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RHEUMATIC HEART DISEASE IN PHILADELPHIA HOSPITALS[1]

A Study of 4,653 Cases of Rheumatic Heart Disease, Rheumatic Fever, Sydenham's Chorea, and Subacute Bacterial Endocarditis Involving 5,921 Admissions to Philadelphia Hospitals, From January 1, 1930, to December 31, 1934

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INTRODUCTION

An analysis of the hospital records of 4,653 cases of rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis, covering the years 1930–34, has been undertaken in order to obtain as accurate a picture as possible of diseases generally ascribed to rheumatic infection.

Among the chief difficulties attending studies of rheumatic conditions are the lack of standardization in the nomenclature of these diseases, lack of a satisfactory generic term embracing all conditions included in this group, the high degree of overlapping of rheumatic fever, Sydenham's chorea, and rheumatic heart disease, and the common occurrence of a number of complicating factors, some of which may be considered as distinct clinical entities.

There is no entirely satisfactory term for describing rheumatic fever, Sydenham's chorea, and rheumatic heart disease as a whole. Rheumatic heart disease often occurs without clinically demonstrable rheumatic fever. Not infrequently signs of heart disease develop prior to arthritic phenomena. Since heart disease is the most important and most frequent single manifestation of the rheumatic syndrome, it cannot be regarded as a complication or sequella of rheumatic fever. The term "rheumatic infection" is not wholly descriptive or sufficiently inclusive since Sydenham's chorea, conceded by most students of the problem to be a manifestation of the rheumatic syndrome, may occur without detectable signs of infection. Well-developed rheumatic heart disease, such as mitral stenosis, often occurs without a demonstrable antecedent history of infection. Per-

[1] From the Division of Infectious Diseases, National Institute of Health.

haps the term which best describes the condition as a whole is "rheumatic state," an expression used by Coburn (*1*). Its chief advantage is that it is noncommittal concerning the role of infection, and its chief drawback is that it is an awkward expression.

In these articles rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis engrafted on rheumatic heart disease will be referred to as "rheumatic conditions," though this term is admittedly far from satisfactory. The word "rheumatic" means different things to different persons. To the pathologist it implies conditions of the joint cavities unattended by destructive processes, in contradistinction to arthritic processes which are essentially destructive lesions. Even here is encountered the twilight zone of "rheumatoid arthritis." To the pediatrician, especially those in Great Britain, "rheumatic" is limited to the description of rheumatic fever, rheumatic carditis, and Sydenham's chorea of childhood, the problem as a whole often being referred to as "juvenile rheumatism." To the student of arthritic diseases "rheumatic" or "rheumatism" is used to cover the entire problem of arthritic diseases, rheumatic fever, lumbago, and even gout. To the layman "rheumatism" generally means any ache or pain involving muscles, joints, bones, and at times even the nervous system. The latter conception at least has the merit of relative clarity.

Rheumatic heart disease is the most frequent and most devastating rheumatic condition. From both the clinical and public health points of view it constitutes the core of the problem. Rheumatic fever without heart disease is usually a self-limited disease which rarely results in permanent damage even to the joint cavities. Its clinical phenomena can usually be controlled by the use of appropriate analgesics and antipyretics. Simple Sydenham's chorea is a distressing disease often of long duration, confined for the most part to persons in the second and third quinquennia of life. It very rarely causes death and only occasionally leaves permanent sequellae. The chief source of concern is the cardiac involvement which so frequently develops during the course of or subsequent to rheumatic fever and chorea.

Compared to most disease conditions a study of rheumatic infections offers many perplexities. A writer dealing with acute communicable diseases and such diseases as tuberculosis, syphilis, most metabolic diseases, and even nervous and mental disorders and malignant tumors, is able to describe and usually define the condition under study in its entirety, or to limit study to involvement of a single organ or to a commonly recognized clinical manifestation. In a study of rheumatic conditions such a consideration is hardly possible, owing to the many permutations and combinations of diseases, complications, and sequellae of both fatal and nonfatal cases. It is therefore necessary to

consider rheumatic heart disease, rheumatic fever, and chorea not only as separate clinical entities but in various combinations.

There is also the important problem of subacute bacterial endocarditis. This highly fatal disease often occurs as a definite complication of rheumatic heart disease while in many other cases a relationship between these diseases is suspected but cannot be proved even on the basis of necropsy findings. Clinically rheumatic heart disease and subacute bacterial endocarditis often have much in common. Sometimes the transition from what is apparently rheumatic fever to subacute bacterial endocarditis is so gradual that the change cannot readily be observed.

Sydenham's chorea is a nervous manifestation whose exact relationship to other rheumatic conditions is imperfectly understood, and under certain conditions disputed. Its morbid anatomy is very imperfectly understood. Rheumatic fever may vary in intensity from mild joint and muscular pains to severe migrating polyarthritis. Signs of systemic infection in rheumatic fever run the entire gamut of severity from the barely detectable to the rapidly overwhelming. Cardiac involvement varies in degree and extent. These statements, however, should not be interpreted as indicating a state of diagnostic nihilism; rheumatic conditions seen in hospital practice are usually of sufficient severity and of a sufficiently characteristic clinical picture to be diagnosed with a high degree of accuracy.

This study constitutes the first attempt to depict rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis as hospital problems in a large city over a period of several years. Since the discovery of the relationship of rheumatic fever to heart disease, many excellent studies have been made. With few exceptions they have dealt with isolated aspects of the problem or with limited age groups. Even when patients of all ages were studied, the results were likely to be influenced by peculiarities in the composition of the case load of a given hospital. Consequently the results have tended to be fragmentary. Students of rheumatic infection among children have even gone so far as to designate it as "juvenile rheumatism" as though it were separate and apart from the problem as a whole, while writers dealing with rheumatic valvular diseases have often been so engrossed in the mechanical effects of these lesions on the circulatory system that they have failed to give due recognition to the significance of rheumatic infection in adult life.

The findings of the present study have been arranged in five parts:

Part I. Rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis as a hospital problem.

Part II. Age, race, and sex distribution and interrelation of rheumatic fever, Sydenham's chorea, rheumatic heart disease, and subacute bacterial endocarditis.

Part III. Fatal rheumatic heart disease and subacute bacterial endocarditis.

Part IV. Influence of season and certain meteorological conditions.

Part V. Distribution by locality of rheumatic conditions in Philadelphia.

Parts II, III, IV, and V will be published in succeeding issues of Public Health Reports.

I. RHEUMATIC HEART DISEASE, RHEUMATIC FEVER, SYDENHAM'S CHOREA, AND SUBACUTE BACTERIAL ENDOCARDITIS AS A HOSPITAL PROBLEM

This study, made during 1935, consists in an analysis of the records of 4,653 cases of rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis involving 5,921 admissions to Philadelphia hospitals during the 5-year period from January 1, 1930, to December 31, 1934. Considerable improvement was noted during the period under study in the diagnosis of rheumatic conditions and in terminology used to describe them. This was aided in no small measure by the widespread adoption by hospitals in Philadelphia of the nomenclature of the American Heart Association. Future studies will be greatly facilitated, since most hospitals in this area are now diagnosing heart disease on the basis of etiology.

Owing to lack of standardization in the nomenclature of these diseases, a matter commented upon by Paul (*2*), it was necessary to review records involving a number of other conditions, such as valvular heart disease, mitral stenosis, mitral insufficiency, all forms of endocarditis, pericarditis, pancarditis, acute articular rheumatism, rheumatic arthritis, and, sometimes, myocarditis. Many of these records were rejected after review since they apparently described other kinds of heart disease than rheumatic heart disease or subacute bacterial endocarditis.

It is believed that the 4,653 cases included in this series represent the minimum number of cases of rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis in Philadelphia hospitals during this period. In reviewing hospital records, care was taken to limit the series to cases which definitely appeared to fit into the pattern of these conditions. With more liberal selection more cases would have been included, but the opportunity for error would have been greatly enhanced. With a policy of conservatism in selection, the series is smaller but probably more accurate.

ADMISSIONS STUDIED

Practically all hospital statistics are based on the number of admissions and on admission rates. From a strictly scientific point of view this is not as accurate in many instances as statistics based on individual cases. From the hospital viewpoint the number of admissions is of greater importance than the number of cases since it is the number of admissions and duration of hospitalization which determines the importance of a disease as a hospital problem.

TABLE 1.—*Number of admissions and percentage of total admissions with rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis in 36 civilian hospitals in Philadelphia from January 1, 1930, to December 31, 1934*

	Number of admissions	Percentage of total admissions
Admissions from all causes (1930–34)	850,428	
Total admissions with rheumatic infections and subacute bacterial endocarditis	5,921	0.70
All rheumatic infections	5,801	.68
Rheumatic heart disease	4,869	.57
Rheumatic fever with rheumatic heart disease	960	.11
Sydenham's chorea with rheumatic heart disease	[1] 362	.04
Rheumatic heart disease complicated by subacute bacterial endocarditis	223	.03
Uncomplicated rheumatic heart disease	3,354	.39
Rheumatic fever without heart disease	499	.06
All rheumatic fever	1,459	.17
Sydenham's chorea without heart disease	[2] 444	.05
All Sydenham's chorea	806	.09
Subacute bacterial endocarditis not superimposed on rheumatic heart disease	120	.01
All subacute bacterial endocarditis	343	.04

[1] Including 30 in which rheumatic fever and chorea occurred during same admission.
[2] Including 11 in which rheumatic fever and chorea occurred during same admission.

Altogether, there were 5,921 admissions for rheumatic conditions and subacute bacterial endocarditis. Of this number, 5,801, or 98 percent, definitely had some form of rheumatic infection while 120, or 2 percent, had subacute bacterial endocarditis apparently not engrafted on rheumatic heart disease (table 1).

Of the 5,801 admissions with rheumatic conditions, 4,869, or 83.9 percent, had some form of rheumatic heart disease. Of this number, 223, or 4.6 percent, had subacute bacterial endocarditis engrafted on rheumatic heart disease, while 4,646, or 95.4 percent, had rheumatic heart disease without this complication. Among 4,869 admissions with rheumatic heart disease, 3,354, or 68.9 percent, had rheumatic heart disease uncomplicated by rheumatic fever, chorea, or subacute bacterial endocarditis.

Of the 5,801 admissions with rheumatic conditions, 960, or 16.5 percent, had rheumatic fever with rheumatic heart disease, while 499, or 8.6 percent, had rheumatic fever without clinically recognized heart disease. Altogether, 1,459, or 25.2 percent, had rheumatic fever. Sydenham's chorea was present in a total of 806 admissions, or 13.9 percent, of the total with rheumatic infection. Of the 5,801 admis-

sions 444, or 7.7 percent, had simple Sydenham's chorea without clinical evidence of heart disease, while 362, or 6.2 percent, had chorea with rheumatic heart disease. There were 41 admissions in which both rheumatic fever and chorea occurred. These were considered as separate entities and for this reason the items in table 1 overlap to a certain extent.

Subacute bacterial endocarditis engrafted on rheumatic heart disease occurred in 223, or 3.8 percent, of the 5,801 admissions with rheumatic conditions. In addition, there were 120 admissions with subacute bacterial endocarditis not engrafted on rheumatic heart disease, or in which the relationship between these conditions was not definitely established. It is probable that in some of these a rheumatic background was present. Subacute bacterial endocarditis was included because it often occurs as a complication of rheumatic heart disease, and because opportunity is afforded to compare certain features of subacute bacterial endocarditis with a known rheumatic background with cases in which the relationship is not proved. Subacute bacterial endocarditis apparently not engrafted on rheumatic heart disease constitutes only 2.0 percent of the 5,921 admissions in this series and consequently does not influence it to any great extent.

RELATION OF ADMISSIONS TO NUMBER OF INDIVIDUAL CASES

There were 5,921 admissions of 4,653 patients during this 5-year period, or 1.27 admissions per patient. Even over such a relatively long period this does not represent an entirely accurate index of the number of admissions for each patient. Many of these patients were admitted to hospitals only as a final resort and either died in hospital or soon after discharge. The natural history of rheumatic heart disease covers such a long period that frequently a patient is admitted for rheumatic fever or chorea in childhood and not readmitted for congestive failure or subacute bacterial endocarditis until perhaps 20 to 30 years later.

According to table 2, 81.7 percent were admitted only once during the period under study. Comparatively few patients were admitted more than four times. Most of those admitted more than four times had well-developed valvular heart disease with frequent breakdowns from congestive failure. Many had been hospitalized on several other occasions before this study began, while others continued to be hospitalized after the completion of the 5 years under study.

This type of patient, suffering from the end-results of rheumatic heart disease, sometimes lives for several years on the verge of congestive heart failure. From social and economic standpoints this constitutes one of the most distressing features of rheumatic heart disease. These persons are generally unable to pursue a gainful occupation or their home duties, except in a very limited capacity. Not only is the

community burdened with the cost of frequent hospitalizations and the expense of furnishing medical care during the interim between admissions, but financial assistance is frequently necessary, especially if it is the breadwinner of a family who is afflicted. When the mother or some other member is the victim, the family may have to readjust its mode of living. Frequently a wage earner has to stay at home. Sometimes the family has to live in a first-floor flat to save the patient from the exertion of stair climbing.

TABLE 2.—*Numerical relationship of cases to admissions among 4,653 persons with rheumatic heart disease, rheumatic fever, Sydenham's chorea and subacute bacterial endocarditis admitted 5,921 times to Philadelphia hospitals from January 1, 1930, to December 31, 1934*

Number of patients	Times admitted	Total admissions
3,804	1	3,804
595	2	1,190
171	3	513
53	4	212
18	5	90
4	6	24
3	7	21
1	8	8
2	9	18
1	20	20
1	21	21
4,653		5,921

Two of the patients were admitted 20 or more times during these 5 years. One was a colored woman in the 35–40-year age group who was admitted 21 times for congestive failure. The other was a white female in the 40–45-year age group who had to be admitted periodically for paracenteses and thoracenteses. In addition to rheumatic heart disease with mitral stenosis and aortic insufficiency she probably had an adherent pericardium. She also had auricular fibrillation and frequently showed peripheral signs of congestive failure. She may also have had cirrhosis of the liver, either primary or due to long-standing hepatic congestion. Both of these patients died before the completion of the 5-year period.

These cases illustrate the difficulties attending an analysis of results solely on the basis of admissions, especially when dealing with age, race, and sex distribution, or the occurrence of certain clinical phenomena such as auricular fibrillation. This will be discussed in greater detail in a subsequent section describing certain clinical features of rheumatic infection in Philadelphia.

