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STUDIES ON BLOOD COAGULATION

I. GENERAL CONSIDERATIONS

By LASZLO DETRE, *Senior Immunologist, United States Public Health Service*

INTRODUCTION

Despite the enormous amount of effort devoted to various questions of blood coagulation, one is far from understanding its intrinsic phenomena. The main hindrances to mutual agreement are (1) that there has been no common understanding as to the nomenclature of the substances which enter into reaction; (2) that basic findings, easy to duplicate, were forgotten, and had to be practically "rediscovered"; (3) and that many experiments have never been repeated by critically minded workers, thus leaving an uncertainty as to whether they are reliable. The greatest hindrance, however, is found in the fact that in trying to satisfy the exigencies of the chemical doctrine, most workers emphasize the necessity of working with purified or allegedly pure substances, isolated by various methods from blood plasma and serum. In reproducing the phenomena of coagulation, oftentimes in crude ways, these workers believe that they are justified in neglecting the coagulation phenomena in the unchanged blood. It must be emphasized that we have no proof that fibrinogen as a *detached* chemical unit exists in the blood, that the known and amply studied substance called "thrombin" is in reality the coagulating agent, or even that the "thrombins" isolated by various workers are identical. We have no certain knowledge about the normal anticoagulants, no conclusive chemical evidence of the happenings in the so-called first phase of coagulation (formation of thrombin), no real conception of the role of calcium (except its importance), no valid explanation for the effect of lipin compounds or tissue (platelet) derivatives. Even the mode of action of actively coagulative substances on the coagulable menstruum is unknown.

For those upholding the theory that blood proteins are constituted by a mosaic of separate entities—as albumin, fibrinogen, and the various globulins—the explanation is simple. They accept the theory that in the first phase of coagulation thrombin forms by interaction of preformed so-called prothrombin and calcium, and that this thrombin combines with fibrinogen to form fibrin. Among these

workers may be mentioned Howell, Wadsworth, the Maltaners, Eagle, Quick, and Ferguson, in this country, and Bordet, Gratia, Fuchs, Fonio, Fuld, and Morawitz, in Europe, and, of course, such path-finders as Schmidt, Arthus, and Hammarsten.

However, a number of workers who are just as reliable claim that the attempts at isolation of the real active factors are more or less futile. For them the supposedly isolated factors are artificial products, products of cleavage, corresponding not to the natural mosaic stones of the "live" blood, but rather to the methods employed. The leaders of this group are Pickering, Mills, Hekma, Stuber, A. Fischer, and Nolf. Their theories differ from the accepted one.

The research in blood coagulation needs new points of view and new methods. In this paper an attempt is made to contribute to these needs.

EXPERIMENTAL WORK

The greatest obstacle to the experimental study of blood coagulation lies in the rapidity of this phenomenon. As methods of approach, various workers have adopted rather similar schemes. They have used, chiefly—

(1) Methods which hinder spontaneous clotting (use of paraffined canules and containers);
(2) Plasmas of birds or cold-blooded animals, which show retarded clotting (Delejenne's "bird-plasma");
(3) Mammalian plasma rendered incoagulable by the addition of (*a*) Na, K, NH_4, etc., salts; (*b*) oxalate, citrate, fluoride; (*c*) hirudin, heparin, and like substances;
(4) Plasma gained after intravenous injection of peptone ("peptone plasma") or after an anaphylactic shock, both being spontaneously incoagulable;
(5) Fibrinogen, produced by various methods.

The next step was to study the factors which coagulate these stable substrata. It was then found that various factors can be used in order to provoke clotting in the above-listed substances. Oxalated plasma, for instance, can be clotted by "recalcification" (addition of a surplus of Ca) or thrombin. "Deplateletized" oxalate-plasma needs lipoid extracts beside Ca. Peptone-plasma is clotted by CO_2 or glass powder. Heparinized blood can be clotted by appropriate amounts of Ca (the author's experiments).

In acknowledging that these methods have given us all the data for the prevailing theory of coagulation, we realize that no method was known which would allow the study of unaltered blood or plasma of mammals.

Is there a possibility of gaining conclusive evidence by the use of such products as fibrinogen, prothrombin, serozyme, thrombin, heparin, gained by chemical splitting of mammalian blood? We lean

toward the conception that all experiments conducted with them are but poor images of natural happenings—the more so because the properties of these substances vary with the methods employed. In order to give some examples, we may mention the fact that many "thrombins" are proved to contain some lipoid factors; that there is no proof that the powerful anticoagulant, isolated by Howell from the liver, called "heparin," is really the physiological factor which prevents coagulation; that Bordet's "prothrombin" is identical with Mellanby's "prothrombin"; or that the different "fibrinogens" are all devoid of interfering substances.

In studying the most important papers on coagulation (Wöhlisch's excellent monograph on this subject (*2*) gives almost 1,000 references), we felt that there was a need for a method which gives the desired data without changing profoundly the chemical constitution of blood.

USE OF DILUTED FULL BLOOD

The question arose of slowing up the process of coagulation. After many experiments we conceived the idea of diluting the blood with physiological saline. In taking the necessary precautions (see below), we made a set-up of 10 percent, 7.5 percent, and 5 percent blood-saline dilutions, and found that, whereas 10 percent human blood coagulates spontaneously within 2 to 6 hours, 7.5 percent blood stays unclotted for about 10 to 12 hours, and 5 percent blood stays unclotted for 2 days when kept in the refrigerator. However, in order to obtain this favorable result, certain measures are necessary. It has been known for a long time that the more intensive the contact between the shed blood and the injured tissue, the quicker the coagulation. Addition of tissue juice to blood is one of the best methods for the acceleration of clotting. These and similar considerations brought about this method, studied for the past three years.

The finger must be cleaned with water, the moisture wiped off with a clean towel until the skin is dry. The finger is then pricked, not too superficially, with an 18-gauge needle, or even larger. The first drop is rejected, then the oozing blood, drop by drop, is collected in a 1-cc pipette, previously rinsed with sterile saline. The calculated amount of blood is then suspended in 19 times the amount of saline. The operation will be successful if the wound yields about 1 cc of blood within 1 minute. Slow bleeding leads to spontaneous coagulation.

COAGULATION OF 5 PERCENT BLOOD BY VARIOUS SUBSTANCES

Let us pipette 0.50 cc of this blood suspension (B. S.) into each of a series of meticulously clean agglutination test tubes. The series is kept at room temperature. The well known phenomenon of sedimentation follows. The clear gap between the surface and the blood

cells will increase steadily to about 1 mm in 10 minutes. In about 100 minutes the tube is clarified, the cellular elements being sedimented at the bottom.

To another similar series is added 0.10, 0.05, 0.02, 0.01 cc of any serum, even an old serum. The first tube will coagulate within 10 or 15 minutes, the second within 25 or 30 minutes, the third within 1 hour, and the last either overnight, or not at all. In using fresh (1- to 2-hour old) serum for our experiment, we will see that it acts much more quickly. The titer of fresh serum is a higher one. Table 1 presents in detail the data from one of our experiments:

TABLE 1.—*Clotting of 5 percent blood by added serum*

Amount of serum added	Clotting time	
	Fresh serum	48-hour old serum
0.05 cc	18 minutes	40 minutes.
0.025 cc	25 minutes	80 minutes.
0.01 cc	80 minutes	Next day.
0.005 cc	6 hours	Next day negative.

