.4130	.05410	.04150	.08800
Rheumatism	Highest.	1.7733	.7400	1.0333	1.66100	.10370	.22000
		1.4666	.4666	1.0000	.27060	.23980	.51320
	Lowest.	.5866	.3000	.2866	.04200	.03050	.06530

Briefly, first twenty-two normal, sodium salicylate, passive sweats, resulted as follows:

1. In ten the organic solids are higher than the inorganic.

2. Eleven out of twenty-five passive, normal sweats contain more organic solids than inorganic.

3. Twenty-three out of twenty-five normal, pilocarpin, passive sweats contain more organic solids than inorganic.

4. Two out of ten acetanilid sweats contain more organic than inorganic solids.

5. Seven quinin sweats contain less organic than inorganic solids.

Note that the pilocarpin sweats, with a few exceptions, contain more organic than inorganic solids; that the quinin sweats exceed in inorganic solids; that the salicylate sweats are about evenly divided, relative to organic and inorganic solids; that the passive sweats slightly favor the inorganic solids; that the acetanilid sweats favor the inorganic solids.

From the chemic analysis it at once becomes apparent that the drugs herein mentioned have more or less selective action.

Note that the first sweat obtained from a case of acute articular rheumatism during the height of the disease, contained a large excess of solids. (See Rheumatism, No. 5.) This fact opens up some interesting questions relative to the cause, or conditions, that accompany rheumatism, and I can hardly dismiss the subject without discussing the disease. The causes, direct or indirect, can be classified as follows: 1, retention of normal tissue waste material; 2, perverted functional activity, or tissue metabolism, whereby substances foreign to the normal body are produced, which cause rheumatism; 3, septic infection; 4, one or both of the first two causes which favor infection, just as diabetes mellitus renders infection more possible.

Returning to cause 1, I do not believe that it alone causes rheumatism; because if this were true, the disease would be much more amenable to treatment and would not be affected so much by other circumstances, such as atmospheric changes, epidemic features, etc.

The second cause is related to the first, differing from it, however, in that the cause is due to abnormal tissue products, and not retention of normal tissue waste. A thorough consideration of this cause would involve an extensive analysis of nutrition, special organic functions and chemistry of waste material. However, recalling now that the first sweat of a rheumatic, obtained during the height of the disease, is excessively charged with solids, we are led to assume that these solids represent tissue waste; furthermore, coincident with this feature, marked amelioration of the rheumatism follows, and especially so where profuse sweating is produced by the combined hot-air and sodium salicylate treatment. Those who favor the infection theory may argue that the tissue waste is more or less a feature of all infections, and that the salicylate aids in eliminating, as is shown by the analysis of sweat.

In reference to the third cause, this may be said: there is an infection, which, however, is rendered possible only by pre-existing, non-septic conditions mentioned in the first or second causes; believing that salicylate has an active effect on the joint symptoms, as based on clinic facts, it must be conceded that the secondary lesions, such as pericarditis, endocarditis,

etc., are not modified by this drug, and that the former, from the standpoint of some pathologists, are due to pathogenic micro-organisms. This fact rather strengthens the belief that we are dealing with both auto-intoxication and infection. This, it seems, is at present the most plausible theory.

Note that the first sweat from a case of uremic poisoning, the result of chronic interstitial nephritis, contained a large excess of solids (see Nephritis No. 4), a feature that was followed by marked amelioration of the uremia; the succeeding sweats were nearly normal. This case plainly illustrates that the skin can be used for eliminating purposes to the exclusion of other emunctories in nephritis; furthermore, this sweat feature is always present in those cases where the renal lesion forbids sufficient elimination; those wherein the urinary excretion is nearly or quite normal have not brought to light any marked sweat features from a chemic point of view; however, this statement must be accepted as purely provisional until more investigations have been made. Recalling my experience with various uremic manifestations, I feel safe in asserting that the induction of sweat by means of externally applied heat, and with or without pilocarpin, is the most reliable method of eliminating rapidly and effectively.