ADMISSIONS FROM ALL CAUSES WITH RHEUMATIC CONDITIONS AND SUBACUTE BACTERIAL ENDOCARDITIS

Among 850,423 admissions from all causes in 36 civilian hospitals in Philadelphia during the 5-year period under study, rheumatic conditions and subacute bacterial endocarditis were indicated in 5,921

admissions, or 0.70 percent (see table 1). Excluding 120 admissions for uncomplicated subacute bacterial endocarditis, rheumatic infection was present in 5,801 admissions, or 0.68 percent of admissions from all causes. Rheumatic heart disease was noted in 4,869 admissions, or 0.57 percent of the total admissions. There were 1,459 admissions for rheumatic fever with or without heart disease, or 0.17 percent of admissions from all causes. Sydenham's chorea was present in 0.09 percent of the total admission load during this period. Subacute bacterial endocarditis was present in 343, or 0.04 percent of all admissions. Most of the subacute bacterial endocarditis was on a rheumatic basis.

TABLE 3.—*Percentage of total admissions involving rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis in various types of hospitals in Philadelphia from January 1, 1930, to December 31, 1934*

Status of hospital	Number of hospitals	Admissions from all causes	Admissions with rheumatic conditions and subacute bacterial endocarditis	Percentage of admissions with rheumatic conditions and subacute bacterial endocarditis
Hospitals approved for interneship by American Medical Association	26	784, 787	5, 009	0. 64
Hospitals with medical school affiliation [1]	14	503, 661	3, 984	.79
Hospitals with cardiac clinics	22	655, 519	4, 872	.74
Hospitals without cardiac clinics	14	194, 904	1, 050	.54
Hospitals not approved for interneship and without medical school affiliation	6	38, 249	147	.38
Children's hospitals	3	27, 042	421	1. 56

[1] Limited to hospitals used for undergraduate or graduate teaching of general medicine, heart disease, or pediatrics.

Of the 5,921 admissions for these diseases, 5,009 occurred in 26 hospitals (table 3) approved for interneship by the American Medical Association. In these hospitals, rheumatic conditions and subacute bacterial endocarditis occurred in 0.64 percent of all admissions. In the 3 children's hospitals these diseases were present in 1.56 of admissions from all causes. In 14 hospitals used by the 5 medical schools in this city for undergraduate or graduate instruction in general medicine, heart disease, and pediatrics, these diseases were indicated in 0.79 percent of the total admissions. In 22 hospitals with heart clinics approved by the American Heart Association these diseases were present in 0.74 percent of all admissions. In 6 hospitals not approved for interneship and not affiliated with medical schools these diseases were present in only 0.38 percent of admissions from all causes.

The higher incidence in children's hospitals is due to the increased susceptibility of children to rheumatic infection. Since most admis-

sions to children's hospitals are of very short duration, especially for tonsillectomies, the significance of rheumatic disease in childhood as a hospital problem is even greater than these figures indicate.

Of the 5,921 admissions involving these conditions, 67.3 percent were to hospitals with medical school affiliation, while 84.6 percent were to hospitals approved for interneship by the American Medical Association. The higher incidence of rheumatic infection in these hospitals and in hospitals with cardiac clinics is due to better diagnosis, together with an increasing tendency to refer patients from out-patient departments, particularly cardiac clinics, to hospitals before serious complications develop. These hospitals almost all have large public wards and receive State aid or gifts from religious or other benevolent organizations. Consequently they are able to furnish hospitalization free of charge or for nominal fees to needy persons.

Most of the hospitals in Philadelphia not recognized for interneship by the American Medical Association are small private hospitals. These hospitals generally specialize in surgical cases. They usually have small or poorly organized out-patient departments, and small pediatric services. They do not treat many charity cases.

There was considerable difference in the percentage of total admissions with rheumatic infection and subacute bacterial endocarditis in various hospitals (table 4). Large general hospitals and children's hospitals in the center of the city had the highest percentages of admissions, and most of the admissions were to these hospitals. At the Philadelphia General Hospital 0.79 percent of all admissions had rheumatic conditions or subacute bacterial endocarditis, while nearly 15 percent of all admissions with these diseases in the entire city were to this institution. At the Pennsylvania Hospital, 1.09 percent of all admissions, the highest incidence of any general hospital in the city, had these diseases. This hospital is located in the oldest and one of the poorest sections of the city. It has large public wards and treats many Negroes, and white persons of Italian and Russian birth or extraction, many of whom are extremely poor. It has an unusually large and active cardiac clinic and its staff is very much interested in cardiac conditions.

The Children's Hospital had the highest incidence of admissions, 1.8 percent, of any hospital in the city. This institution is located in one of the poorest sections of Philadelphia. During the economic depression very few private beds were filled. Its cardiac clinic treats many patients with rheumatic heart disease, and the clinic chief is a diligent student and earnest research worker in the field of heart disease in children.

TABLE 4.—*Distribution by hospitals of 5,921 admissions with rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis occurring in Philadelphia hospitals from January 1, 1930, to December 31, 1934*

Name of hospital	Admissions from all causes during 5-year period	Number of admissions with rheumatic heart disease, rheumatic fever, chorea, and subacute bacterial endocarditis	Percentage of total admissions due to rheumatic conditions and subacute bacterial endocarditis	Percentage admissions for rheumatic conditions and subacute bacterial endocarditis in each hospital
Babies [1]	1,377	1	0.07	0.02
Broad Street	7,301	7	.10	.12
Chestnut Hill [1]	10,509	33	.31	.56
Children's Heart [2]	345	345	100.00	5.83
Children's [2 3 4]	11,166	201	1.80	3.39
Frankford [1 4]	16,332	138	.84	2.33
Frederick Douglass	3,001	15	.50	.25
Germantown [1 4]	32,489	128	.39	2.16
Graduate [1 2 4]	41,201	288	.70	4.86
Hahnemann Medical College [1 2]	54,349	295	.54	4.98
Jefferson Medical College [1 2 4]	67,298	352	.52	5.95
Jewish [1 2 4]	34,183	193	.56	3.26
Lankenau [1 4]	19,157	111	.58	1.87
Mary Drexel [2 3 4]	5,097	65	1.28	1.10
Mercy [1]	8,837	29	.35	.49
Methodist [1]	23,757	84	.35	1.42
Misericordia [1 4]	23,365	251	1.07	4.24
Mount Sinai [1 4]	31,309	305	.97	5.15
Northeastern [1]	11,140	96	.86	1.62
Northern Liberties [4]	8,688	70	.81	1.18
Pennsylvania [1 2 4] and Maternity	49,410	541	1.09	9.14
Philadelphia General [1 2 4]	112,214	884	.79	14.93
Presbyterian [1 4]	22,640	188	.83	3.18
Protestant Episcopal [1 4]	29,429	214	.73	3.61
Roxborough [4]	11,141	38	.34	.64
St. Agnes [1]	24,801	63	.25	1.06
St. Christopher's [2 3 4]	10,779	155	1.44	2.62
St. Joseph's [1]	13,019	22	.17	.37
St. Luke's [1 2 4]	17,923	105	.59	1.77
St. Mary's [1]	17,246	20	.12	.34
Stetson	6,741	16	.24	.27
Temple University [1 2 4]	42,611	228	.54	3.85
University of Pennsylvania [1 2 4]	0 44,937	239	.53	4.04
Women's [1 4]	12,002	85	.71	1.44
Women's Homeopathic [1]	12,981	24	.18	.41
Women's Medical College [1 2 4]	12,148	92	.76	1.55
Total	850,423	5,921	.70	100.00

[1] Hospitals approved for interneship by American Medical Association.
[2] Hospitals used for graduate or undergraduate medical instruction in medicine or pediatrics.
[3] Children's hospitals, exclusive of special institutions.
[4] Hospitals with heart clinics.
[5] Limited to infants. Bed capacity of only 15 beds.

Most of the hospitals approved for interneship with lower incidences of admissions involving rheumatic conditions and subacute bacterial endocarditis are either located in the outskirts of the city or are under religious denominational control. Hospitals under church control do not receive a per diem allowance from the State for hospitalizing free patients. Therefore, while they are able to furnish many persons with hospitalization at low rates or free of charge they do not treat as large a proportion of indigent persons as hospitals receiving a per diem allowance from the Commonwealth of Pennsylvania for the care of its indigent citizens. Consequently, not as many cases of these diseases were treated in denominational institutions. The Misericordia Hospital, however, was an exception. In this hospital, 1.07 percent of all admissions were due to these causes, despite the fact that

it does not receive State aid and is located in one of the better residential sections in West Philadelphia. The high incidence of admissions is probably due in no small measure to the keen interest of at least one of the members of its staff.

TABLE 5.—*Principal causes for 5,921 admissions involving rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis in 36 civilian hospitals in Philadelphia, from January 1, 1930, to December 31, 1934*

Diagnosis	All causes		Rheumatic conditions		Subacute bacterial endocarditis		Other medical conditions		Surgical conditions		Obstetrics		Tonsillectomies	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total admissions with rheumatic conditions and subacute bacterial endocarditis	5,921	100	5,161	87.2	343	5.8	76	1.3	142	2.4	129	2.2	70	1.2
All rheumatic conditions	5,801	100	5,161	89.0	223	3.9	76	1.3	142	2.4	129	2.2	70	1.2
Rheumatic heart disease	4,869	100	4,234	87.0	223	4.6	75	1.6	138	2.8	129	2.6	70	1.4
Rheumatic fever with rheumatic heart disease	960	100	958	99.8	0	0	0	0	0	0	2	.2	0	0
Sydenham's chorea with rheumatic heart disease	[1] 332	100	330	99.4	0	0	0	0	0	0	2	.6	0	0
Rheumatic heart disease complicated by subacute bacterial endocarditis	223	100	0	0	223	100	0	0	0	0	0	0	0	0
Uncomplicated rheumatic heart disease	3,354	100	2,946	87.8	0	0	75	2.2	138	4.2	125	3.7	70	2.1
Rheumatic fever without heart disease	499	100	495	99.2	0	0	0	0	4	.8	0	0	0	0
All rheumatic fever	1,459	100	1,457	99.9	0	0	0	0	0	0	2	.1	0	0
Sydenham's chorea without heart disease	[1] 433	100	432	99.8	0	0	1	.2	0	0	0	0	0	0
All Sydenham's chorea	[1] 765	100	762	99.6	0	0	1	.1	0	0	2	.3	0	0
Subacute bacterial endocarditis not engrafted on rheumatic heart disease	120	100	0	0	120	100	0	0	0	0	0	0	0	0
All subacute bacterial endocarditis	343	100	0	0	343	100	0	0	0	0	0	0	0	0

[1] 41 with rheumatic fever and chorea during same admission counted as rheumatic fever.

MEDICAL ADMISSIONS WITH RHEUMATIC CONDITIONS

During 1928, 2 years before the beginning of this series, an exhaustive study of Philadelphia hospitals was conducted under the direction of Dr. Haven Emerson (*3*). This survey indicated that only 26 percent of the total admissions to 29 general hospitals were for medical conditions, in contradistinction to admissions for surgical, obstetrical, and other causes. Only 27 percent of admissions to 3 children's hospitals were for medical conditions. Based on this survey, it is estimated that rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis were present in 2.4 percent of medical admissions to general hospitals, and in 5.8 percent of medical admissions to children's hospitals.

PRINCIPAL CAUSES OF ADMISSIONS

Rheumatic heart disease, rheumatic fever, and Sydenham's chorea were the principal causes of 87.2 percent of 5,921 admissions involving these conditions to Philadelphia hospitals during 1930–34. Subacute bacterial endocarditis accounted for 5.8 percent of these admissions. Rheumatic conditions and subacute bacterial endocarditis therefore accounted for 93 percent of all admissions involving this group of diseases.

Only 1.2 percent were admitted for tonsillectomies. This does not imply that tonsillectomies were performed on only 1.2 percent of the cases of rheumatic heart disease hospitalized during this period. In many cases tonsillectomies were performed, but the primary cause for admission was some form of rheumatic infection.

Medical problems other than rheumatic fever, Sydenham's chorea and rheumatic heart disease were the principal causes of 1.3 percent of the 5,921 admissions involving these conditions. This low percentage probably results from the fact that a number of these patients were acutely ill with such conditions as pneumonia, diabetic acidosis, blood dyscrasias, acute infectious diseases, and other conditions which tend to mask signs of heart disease, or else exigencies prevented more than a casual examination of the heart.

General surgical conditions were the primary causes of 2.4 percent of these 5,921 admissions, while another 2.2 percent were obstetrical admissions. This would have been increased had hospitals devoted entirely to maternity care been included in this series. Because of unusually obsolete terminology and inadequate cross-indexing of diagnoses it was extremely difficult to obtain the records of maternity cases with heart disease, even in general hospitals. Often the reference to the cardiac condition was so short that it was not possible to be certain that the heart disease was of the rheumatic type. Only 2 cases of chorea gravidarum were admitted. In both an associated cardiac lesion was present.

With the exception of subacute bacterial endocarditis, rheumatic conditions were the principal reasons for admission in all of the categories listed in table 5. Of the 4,869 admissions with rheumatic heart disease, 87.0 percent were for rheumatic heart disease and 4.6 percent for complicating subacute bacterial endocarditis. Altogether, 91.6 percent were directly or indirectly attributable to rheumatic infection. Of the 1,459 admissions for rheumatic fever with or without heart disease, 99.9 percent were for rheumatic conditions, while of 765 admissions for Sydenham's chorea with or without heart disease, 99.6 percent were for rheumatic conditions including chorea.

RELATION OF PRIVATE TO WARD ADMISSIONS

According to table 6, 93.2 percent of 5,921 admissions for rheumatic conditions and subacute bacterial endocarditis during this period were to the wards of general and children's hospitals. Of the 5,801 admissions with rheumatic conditions, 93.3 percent were ward patients. Of the 4,869 admissions with rheumatic heart disease 93.4 percent occupied ward beds. Of 1,459 admissions with rheumatic fever with or without rheumatic heart disease, 93.1 percent were to the wards, while 97.5 percent of admissions with chorea were ward patients. These figures substantiate the general impression that rheumatic fever, Sydenham's chorea, and rheumatic heart disease are essentially problems of the class of patients encountered on the wards of general and children's hospitals. The ratio of ward to private admissions is approximately 15:1.

TABLE 6.—*Type of bed occupied (ward or semiprivate and private) during 5,921 admissions with rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis from January 1, 1930, to December 31, 1934*

Diagnosis	Total		Bed occupied					
			Ward		Private or semiprivate		Status unknown	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total admissions with rheumatic conditions and subacute bacterial endocarditis	5,921	100	5,520	93.2	395	6.7	6	0.1
All rheumatic infections	5,801	100	5,416	93.3	380	6.5	5	.1
Rheumatic heart disease	4,869	100	4,549	93.4	315	6.5	5	.1
Rheumatic fever with rheumatic heart disease	960	100	912	94.9	46	4.8	2	.2
Sydenham's chorea with rheumatic heart disease	332	100	325	97.9	7	2.1	0	0
Rheumatic heart disease complicated by subacute bacterial endocarditis	223	100	196	87.9	27	12.1	0	0
Uncomplicated rheumatic heart disease	3,354	100	3,116	92.9	235	7.0	3	.1
Rheumatic fever without heart disease	499	100	446	89.4	53	10.6	0	0
All rheumatic fever	1,459	100	1,358	93.1	99	6.8	2	.1
Sydenham's chorea without heart disease	[1] 433	100	421	97.2	12	2.8	0	0
All Sydenham's chorea	[1] 765	100	746	97.5	19	2.5	0	0
Subacute bacterial endocarditis not engrafted on rheumatic heart disease	120	100	104	86.7	15	12.5	1	.8
All subacute bacterial endocarditis	343	100	300	87.5	42	12.2	1	.3

[1] 41 with rheumatic fever and chorea during same admission counted as rheumatic fever.