Examined serum: Sheep serum.
Examined blood: Human, 5 percent.
Amount of blood: 0.50 cc.

Figure 1 represents another similar experiment (fresh serum).

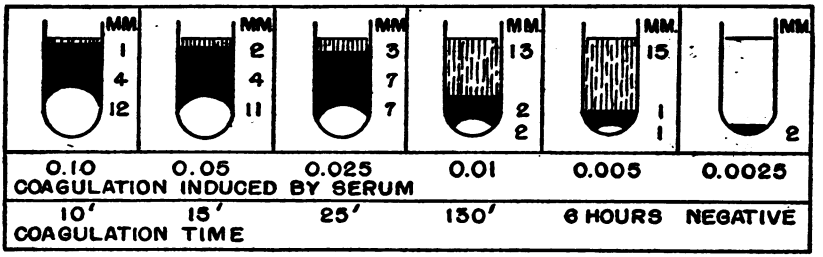

FIGURE 1.—Coagulation elicited by decreasing amounts of coagulant.

Table 2 shows the effects of "crude thrombin" prepared by the Gamgee-Howell method (extraction of fibrin with 8 percent NaCl) from sheep fibrin:

TABLE 2.—*Clotting of 5 percent blood (0.5 cc) by crude thrombin*

Added crude thrombin	0.025	0.004	0.0016	0.0008	0.0004	0.00016	0.00008
Clotting time	2 min.+	10 min.+	10 min.+	16 min.+	27 min.+	overnight	–

The reaction is a quantitative one.

Table 3 shows the effects of purified thrombin-Howell.

TABLE 3.—*Clotting of 5 percent blood (0.5 cc) by purified thrombin*

Added purified thrombin	0.0008	0.0004	0.00016	0.00008	0.00004	0.000016
Clotting time	10 min. +	10 min. +	22 min. +	66 min. +	180 min. +	−

Purified thrombin has a much stronger action than crude thrombin.

DESCRIPTION OF THE CLOTTING PHENOMENON IN A 5 PERCENT BLOOD SUSPENSION

After having found out which amount of serum or thrombin provokes complete clotting within 60 minutes, let us duplicate this mixture and watch the occurrence more closely.

For about 40 to 45 minutes, tubes with and without added serum act alike. In both, sedimentation takes place; both show clear supernatant fluid about 4 mm in depth above the red column.

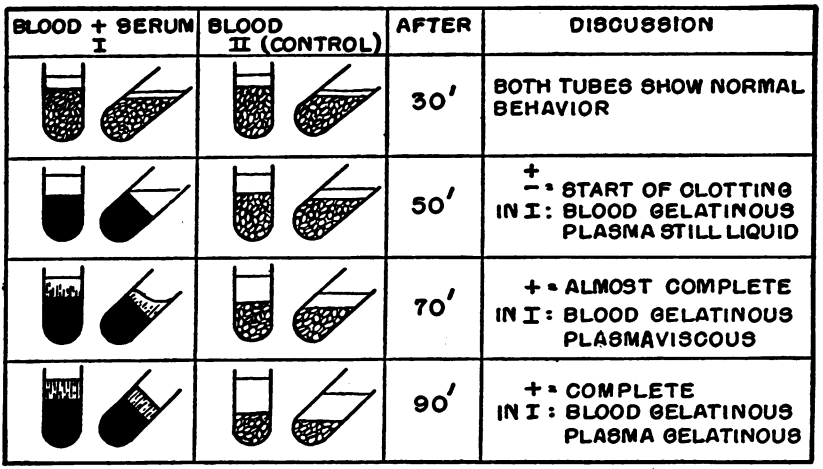

FIGURE 2.—Sedimentation in control (II) and automatic registration of coagulation time (I).

The first signs of incipient coagulation manifest themselves at the bottom of the test tube. With a good hand lens we can see a characteristic, weblike structure spreading from the bottom upwards. This movement is easy to recognize even without a hand lens. In tilting the control tube the upper level of the sedimented corpuscular elements will quickly follow the movement of the tube, whereas in the tube with incipient coagulation they will keep their original position. The coagulation will soon reach the clear plasma; filaments will appear, which unite in forming a loose, then a dense web. When the web reaches the upper level, the coagulation is complete.

Note the constancy of blood level in tube I, figure 2, after clotting has started, in contrast to the progressive sedimentation in the control tube, II.

Soon after the coagulation reaches its maximal intensity, the retraction of the clot starts. It begins at the bottom, retracting toward the upper level. Figure 3 shows this process.

As can be seen, the tubes register automatically the time that coagulation occurred. The deeper the level of the clot, the more delayed was the clotting. Sometimes, however, mainly when the coagulation

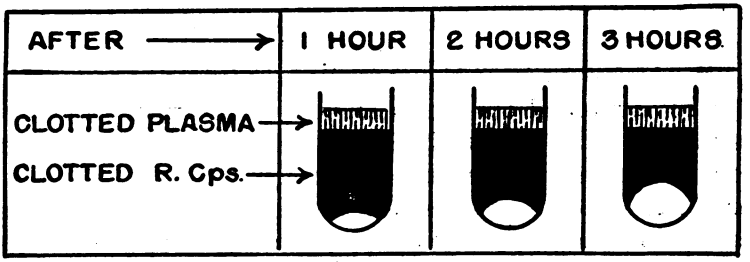

FIGURE 3.—Retraction of clots.

was a very delayed and a weak one, the retracting fibrin fibers lift the clot to the surface, as shown in figure 4.

A close observation of these pictures gives many details.

COAGULATION OF PLASMA

Our "plasma" is the supernatant of the centrifuged 5 percent blood suspension. As coagulation goes, it has the same properties as the blood itself. It can be coagulated by the same factors. The coagu-

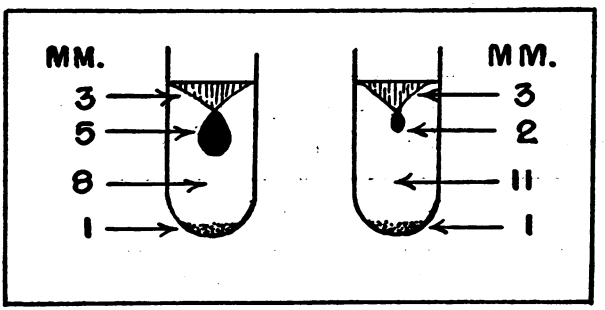

FIGURE 4.—Retraction of clot after delayed coagulation.

lation of the plasma does not start at the bottom, but practically the whole tube shows uniformly the subsequent occurrences. The clotting starts with a peculiar opalescent hue of the formerly water-clear liquid; this opalescence progresses later into a faint turbidity, caused by the appearance of the finest granules. Later a "silky" shine indicates the formation of small fibrillae. At this moment the liquid is somewhat viscous; the air bubbles (if present) on the surface move rather sluggishly when the tube is tilted. The viscosity increases, and finally the

content of the tube is gelatinized, indicating the completeness of clotting. We may mention, also, that for the same clotting time, plasma needs two to three times more serum or thrombin than does the blood.