Here I will interpose a comparison, including the added totals of six normal, passive sweats, compared to six nephritic and six sodium salicylate, acute rheumatic, passive sweats, given in percentages as follows:

	Per cent. Inorganic.	Per cent. Organic.	Per cent. Nitrogen urea.	Per cent. Total nitrogen.
Six cases normal	3.6406	2.6045	.18356	.39835
Six cases nephritis	4.73354	9.09804	1.90274	2.32336
Six cases rheumatism . . .	9.83698	12.16181	.90195	2.02510

Note the preponderance of organic and inorganic solids in rheumatism over the nephritic sweats, and the striking difference when compared to the normal, passive sweats. Among the clinic features it should be mentioned that the induction of passive hot-air sweats, coincident with the administration of the drugs mentioned in this article, lessens the toxic effects of the former; thus cinchonism was rarely noticeable enough to cause distress; the sialogogue effect of pilocarpin was rarely observed, this applies with equal force to the toxic effects of pilocarpin; acetanilid in 10-grain doses was not followed by marked cyanosis or prolonged depression. The drugs used were given in the following doses: Quinin, 10 grains; acetanilid, 10 grains; pilocarpin, from $\frac{1}{8}$ to $\frac{3}{4}$ grain; sodium salicylate in 30-grain doses.

A number of cases of malarial hemoglobinemia and toxemia were treated with quinin and hot-air baths, and, it appears, with better results than without the hot-air bath. Furthermore, all malarial cases responded more readily than normal to sweat induction; this feature was particularly noticeable. The good results following this treatment are due, I believe, to the eliminant effects of the sweat and, secondarily, to the physiologic action of the hot-air bath, which indirectly causes increased functional activity or tissue metabolism.

We are familiar with the fact that mercurial inunctions can be used with more satisfaction when combined with passive sweats. Thus I had a case of secondary syphilis which was extremely sensitive to mercurial salts; however, I prescribed mercurial inunctions and about eight hours thereafter a passive sweat; so treated, I was able not only to continue the inunctions but gave mercurial salts internally as well, without occasioning mercurial poisoning. You will recall that one observer claims that the skin eliminates more mercury than the kidneys. I am aware that this method is not new, but mention it on account of its importance from a clinic and therapeutic standpoint.

A brief review of the physiologic action of the hot-air bath will not be out of place. Without other aids the following conditions occur: 1, hyperemia and congestion of the skin, which then contains more fluids and becomes a better conductor of heat; 2, the skin becomes moistened by sweat, which in turn favors abstraction and increased excretion of heat; 3, the pulse-rate increases coincident with diminished arterial tension; 4, the bodily temperature becomes slightly elevated; 5, there is now increased respiration which Sihler claims is due to the warming of the blood, thereby augmenting the consumption of oxygen and excretion of carbon dioxid, the latter being due to increased tissue changes. Landois states that a man weighing sixty kilograms enlarges about sixty-two c.c. when his temperature is raised from the normal temperature to 104 F.; this enlargement is associated with expansion of the peripheral tissues and increased cutaneous congestion at the expense of internal depletion.

The administration of antipyretics in full doses, combined with the passive, dry-heat sweats in normal subjects does not modify the physiologic effects just mentioned. In fact, these drugs apparently lose their antipyretic effects. This fact opens up an interesting question; however, it would not be in keeping with the object of this paper to discuss it fully. But in all cases where quinin, sodium salicylate and acetanilid were given, and within thirty minutes were followed by the application of the hot-air bath, the temperature became elevated from 1 to 3 degrees F. above normal, reaching its highest about ninety minutes after the drug administration, and coincident with profuse sweating. Removal from the hot-air bath caused the temperature to fall rapidly.