One of the principal reasons for this is the very long duration of hospitalization required, the total cost of which few people can afford. Rheumatic heart disease occupies an intermediary position with regard to chronicity. Longer periods of hospitalization are required than for most surgical conditions, acute infectious diseases, and even most other forms of heart disease, but not so long as for tuberculosis, many cases of cancer, and nervous and mental diseases. The fact that rheumatic heart disease attacks the young should be taken into account since the wage earner of the family is not as likely to be affected as in some other conditions.

A somewhat lower percentage of ward admissions was indicated among patients with subacute bacterial endocarditis. Of all admissions for this condition 87.5 percent were ward patients. Practically the same percentage of ward patients obtained regardless of a definite rheumatic background. The slightly lower percentage of ward admissions is probably due to the fact that relatively more people in better economic circumstances succumb to this condition. Subacute bacterial endocarditis is often engrafted on a minor grade of rheumatic heart disease which has not previously incapacitated the patient.

Over 90 percent of the white patients were treated in hospital wards, while 100 percent of the colored patients received ward care. Emerson (*3*), in 1928, found that 35 percent of patients admitted to general hospitals occupied private or semiprivate rooms while 65 percent were admitted to the wards. Even though there has been a certain decrease because of the economic depression in the scale of beds occupied, it remains apparent that rheumatic heart disease, rheumatic fever, and Sydenham's chorea are diseases preponderantly encountered on hospital wards. Practical experience with a number of the patients included in this series and other cases makes it difficult to believe that even in relatively prosperous years many of these patients have ever been above the economic level of those commonly seen on the wards of general hospitals.

ANNUAL ADMISSIONS

A considerable increase in total admissions from these causes and in the percentage of these admissions among admissions from all causes was indicated during the first 3 years under study (table 7). After this, only slight annual fluctuations occurred. During 1932–34 the percentage of the 5,921 admissions during each year under study varied less than 0.5 percent annually. On the basis of the number of admissions during the last 3 years of the study, the total number of admissions to Philadelphia hospitals involving these conditions is probably slightly in excess of 1,200 per year.

In addition to computing admissions on the basis of total admissions with rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis, consideration was given to the number of initial admissions during the period under study. This is based on the number of new cases added to the series each year and its total approximates the number of cases in contradistinction to the number of admissions. The initial admissions were not necessarily the first admissions since many had been admitted prior to 1930. During the last 3 years initial admissions to the series approximate quite closely the true incidence of first admissions, with the exception of patients who were admitted for advanced rheumatic

heart disease, including subacute bacterial endocarditis, but who gave a history of previous hospitalization years ago for rheumatic fever or chorea. Since a considerable number of the adult population of Philadelphia is foreign born or, in the case of the Negro population, has migrated from the Southern States, previous admissions in the distant past were often to hospitals outside of this city.

TABLE 7.—*Percentage of admissions with rheumatic infections and subacute bacterial endocarditis among admissions from all causes in each year under study during 1930–34 in Philadelphia hospitals, based on total admissions from these causes and initial admissions from these causes during the period under study; also percentage of admissions from these causes during each year*

Year	All admissions	Total admissions with rheumatic conditions and subacute bacterial endocarditis	Percentage of all admissions	Initial admissions with rheumatic conditions and subacute bacterial endocarditis	Percentage of all admissions	Percentage of total admissions with rheumatic conditions and subacute bacterial endocarditis each year
1930	176,521	995	0.56	884	0.50	16.9
1931	169,045	1,158	.69	942	.56	19.7
1932	169,803	1,240	.73	949	.55	21.1
1933	172,121	1,258	.73	928	.54	21.4
1934	162,993	1,230	.75	912	.57	20.9
Total	850,423	[1] 5,881	.69	[2] 4,615	.54	100.0

[1] In 40 admissions the year was not determined.
[2] In 38 cases the year of initial admission was not determined.

On the basis of initial admissions during this period, only slight annual variations in the number of admissions and percentage of total admissions were noted (table 7). The lowest number, 884 initial admissions, occurred during 1930. This low number is probably attributable to difficulties in obtaining records owing to the lapse of time between 1930 and the beginning of the survey, to misplaced records, and to changes in diagnostic terminology and filing systems. The highest number, 949 initial admissions, occurred during 1932. During 1934, the last year under study, there was a slight decline to 912 new admissions. Since it is unlikely that many of the admissions added to this series during 1934 had been hospitalized prior to 1930, there are probably about 900 new admissions involving these conditions each year in Philadelphia hospitals.

ESTIMATED PATIENT-DAYS

Unfortunately, at the time this survey was made the number of days of hospitalization was not determined. In an endeavor to obtain an estimate of the duration of admissions from the diseases under study, the mean duration of 1,431 admissions for these conditions was ascertained. These included 834 admissions for rheumatic heart disease, 284 for rheumatic fever with or without heart disease, 163 for chorea with or without heart disease, and 150 for subacute bacterial endocarditis. This information was obtained from 12 large gen-

eral and 2 large children's hospitals. The number of admissions from each hospital was roughly prorated on the basis of its total number of admissions for rheumatic conditions. The mean days duration of hospitalization for rheumatic conditions, including subacute bacterial endocarditis, was estimated at 41 days. This was exclusive of admissions to the Children's Heart Hospital, which averaged 178 days. The mean duration of admissions for rheumatic heart disease was 37 days, for rheumatic fever 46 days, for chorea 54 days, and for subacute bacterial endocarditis 40 days.

The mean duration of admissions was usually longer in children's than in general hospitals, averaging 59 days for all rheumatic conditions as compared with 35 days. The mean duration of admissions for rheumatic heart disease was 60 days in children's as compared with 31 in general hospitals. For rheumatic fever it was 59 days as compared with 40 days. It was about the same for chorea, averaging 53 days in children's hospitals as compared with 54 days in general hospitals.

On this basis, the estimated mean duration of 105 admissions for rheumatic heart disease to children's hospitals was approximately 6,300 days, for 159 admissions for rheumatic fever with or without heart disease 9,400 days, and for 152 admissions for Sydenham's chorea with or without heart disease 8,000 days. Based on this estimate, there were 23,700 patient-days of hospitalization with these conditions in children's hospitals in Philadelphia during 1930–34.

The estimated total duration of 3,005 admissions to general hospitals for uncomplicated rheumatic heart disease was 93,000 patient-days. For 1,248 admissions for rheumatic fever with or without heart disease the mean duration is estimated at approximately 50,000 days, for 564 admissions for chorea with or without heart disease at 30,500 days, and for 340 admissions for subacute bacterial endocarditis at 14,000 days. On this basis there were 187,000 days of hospitalization from rheumatic heart disease, rheumatic fever, chorea, and subacute bacterial endocarditis in general hospitals in Philadelphia during the period under study.

Besides the admissions to children's and general hospitals, there were 345 admissions to the Children's Heart Hospital, an institution devoted to the prolonged care of children with rheumatic heart disease, rheumatic fever, and chorea. According to the Philadelphia Heart Association, these admissions totaled 61,309 days during the 5-year period, an average of 178 days duration for each admission. This figure is based on the annual reports of the Philadelphia Heart Association and was furnished through the courtesy of Miss Helen Heikes, executive secretary.

There were altogether 23,700 estimated patient-days from the diseases under study in children's hospitals, 187,000 estimated patient-

days in general hospitals, and approximately 61,300 patient-days in Children's Heart Hospital, an estimated total of 272,000 patient-days in all hospitals from rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis. Excluding the Children's Heart Hospital, which is in a special category, it is estimated that there were 210,700 patient-days of hospitalization in general and children's hospitals during this 5-year period. If from this number is subtracted 5,000 patient-days due to subacute bacterial endocarditis in which the rheumatic background was not evident, there were 205,700 patient-days during the 5-year period in Philadelphia hospitals attributable to rheumatic infection, an average of over 40,000 patient-days annually. If the Children's Heart Hospital is included, the average number of patient-days exceeds 50,000 per year.

PERCENTAGE OF PATIENT-DAYS FOR THESE CONDITIONS

According to Emerson's report (*3*), the average stay in a general hospital in Philadelphia during 1928–29 was 11.1 days. On this basis, 823,381 admissions from all causes to general hospitals in Philadelphia during 1930–34 resulted in approximately 9,140,000 patient-days. The estimated number of patient-days for rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis in general hospitals was 187,000. It is estimated that these conditions accounted for or were important factors in approximately 2 percent of patient-days.

During 1930–34 there were 27,042 admissions to children's hospitals from all causes. According to the Philadelphia Health and Hospital Survey, the mean duration of admissions to children's hospitals in Philadelphia is 11.7 days. There were, on this basis, approximately 316,000 patient-days from all causes during this 5-year period. The total estimated patient-days in children's hospitals with rheumatic heart disease, rheumatic fever, and chorea was 23,700 days, or 7.5 percent of the total patient-days.

For both general and children's hospitals it is estimated that there were 9,446,000 patient-days from all causes and 211,000 patient-days from the conditions under study. On this basis these conditions account for about 2.3 percent of patient-days.

ESTIMATED COST OF HOSPITALIZATION

Based on a cost of $6 per day, the average per diem cost of hospitalization in general hospitals according to Emerson's survey, hospitalization of these conditions in general hospitals cost $1,125,000 during this period. Based on a per diem cost of $5 in children's hospitals, hospitalization for rheumatic conditions in these hospitals cost

$117,500. During the 5-year period the budget of the Children's Heart Hospital amounted to approximately $120,000. Thus the entire cost of rheumatic conditions in general and children's hospitals and the Children's Heart Hospital was $1,362,500 for the 5-year period, or over $272,000 a year. Excluding the Children's Heart Hospital, the cost is over $248,000 a year for the care of patients with these diseases in general and children's hospitals.

The estimate of the costs of hospitalization is exclusive of charges for professional services of physicians. Since 93 percent of admissions were ward patients, professional services were for the most part rendered gratuitously by the physicians of Philadelphia. These estimates do not take into consideration the cost of treatment by private physicians in some instances and to a greater extent in clinics, or the extremely important factor of loss in earning power as a result of disability from these conditions.

CONVALESCENT FACILITIES

The Children's Heart Hospital, an institution sponsored by the Philadelphia Heart Association and financed largely by the United Campaign, the local community fund, is the only institution with facilities devoted strictly to the prolonged care of persons recovering from attacks of rheumatic infection. This sanitarium provides treatment during the interim between hospitalization on the wards of general and children's hospitals for acute rheumatic fever, rheumatic carditis, and chorea and the time when the patient has reached a stage of complete subsidence of the infection.

The facilities of this institution are limited. In normal times it has a capacity of 60 beds. There is no provision for prolonged institutional care of persons over 13 years of age. During most of the period under study it was reduced to 30 beds because of the economic depression, and only girls were admitted. Furthermore, many families cannot afford to pay the modest charge of $3 per week for hospitalization. As a consequence, many of the most destitute families are unable to send their children to this institution. There are, however, a certain number of free beds. Social service departments of general hospitals, church organizations, and other social agencies also provide for a certain number of cases.

Owing to the limitations of age, bed capacity, and the cost of this form of treatment, only a small proportion of patients recovering from attacks of rheumatic fever or chorea receive this treatment. In addition to the Children's Heart Hospital, a few other general convalescent homes occasionally treat persons recovering from rheumatic fever or chorea, or from various clinical manifestations of rheumatic heart disease. Treatment in these institutions is limited almost entirely to children.

Of the 5,921 admissions during the quinquennium under study, only 345, or 5.8 percent, were admitted to the Children's Heart Hospital. Of the 2,389 cases under 20 years of age, the period in which prolonged treatment in special institutions is of the greatest benefit, only 329, or 13.8 percent, were treated in this sanitarium. Of the 345 admissions to the Children's Heart Hospital 40, or 11.6 percent, terminated fatally before the conclusion of the 5-year period. On the other hand, only 40, or 13.6 percent, of the 295 fatal cases of rheumatic heart disease among persons under 20 years of age had been treated at the Children's Heart Hospital.

It is, therefore, evident that this institution furnishes convalescent care for only a small part of the total case load. The percentage of cases treated is so small that it is impossible to evaluate this form of treatment. It is much as though a dam were constructed a third of the distance across a stream. Based on British estimates of at least 6 to 8 beds per 100,000 population (*4*, *5*), and on experience in London (*6*, *7*), at least 200 beds would be required to provide sufficient convalescent facilities for the metropolitan area of Philadelphia. It is doubtful whether this would be sufficient to care for all of the adult cases requiring prolonged periods of rest following cardiac break-downs, or to provide domiciliary care for far-advanced cases of rheumatic heart disease.

SUMMARY

During the 5-year period from January 1, 1930, to December 31, 1934, there were 5,921 admissions involving rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis to 36 hospitals in Philadelphia. Of these admissions, 5,801 were for rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis on a rheumatic basis, while 120 were for subacute bacterial endocarditis in which a definite relationship to rheumatic heart disease was not determined.

Comment is made on difficulties in terminology in describing rheumatic conditions, and on the variety of combinations in which they occur. Considerable improvement in diagnostic standards and in the maintenance of hospital records was noted during the period under study.

The diseases under study were indicated in 0.70 percent of admissions from all causes to Philadelphia hospitals. In 3 children's hospitals they were present in 1.56 percent of all admissions. In 14 teaching hospitals these conditions were noted in 0.79 percent of all admissions. Most of the admissions were to the large general and children's hospitals located in the center of the city.

It is estimated that the conditions under study were present in 2.4 percent of medical admissions to general hospitals and 5.8 percent of medical admissions to children's hospitals.

Rheumatic heart disease, rheumatic fever, and Sydenham's chorea were the principal causes of 87.2 percent of these admissions, while subacute bacterial endocarditis was the principal cause of 5.8 percent of the 5,921 admissions constituting this series. Practically all admissions involving rheumatic fever and chorea were caused primarily by those conditions.

Over 93 percent of admissions involving rheumatic conditions were to the wards of general and children's hospitals. This substantiates the view that rheumatic heart disease is essentially a problem of the class of patients treated on hospital wards.

The total number of admissions to Philadelphia hospitals for rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis, most of which is superimposed on rheumatic heart disease, is probably slightly over 1,200 a year; of these, over 900 are first admissions.

It is estimated that rheumatic conditions and subacute bacterial endocarditis were factors in 272,000 patient-days in Philadelphia hospitals during this 5-year period. Of this number, only about 5,000 patient-days were due to subacute bacterial endocarditis not superimposed on rheumatic heart disease. It is estimated that rheumatic conditions were in varying degrees accountable for 187,000 patient-days in general hospitals and 23,700 patient-days in children's hospitals. They result in over 40,000 patient-days annually in general and children's hospitals. In addition, there were about 61,300 patient-days caused by rheumatic conditions at the Children's Heart Hospital, a sanitarium furnishing prolonged convalescent care. Including this institution, rheumatic conditions account for, or at least are concerned in, over 50,000 patient-days each year in Philadelphia hospitals.