For some special purposes, such as the study of prophases (see below) the use of "plasma" is preferable; but for most tests we prefer the use of whole blood, which, as mentioned, registers details unrecognizable in plasma-clotting.

Time factor, retraction.—It may be mentioned that retraction of clotted plasma is not seen as frequently as in clotted blood. This suggests, as claimed by many authors, the important role played by the corpuscular elements in the retraction phenomenon.

Special experiments were undertaken to determine whether or not the age of the blood sample taken influences the coagulability. It can be shown that immediately after the bleeding the blood is less coagulable than later. The coagulability increases slowly, and reaches its maximum about 1 to 2 hours after the blood is taken. The maximal point once reached, the suspension remains remarkably stable. It can be reexamined after an interval of about 6 to 8 hours, and will give constantly the same titer. This facilitates comparative tests. The increasing coagulability during the first 60 minutes is easily explained by the findings of those who demonstrated the important role of platelet destruction in the first phase of coagulation (thrombin-formation).

COAGULATION OF 5 PERCENT BLOOD BY CALCIUM

The importance of the role played by ionized calcium in coagulation has been long recognized and universally accepted. As early as 1890 Arthus and Paget discovered the anticoagulant power of oxalate, which combines with calcium, forming insoluble calcium oxalate, or sodium citrate and fluoride, which form nonionized calcium compounds. It is also well known that by recalcification, i. e., addition of proper amounts of calcium to oxalated (etc.) plasmas, clotting promptly starts. Those who accept the existence of prothrombin in "live" plasma believe that calcium ions combine with prothrombin, forming the real coagulant, i. e., the thrombin.

Our case is different, however. In our 5 percent blood suspension no essential change could have occurred, the chosen diluent, saline, being practically inert to the blood. (This inoffensive behavior of saline can be shown by using instead of a 5 percent suspension a 10 or 15 percent suspension, which clots spontaneously.) The experiment showed that very minute amounts of calcium have the property of clotting the 5 percent suspension.

This discovery was the result of a curious accident. By an error we were given (as we found later) tap water, labeled "distilled water."

This water specimen, when properly salinized, induced prompt clotting of any collected blood even in 2 to 3 percent suspensions. After the error had been recognized, we easily found that the irregularity was caused by the calcium content of the water used.

Further experiments demonstrated the powerful clotting power of added $CaCl_2$. The experiment of adding 0.01-cc quantities of calcium dilutions to 0.40 cc blood (5 percent) was made. Table 4 shows one of our numerous titrations.

TABLE 4.—*Clotting of 5 percent blood by $CaCl_2$*

(0.01 cc of calcium chloride diluted from 1:25 to 1:4000 added to 0.40 cc blood)

	(a)	(b)	(c)	(d)	(e)	(f)
Added dilutions of $CaCl_2$	1:25	1:250	1:500	1:1000	1:2000	1:4000.
Final concentration of $CaCl_2$ (in mixtures).	1:1000	1:10000	1:20000	1:40000	1:80000	1:160000.
Final concentration of atomic Ca (in mixtures) (calculated on basis of 1 mol. crystal water).	1:2300	1:23000	1:54000	1:128000	1:256000	1:512000.
Clotted within	3–5 minutes.	10–15 minutes.	25–35 minutes.	1–1½ hours	overnight + or ±.	–

The clotting power of calcium is remarkably strong. Knowing that 100 percent blood contains around 1:2000 Ca, our 5 percent blood suspension corresponds to a 1:160000 Ca solution. In adding 1:128000 Ca (column d) or doubling the original Ca content, one is able to induce within 1 to 1½ hours the clotting of the otherwise remarkably stable blood suspension.

In view of the stable nature of the calcium solution, we recommend for all wishing to duplicate our experiments that they undertake first the study of calcium-induced coagulation before attacking the problems connected with serum or thrombin-induced clotting.

ANALYSIS OF THE COAGULATION WITH HELP OF COLLOIDAL FACTORS

The analysis of coagulation with the help of colloidal factors is basically new; it has never been attempted before.

A casual observation led us toward this new field of research. In a short paper published by the author (*9*) it was shown that a typhoid extract to which is added a small amount of typhoid antiserum and a drop of 1 percent India ink gives origin within a few minutes to the formation of large, black flocculi. This so-called India-ink phenomenon is explained by the surface action of the colloidal carbon suspension, which renders visible the otherwise invisible or subvisible reaction between typhoid flagellar substance (H substance) and H agglutinins.

INDIA INK REACTION

Seeing a possibility of working out a rapid bed-side diagnosis by using the India ink as a possible accentuating factor, we collected blood of a typhoid-immunized rabbit, in saline, and added to it a typhoid culture and ink. We witnessed a rapid clumping of the

added India ink. Further work showed, however, that this clumping has nothing to do with the immune reaction, described as the India-ink phenomenon, as any freshly taken blood gives the reaction shortly after the addition of India ink. It was found subsequently that the reaction is connected with the clotting of blood. As long as the blood-suspension is unclotted, no change is visible; but when coagulation occurs, the reaction is highly developed. The observation that aged serums show but faintly the power of ink clotting necessitated the systematic study of the hitherto unknown reaction.

We arrived at the following conclusions, which will be discussed in detail below:

At a considerable time before visible coagulation starts, the plasma of the examined blood sample acquires the faculty of precipitating India ink. This power increases steadily until it reaches its maximal point, shortly before visible coagulation occurs. From this point on,

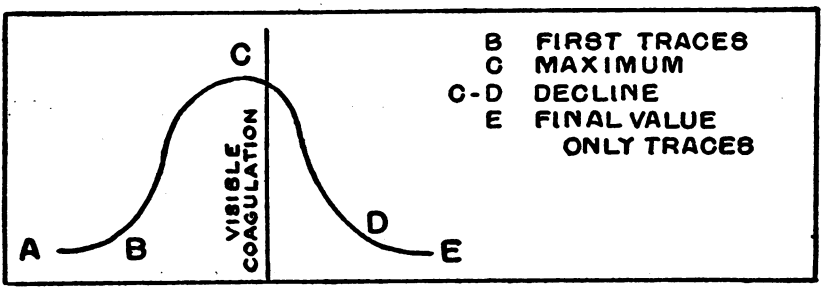

FIGURE 5.—Schematic curve of the ink reaction of coagulating blood.

there is a steady decline in the reaction capacity of the blood. The serum formed around the clot continues to react for a varied period of time, but the reactions become weaker and disappear almost completely.

Several additional facts elucidated the nature of this reaction. It was found at first that spontaneous coagulation (for instance, of a 10 to 15 percent blood suspension) and coagulation induced by serum or thrombin preparations act alike. In all cases, the curve shown in figure 5 could be obtained.

The reaction may be studied as follows: Add enough calcium, serum, or thrombin to a 5 percent blood suspension to provoke a coagulation within, say, 1 hour.

Let us remove every 10 minutes 0.10 cc of the clarifying blood plasma, add it to 0.3 cc saline, and add 1 drop (about 0.03 cc) of a 1 percent India ink[1] solution in distilled water. The individual mixtures are examined after 5, 10, 30, and 60 minutes, and so on.

[1] Higgins' ink was used.