In septic conditions, such as articular rheumatism, treated with sodium salicylate and the hot-air bath, there was no deviation from the effect just mentioned. Among the anomalous results of dry heat application I will cite the following case: A young woman, on account of a retained dead fetus, fell a victim to acute septic intoxication and acute septic nephritis. The pulse was constantly over 120 per minute, weak and compressible; the temperature ranged from 96 to 97 F.; the urine did not exceed four ounces in twenty-four hours and contained casts, albumin, blood-corpuscles, bile pigments and acetone. The whole condition was rendered more desperate by a violent uremic gastritis; it was imperative to eliminate effectively, and I realized that this could be accomplished most readily by inducing free sweating, and overcoming the depression incident thereto by means of strychnia. She was placed in contact with hot-water bottles; in the course of an hour the temperature rose to 102 F., and the pulse became stronger and did not exceed 95 per minute, however, instead of inducing free perspiration, the patient would excrete from six to eight ounces of urine after each application; this treatment was continued twice daily until recovery ensued. The case plainly illustrates the intimate relation between

the kidneys and the skin, and is mentioned only for the sake of interest. It is well known that the renal secretion is often increased by diaphoretics; though as a general rule the reverse is true. Note, however, in the case just cited, the dry heat increased the pulse strength and lessened the frequency; just contrary to the results observed in normal individuals.

Toxic experiments, as I have already stated, were made in a few instances; I submit those that were made, with the understanding, however, that much work is to be done in the future relative to this item.

In the first experiment I injected subcutaneously, 5 c.c. into a guinea-pig weighing 300 grams. No effect was noticed beyond the usual symptoms of fright. The sweat used was from a normal case.

In the second experiment, 9 c.c. of sweat from a case of chronic articular rheumatism was injected intraperitoneally into a guinea-pig weighing 270 grams. In the next 20 minutes I noticed muscular tremor, rapid respiration, ears slightly cyanosed. All these symptoms disappeared within an hour.

In the third experiment I injected 20 c.c. of normal sweat into a guinea-pig weighing 300 grams, subcutaneously. No effect whatever followed.

In the fourth experiment I injected 9 c.c. of chronic malarial fever sweat into a 270-gram weight guinea-pig, directly over the lumbar spine, subcutaneously. Result: Immediate effect, breathing laborious, ears cyanosed, pig fell on its side and lay still about six minutes, when in attempting to get up it was discovered that the hind extremities were totally paralyzed. This condition was followed by atrophy of the hind limbs and in six weeks death ensued, without recovery of paraplegia. I believe the lesion was due to pressure of injected fluid, and not traceable to the effects of the sweat ingredients.

In the fifth experiment I injected 30 c.c., subcutaneously, of sweat from a case of chronic nephritis into a fifteen-ounce guinea-pig. The pig was quiet for three hours, refused to drink or eat, had occasional muscular tremor or rigor, but recovered fully in twenty-four hours.

In the sixth experiment I injected 20 c.c. of sweat from a case of chronic malarial toxemia and hemaglobinemia, subcutaneously, into a ten-ounce guinea-pig. No effect or departure from the normal was observed.

In the seventh experiment I subcutaneously injected 32 c.c. of sweat obtained from a case of post-malarial anemia, into a guinea-pig weighing eight and a half ounces. Within ten minutes there was a well-defined rigor, rapid respiration, cyanosis of the ears; pig seemed stupid and did not actively respond to pin prick. The rigor persisted thirty minutes, and the pig fully recovered in an hour.

In the eighth experiment, subcutaneous injection of 50 c.c. of normal, passive pilocarpin sweat into a guinea-pig weighing twelve ounces. No effect was observed.

In the ninth experiment I injected, subcutaneously, 55 c.c. of malarial sweat obtained during the height of temperature rise in a case of quotidian malarial fever after a well-defined malarial chill. The guinea-pig weighed eleven ounces. The immediate effect was a light rigor from that time up to death (which occurred within ten hours). The guinea-pig, which seemed in a stupor during the first few hours, gradually became comatose and died, refusing all food and drink. Post-mortem disclosed no abnormal conditions, except hyperemia and some cloudy swelling of both kidneys. I believe the sweat in this instance was toxic and the cause of death.