It is estimated that the conditions under study accounted for or were responsible factors in 2.0 percent of patient-days in general and 7.5 percent in children's hospitals.

The estimated cost of hospitalization of patients with these conditions is over $272,000 a year, exclusive of physicians' services, most of which are rendered gratuitously.

Prolonged convalescent care is furnished such a small percentage of patients with rheumatic fever, chorea, and rheumatic heart disease that it is not possible to evaluate its benefit. Only 13.8 percent of patients under 20 years of age were treated at the Children's Heart Hospital. Of the fatal cases under 20 years of age, only 13.6 percent had been admitted to that institution.

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FACTORS INFLUENCING THE EFFICACY OF PHENOLIZED RABIES VACCINES

I. STRAINS OF FIXED VIRUS [1]

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This series of experiments was designed to investigate the properties of 31 strains of rabies fixed virus, 28 of which are now being used in the manufacture of rabies vaccine in this country and abroad. Such an investigation, especially of the immunizing power of these strains, seemed indicated in view of Webster's report (*1*) that of 33 rabies vaccines purchased on the open market and tested in mice, only 2 showed any immunizing ability. In these experiments we hoped to determine any variations in strains of fixed virus having the same origin, thus demonstrating a varying evolution in different laboratories, and to learn, if possible, the reason for these differences.

Reports in the literature of comparisons of different strains of rabies fixed virus are rather scarce. This is probably due to the widespread use of the Pasteur strain and its derivatives. In India Shortt, Cunningham, and Malone, and their coworkers (*2, 3, 4*), have compared the immunizing potency of their local Kasauli strain with the Pasteur strain in both man and monkeys. They found the Pasteur strain to be slightly superior in producing immunity, and noted that the Kasauli strain was much less resistant to the action of ether. Lepine (*5*) and again Levaditi and Schoen (*6*) have studied the Pasteur strain and several substrains derived from it some years ago. They found that the Pasteur strain itself over a period of years had changed in its resistance to the effect of glycerin and desiccation and that the virulence of the cords of infected animals had decreased. One of the substrains had recovered its ability to infect by the subcutaneous route and produced definite Negri bodies. These authors explain the differences in substrains of the same origin by differences in the technique of their passage and in the type of rabbits used.

[1] From the Division of Biologics Control, National Institute of Health.

There have been other evidences of the possible evolution of fixed virus even after being fixed for many years. Nicolau and Kopciowska (*7*) claim to have reverted the Pasteur fixed strain back to a virus with the characteristics of street virus by repeated brain to peripheral nerve passages, although Levaditi and Schoen (*6*) were unable to repeat this procedure. Proca and Jonnesco (*8*) have caused a lasting prolongation of the incubation period of a fixed virus by passing it through mice partially protected by rabies immune serum. Dodero (*9*) has produced the same effect by allowing fixed virus to remain in glycerin for several months.

Defries and Campbell (*10*) have compared the relative virulence by the intracerebral and intramuscular routes of the original Pasteur strain and one of its substrains carried in this country for over 25 years, and found definite differences.

As to the method of evaluating the properties of any one strain of fixed rabies virus, Remlinger and Bailly (*11*) recommend determining its incubation in the rabbit; response to desiccation, glycerin, dilution (titer), ether and phenol; its pathogenic power by different routes; and finally its immunizing power. These authors point out the evolution of the fixed virus over a long time as proving the necessity for periodic routine evaluation of its properties, and especially is this true in those laboratories making live virus vaccines for human use. And, again, Remlinger (*12*) has suggested the isolation of the most highly immunizing strain of fixed virus and its yearly distribution to all laboratories making rabies vaccine from a central source where the virus could be checked periodically.

The history of each strain of virus tested has been obtained as completely as possible. This was often quite difficult because the strain had passed through as many as four different laboratories from the original isolation of the street virus to its present location over as long a period as 57 years.

The information for each virus is listed in table 1, and it is seen that 25 of the 31 strains had their origin in the original Pasteur strain carried at the Pasteur Institute in Paris. All of these have been through at least 1,000 intracerebral passages and are therefore far removed from the original street virus.

In addition to the substrains from the original Pasteur virus there were four other originally individual strains, one of which has two substrains.

With a few exceptions all have been carried in rabbits and preserved in glycerin between passages while the frequency of intracerebral transfer has varied from every 5 days to 7 months. These figures for the frequency of transfer are average, the time the virus has been carried in the laboratory supplying it being divided by the number of passages made in that laboratory.

TABLE 1.—*History of strains of fixed rabies viruses*

No. of strain	Source	Date isolated as street virus	Number of passages to date	Frequency of recent passage	Animal used for passage	How preserved
1	Pasteur	1882	2,000+	1 month	Rabbit	Glycerin.
2	do	1882	2,000+	1 week	do	Do.
3	do	1882	2,000+	3 weeks	do	Do.
4	do	1882	2,000+	1 week	do	Do.
5	do	1882	2,000+	1 month	do	Do.
6	do	1882	2,000+	7 months	do	Dried.
7	do	1882	2,000+	5 months	do	Glycerin.
8	do	1882	2,000+	2 weeks	do	Do.
9	do	1882	2,000+	2 weeks	do	Do.
10	do	1882	2,000+	2 months	do	Do.
11	do	1882	2,000+	5 days	do	Do.
12	do	1882	2,000+	3 weeks	do	Do.
13	do	1882	2,000+	1 week	Mouse	Do.
14	do	1882	2,000+	2 months	Rabbit	Dried.
15	do	1882	2,000+	6 months	do	Do.
16	do	1882	2,000+	2 months	do	Glycerin.
17	do	1882	1,650	1 week	Mouse	Do.
18	do	1882	2,000+	2 weeks	Rabbit	Do.
19	do	1882	2,000+	2 weeks	do	Do.
20	do	1882	2,000+	3 weeks	do	Do.
21	do	1882	1,000+	6 months?	do	Dried.
22	do	1882	1,000+	5 months	do	Glycerin.
23	do	1882	1,000+	6 months	do	Dried.
24	do	1882	1,000+	4 months	do	Do.
25	do	1882	1,617	2 weeks	do	Do.
26	Budapest	1886	15,000	1 week	do	Glycerin.
27	Texas	1905	300+(?)	3 weeks	do	Do.
28	do	1905	300+(?)	2 months	do	Do.
29	do	1905	300+(?)	2 weeks	do	Do.
30	Rockefeller	?	169	1 week	Mouse	Do.
31	Alabama	1935	62	3 weeks	do	Do.

METHOD OF STUDY OF EACH STRAIN

Incubation period and duration of paralysis.—The original rabbit or mouse brain containing the strain of fixed virus was used either directly or after one or at most two mouse passages.

A 1/10 emulsion was made, centrifuged at 1,000 r. p. m. for 10 minutes and 0.2 cc. of the supernatant injected intracerebrally into a rabbit weighing between 1,500 and 2,000 grams. This rabbit was observed for the time of developing symptoms and allowed to die. The brain was removed and stored in 50 percent glycerin at 0° C. for 1 month; then a portion of the bulb was emulsified and the passage was repeated in a second rabbit.

This rabbit was killed with chloroform on the first day of complete paralysis.

Titer of virus in rabbit brain.—The second rabbit passage brain was emulsified in normal salt solution to a 20 percent emulsion. A portion of this was diluted to a 10 percent emulsion, centrifuged, and serial tenfold dilutions in saline made from the supernatant. Three-hundredths cc. of each dilution was injected intracerebrally into 3 Swiss mice weighing from 15 to 20 grams. The titer was taken to be the highest dilution causing death in at least 2 out of the 3 mice.

Infectivity by intramuscular inoculation.—Five-hundredths cc. of the supernatant from a 1:10 emulsion of the second rabbit passage brain was injected into each masseter muscle in 3 Swiss mice weighing

from 12 to 15 grams. Death of 2 or more mice with typical rabies symptoms was the criterion of ability of the virus to infect when given intramuscularly.

Preparation of phenolized vaccine.—The 20 percent emulsion made from the second rabbit passage brain was filtered through fine gauze into a 250 cc. Erlenmeyer flask with a cotton plug. An equal volume of 2 percent phenol in saline was then added and the flask was placed in the incubator at 37° C. for 24 hours, after which time it was removed and an equal volume of saline added to make a 5 percent emulsion with 0.5 percent phenol. This was placed in the cold room at 5° C. until used.

Resistance to phenol.—Ten cc. of the 10 percent emulsion containing 1 percent phenol made in preparing the phenolized vaccine was placed in a 25 cc. Erlenmeyer flask with a cotton plug and put in the incubator at 37° C. At the end of 24, 48, and 96 hours 0.2 cc. was removed and diluted with an equal amount of saline. Three-hundredths cc. of the resulting 5 percent emulsion was injected intracerebrally into 2 Swiss mice weighing from 12 to 15 grams. Death of both mice with symptoms of rabies was taken to show viability of the virus.

Viability of virus after 2 months' storage.—Two months after the preparation of the phenolized vaccine and its storage at 5° C., 0.03 cc. was injected, undiluted, intracerebrally into 3 mice. Death from rabies of 2 of the 3 mice was necessary to show viability.

Immunizing potency of phenolized vaccine.—After 2 months' storage at 5° C. each vaccine was used to immunize a group of 25 Swiss mice weighing 15 to 20 grams. The vaccine was diluted according to the titer of the rabbit brain used to make the vaccine so that each dose would contain 400 mouse intracerebral M. L. D.'s. This meant that a vaccine whose titer had been 10^{-3} was used undiluted; that having a titer of 10^{-4} was diluted 1:10, and so on. This was done to assure an equal amount of virus in a dose for all strains.

Twenty-five hundredths cc. of the proper dilution (diluted each time used from stock vaccine) was injected every second day, intraperitoneally, for 10 doses.

Thirty days from the start of the immunization the test dose was given. The virus used as the test dose was one of the fixed virus strains being tested but this was the only homologous strain in the study. It had been isolated from a rabid dog in 1935 and carried through 70 passages in mice when first used. Mouse passage brains were emulsified in saline at 1/10 dilution, centrigued at 1,000 r. p. m. for 10 minutes, and serial dilutions made from the supernatant in such a way that they would contain 10, 25, 50, 100, 1,000, and 2,000 M. L. D.'s. This strain of virus used as the test dose was passaged through mice just before each group of vaccines was to be tested.

Three-hundredths cc. of each dilution was injected intracerebrally into 3 to 5 immunized mice. The mice were observed for 30 days and the 50 percent end point was determined by the method of Reed and Muench (*13*).

Control mice obtained at the same time as those immunized received ten-fold dilutions of the test virus intracerebrally to determine what dilution represented 1 M. L. D.

Resistance to glycerin.—The first rabbit passage brain was kept at 0° C. in 50 percent glycerin. Three months after its removal from the rabbit and each month subsequently it was tested for viable virus. A small piece of the bulb was removed, emulsified at 1:10 in saline, centrifuged, and 0.03 cc. of supernatant injected into 2 mice.

Test of identity and specificity of virus strain.—A hyper-immune rabbit serum was produced by 21 daily subcutaneous doses of 2 cc. of a 5 percent rabbit brain emulsion with 0.5 percent phenol prepared from one of the fixed virus strains previously found to be highly immunogenic. This subcutaneous immunization was followed by 3 intraperitoneal doses of 5 cc. of the same vaccine given 1 week apart. Finally, an intraperitoneal dose of 5 cc. of a 5 percent emulsion of live virus was given. The rabbits were bled 10 days following the last dose of virus.

The specificity of this immune serum was first tested by mixing it with equal parts of a 1:500 dilution of rabies street virus (first guinea pig passage), incubating 2 hours at 37° C., then injecting 0.03 cc. of the mixture intracerebrally into 5 Swiss mice (15–20 grams). The same procedure was done simultaneously, using normal rabbit serum.

Four of the mice receiving the street virus emulsion incubated with normal rabbit serum died with typical rabies symptoms and were positive for Negri bodies. All five mice receiving the immune serum street virus mixture survived.

In testing for the specificity of individual fixed virus strains this procedure was repeated. Mouse passage brains for each strain were emulsified, centrifuged, and diluted to 1:5,000. Equal parts of these virus dilutions were mixed with immune serum and normal serum, incubated 2 hours at 37° C., then 4 Swiss mice (15–20 grams) were injected intracerebrally with 0.03 cc. of each mixture. At least 50 percent mortality in the mice receiving the virus-normal serum mixture and no deaths in those injected with the virus-immune serum mixture were the criteria of specificity of the virus strain.

RESULTS

Incubation period and duration of paralysis.—The incubation period varied from the shortest of 4 days to the longest of 13 days. There was agreement with that found in the laboratory from which the strain had been obtained in 24 strains and a difference in 7 strains. Of the 7

strains showing a different incubation period in this laboratory from that in the original, 4 had a longer and 3 a shorter incubation here. One which was longer and one shorter had been carried exclusively in mice in the original laboratory, and our figures represent the incubation in rabbits.

However, in the duration of the paralysis, where the shortest period was 1 day and the longest 7 days, there was not as much agreement. In 10 strains the paralysis lasted the same period as reported in the original laboratory and in 21 strains it differed, being longer in this laboratory in 18 and shorter in 3.

Some idea as to the amount of variation possible in the incubation period with the same strain on different passages is obtained from the

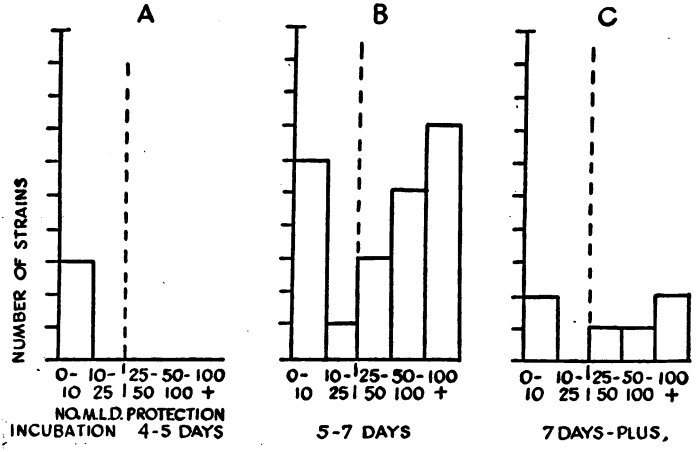

FIGURE 1.—Relation of immunizing potency to incubation period in rabbits.

fact that in 7 of the 31 strains there was a difference of more than 1 day in the incubation of the first and that of the second rabbit passage.

The duration of paralysis was observed in only the first rabbit passage but from observations on a few individual virus strains carried through several passages a variation of 1 or 2 days is not uncommon.