The following tabulation shows the result of one of numerous experiments:

Sample removed:	*Ink reaction*
Immediately	in 60 minutes, −.
After 10 minutes	in 60 minutes, ?
After 20 minutes	in 30 minutes, ±; in 60 minutes, ++.
After 30 minutes	in 5 minutes, ±; 10 minutes, ++; 30 minutes, ++++.
After 40 minutes	in 1 minute, +; 5 minutes, ++++.
After 50 minutes	immediately ("lightning reaction").
After 60 minutes	in 1 minute, +; 5 minutes, ++; 10 minutes, ++++.
Meanwhile coagulation occurs:	
After 70 minutes	in 5 minutes, +; 10 minutes, +++; 50 minutes, ++++.
After 80 minutes	in 10 minutes, +; 60 minutes, +++.
After 100 minutes	in 30 minutes, +; 60 minutes, ++.
After 120 minutes	in 60 minutes, +.
After 3 hours	in 60 minutes, ? or −.

PROPHASE AND METAPHASE

Visible coagulation is preceded by a "prophase," characterized by the formation of ink-reacting properties, and succeeded by a "metaphase" characterized by the steady decline of this power (see fig. 6).

Further analysis showed that the shorter the interval between the addition of clotting factor and the provoked coagulation, the nearer the maximum of ink reaction to the visible clotting, and the shorter the duration of the ink power. In other words, the speedier the clotting, the shorter both the ink prophase and ink metaphase. In some cases, for instance, in using as clotting factor 1:1000 to 1:4000 Ca, the two phases mentioned are recognized only upon using special precautions. On the other hand, in prolonging coagulation time for 2 or 3 hours one has ample opportunity for the demonstration of the described phenomenon.

PROLONGING COAGULATION TIME

There are several ways of prolonging coagulation time. One of them, already mentioned, consists of adding small amounts of any of the clotting factors (Ca, serum, thrombin) to the coagulable substances. We may add still more methods, all perfectly suited for the production of what we may call the "slow motion picture" of coagulation. These are as follows:

(*a*) Increase of the NaCl content of the blood to 2 or 3 percent;
(*b*) Addition of other salts in proper amounts (K, Cl, LiCl, ammonium chloride, ammonium sulfate);
(*c*) Addition of "sub-active" doses of hirudin or heparin.

With all these methods it was shown that there is a phase of rather long duration, 1 to 2 hours, in which the examined plasma does not give any trace of coagulation, but gives what we call the "indicative" ink reaction.

In order to understand this reaction, it seemed advisable to study, as to their reaction toward ink, all the ingredients of the mixtures destined to coagulate later. These studies gave rather interesting results.

Let us consider first the blood. (1) After centrifuging the unclotted plasma of the control blood used, and adding to 0.40 cc of this 1 drop of ink solution, no reaction occurs. (2) Crude thrombin and purified thrombin are both ink-inactive. (3) Serum used as thrombic factor: In our usual experiments, we add 0.05 or 0.03 cc of serum to 0.40 cc

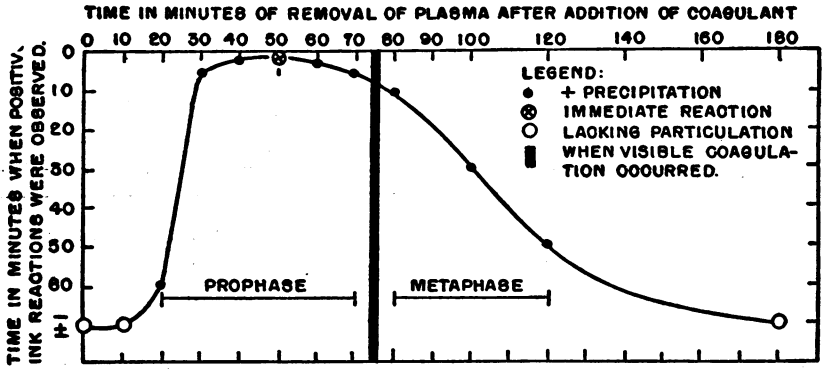

FIGURE 6.—Detailed curve of ink reaction of blood.

blood. The serum is therefore diluted 9 to 14 fold. It can be shown that this dilution (in saline) is ink-inactive.

CALCIUM USED AS CLOTTING FACTOR

Calcium is a potent ink-precipitating agent, as shown in table 5. The method employed was as follows: To a set-up of $CaCl_2$ dilutions, in saline, is added 1 drop of 1 percent of India ink. Reading is made after 2 hours.

TABLE 5.—*Precipitation of India ink by $CaCl_2$*

$CaCl_2$ dilutions	1:100	1:200	1:400	1:800	1:1600
				+	−
Results	Full clarification	Same	Incomplete; liquid is somewhat smoky.	Smallest granules.	Liquid: Brown.
	Largest black clumps.	———	Large granules.	Liquid: Brown.	No particulation.

In comparing the slight (+) flocculation elicited by 1:800 Ca with the complete sedimentation within 1 to 2 minutes produced in coagulable blood by previously added 1:10000 or 1:20000 Ca, there can be no doubt that the two phenomena have no connection whatever. We have direct proof for this view.

Further experiments show that the direct ink-precipitating effect of calcium is abolished by the addition of as little as 1 percent of serum.

Experiment: To 1 cc of 1:400 dilution (in saline) of $CaCl_2$ are added increasing quantities of any serum. Then 1 drop of ink is added.

Reading, after 2 hours, is as follows:

TABLE 6.—*Hindrance of ink-precipitating effects of Ca by addition of serum*

	Quantity of serum					
1 cc of 1:400 $CaCl_2$ added to	0.03	0.02	0.01	0.005	0.002	0 (Control)
Ink reaction	−	−	−	±	+	++++

In considering that our 5 percent blood samples correspond to a serum (or plasma) solution of 3 percent, we see that there is three times more serum present than necessary to prevent the direct Ca effect on ink. (It should be mentioned that the graphical analysis of the protecting power of serum showed that serum acts as a "protective colloid.")

THE INDICATIVE INK REACTION

We feel justified in believing that our "indicative ink reaction" is not caused by any of the ingredients used, but that it indicates changes occurring by the interaction of the formerly ink-inactive substances during coagulation.

Let us analyze the phenomenon as it presents itself in the prophase or metaphase of coagulation. We have noted that, long before coagulation occurs, the aliquot parts of the clear plasma removed gave a reaction with ink. Great difficulties were encountered in explaining this phenomenon. Our first and obvious explanation was that the "thrombin," formed through the interaction of calcium and prothrombin, must be the ink-active factor. The ink analysis of both "crude thrombin" and purified "Howell-thrombin" showed, however, that this explanation is incorrect. Both thrombins are absolutely inactive toward ink.

"*Lightning reaction.*"—Close observation of the action a few minutes prior to the expected visible blood clotting leads us to the right path. In the tabulation on page 840 is found the term "lightning reaction."

This term was used to emphasize the extraordinary rapidity of the phenomenon which occurs shortly before visible coagulation starts.

The formerly perfectly translucent liquid becomes, after addition of ink, immediately turbid, and flocculi of a rather fibrillar structure appear; the fibrillae form a large, coal black web; and, finally, a solid black clump of irregular shape, identical with the usual aspect of fibrin, becomes visible. The precipitate formed is nothing but ink-charged fibrin.