In the tenth experiment I injected, intraperitoneally, 45 c.c. of sweat from a case of splenic-myelogenic leukemia, into a guinea-pig weighing nine ounces. No abnormal effect whatever followed this injection.

This completes the toxic experiments made by myself with the assistance of Dr. Friedberg. No conclusions can be drawn from them except that it requires large doses to produce any effect. In no instance was the sweat sterilized, because it was assumed that extreme heat would modify the sweat composition and thereby cause fallacious results; however, the skin was thoroughly cleansed before the sweat, and only sterilized gauze was used in all the experiments.

Assuming that the extraction of considerable fluid from a body in a short space of time altered the specific gravity of the blood, we used the chloroform-benzol method for determining the specific gravity of the blood, before and after profuse sweating. We did not note any marked difference. While the method is not infallible, I believe it will at least show any important difference. Thirteen cases were submitted to this test. It simply adds an item to the belief that the blood is a fairly stable compound and that the tissues are used partly as storehouses, or the fluid obtained by sweating is indirectly eliminated from the blood in the short space of an hour: the blood, however, preserves a certain uniform composition by taking up substances from the tissues or cells of the bodily organs during the sweating.

Among the questions that suggest themselves is one that concerns the surgeon: Does sweat possess slight antiseptic properties, and thereby render more or less innocuous the large number of micro-organisms ever present in the skin? One observer quoted in the history claims that it does toward the bacillus pyocyaneus. I have arranged to answer this question in a later report.

Before closing this article it would be of some interest to briefly discuss some of the features that have a bearing on certain skin diseases. Recalling now that sweat is always of acid reaction, and that this acidity is due to the fatty acids and sebum in the sweat and skin, may it not be reasonable to assume that this fact has a direct bearing on the chronicity of some skin diseases, such as psoriasis or chronic eczema? Abrasions or external skin lesions, it seems to me, must be constantly irritated by the substances mentioned, and thereby cause not only the chronicity, but also the itching so constantly present. We have learned that repeated sweating finally brings about an alkaline or neutral reaction, and that acetanilid favors a neutral reaction, and I offer it as a suggestion that the treatment of skin diseases is open to considerable study, when looked at from the standpoint herein suggested. I assume that a neutral or alkaline sweat would be far less irritating to the skin lesion, and in removing the irritant factor give decided therapeutic results. At all events, I have found that repeated sweating does result in causing a soft, clean, non-odorless skin, avoiding, however, the drying of sweat on the skin, thereby preventing the effect bacteria would have in indirectly causing decomposition of fatty acids.

This completes the present paper and before closing I wish to extend thanks to Dr. Friedberg, who assisted

me in all the work done and in obtaining specimens; to the German Hospital which made it possible to secure nearly all the material, and to the Alexian Brothers' Hospital; and lastly, to Dr. J. A. Wesener who made all the chemic analyses, and offered suggestions that materially aided in making the work successful.

CEREBROSPINAL PNEUMOCOCCUS INFECTION.

REPORT OF A CASE.

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There are many cases of rare clinic interest unreported, because the history is incomplete or because of loss of interest on the part of the observer, after the puzzle is solved by the post-mortem. Such cases are however very instructive to the reader, and the following is reported, in the hope of illustrating a rather obscure manifestation of pneumococcus infection:

On Monday, February 26, I was called in consultation to see a girl 15 years old, who had been suffering during five weeks with a complex of symptoms resembling very closely the symptoms of relapsing fever. The sickness was initiated by a chill of great severity, followed by very high temperature and severe headache, and pain extending down the back and legs. The pulse was not as rapid as would ordinarily be expected with such a temperature. The temperature fluctuated about 104 and 105 F., for nine days, when there was a complete remission. The headache disappeared, the temperature and pulse became normal, and the young girl acted as a convalescent, ate and drank naturally, and slept well. This intermission lasted a little less than a week, when a second, but shorter, spell came on with a second chill. The temperature again rose to 104, the pain in the head, the distress, and the high pyrexia returned. The pulse was again a little lower than we could ordinarily expect. This attack lasted seven days, when there was again a complete intermission, the temperature coming down to normal and with a cessation of all the other symptoms, as before. The third relapse occurred at the end of another week, with a chill and high temperature which lasted only two days, when there was an intermission of four days. A fourth relapse followed. It was during the second twenty-four hours of this relapse that I was called in and observed the girl. The patient's temperature was at this time 104 and her pulse 96. The face and body showed some emaciation, the pupils were dilated and the child was vomiting at short intervals. The respirations were slightly accelerated. The little girl begged for some relief, complained of her dreadful headache, grasped her head in her hands, and complained of the lightest touch over the scalp or face or arms or any part of the body. This hyperesthesia seemed to me most accentuated over the left side of the head, behind the ear. Her favorite position was curled up on her right side. The tongue was not noticeably coated, but the lips were chapped and about the nostrils there was some evidence of sordes. The heart and lungs and abdomen and extremities were perfectly negative on examination, except during the first and second paroxysm of fever, when there was enlargement and tenderness of the liver and spleen. Careful search was made for an area of possible pneumonia, and the heart was carefully examined for endocarditis. The abdomen and pelvis were carefully examined for suppurative foci. All the joints were examined for evidence of infection. There was no tremor of the hands and no evidence of impairment of motion or of sensation —except the hyperesthesia mentioned. The hearing seemed to be equal in both ears and the sight seemed to be perfect in both eyes. There was no evidence of any perversion of taste and the only abnormal sensation was the general hyperesthesia and the severe headache, which was referred indefinitely to every part of the head.

The diagnosis seemed to rest between relapsing fever, malaria, typhoid fever, meningitis from middle ear disease, and meningitis from some other form of infection.

With the assistance of Dr. Hall, the blood was examined, and relapsing fever and malaria both excluded. The blood-count showed a slight leucocytosis, but otherwise was perfectly normal. As soon as this result had been determined a needle was introduced into the spinal canal at the junction of the third and fourth lumbar vertebræ, and the cerebrospinal fluid allowed to run off, drop by drop. Two agar tubes and two blood-serum plates were inoculated from this serum. In twenty-four hours they had every one shown a pure culture of a diplococcus, apparently the diplococcus of pneumonia. By this means the pathologic character of the disease was definitely determined. We had to deal with a case of pneumococcus infection of the cerebrospinal lymph-spaces. At this juncture, we determined on an experiment, and secured for a small fee, three ounces of blood from a healthy German man, 21 years old, one week after a crisis from a true pneumococcus pneumonia. The blood was taken from the median vein, with all antiseptic precautions, into a sterilized flask, which was immediately put on ice and encouraged to coagulate rapidly by the addition of a few drops of calcium chlorid solution and interrupted heat and cold.

A sufficient amount of serum was at hand in twelve hours and hypodermic injection of this serum was begun; at first 60 drops, at each subsequent injection, at intervals of six hours, a double quantity. The effects of the injections seemed to be noticed at once, in a lowering of the temperature and general improvement. This continued for three days, when all the symptoms grew worse. There were repeated chills and an excessively high temperature, tremor of the extremities and apparently paralysis or an inability to co-ordinate the motions of the right leg and right arm. The right side of the face seemed to be less expressive. The patient continued to lie on the left side of the head, but turned on the right side of her body. The pupils were equally dilated, although no remedies had been administered which could produce such result. After this stupor had continued for twenty-four hours with a gradual aggravation of the symptoms; the skin over the left mastoid seemed to be edematous. This was the first localizing sign which was incontrovertible, and I determined to act on the assumption that the pneumococcus infection was due to a primary pneumococcus infection of the ear, and resulting pneumococcus meningitis and probably sinus thrombosis.

The patient's head was, therefore, shaved and prepared for operation. After shaving, the edema of the scalp over the mastoid was much plainer and a lymph