Figure 1 shows that 3 viruses having the short incubation of 4 to 5 days all gave less than 10 M. L. D. protection in the immunity test. Of 22 viruses with an incubation period of 5 to 7 days, 7 gave less and 15 more than 25 M. L. D. protection. Only 6 strains had incubation periods of over 7 days, and of these 4 gave over 25 M. L. D. protection. Therefore it would seem that those viruses whose incubation periods in rabbits fall within the usual 5 to 7 days or longer are more likely to be immunogenic than those having an unusually short incubation.

Ando (*14*), in comparing 2 strains of fixed virus, found that the one having a shorter incubation period in rabbits gave a higher titer

of immune bodies in the serum but he did not compare them as to the immunity produced.

Titer of virus in rabbit passage.—Titers varied from 10^{-3} to 10^{-5}. It was 10^{-3} in 5 strains, 10^{-4} in 20 strains, and 10^{-5} in 6 strains.

These values are lower than those usually reported for fixed virus rabbit passage titers. The reason for this is the fact that saline was used as the diluent instead of 10 percent horse serum or hormone broth, these latter having been shown to keep the virus viable longer in very high dilutions at room temperature (*15*). However, all titers were done in the same manner, and for comparative purposes the procedure used is valid.

In an unpublished experiment we have shown that the degree of immunity produced by a rabies vaccine is directly related to the titer of the virus used. For that reason all vaccinated groups were given the same amount of virus so that the different degrees of immunity produced would not be caused by differences in titer.

Infectivity by intramuscular inoculation.—All but one of the 31 strains were infective by the intramuscular route in spite of the fact that one of the characteristics of fixed rabies virus is supposed to be its relative inability to produce the disease when injected peripherally.

No attempt was made to titer the viruses by intramuscular injection and in the technique here used a relatively large dose (0.1 cc. of 10 percent emulsion supernatant) was given near the central nervous system (masseter muscle) in small mice (12 to 15 grams).

Most of the early experiments in which it was demonstrated that fixed virus given peripherally only rarely was infective were done with rabbits. Several authors more recently have shown fixed virus to be infective intramuscularly in mice even in high dilutions (*1*, *10*).

That the ability to infect mice peripherally, insofar as here tested, has no relation to the amount of immunity produced is obvious since all but one strain did infect by that route. However, the one strain that failed to infect mice when given peripherally gave no immunity.

Fermi (*16*) has stated that a fixed virus which was more virulent by the subcutaneous route gave a greater immunity in experimental animals. However, Ando (*14*) was unable to demonstrate any difference in the immunizing potency of vaccine made from a fixed virus infective subcutaneously as compared to one noninfective by that route.

Resistance to 1 percent phenol.—Different strains resisted 1 percent phenol from less than 24 hours to more than 4 days. Ten strains were not viable, as far as being able to cause rabies in young mice, at the end of 24 hours incubation. Eight strains were viable at 24 hours but not at 48 hours. Six were viable at 48 hours but not at 96 hours. Seven were viable at 96 hours and were not tested beyond that point.

Here again several individual strains were tested for resistance to 1 percent phenol on different rabbit passages and variations were found even with the same strain, sometimes being "killed" in 24 hours in one passage brain and again in 96 hours in another passage. However, the figures quoted in table 2 are those for the rabbit brain emulsions used to make the vaccines for the immunity experiments and are therefore comparable as far as their possible effect on the relative immunizing power of the vaccines.

In figure 2 the degree of immunity produced by the vaccines is plotted against the ability of the virus strains to resist 1 percent phenol. Of 10 viruses killed in less than 24 hours, 7 gave less and 3 more than 25 M. L. D. protection. Eight strains resisting phenol for 24 hours had 3 with less and 5 with more than 25 M. L. D. protection. Four gave immunity against more than 25 M. L. D. and 2

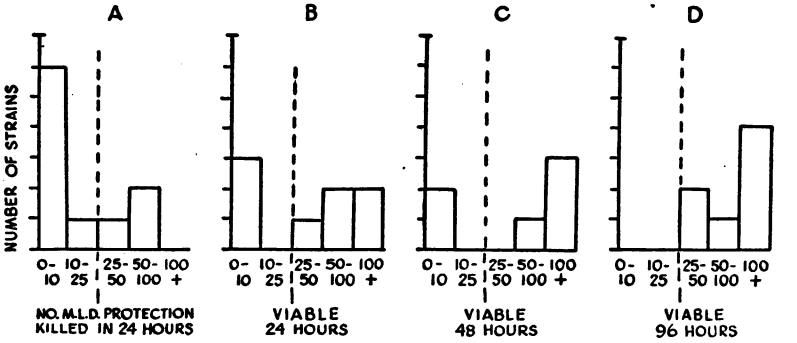

FIGURE 2.—Relation of immunizing potency to resistance to phenol.

less in the group resisting phenol for 48 hours. All 7 viruses resisting phenol for 96 hours gave over 25 M. L. D. protection.

Apparently the ability to resist the lethal effect of phenol adds to the immunogenic value of the virus in the form of phenolized vaccine.

Viability of virus after 2 months' storage.—In none of the 31 strains was there sufficient viable virus to cause rabies when given intracerebrally in young mice after it had been stored at 5° C. for 2 months.

It is interesting to note that 21 of the phenolized vaccines at the time of their removal from the incubator and before being stored in the cold room did show viable virus. The 0.5 percent phenol in the prepared vaccine even at 5° C. apparently continues to destroy any viable virus left after incubation.

Immunizing potency of phenolized vaccine.—Slight or no immunity (0–25 M. L. D. protection) was given by 12 viruses, moderate immunity (25–100 M. L. D. protection) by 10 viruses, and a high degree of immunity (100+ M. L. D. protection) by 9. The highest immunity produced was against at least 2,000 M. L. D.

Resistance to glycerin.—Four virus strains were not viable after 3 months' storage in 50 percent glycerin at 0° C. Four strains were viable up to 6 months, and 23 strains were viable for 6 months or longer.

As seen in figure 3 there was apparently no direct relationship between the ability of the virus to resist the effect of glycerin and its immunizing power in the form of phenolized vaccine.

Specificity of virus.—All strains were shown to be rabies virus in the tests for specificity using known rabies immune serum.

Relation of immunizing power to frequency of passage transfer.—In figure 4 the strains of viruses have been divided into those transferred

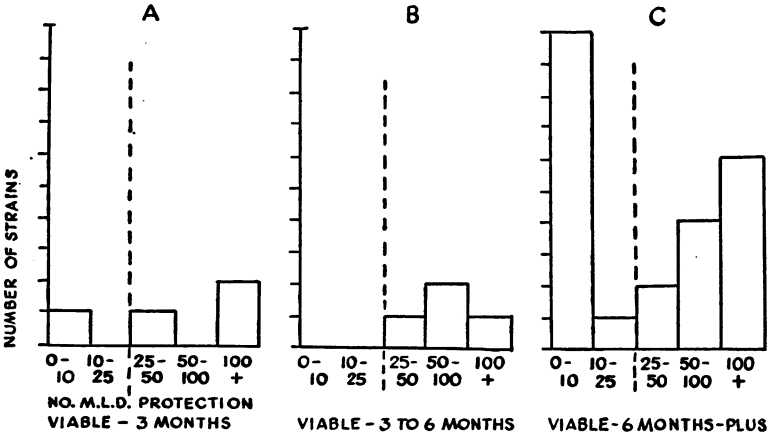

FIGURE 3.—Relation of immunizing potency to resistance to glycerin.

every 2 weeks or less, those every 2 to 4 weeks, and those every 4 weeks or longer. Of 13 strains in the 2-week group, 8 gave more than and 5 less than 25 M. L. D. protection with the vaccines. In the 2 to 4-week groups there were 4 with more and 4 with less than 25 M. L. D. immunity. Only 4 viruses were transferred every 4 weeks or longer, and 3 of these protected against more than 25 M. L. D.

Six virus strains have been omitted from this table because they have been carried in the dried state *in vacuo* between transfers and therefore are not comparable.

Although not clear-cut there does appear to be some trend toward greater immunizing power in those transferred more frequently. The virus strain giving the greatest degree of immunity was transferred the most frequently (every 5 days).

Relation of immunizing power to degree of removal from original street virus.—That the number of passages removed from the original street virus has no relation to the immunizing value of the virus strain is obvious from the variable results with the large group of

substrains having the Pasteur virus as their source. Yet it is interesting to note that of 5 substrains derived from street virus more recently than the Pasteur strain, 3 gave immunity to over 100 M. L. D. Ando (*14*) has reported that a higher degree of immunity is obtained in animals with vaccine made from a more recently fixed virus than from one fixed for a long period of time.

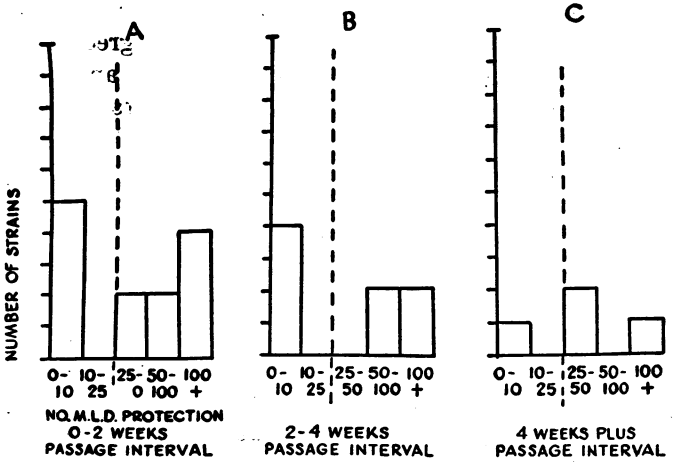

FIGURE 4.—Relation of immunizing potency to frequency of passage transfer.

TABLE 2.—*Properties of strains of fixed rabies viruses*

No. of strain	Incubation period (days)		Duration of paralysis (days)		Resistance to phenol (days)	Resistance to glycerin (months)	Peripheral infectivity	Specificity	Titer	Viability (vaccine) 2 months 5° C.	Immunity 50 percent end point number M. L. D.
	Source	NIH	Source	NIH							
1	5-6	5-6	2-3	1	0	10+	+	+	10^{-4}	−	10−
2	6-7	5-7	1-2	1	2	6	+	+	10^{-5}	−	10−
3	6-7	5-6	1	3	0	6	+	+	10^{-5}	−	1
4	5-6	5	1-2	4	1	4	+	+	10^{-3}	−	200
5	5-6	6	1-2	4	1	7+	+	+	10^{-4}	−	5
6	5-6	5-6	1-2	6	4+	8+	+	+	10^{-4}	−	100
7	5	7-8	(?)	3	4+	10+	+	+	10^{-4}	−	140
8	5	4-5	2	1	1	7	+	+	10^{-5}	−	2
9	5-6	6	1−	4	0	8+	+	+	10^{-3}	−	82
10	5	5	2	2	0	7	+	+	10^{-4}	−	4+
11	6	5	1-2	7	4+	6	+	+	10^{-4}	−	2,000+
12	6	4-5	1-2	5	0	7	+	+	10^{-3}	−	0
13	6-8	4-9	2-4	3-5	0	6+	−	+	10^{-3}	−	0
14	5	4-6	1	1	0	7	+	+	10^{-4}	−	84
15	5-6	5-6	1	2	2	3	+	+	10^{-4}	−	100+
16	7	6-8	2+	4	1	3	+	+	10^{-4}	−	28
17	7-8	6-9	2-4	5	1	7	+	+	10^{-4}	−	100+
18	5-6	5	1-2	3	4+	7	+	+	10^{-5}	−	37
19	4-5	5-6	2-4	2	4+	10+	+	+	10^{-4}	−	36
20	4-5	5	1	3	1	9	+	+	10^{-5}	−	100
21	5	5-6	1−	6	4+	9+	+	+	10^{-4}	−	225
22	4	5-6	3-4	3	2	4	+	+	10^{-4}	−	55
23	5-6	4-6	1-2	3	0	8+	+	+	10^{-4}	−	16
24	5-6	7	1-2	4	1	7+	+	+	10^{-4}	−	3
25	7-8	6-8	2	6	1	5	+	+	10^{-4}	−	100
26	4	4-5	3-4	5	2	2	+	+	10^{-4}	−	5−
27	5	5	2-3	2	2	2	+	+	10^{-3}	−	500
28	5-6	5-6	1-2	6	0	5	+	+	10^{-5}	−	27
29	4-5	5	1−	5	4+	8	+	+	10^{-4}	−	175
30	5	12-13	2-4	1	0	6	+	+	10^{-4}	−	1
31	8	6-7	(?)	4	2	7	+	+	10^{-4}	−	100+

Comparison of substrains of common origin.—As can be seen in table 2, in which the substrains Nos. 1 to 25 are all derivatives of the Pasteur strain, there are wide variations in every property tested, showing the evolution of this one virus strain as it has been carried under different conditions over a long period of time.

Virus No. 13, for instance, was derived from No. 12 one year ago, while No. 12 came from No. 11 about 5 years before that. It is interesting that No. 11 now gives the highest degree of immunity (2,000+ M. L. D. protection) whereas Nos. 12 and 13 give no protection whatsoever. During the 6 years since removal from No. 11, virus No. 12 had been carried through 146 passages. However, 50 passages within the 1 year since removal from No. 12 have failed to change No. 13 in any of its characteristics except that it no longer infects mice when given peripherally.

DISCUSSION

That any one strain of fixed rabies virus can change in its biologic properties even though carried in a uniform manner in one laboratory is sufficient reason to recommend a routine checking of the virus periodically. Such a check for those laboratories producing killed virus vaccines should include:

(1) Specificity of virus: By means of a virus neutralization test with known rabies immune serum.

(2) Resistance to chemical: Samples of vaccine removed at intervals during preparation and tested for viable virus by intracerebral inoculation into young mice.

(3) Virulence of rabbit brains: Titer brain emulsion by injecting serial ten-fold dilutions of centrifuged brain emulsion intracerebrally in young mice.

(4) Immunizing potency: Immunize mice with the final vaccine product, then test with the known rabies virus (*17*).

In those laboratories using live virus vaccines, it is further recommended that the evaluation of their fixed virus strains also include:

(5) Infectivity subcutaneously: Inject mice subcutaneously with serial ten-fold dilutions of virus emulsion to determine if virus is infective when given by that route and, if so, what dilution represents the M. L. D.

(6) Resistance to desiccation (where Pasteur type vaccine is being prepared): Samples of cords dried a varying number of days, emulsified, and injected intracerebrally in young mice to detect the point at which the virus is no longer viable.

The experiments here reported show that as far as phenolized vaccines are concerned (15 of the strains are now used to manufacture phenolized vaccines) the various strains of rabies fixed virus differ markedly in their immunizing potency even though derived from the

same parent strain. The need of establishing a strain of high immunogenic value for use in manufacturing rabies vaccines for human or animal use is obvious. There need be no excuse for marketing vaccines known to have poor or even no immunizing power. However, suppose we were to determine the strain that is the most immunizing and supply it to all laboratories making rabies vaccine. We would have no assurance that 5 years, or even 1 year later those substrains would all still be highly immunogenic. In other words, owing to the manner in which the virus might be handled in different laboratories, the evolution of the strain might very well be toward less and less immunizing potency.