Granular and fibrillar fibrin.—At the height of the process, there is evident fibrin formation present; the greater the digression each direction from this point, the less characteristic are the compounds formed. Finally a stage is reached in which only a slowly forming granular precipitate is visible. This granular precipitate, as shown by dilution experiments, must be considered as granular fibrin.

Now a great step has been made toward the explanation of the problem. Fibrin, as we understand its formation, is produced by the interaction of thrombin and fibrinogen. As the final product of the indicative ink reaction is fibrin, the assumption is obvious that the plasma in which the ink elicited the reaction must have contained both the fibrinogen and the thrombin. It is assumed that they are both present and may be in a loose union, in order to coagulate later on.

Experiments showed that assumption to be correct. The presence of fibrinogen was demonstrated by the fact that proper doses of thrombin provoke speedy clotting of the "labile" plasma; the presence of thrombin, or, speaking more generally, of "coagulative substances," by the ability of the removed plasma samples to provoke clotting in a second blood sample.

In pursuing this direction of research further, we succeeded even in determining, in a crude mathematical way, the amount of clotting substances in the ink-positive stage of blood specimens later to coagulate.

In order to correlate the intensity of the indicative ink reaction with the intensity of clotting power, we proceeded in the following way: Two series of test tubes were prepared; one series contained 0.40 cc of saline and one drop of India ink; the other series contained 0.25 cc of 5 percent blood. Then 0.25 cc of a human serum was added to 5 cc of 5 percent plasma, previously proved to possess normal coagulability. From time to time 0.2 cc of this plasma-serum mixture was removed and 0.10 cc of it was added to the ink tube, and the same quantity to the 5 percent blood tube. The results were as follows: The ink series gave the expected curve of reaction. The blood series gave a duplicate of the curve, showing that the ink-reacting and clotting substances develop in close harmony.

Analogy to immune ink reaction.—There can be no doubt that the coagulation can be divided into two phases. In the first phase the interacting substances are present without giving evidence of their presence by any signs of coagulation; in the second phase the coagulation becomes manifest. In the first phase, their presence can be shown by our indicative ink reaction, which seems to be a perfect replica of the immune ink reaction. Two substances having affinity for each other form an invisible reaction, which is rendered visible by the catalytic surface activity of a potent colloidal agent, i. e., the ink. In the case of the immune reaction, the two interacting substances are the floccular antigens and their respective antibodies; whereas in the prophase or metaphase of coagulation, the two interacting substances are the fibrinogen and the clotting principle.

Thrombin and calcium formative agents of real coagulant.—In this summary the universally used term "thrombin" is avoided; and some explanation of this point is necessary.

In inducing coagulation in 5 percent blood with calcium alone, there seems to be no possible objection to the accepted idea of thrombin formation through interaction of the normally present "prothrombin" with calcium. But the case is different when coagulation is induced with thrombin. Plasma or blood treated with thrombin are at first ink-inactive and unable to provoke secondary coagulation. Both of these faculties develop only after a certain time and reach their maximum shortly before visible coagulation is shown. The complete parallelism of calcium and thrombin effects can be explained only in one way: Neither one is the real coagulant; on the contrary, the real coagulant is a product of their interaction on the unclotted blood. We gathered enough evidence by analyzing the interaction of calcium on 56°-heated plasma (see below) in order to assume that what we call "thrombin" is but the precursor, or causative agent, of a process which leads to the formation of the real, until now unknown, coagulant. (Strictly speaking we are not even entitled to characterize this coagulant factor as a definite "substance." Some considerations lead to the theory that the coagulant "factor" is in reality a coagulant "state.")

"LIQUID" FIBRIN

We arrived at the conclusion that during both the prophase and the metaphase of coagulation there must exist a special phase of fibrin which we may call "liquid" fibrin. We use this term to designate a substance which is fully equivalent to the well-known fibrin, with the only exception that it is not coagulated. It offers a complete analogy to many immunological phenomena, for instance, to the invisible agglutination, first described by Bordet and Nolf. The agglutination, as is known, needs 3 (not 2) reacting substances—the antigen, the

antibody, and the electrolytes. In the absence of this third component, the agglutination is not manifest. Antigen and antibody are united, but the formed compound stays in solution and changes to a particulate (precipitated) stage only when it is given the minimal amount of salt. In the stage of "liquid" fibrin the stage of particulation is not reached, probably on account of special quantitative hindrances.

The study of "liquid" fibrin is still in its embryonic stage. Especially, the question whether the two substances which are the essential components of liquid fibrin (fibrinogen and the newly formed "coagulant") are or are not bound, could not be solved to a satisfactory degree.

CONTROVERSIAL ISSUES

Using our two new methods (use of a diluted blood suspension, and use of India ink), some research work was undertaken in order to have a clearer insight into controversial issues. They are enumerated in the order in which they were studied.

Substitution of other colloids for ink.—In order to ascertain whether any constituent of the India ink suspension or the colloidal state of this reagent plays the important role of rendering visible a still invisible coagulation, we attempted to substitute other colloids for India ink. The best results were obtained with a colloidal suspension made by diluting an alcoholic solution of resin in 0.1- to 0.2-percent saline. All essential features of the ink reaction could be duplicated; for instance, the granular reaction in the prophase, the fibrinous "lightning reaction" shortly before visible coagulation occurs, the late granular reaction of the metaphase, etc. However, for practical reasons, we prefer ink to resin.

Electrolytes.—The hindering influence of an excess of electrolytes on coagulation can be easily demonstrated and studied. Very interesting curves were plotted in comparing the hindering power of different salts, and in studying their mutual antagonism.

Influence of suspended particulate matter.—The accelerating influence of suspended organic and inorganic particles on the speed of coagulation is a phenomenon that many workers have studied. They compare it with the almost instantaneous crystallization induced in oversaturated salt solutions by the addition of tiny crystals, which act as centers of crystallization. The sudden freezing of overchilled water when a small piece of ice is added is a similar phenomenon. The spontaneous clotting of (otherwise noncoagulant) peptone plasma by shaking it with glass powder is the paradigm of this phenomenon.

We studied this question first by preparing underclotting mixtures (or "liquid fibrin") and adding to the clear plasmas various quantities of typhoid suspensions. The accelerating power of these suspensions was easily demonstrated.

In order to show the importance of the active surface in a second series, agglutinated typhoid suspensions were added to the "liquid" fibrin. It was shown that their accelerating power was greatly lessened. Appropriate controls made it clear that the reduction of surface (caused by agglutination) is responsible for this very evident difference between finely dispersed and agglomerated bacilli.

Analysis of the action of heparin.—Heparin is the powerful anticoagulant isolated and analyzed by its discoverer, H. W. Howell. This investigator showed that heparin has to be considered as an antiprothrombin because it hinders the conversion of prothrombin into thrombin. He advanced the theory that heparin, considered by him as the physiological anticoagulant of live blood, combines in shed blood with the lipoidal tissue factor, or platelet factor, so essential for the formation of thrombin, and is thereby rendered inactive. Our experiments gave another explanation for the anticoagulant power of heparin.

By the aid of our method it was constantly shown that heparin acts as an anticalcium factor. It combines in constant proportions with $CaCl_2$. The compound (heparin+Ca) has then lost its power of inducing coagulation, being precipitated somewhat similarly as is oxalate-calcium. This unexpected finding was shown in demonstrating that—

(*a*) A coagulating dose of Ca could be overcompensated by previous addition of heparin to blood, or to the Ca solution.