Therefore, a very important part of the problem is the determination of how to build up and maintain the immunizing value of a fixed rabies virus strain. Work directed toward answering this question is now in progress and will be published at a later date.

From the analyses made of the results in this investigation of 31 strains (figs. 1 to 4) immunizing potency is apparently not related to the degree of removal from street virus, the resistance to glycerin, or the animal in which carried. It does seem to be related, as would be expected, to its ability to resist the killing effect of phenol and perhaps to the rapidity with which it is passaged.

There is also evidence that those strains having the usual incubation periods of 5 to 7 days, or longer, are more likely to be immunogenic than those with shorter incubations.

SUMMARY

Marked variations were found in the properties of 25 substrains derived from the original Pasteur strain.

Immunizing power of strains seemed related to their ability to resist phenol, to the rapidity of their passage transfer, and possibly to the length of the incubation period in rabbits.

High immunizing potency is not an inherent characteristic of any particular strain but apparently can be increased or decreased during its passage transfers over a long period of time.

Laboratories manufacturing rabies vaccine should investigate the properties of their rabies fixed virus strain periodically.

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CARE OF THE FEET *

General Statement.

No part of the human body is more apt to be overworked and neglected than the feet, yet their care is of prime importance to our health as well as to our comfort. It is estimated that 90 percent of all people in the United States suffer from some kind of foot trouble. Over 80 percent of the individuals who failed to qualify for military service in the first World War were rejected because of defects of the feet. These findings stimulated research which will be of great public benefit, for as a result it has been shown that many foot disorders can be avoided through the practice of simple and effective protective measures. Shoes show the good effects of improved design, and the public is now buying shoes for fit as well as for looks.

Cause of Foot Disorders.

Many defects of the feet are the result of improper care during infancy. The wearing of poorly fitting shoes and hose is rightfully blamed for much foot trouble. Tight shoes cause pressure and shoes that are too large cause friction. Together these conditions are responsible for a large proportion of the corns, bunions, and ingrown toenails which plague those who wear shoes. The heels of shoes should be watched for one-sided wear and kept straight to avoid running the shoes over.

* This material is available in leaflet form and may be obtained by addressing the Surgeon General, U. S. Public Health Service, Washington, D. C.

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During Infancy and Childhood.

All congenital deformities should be attended to as early in the child's life as possible. The orthopedic surgeon may be able to correct many of these cases without a cutting operation.

The use of devices to encourage a child to walk early is not recommended. During the period when the tiny bones are forming and the muscles are gaining strength it is not advisable to force the child to walk before it is ready to do so.

From the time the child first starts to bear weight on his feet, shoes should be well fitted and well supported through the arch of the foot, particularly for children whose feet tend to flatten when they stand up.

During School Life.

Results of school examinations have demonstrated that 80 percent of the girls and 65 percent of the boys have definite signs of foot troubles. The importance of the size of stockings is not sufficiently recognized. During the period of rapid growth the foot should be measured frequently to insure the wearing of stockings of proper foot length. "Gym" shoes should be worn only during the gymnasium period and not through the entire day, for a flat-soled shoe of this type does not supply adequate support for the feet, particularly the arches.

The growing child should be taught the importance of foot cleanliness and how to protect the feet against ill effects of what may seem to him to be minor injuries.

During Adult Life.

As age advances, the bones and cartilage of the feet become harder and more brittle and defects are far more difficult to correct. Foot trouble may be a part of a general bodily condition where attention should be directed toward the improvement of the general health.

The footwear of the expectant mother should receive special attention, for the increased weight of child-bearing imposes a greater strain on the feet. Pressure within the abdomen interferes with the free circulation of blood in the legs and feet, with the result that they may swell sufficiently to change the fit of both hose and shoes.

Standing and Walking.

Faulty use of the feet in standing and walking is responsible for much foot trouble.

Standing.—When standing for long periods, place the feet 2 to 4 inches apart, point them straight ahead and support the weight on the outside of the feet. To avoid forming the habit of standing on relaxed feet one should, from time to time, deliberately exercise the muscles of the arch by drawing up and relaxing the toes.

In stepping forward the weight should fall first on the heel, whereupon the body is carried forward over the foot, weight being applied along the outside of the foot from the heel to the small toe and finally across the forward part of the foot to the great toe. The ideal position of the foot in walking is pointed straight ahead or with the toes pointed slightly toward the midline. Jarring the body incident to vigorous walking may be relieved by wearing rubber heels.

The Toenails.

The toenails should be cut straight across and not too short. Avoid rounding the nails at the corners where pressure from the shoe may cause improperly cut nails to grow into the flesh, with painful and disabling results.

Excessive Perspiration.

Excessive sweating of the skin of the feet is often a source of annoyance to the individual and those about him. Frequent cleansing and careful drying of the feet, together with frequent changes to dry hose and shoes may aid in relieving this condition.

Infection of Feet.

Prompt care of all wounds and blisters on the feet may prevent serious consequences. Since the feet, covered by hose and shoes, afford conditions favorable to the growth of germs (warmth, dampness, and darkness), a serious foot infection may develop rapidly from a small beginning.

Fallen Arches (Flat Feet).

Fallen arches are the result of weakened leg muscles which allow the main or lengthwise arch in the foot to sag. An orthopedic surgeon should be consulted about this condition, as special treatment frequently is indicated. The wearing of a "stock" arch supporter is not to be recommended as a routine procedure.

Hygiene of Feet.

1. The feet should be bathed at least once a day with soap and warm water and then thoroughly dried.

2. Attention should be given to the proper fitting of hose and shoes.

3. Practice a method of standing and walking which is mechanically correct. When sitting it is a good habit to cross the feet at the ankles (not the legs at the knees) for relaxation.

4. Exercise the feet. The arches may be strengthened by bending the toes, best accomplished by picking up small objects, such as marbles, with the toes.

COURT DECISION ON PUBLIC HEALTH

Compensation under workmen's compensation act for death from typhoid fever denied.—(Pennsylvania Superior Court; *Loudon* v. *H. W. Shaull & Sons et al.*, 13 A.2d 129; decided April 29, 1940.) A laborer on highway work died from typhoid fever and his widow sought compensation under the Pennsylvania Workmen's Compensation Act. The decedent became ill on or about August 21, 1936, his illness was diagnosed as typhoid fever on August 28, and death occurred on September 14. It was conceded by the employer and the insurance carrier, for the purposes of the case, that the decedent's death was definitely traceable to the drinking of contaminated water while at work, some time during the month of August, but in opposing an award they asserted that there was no evidence showing the exact date of the absorption of the germ or of other facts that constituted an "accident" within the meaning of the workmen's compensation statute. On the basis that the deceased became ill on August 21 and that there was medical testimony indicating that the average incubation period for typhoid fever was from 10 to 14 days, the compensation authorities had found that the accident occurred on or about August 11.

The holding of the superior court was that the award made to the claimant could not stand. Pointing out that an accident was a "sudden and unexpected event," the court said that a sudden event implied a distinct happening or occurrence at a particular time and that "When this alleged accident happened no one could state and no attempt was made to do so." After briefly reviewing the medical testimony given as to the incubation period for typhoid fever, the court stated that, under that testimony, the time of the alleged accident could not be definitely fixed and that, while the exact moment an accident occurred need not be determined, the date should be definitely stated with reasonable certainty. "To fix a time when the germ entered decedent's body, which is the accident alleged, would be a mere surmise."

DEATHS DURING WEEK ENDED AUGUST 24, 1940

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 24, 1940	Corresponding week, 1939
Data from 88 large cities of the United States:		
Total deaths	7,063	6,895
Average for 3 prior years	7,064	
Total deaths, first 34 weeks of year	292,735	287,111
Deaths under 1 year of age	476	451
Average for 3 prior years	509	
Deaths under 1 year of age, first 34 weeks of year	17,105	17,204
Data from industrial insurance companies:		
Policies in force	64,973,192	66,791,913
Number of death claims	10,997	10,328
Death claims per 1,000 policies in force, annual rate	8.8	8.1
Death claims per 1,000 policies, first 34 weeks of year, annual rate	10.0	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 31, 1940

Summary

Reports from the State health officers show a slight decline in poliomyelitis for the current week, with 606 cases reported as compared with 623 for the preceding week and with a 5-year (1935–39) median of 479.

The highest incidence of poliomyelitis is still being recorded for the East North Central and West North Central groups of States, which reported 405, or 67 percent, of the current weekly total while comprising only about 30 percent of the total population. Decreased incidence is shown in 5 of the geographic areas, while slight increases occurred in 4. The largest numbers of cases were reported from Michigan (135), Indiana (68), Iowa (56), Kansas (43), and West Virginia (41).

Of the 9 important communicable diseases included in the following table, only influenza, measles, and poliomyelitis were above the 5-year median expectancy, and only diphtheria and smallpox were higher than during the preceding week.

Of 379 cases of typhoid fever (5-year median, 614) 255 cases were reported in the South Atlantic and South Central States, with 40 cases in Texas, 33 in Arkansas, 29 in North Carolina, 24 in Louisiana, and 23 in Georgia.

Ten cases of Rocky Mountain spotted fever were reported for the current week, all in midwestern and eastern States, and 53 cases of endemic typhus, all but 1 (in California) of which were in the South Atlantic and South Central States.

For the current week the Bureau of the Census reports 7,274 deaths in 88 major cities of the United States, as compared with 7,063 for the preceding week and with a 3-year (1937–39) average of 7,204 for the corresponding week.

Telegraphic morbidity reports from State health officers for the week ended August 31, 1940, and comparison with corresponding week of 1939 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39
	Aug. 31, 1940	Sept. 2, 1939		Aug. 31, 1940	Sept. 2, 1939		Aug. 31, 1940	Sept. 2, 1939		Aug. 31, 1940	Sept. 2, 1939	
NEW ENG.												
Maine	0	4	1	------	------	------	3	1	9	0	0	0
New Hampshire	0	0	0	------	------	------	0	0	0	0	0	0
Vermont	0	0	0	------	------	------	2	3	0	0	0	0
Massachusetts	1	3	3	------	------	------	52	30	21	0	0	0
Rhode Island	0	0	0	------	------	------	2	13	2	0	0	0
Connecticut	0	0	1	1	------	------	6	11	4	0	0	0
MID. ATL.												
New York	5	8	11	[1] 6	[1] 1	[1] 1	128	54	75	1	1	3
New Jersey	1	0	2	------	------	1	27	5	14	1	0	1
Pennsylvania	4	11	16	------	------	------	39	40	83	1	2	4
E. NO. CEN.												
Ohio	1	13	13	1	4	4	8	14	14	0	2	1
Indiana	5	12	5	4	2	4	1	7	3	1	0	1
Illinois	5	10	15	6	6	6	22	8	11	2	0	2
Michigan [2]	1	6	6	------	3	2	55	0	27	1	1	0
Wisconsin	1	0	2	20	10	12	79	22	33	0	1	1
W. NO. CEN.												
Minnesota	2	10	2	2	1	1	1	26	6	0	0	0
Iowa [2]	17	2	5	------	------	1	15	17	2	2	0	1
Missouri [2]	1	7	8	------	------	14	2	1	2	2	0	1
North Dakota	4	2	2	1	------	------	0	2	2	0	1	0
South Dakota	0	0	0	------	4	------	0	5	0	1	0	0
Nebraska	0	0	1	------	------	------	3	0	2	0	1	0
Kansas	2	9	2	6	------	------	12	2	2	0	0	0
SO. ATL.												
Delaware [2]	0	0	0	------	------	------	2	0	0	0	0	0
Maryland [2 3]	1	1	3	2	------	1	3	4	6	1	0	1
Dist. of Col	2	1	2	------	1	------	3	2	2	0	1	1
Virginia [3 4]	15	16	23	38	12	------	10	7	7	1	0	2
West Virginia [3]	2	5	11	7	3	16	1	3	3	0	1	1
North Carolina [3 4]	4	61	44	------	------	1	2	19	19	0	1	2
South Carolina	4	6	6	90	115	53	10	3	3	1	0	0
Georgia [3 4]	7	45	16	25	15	------	4	6	0	0	0	0
Florida [4]	3	3	6	3	4	------	0	4	1	0	0	0
E. SO. CEN.												
Kentucky	9	10	19	2	------	3	23	2	9	0	1	2
Tennessee [3]	4	6	6	4	7	7	7	6	2	1	0	0
Alabama [4]	9	12	21	3	6	6	27	1	3	3	0	1
Mississippi [3 4]	12	17	17	------	------	------	------	------	------	0	1	0
W. SO. CEN.												
Arkansas	6	22	14	3	12	4	4	3	3	0	0	0
Louisiana [4]	5	7	7	1	5	7	0	1	0	1	0	1
Oklahoma	5	7	7	5	4	8	1	3	3	0	0	0
Texas [4]	22	25	31	108	33	33	29	27	18	3	0	0
MOUNTAIN												
Montana	5	0	1	------	------	------	9	11	7	0	0	0
Idaho	0	0	0	------	------	------	0	0	0	0	0	0
Wyoming	0	0	0	------	1	------	0	8	4	0	0	0
Colorado	4	13	9	------	5	------	14	3	3	0	0	0
New Mexico	5	1	2	------	1	------	6	0	1	1	0	0
Arizona	0	0	0	30	7	7	7	1	1	0	1	0
Utah [2]	0	0	0	------	------	------	9	4	4	0	0	0
PACIFIC												
Washington	0	1	0	------	------	------	3	23	5	0	0	1
Oregon	1	2	2	5	1	4	9	10	5	0	0	0
California [4]	10	19	19	10	11	11	26	53	53	0	0	1
Total	185	377	377	383	274	310	666	465	633	24	15	42
35 weeks	9,231	12,687	15,410	169,989	152,280	142,093	230,037	349,371	349,371	1,169	1,423	4,292

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 31, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1935–39	Week ended		Median 1935–39	Week ended		Median 1935–39	Week ended		Median 1935–39
	Aug. 31, 1940	Sept. 2, 1939		Aug. 31, 1940	Sept. 2, 1939		Aug. 31 1940	Sept. 2, 1939		Aug. 31, 1940	Sept. 2, 1939	
NEW ENG.												
Maine	1	0	1	0	1	4	0	0	0	3	4	3
New Hampshire	0	0	0	2	1	0	0	0	0	0	0	0
Vermont	0	2	0	0	1	1	0	0	0	0	1	0
Massachusetts	2	3	3	10	18	26	0	0	0	7	4	4
Rhode Island	1	0	0	2	0	1	0	0	0	0	0	0
Connecticut	0	1	2	7	3	4	0	0	0	7	4	3
MID. ATL.												
New York	20	100	52	38	46	72	0	0	10	12	11	28
New Jersey	4	10	10	19	16	13	0	0	0	4	6	6
Pennsylvania	13	44	13	42	57	65	0	0	0	10	16	24
E. NO. CENT.												
Ohio	21	11	14	17	46	46	0	2	0	6	10	29
Indiana	68	2	2	23	33	29	0	0	0	6	14	16
Illinois	20	9	19	70	57	77	1	1	1	16	259	25
Michigan [2]	135	109	34	41	75	62	3	0	0	4	9	14
Wisconsin	19	7	7	30	66	55	0	0	0	1	0	1
W. NO. CEN.												
Minnesota	6	60	5	15	13	18	3	3	2	1	2	2
Iowa [3]	56	2	2	13	21	17	0	2	2	0	3	4
Missouri [3]	18	0	0	6	14	19	1	0	1	8	9	25
North Dakota	1	1	1	3	6	4	0	0	0	2	1	1
South Dakota	5	1	0	1	9	6	3	1	1	0	0	1
Nebraska	13	2	0	2	3	4	0	1	1	2	1	0
Kansas	43	3	2	19	27	23	0	0	1	7	4	11
SO. ATL.												
Delaware [3]	0	0	0	0	1	1	0	0	0	1	1	1
Maryland [2 3]	1	1	1	5	12	11	0	0	0	6	5	10
Dist. of Col	0	1	1	4	2	2	0	0	0	4	2	5
Virginia [3 4]	7	0	3	1	5	10	0	0	0	5	13	19
West Virginia [3]	41	2	2	11	10	16	0	0	0	6	12	17
North Carolina [3 4]	1	8	8	23	30	24	0	0	0	29	20	19
South Carolina	1	6	1	8	3	3	0	0	0	8	6	18
Georgia [3 4]	3	2	2	3	13	10	0	0	0	23	18	18
Florida [4]	3	7	2	2	2	2	0	0	0	3	1	2
E. SO. CEN.												
Kentucky	10	3	7	17	29	29	0	1	0	16	33	34
Tennessee [3]	4	3	2	10	10	10	0	0	0	15	9	13
Alabama [4]	4	1	4	20	17	13	0	0	0	14	6	16
Mississippi [2 4]	0	0	2	4	11	8	0	0	0	13	9	9
W. SO. CEN.												
Arkansas	1	2	0	4	9	8	0	2	0	33	19	13
Louisiana [4]	7	0	0	6	1	7	0	0	0	24	20	19
Oklahoma	3	2	0	8	9	7	1	0	0	15	13	16
Texas [4]	8	8	8	16	31	24	0	0	0	40	60	59
MOUNTAIN												
Montana	16	0	0	13	9	8	0	0	0	2	2	2
Idaho	1	1	0	3	0	1	0	0	0	0	2	2
Wyoming	4	0	0	1	3	4	3	0	0	1	1	1
Colorado	3	1	1	7	4	7	0	1	0	5	3	4
New Mexico	2	2	0	0	1	2	0	0	0	4	7	10
Arizona	1	8	1	1	1	1	0	1	0	0	2	3
Utah [3]	3	1	0	2	5	10	0	0	0	1	2	2
PACIFIC												
Washington	20	1	1	9	8	9	0	0	3	7	3	3
Oregon	3	2	1	4	6	16	2	1	1	1	3	3
California [4]	13	50	24	39	54	54	0	0	1	7	12	12
Total	606	479	479	581	799	844	17	16	27	379	642	614
35 weeks	3,288	3,018	3,018	120,056	117,978	166,580	1,988	8,707	8,080	5,784	8,226	9,268

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 31, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Whooping cough	
	Week ended	
	Aug. 31, 1940	Sept. 2, 1939
NEW ENG.		
Maine	23	15
New Hampshire	0	0
Vermont	3	51
Massachusetts	72	112
Rhode Island	1	39
Connecticut	20	66
MID. ATL.		
New York	216	264
New Jersey	74	96
Pennsylvania	309	438
E. NO. CEN.		
Ohio	144	209
Indiana	19	44
Illinois	94	220
Michigan [3]	200	191
Wisconsin	59	121
W. NO. CEN.		
Minnesota	8	17
Iowa [3]	23	19
Missouri [3]	8	20
North Dakota	7	34
South Dakota	6	14
Nebraska	3	2
Kansas	41	17
SO. ATL.		
Delaware [2]	4	6
Maryland [2 3]	76	39
Dist. of Col	9	29
Virginia [3 4]	22	18
West Virginia [3]	43	5
SO. ATL.—continued		
North Carolina [3 4]	93	110
South Carolina	18	6
Georgia [3 4]	12	17
Florida [4]	0	7
E. SO. CEN.		
Kentucky	27	24
Tennessee [3]	25	22
Alabama [4]	21	18
Mississippi [3 4]	----	----
W. SO. CEN.		
Arkansas	5	16
Louisiana [4]	6	23
Oklahoma	8	2
Texas [4]	142	40
MOUNTAIN		
Montana	6	11
Idaho	0	1
Wyoming	2	3
Colorado	9	9
New Mexico	7	10
Arizona	14	1
Utah [3]	36	89
PACIFIC		
Washington	23	12
Oregon	14	7
California [4]	215	67
Total	2,167	2,531
35 weeks	112,304	131,769

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended Aug. 31, 1940, 10 cases as follows: Iowa, 1; Missouri, 1; Delaware, 1; Maryland, 2; Virginia, 2; North Carolina, 1; Georgia, 1; Tennessee, 1.
[4] Typhus fever, week ended Aug. 31, 1940, 53 cases as follows: Virginia. 1; North Carolina, 4; Georgia, 15; Florida, 3; Alabama, 12; Mississippi, 2; Louisiana, 5; Texas, 10; California, 1.

PLAGUE INFECTION IN GROUND SQUIRRELS AND FLEAS IN CALIFORNIA AND WYOMING

IN GROUND SQUIRRELS AND FLEAS IN SAN BERNARDINO COUNTY, CALIF.

Under date of July 30, 1940, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved in organs from 4 ground squirrels (*C. fisheri*) submitted to the laboratory on July 9 from a ranch approximately 12 miles northwest of Big Bear Lake, and under date of August 20, in a pool of 91 fleas from 44 golden-mantled squirrels submitted to the laboratory on July 26 from Fawnskin Valley, 1 mile north of Fawnskin Resort, San Bernardino County, Calif.

IN GROUND SQUIRREL AND FLEAS IN SUBLETTE COUNTY, WYO.

Under date of August 21, 1940, Surgeon L. B. Byington reported plague infection proved in a pool of 54 fleas from 22 ground squirrels, in tissue from 1 ground squirrel, all from a locality 8 to 10 miles north of Kendal Ranger Station, Sublette County, Wyo., and in a pool of 18 fleas from 14 ground squirrels taken from 12 to 15 miles north of the same station. The ground squirrels, all of the same species, *C. armatus*, were all shot the same day, August 6, 1940.

VENEREAL DISEASES

New Cases Reported for June 1940 [1]

Reports from States

	Syphilis									Gonorrhea		Other venereal diseases	
	Early			Late		Congenital		All syphilis [2]					
	Primary and secondary	Early latent [3]	Rate per 10,000 population	Includes late latent	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population
Alabama	224	265	1.67	253	0.86	63	0.22	1,323	4.52	479	1.64	4	0.01
Alaska [4]													
Arizona	18	22	.96	79	1.89	8	.19	177	4.23	131	3.13	1	.02
Arkansas	213	256	2.26	347	1.67	29	.14	984	4.74	156	.75	14	.07
California	[5] 351		.56	1,132	1.81	74	.12	1,682	2.69	1,418	2.27	15	.02
Colorado	78		.72	119	1.10	19	.18	216	2.01	63	.58		
Connecticut	16	10	.15	77	.44	4	.02	130	.74	101	.58	1	.01
Delaware	13	13	.99	14	.53	7	.27	135	5.13	33	1.25	2	.08
Dist. of Col								574	9.03	291	4.58	5	.08
Florida	215	497	4.19	974	5.73	63	.37	1,819	10.71	203	1.19	13	.08
Georgia		1,238	3.98	644	2.07			1,882	6.05	72	.23	8	.03
Hawaii	4	2	.15	19	.47	8	.20	53	1.31	78	1.93		
Idaho	15		.30	[6] 16	.32	1	.02	35	.70	8	.16		
Illinois	161	358	.66	1,201	1.52	81	.10	1,801	2.27	1,389	1.75	28	.04
Indiana	86	117	.58	365	1.05	35	.10	743	2.13	133	.38		
Iowa	37	39	.30	74	.29	9	.04	168	.66	111	.43		
Kansas	44	25	.37	61	.33	10	.05	188	1.01	88	.47	1	.01
Kentucky	78	203	.95	40	.14	21	.07	539	1.82	282	.95	2	.01
Louisiana	267		1.25	1	.004			486	2.27	111	.52	14	.07
Maine	12	1	.15	21	.24	3	.03	37	.43	23	.27		
Maryland	87	17	.62	159	.94	10	.06	714	4.24	300	1.78	17	.10
Massachusetts	46		.10	320	.72	23	.05	389	.88	292	.66		
Michigan	89	101	.39	428	.88	36	.07	802	1.64	545	1.12	25	.05
Minnesota	9	12	.08	209	.78	11	.04	246	.92	183	.69	2	.01
Mississippi	222	755	4.79	916	4.49	135	.66	4,485	21.99	2,480	12.16	1	.005
Missouri	167	478	1.60	207	.51	28	.07	942	2.34	266	.66	8	.02
Montana	10		.18	13	.24			30	.55	15	.27		
Nebraska	20	6	.19	28	.21	1	.01	55	.40	49	.36		
Nevada	1	2	.29	10	.98			13	1.27	10	.98	1	.10
New Hampshire						5	.10	14	.27	5	.10		
New Jersey	86	120	.47	413	.05	45	.10	713	1.63	238	.55	34	.08
New Mexico	22	5	.64	52	1.23	9	.21	89	2.11	30	.71	1	.02
New York	207	383	.45	2,442	1.88	151	.12	3,400	2.62	1,524	1.17	41	.03
North Carolina	178	709	2.51	627	1.78	116	.33	1,648	4.67	412	1.17	8	.02
North Dakota	6	5	.15	10	.14	6	.08	36	.51	28	.39		
Ohio	196	249	.66	887	1.31	53	.08	1,385	2.05	103	.15	1	.001
Oklahoma	107	144	.98	223	.87	38	.15	767	2.98	388	1.51		
Oregon	25	20	.43	80	.77	6	.06	132	1.27	117	1.13		
Pennsylvania	151	400	.54	523	.51	44	.04	1,118	1.09				
Rhode Island	2	8	.15	83	1.22	3	.04	107	1.57	50	.73		
South Carolina	439	366	4.25	575	3.04	30	.16	1,428	7.55	85	.45	6	.03
South Dakota	27	7	.49	24	.35	6	.09	64	.92	18	.26	1	.01
Tennessee	317	494	2.77	823	2.81	65	.22	1,704	5.83	398	1.36	13	.04
Texas	227	340	.91	576	.92	79	.13	1,565	2.51	528	.85	49	.08
Utah	8	2	.19	36	.69	1	.02	47	.90	37	.71		
Vermont	3	1	.10	8	.21	2	.05	14	.36	20	.52		

See footnotes at end of table.

Reports from States—Continued

	Syphilis									Gonorrhea		Other venereal diseases	
	Early			Late		Congenital		All syphilis					
	Primary and secondary	Early latent	Rate per 10,000 population	Includes late latent	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population
Virginia [4]													
Washington	55	18	0.44	81	0.48	9	0.05	199	1.19	325	1.94	5	0.03
West Virginia	105	63	.88	104	.55	22	.12	556	2.92	291	1.53	2	.01
Wisconsin	17	20	.13	118	.40	6	.02	161	.55	104	.35	2	.01
Wyoming	22	6	1.18	31	1.31	1	.04	65	2.74	18	.76	------	------
Puerto Rico [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Virgin Islands [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Total	4,683	7,777	.97	15,443	1.21	1,376	.11	35,860	2.80	14,029	1.10	325	.03

Reports from cities of 200,000 population or over

Akron	2	16	0.65	38	1.38	1	0.04	57	2.07	19	0.69	------	------
Atlanta	------	258	8.59	102	3.40	------	------	360	11.99	36	1.20	1	0.03
Baltimore	78	3	.97	134	1.60	4	.05	487	5.83	206	2.47	15	.18
Birmingham	70	26	3.26	63	2.14	16	.54	295	10.02	38	1.29	------	------
Boston	12	------	.15	97	1.22	6	.08	128	1.61	118	1.48	------	------
Buffalo	14	2	.27	85	1.41	------	------	101	1.68	63	1.05	------	------
Cincinnati [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Chicago	81	146	.62	710	1.94	34	.09	971	2.65	868	2.37	24	.07
Cleveland	44	35	.84	199	2.11	5	.05	283	3.00	112	1.19	3	.03
Columbus	21	28	1.56	47	1.50	5	.16	112	3.57	29	.93	------	------
Dallas	------	------	------	------	------	------	------	235	7.73	119	3.92	------	------
Dayton	8	12	.90	34	1.53	4	.18	58	2.62	28	1.26	------	------
Denver	------	------	------	------	------	------	------	132	4.38	61	2.02	------	------
Detroit	54	100	.85	359	1.98	14	.08	527	2.90	340	1.87	29	.16
Houston	44	66	3.07	112	3.13	18	.50	360	10.05	215	6.00	3	.08
Indianapolis	7	------	.18	19	.49	1	.03	87	2.26	29	.75	------	------
Jersey City	6	4	.31	28	.86	5	.15	43	1.32	12	.37	------	------
Kansas City [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Los Angeles	------	129	.85	455	2.99	25	.16	609	4.00	388	2.55	1	.01
Louisville	9	91	2.95	3	.09	7	.21	172	5.07	70	2.07	7	.21
Memphis [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Milwaukee	5	------	.08	62	.98	2	.03	69	1.10	20	.32	2	.03
Minneapolis	2	16	.36	14	.28	1	.02	43	.86	49	.98	1	.02
Newark	19	23	.92	143	3.15	9	.20	194	4.27	72	1.59	3	.07
New Orleans [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
New York	207	312	.69	1,680	2.24	107	.14	2,508	3.35	1,067	1.42	43	.06
Oakland	6	10	.51	73	2.33	3	.10	92	2.94	58	1.85	1	.03
Omaha	10	1	.49	11	.49	------	------	22	.98	16	.72	------	------
Philadelphia [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Pittsburgh	------	------	------	------	------	------	------	327	4.64	21	.30	------	------
Portland	13	11	.75	41	1.28	1	.03	66	2.06	52	1.62	------	------
Providence [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
Rochester	1	------	.03	27	.79	1	.03	29	.85	51	1.49	------	------
St. Louis	50	165	2.55	305	3.62	13	.15	533	6.32	174	2.06	9	.11
St. Paul	------	------	------	------	------	------	------	36	1.25	15	.52	------	------
San Antonio [4]	------	------	------	------	------	------	------	------	------	------	------	------	------
San Francisco	41	------	.59	129	1.87	3	.04	173	2.51	189	2.74	5	.07
Seattle	21	17	.98	47	1.21	4	.10	91	2.35	134	3.46	1	.03
Syracuse	------	1	.04	64	2.84	------	------	65	2.88	8	.35	------	------
Toledo	7	5	.39	67	2.15	4	.13	83	2.67	31	1.00	1	.03
Washington, D. C.	------	------	------	------	------	------	------	574	9.03	291	4.58	5	.08
Total	832	1,477	.90	5,148	2.00	293	.11	9,922	3.55	4,999	1.79	154	.07

[1] Figures preliminary and subject to correction.
[2] Includes "not stated" diagnosis.
[3] Duration of infection under 4 years.
[4] No report for current month.
[5] Includes early latent of less than 1 year's duration.
[6] Includes early latent, late, and late latent.