(*b*) A coagulation preventing dose of heparin could be overcome by increasing the quantity of added calcium.

(*c*) The amount of heparin necessary to neutralize calcium, or of calcium to neutralize heparin, is remarkably stable and follows almost stoichiometric laws. It was found that 1 part of $CaCl_2$ is neutralized by 1:10 heparin (or 1 heparin by 10 Ca). For instance, 0.01 of $\frac{CaCl_2}{1000}$ was neutralized by 0.01 $\frac{\text{heparin}}{10000}$.

(*d*) What we emphasize especially is the fact that the same neutralizing ratio of 1:10 was also found for other Ca reactions. For instance, in order to hinder the ink-precipitant power of calcium, the same ratio of heparin was found effective as the ratio fitted to hinder the blood coagulative power of the same calcium solution.

Data about hirudin.—Hirudin, the anticoagulant extracted from leeches, is considered by most workers as a typical "antithrombin." It is supposed to neutralize thrombin already formed. However, with our method it was found that it neutralizes the clotting power of calcium and is, conversely, neutralized by calcium. The theory, first advanced by Gratia (*5*), that hirudin interferes with coagulation in any phase of the clotting process, found an experimental explanation.

Oxalate.—In precipitating calcium, oxalate renders freshly shed blood incoagulable. Oxalated blood or plasma, however, is promptly

clotted not only by adequate doses of calcium but also by thrombin. It is generally assumed that oxalate is unable to combine with the calcium already forming a part of the thrombin molecule.

A thorough analysis of oxalate activity indicated that the old view must be reconsidered. In fact, our studies demonstrated that weak coagulants, as present for example in 56°-heated serum, can be rendered ineffective by previous addition of a quantity of oxalate which would not prevent clotting when added to the blood to be clotted. This result was obtained in comparing the anticoagulant power of oxalate on equipotent solutions of $CaCl_2$, 56°-heated rabbit serum, and unheated rabbit serum.

Our experiments indicate that in a previously oxalated blood menstruum, fibrinogen combines readily with the coagulant added; in other words, coagulation occurs *before* oxalate interacts with the coagulant, whereas if the same amount of oxalate is added to the coagulants examined after a certain time (1 to 1½ hours) they are decalcified by oxalate and rendered inactive. Widely divergent observations of different authors as to oxalate become easily explained. It might be stated that, by our methods, we could show that the coagulant power of serum is the result of two agents, viz, residual "thrombin" and calcium. The older the serum, the weaker the thrombin factor, the calcium being practically unchanged. In inactivated (30-minute, 56°-) serum, the coagulant power is greatly reduced as compared with the same unheated serum.

Heated fibrinogen.—It is known that a very short (5-minute) heating of blood or fibrinogen destroys the faculty of being clotted by thrombin. Our methods enabled us to analyze this phenomenon. We reached the following conclusions:

(*a*) The centrifuged plasma of 5-percent blood after a short (5–10-minute) heating to 56° loses the faculty of being clotted by Ca, serum, or thrombin.

(*b*) 56°-heated plasma becomes opalescent. This faint turbidity can be removed by centrifuging.

(*c*) The centrifugates can be reemulsified in saline without entering into solution.

(*d*) Upon addition of active serum or calcium, the suspension shows slight clumping not unlike agglutination, but does not coagulate.

(*e*) Nevertheless the ambient fluid removed after 60 to 90 minutes gives evidence of two newly acquired qualities, viz, it gives a powerful indicative ink reaction, and provokes coagulation when added to coagulable blood. It was shown, therefore, that the precipitate of heated plasma acts like unheated plasma, with the only exception that it does not coagulate. Under the influence of calcium, it produces ink-positive and coagulant substances just as does normal plasma.

SOME REFLECTIONS ABOUT ANTICOAGULANT FACTORS OF CIRCULATING BLOOD

In possession of methods giving us almost mathematical results, an attempt was made to understand conditions in nature. Let us assume that, by any of the known pathological conditions (trauma, bacterial infections affecting the walls of capillaries, bacterial emboli, defects in circulation, etc.), thrombin is released. In view of the fact that, during coagulation, new thrombin is formed or released, it is difficult to understand why coagulation, after its onset in any part of the organism, does not advance to lethal proportions. Rather simple quantitative considerations will give the proper explanation.

Coagulation is a strictly quantitative process.—Coagulation depends only on the amount of added clotting factor (Ca, serum, thrombin) whether we shall witness an instantaneous, a speedy, a normal, a delayed, or a negative coagulation. In analyzing these negative effects, it can be shown with the ink method that slight amounts of ink-active substances are formed even in these apparently "negative" mixtures, but the process evidently does not ripen to such an intensity as to provoke clotting.

Dilution with saline.—By dilution of 5 percent blood with a non-coagulable menstruum, saline, for instance, it was shown that greater dilutions need greater quantities of calcium. In plotting the observed data by Cartesian coordinates, curves of parabolic character were obtained. (See fig. 7.)

In diluting 5 percent blood twice, we need two times as much Ca for the 60-minute clotting. More than four times as much Ca is needed for the 60 minute coagulation of a 1.25 percent blood suspension as with the routine 5 percent suspension.

Dilution with plasma.—By dilution of our 5 percent blood with a coagulable menstruum, diluted plasma, for instance, the problem is an additional one. If blood needs n Ca, and plasma m Ca, then the results are

1 blood + 1 plasma = $n + m$
1 blood + 2 plasma = $n + 2\ m$
1 blood + 4 plasma = $n + 4\ m$
1 blood + x plasma = $n + x\ m$

Plotted graphically, the results are characterized by a straight line which is broken near the starting point (fig. 8).

By adding 5 percent blood to 5 percent blood, an unbroken straight line is obtained, as the expression of straight quantitative conditions. In interpreting the curves in words, we may make the rather obvious statement that the amount of thrombin fitted to coagulate a certain amount of blood does not suffice for clotting either the same amount diluted, or multiples of the same amount. The first case occurs only

under experimental conditions; the second is the one which occurs normally.

Fibrinogen as protective anticoagulant of blood.—What is the normal anticoagulant of blood which renders inactive the thrombin already present? It is the fibrinogen itself. This protective influence of circulating fibrinogen becomes possible only and exclusively (*a*) by the affinity existing between fibrinogen and the clotting factor; (*b*)

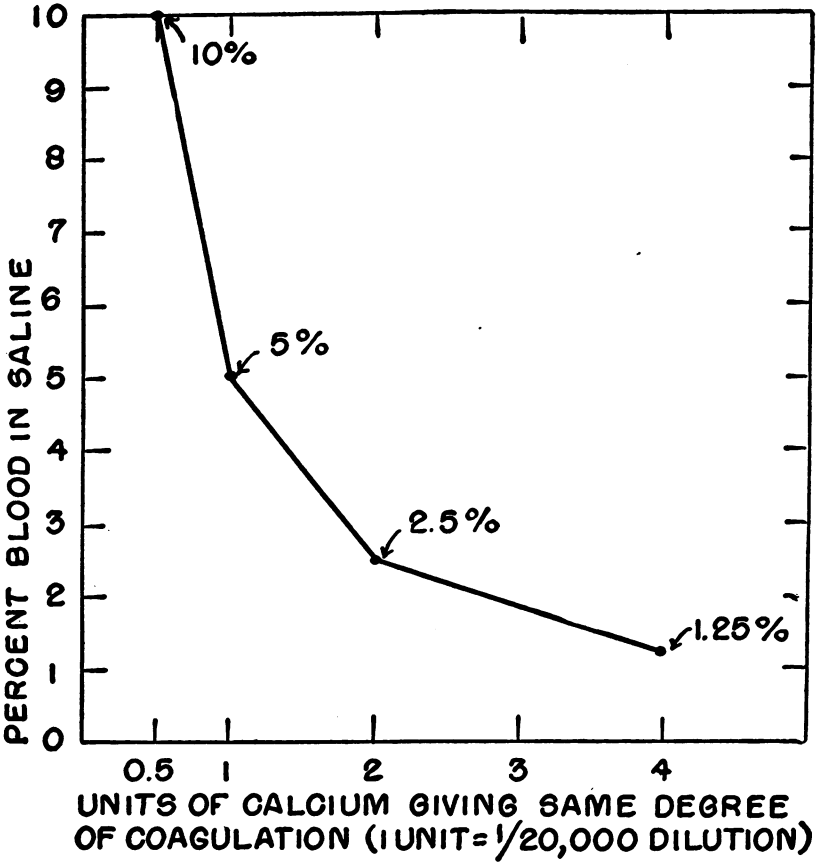

FIGURE 7.—Titers of blood dilution.

by the fact that determined minimal amounts of clotting factors are necessary in order to provoke clotting; (*c*) by the fact that "subclotting" quantities combine with fibrinogen and may even elicit the formation of ink-active principles, but they do not manifest themselves in provoking visible coagulation.

Experimental proof.—A very simple experiment demonstrates the correctness of this view. If the normal protective substance is the same one which is coagulable, then we are able to protect our 5 percent blood against any studied clotting factor by letting it act on a small

portion of the coagulable menstruum. The clot formed on the contact zone will protect the remainder of the blood. We stratified, in the ordinary precipitation tubes, 5 percent blood with a solution of such a percentage of calcium which, when mixed with the total amount examined, would provoke clotting within 60 minutes (1:40000 final concentration of $CaCl_2$ would be sufficient).

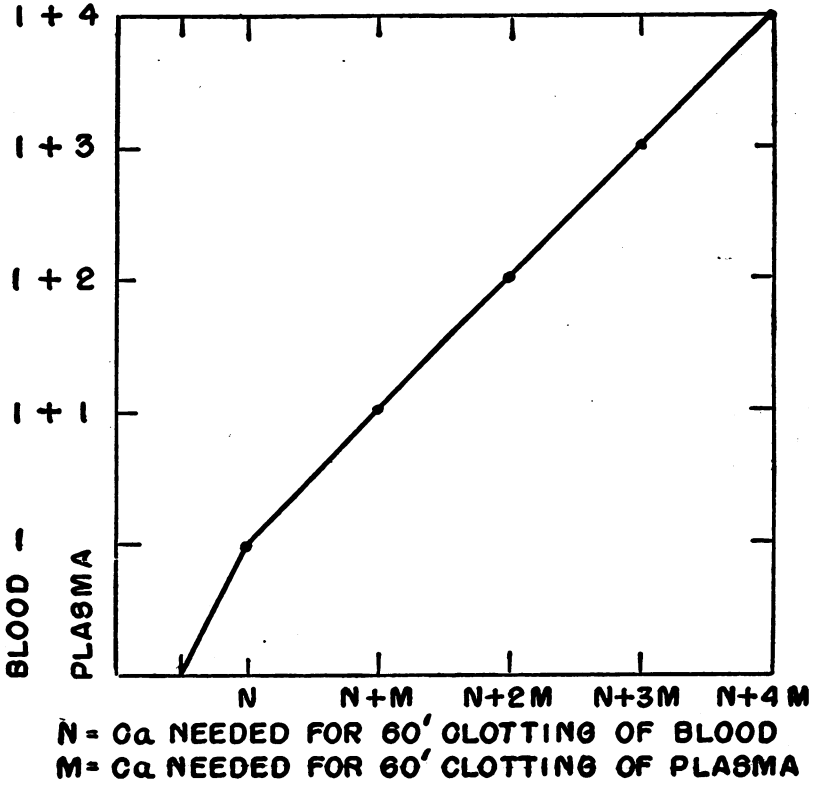

FIGURE 8.—Ca titers of blood diluted with plasma.

After 60 minutes, the control tube (mixed) showed +coagulation; the stratified tube showed + + + coagulation at the contact zone, but does not show coagulation elsewhere.

This important experiment was varied in several ways (use of Petri dishes, use of capillary tubes) and gave consistently the same results. The thrombic factor was rendered ineffective by the interaction of the two substances present at the level of contact. The phenomena of clotting occurring in the live organism can be easily explained.

CONDITIONS IN THE ORGANISM

Cut or bruised wound.—Thrombin forms by the interaction of the tissue factors and shed blood. This blood is removed from the

circulation. It clots promptly. The thrombin is rendered inactive by its combination with the coagulable factors.

Parietal thrombus.—Due to pathological influence, the coating intima is damaged; there are possibilities of thrombin formation. The external surface of the thrombus formed is not in contact with the circulation. The internal surface is in contact with circulating blood. Thrombin is taken up by the blood and rendered inactive. (See A, fig. 9.)

The intensifying influence on intravascular clotting by slowing up of the circulation.—Thrombin acts on fibrinogen locally before it can be removed and rendered inactive.

The old observation of clotting not passing the next bifurcation is easily explained.—The clot is surrounded by stagnant blood, which will clot slowly but surely. The moment the clot reaches the area of steady

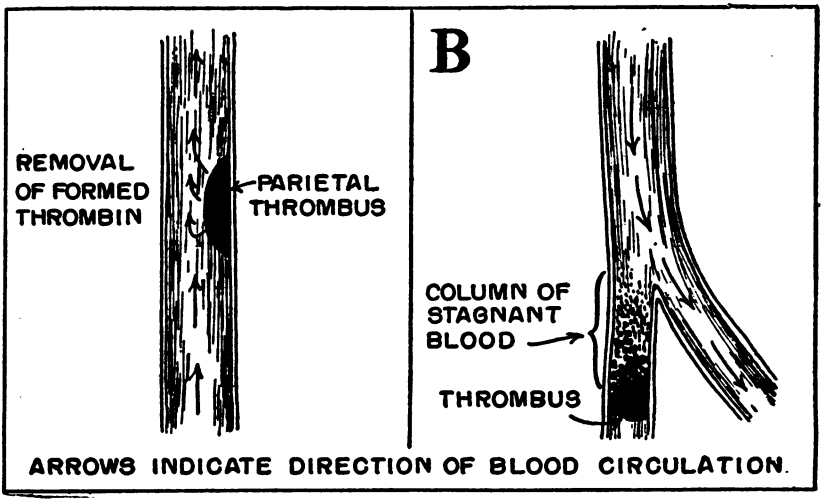

FIGURE 9.—The relation of a thrombus to the circulating blood.

circulation, clotting stops, the physiological anticlotting factors entering into action. (See B, fig. 9.)