WEEKLY REPORTS FROM CITIES

City reports for week ended Aug. 17, 1940

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	81	26	11	249	267	235	3	338	76	1,273	----
Current week[1]	28	20	2	332	188	166	1	308	48	1,145	----
Maine:											
Portland	0	----	0	1	2	0	0	0	0	8	17
New Hampshire:											
Concord	0	----	0	0	0	0	0	0	0	0	4
Nashua	0	----	0	0	0	0	0	0	0	0	4
Vermont:											
Barre	0	----	0	1	0	0	0	0	0	0	3
Burlington	0	----	0	0	0	0	0	0	0	0	9
Rutland	0	----	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	3	----	0	24	7	6	0	12	1	72	184
Fall River	0	----	0	3	0	0	0	0	0	5	25
Springfield	0	----	0	2	0	1	0	1	0	0	32
Worcester	0	----	0	15	2	0	0	1	0	6	49
Rhode Island:											
Pawtucket	0	----	0	0	0	0	0	0	0	0	20
Providence	0	2	0	8	1	0	0	1	1	0	41
Connecticut:											
Bridgeport	0	----	0	1	0	0	0	0	0	5	18
Hartford	0	----	0	2	0	0	0	0	0	2	26
New Haven	0	1	0	0	0	3	0	0	0	3	34
New York:											
Buffalo	0	----	0	1	2	1	0	5	0	5	112
New York	6	6	0	60	25	13	0	58	4	125	1,135
Rochester	0	----	0	0	6	1	0	0	0	6	58
Syracuse	0	----	0	0	2	1	0	0	0	18	28
New Jersey:											
Camden	0	----	0	1	0	0	0	1	0	1	20
Newark	0	----	0	30	1	8	0	10	0	26	88
Trenton	0	----	0	0	2	0	0	1	1	0	32
Pennsylvania:											
Philadelphia	1	1	0	31	5	12	0	14	4	50	306
Pittsburgh	0	----	0	1	8	1	0	8	3	27	126
Reading	0	----	0	5	0	0	0	0	0	16	14
Scranton	0	----	----	1	----	1	0	----	2	0	----
Ohio:											
Cincinnati	0	----	0	1	3	0	0	3	1	16	113
Cleveland	----	----	----	----	----	----	----	----	----	----	----
Columbus	----	----	----	----	----	----	----	----	----	----	----
Toledo	0	----	0	3	1	5	0	3	0	13	74
Indiana:											
Anderson	0	----	0	0	0	1	0	0	0	0	8
Fort Wayne	----	----	----	----	----	----	----	----	----	----	----
Indianapolis	1	----	0	1	4	4	0	5	0	4	95
Muncie	0	----	0	0	0	0	0	1	0	0	17
South Bend	0	----	0	0	0	0	0	0	0	3	12
Terre Haute	0	----	0	0	0	1	0	0	0	0	20
Illinois:											
Alton	0	----	0	0	1	0	0	0	0	0	7
Chicago	4	1	0	16	10	28	0	44	3	92	540
Elgin	0	----	0	2	0	0	0	0	0	3	7
Moline	0	----	0	0	0	0	0	0	0	0	12
Springfield	0	----	0	0	0	0	1	0	0	3	14
Michigan:											
Detroit	2	1	0	49	10	17	0	14	0	126	215
Flint	0	----	0	0	0	1	0	0	2	4	19
Grand Rapids	0	----	0	1	2	0	0	0	0	32	20
Wisconsin:											
Kenosha	0	----	0	1	0	0	0	0	0	0	11
Madison	0	----	0	1	0	0	0	0	0	4	16
Milwaukee	0	----	0	30	2	4	0	4	1	8	93
Racine	0	----	0	1	0	2	0	1	0	2	16
Superior	0	----	0	1	0	1	0	0	0	1	7
Minnesota:											
Duluth	0	----	0	0	0	0	0	0	0	9	14
Minneaplis	0	----	1	2	4	4	0	3	0	7	97
St. Paul	0	----	0	0	2	5	0	0	1	4	51

[1] Figures for Cleveland, Columbus, and Fort Wayne estimated; reports not received.

City reports for week ended Aug. 17, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			0		2	0		0	1	
Davenport	0			0		0	0		0	2	
Des Moines	0		0	0	0	3	0	0	0	0	27
Sioux City	0			0		0	0		0	0	
Waterloo	0			0		0	0		0	3	
Missouri:											
Kansas City	0		0	0	1	0	0	3	0	1	76
St. Joseph	0		0	0	1	0	0	1	1	0	25
St. Louis	0		0	1	12	3	0	7	4	12	189
North Dakota:											
Fargo	0		0	0	1	0	0	0	0	0	11
Grand Forks	0			0		0	0		0	1	
Minot	0		0	0	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	0			0		0	0		0	5	
Nebraska:											
Lincoln	0			1		0	0		0	2	
Omaha	0		0	0	2	0	0	0	0	1	52
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	0	2
Topeka	0		0	1	0	2	0	0	0	3	23
Wichita	0		0	0	2	0	0	0	1	10	23
Delaware:											
Wilmington	0		0	0	1	0	0	0	0	5	28
Maryland:											
Baltimore	0		0	3	4	4	0	8	2	100	187
Cumberland	0		0	0	0	0	0	0	0	2	15
Frederick	0		0	0	0	0	0	0	0	0	5
Dist. of Col.:											
Washington	2		0	1	10	2	0	7	1	12	146
Virginia:											
Lynchburg	0		0	0	0	0	0	0	0	1	10
Norfolk	0		0	0	1	0	0	0	0	0	18
Richmond	0		0	2	1	0	0	2	0	0	42
Roanoke	0		0	0	0	0	0	0	0	1	9
West Virginia:											
Charleston	0	1		0		1	0		0	0	
Huntington	0			0		1	0		0	0	
Wheeling	0		0	0	0	2	0	1	0	2	18
North Carolina:											
Gastonia	0			0		0	0		0	3	
Raleigh	0		0	0	0	1	0	1	0	0	8
Wilmington	0		0	0	2	0	0	0	0	5	10
Winston-Salem	1		0	0	1	2	0	2	0	9	16
South Carolina:											
Charleston	1		0	0	0	0	0	0	0	0	14
Florence	0		0	0	0	0	0	0	1	0	6
Greenville	0		0	0	1	0	0	0	0	11	14
Georgia:											
Atlanta	1	6	0	1	0	0	0	7	0	0	70
Brunswick	0		0	0	0	0	0	1	0	0	4
Savannah	0		0	0	0	0	0	1	2	0	31
Florida:											
Miami	0		0	0	6	0	0	0	0	0	35
Tampa	1		0	1	0	0	0	1	0	0	24
Kentucky:											
Ashland	0		0	0	0	0	0	0	0	1	8
Covington	0	1		0		0	0		0	4	
Lexington	0		0	9	0	0	0	2	0	6	14
Louisville	2		0	0	0	3	0	2	0	26	54
Tennessee:											
Knoxville	0		0	0	0	0	0	0	0	0	31
Memphis	0		0	0	0	1	0	4	0	6	67
Nashville	0		0	0	0	0	0	2	4	10	45
Alabama:											
Birmingham	1		0	1	3	3	0	6	1	1	68
Mobile	0		1	1	1	2	0	0	0	0	26
Montgomery	1			0		0	0		0	1	
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0	1	0	0	0	1	0	1	0	4	
Louisiana:											
New Orleans	1		0	3	6	0	0	9	1	3	130
Shreveport	1		0	0	2	1	0	3	0	1	29

City reports for week ended Aug. 17, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0		0	0	0	1	0	3	0	0	26
Tulsa	0		0	0	2	0	0	1	0	2	41
Texas:											
Dallas	1		0	2	1	1	0	5	2	5	55
Fort Worth	0		0	3	2	1	0	1	0	3	33
Galveston	0		0	0	1	0	0	1	0	0	18
Houston	1		0	0	1	1	0	7	1	0	86
San Antonio	0		0	1	3	0	0	9	2	8	66
Montana:											
Billings	0		0	0	0	0	0	0	0	0	9
Great Falls	0		0	0	1	0	0	0	0	0	8
Helena	0		0	0	0	0	0	0	0	0	5
Missoula	0		0	0	0	0	0	0	0	0	7
Idaho:											
Boise	0		0	0	0	0	0	0	0	0	3
Colorado:											
Denver	0		0	2	2	2	0	5	1	11	87
Pueblo	0		0	2	0	0	0	0	0	0	12
New Mexico:											
Albuquerque	0		0	0	3	0	0	2	0	0	11
Utah:											
Salt Lake City	0		0	11	2	0	0	0	0	29	37
Washington:											
Seattle	0		0	1	4	2	0	1	0	5	81
Spokane	0		0	0	0	0	0	0	0	1	37
Tacoma	0		0	0	0	0	0	0	1	1	36
Oregon:											
Portland	0		0	0	0	0	0	0	0	2	66
Salem	0			0		0	0		0	4	
California:											
Los Angeles	0		0	3	4	8	0	8	0	69	304
Sacramento	0		0	0	0	1	0	2	1	3	26
San Francisco	0		0	2	5	2	0	7	1	28	157

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Nebraska:			
Buffalo	2	1	2	Lincoln	0	0	2
New York	1	0	2	Kansas:			
Rochester	0	0	1	Wichita	0	0	2
New Jersey:				District of Columbia:			
Newark	0	0	1	Washington	1	1	0
Pennsylvania:				West Virginia:			
Philadelphia	0	0	1	Huntington	0	0	9
Indiana:				Florida.			
Muncie	0	0	1	Tampa	0	0	2
South Bend	0	0	3	Kentucky:			
Illinois:				Ashland	0	0	4
Chicago	0	0	2	Louisiana:			
Michigan:				Shreveport	0	1	2
Detroit	0	0	1	Oklahoma:			
Grand Rapids	0	0	1	Oklahoma City	1	0	0
Wisconsin:				Texas:			
Madison	0	0	1	Dallas	1	0	5
Minnesota:				Fort Worth	0	0	1
St. Paul	0	0	3	Houston	0	0	1
Iowa:				Washington:			
Des Moines	0	0	3	Seattle	0	0	1
Sioux City	0	0	6	Spokane	0	0	3
Waterloo	0	0	6	California:			
Missouri:				Los Angeles	0	0	3
Kansas City	0	0	5	Sacramento	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Washington, 1; San Antonio, 1; Sacramento, 1.
Pellagra.—Cases: Baltimore, 1; Charleston, S. C., 2; Savannah, 3; Birmingham, 1; Dallas, 1; Los Angeles, 1; San Francisco, 1.
Typhus fever.—Cases: Brunswick, 1; Savannah, 1; Miami, 3; Tampa, 2; Birmingham, 1; Houston, 3.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 27, 1940.—During the week ended July 27, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis					3			1		4
Chickenpox		12		162	151	27	44	1	19	416
Diphtheria		4		9	1	2	2			18
Dysentery							1		1	2
Influenza		5			20				43	68
Measles			5	111	166	70	47	8	25	432
Mumps				1	44	4	5		2	56
Pneumonia		1			4	3	2		10	20
Poliomyelitis				2	3					5
Scarlet fever			2	64	51	10	5	4	2	138
Tuberculosis		7	11	64	49	10	1	1		143
Typhoid and paratyphoid fever			5	14	3	1	1		1	25
Whooping cough		3	2	174	73	24	17	8	7	308

CUBA

Provinces—Notifiable diseases—4 weeks ended May 25, 1940.—During the 4 weeks ended May 25, 1940, cases of certain notifiable diseases were reported in the Provinces of Cuba, as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Ankylostomiasis		39					39
Cancer		4	3	3		5	15
Chickenpox		2		2	1	6	11
Diphtheria	1	17		5	1	3	27
Leprosy				2			2
Malaria	12	1		8	1	53	75
Measles		8		1		11	20
Scarlet fever		4					4
Trachoma		1					1
Tuberculosis	14	17	33	11	12	26	113
Typhoid fever	12	101	15	27	13	46	214
Whooping cough				9			9

Habana—Communicable diseases—4 weeks ended July 27, 1940.—During the 4 weeks ended July 27, 1940, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	9		Tuberculosis	1	
Malaria	2		Typhoid fever	75	8
Scarlet fever	1				

JAMAICA

Communicable diseases—4 weeks ended August 3, 1940.—During the 4 weeks ended August 3, 1940, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	8	15	Puerperal sepsis	1	1
Diphtheria		1	Tuberculosis	29	64
Dysentery	7	5	Typhoid fever	6	44
Leprosy		1			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of August 30, 1940, pages 1594-1597. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Manchuria.—A telegram dated August 17, 1940, reports 31 cases of cholera with 18 deaths in Shwangchenghsien, southwest of Harbin, Pinkiang Province, Manchuria.

India—Bombay.—During the week ended August 3, 1940, 2 cases of cholera were reported in Bombay, India.

Plague

China—Manchuria.—A telegram dated August 17, 1940, reports 45 cases of plague with 36 deaths in Nungan district northeast of Hsinking, Kirin Province, Manchuria.

Hawaii Territory—Island of Hawaii—Hamakua District.—One rat found July 17; 1, July 20; 2, July 22; and 1, July 24; all about one-half mile from the village of Paauilo, in the Hamakua Mill area, Island of Hawaii, T. H., have been proved positive for plague. Two rats found on August 2 and 3, respectively, within a half mile of Kukaiau Village, Hamakua District, Island of Hawaii, T. H., have been proved positive for plague.

Peru.—During the month of June 1940, plague was reported in Peru, by Departments, as follows: Cajabamba, 1 case; Cajamarca, 5 cases; Libertad, 1 case; Lima, 1 case, 1 death; Tumbes, 5 cases, 1 death.

Thailand—Chingmai.—During the period August 3–17, 1940, 2 cases of plague (1 fatal) were reported in Chingmai, Thailand.

United States.—A report of plague infection in San Bernardino County, Calif., and in Sublette County, Wyo., appears on pages 1638 and 1639 of this issue of PUBLIC HEALTH REPORTS.

Yellow Fever

Colombia—Meta Department.—On July 31, 1940, a fatal case of yellow fever was reported in Meta Department, Colombia.