The formation of pyramid shaped infarcts in any area supplied by end arteries and the various examples of localized thrombosis find an obvious explanation. In short, the quantitative conception of the coagulation process plays the determining role in the explanation of localized clotting. The safeguarding of the organism menaced by locally formed clotting factors is the result of the quantitative relationship existing between coagulable and coagulant compounds.

SUMMARY

Experiments are reported which, it is believed, must lead to a reconsideration of current theories regarding the mechanism of blood clot-

ting. Two original techniques were employed: One consisted of dilution with saline for delaying reactions sufficiently for the purposes of study. The other was the employment of colloidal India ink as a sensitive detector. Evidence is adduced to show that whether clotting occurs or not depends upon quantitative relations among the reagents. The role of a new substance, to which the name "soluble fibrin" has been assigned, is discussed.

REFERENCES

(A great number of papers were reviewed, but reference is made here only to some selected works which may be of especial use to those interested in this subject. Reference is made to some of these in the text.)

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(9) Detre, Laszlo: (a.) The India ink reaction. J. Bact., 31: 67 (January 1936). (b.) Purification of Vi-type *B. typhosus* strains. J. Infect. Dis., 60: 319–334 (May–June 1937). (Gives a brief summary about the use of India ink for detection of both invisible and subvisible agglutination.)

AGE OF DELINQUENTS IN RELATIONSHIP TO RORSCHACH TEST SCORES

By M. J. Pescor, *Passed Assistant Surgeon, United States Public Health Service*

The Rorschach Ink-blot Test has received so much attention in the literature as an approach to the study of personality that the author was intrigued by the possibility of using it as a routine procedure in studying the mental make-up of delinquent individuals. Incidentally, experimentation might also reveal whether it is really a test or merely a crystal ball in which the examiner may read whatever he wants to believe about his patient. With these ideas in mind an investigation was inaugurated dealing with the relationship of various factors to the Rorschach Test. The present article is con-

cerned principally with the age factor. The influence of age on Rorschach scores of nondelinquent individuals, chiefly children and adolescents, has been studied by a number of investigators with equivocal results. Hertz, after summarizing the views of Rorschach, Behn-Eschenburg, Loosli-Usteri, Löpfe, Mira, and Linares, concludes that the influence of age upon Rorschach scores has not been adequately and statistically verified (*1*).

THE SUBJECTS

The test was given to 500 prisoners who had been admitted to the United States Northeastern Penitentiary during the 11 months' period from July 1, 1935, to June 1, 1936. The subjects were chosen at random to get as fair a sampling of the institutional population as possible. Later it was found necessary to discard 24 of the completed tests because certain information was lacking about the persons taking the examinations in question. For this reason all the statistical analyses were based on 476 cases, except for the computation of common response scores, for which purpose the original group of 500 was used.

Combining all medians, averages, and highest frequencies, and leaving out awkward decimal places, a composite individual representing the group of 476 final selections would be a 33-year old married man, from the Northeastern section of the United States, who had been sentenced for passing counterfeit money. He would be a native-born, unskilled laborer, who quit school when he was about half-way through the eighth grade. He would come from a home unbroken by the death or separation of his parents, and would exhibit a mild psychopathic trend. He would have an athletic body build, a mental age of 14 years, 2 months,[1] an educational grade status (Stanford Achievement) of 6.7, and a score of 12 atypical responses on the Woodworth Personal Data Sheet.

Since this particular report concentrates on the age factor, a more detailed discussion of the age of the selected individuals is necessary. The range was from 17 to 77 years, with an average of 33.4 and a median of 32.7 years. The latter compares quite favorably with the median age of 32.3 recorded for all male admissions to the various Federal penal and correctional institutions for the fiscal year, July 1, 1935, to June 30, 1936 (*2*). Therefore, as far as age is concerned the group selected is fairly representative of all Federal prisoners, with the possible exception of those housed in the two reformatories, where the average age of committed individuals is considerably lower, 25.9 years at the U. S. Industrial Reformatory, Chillicothe, Ohio, for instance (*2*). However, 23.1 percent of the selections were under

[1] The tests used were Army Alpha and Beta.

25 years of age, and 6.5 percent were 19 years of age, or under. The proportion of younger men is, therefore, sufficient to make comparative observations possible. If any weakness exists, it is more likely to be in the upper extreme, there being only 1.8 percent individuals 60 years of age, or over, hardly sufficient to justify conclusions regarding the effects of senility on Rorschach Test performance. A graphic presentation of the comparative distribution of ages for the

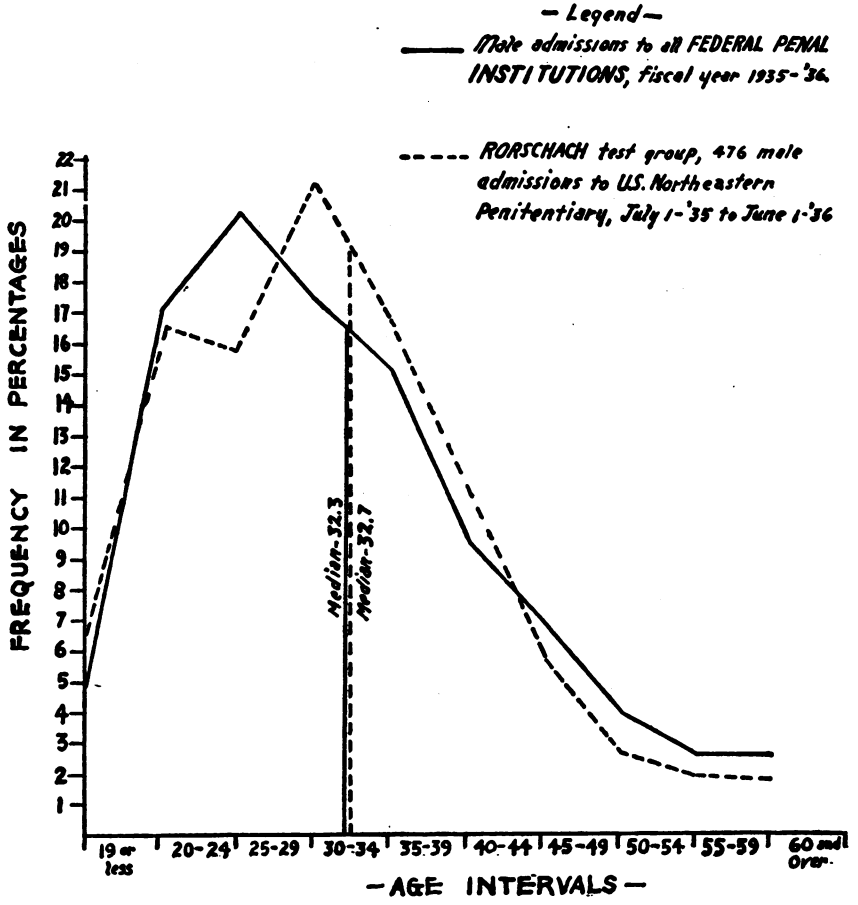

FIGURE 1.—Comparative distribution of ages.

male admissions to all institutions and for the test group will be found in figure 1.

THE PROCEDURE

As the name implies, the Rorschach Test consists of a series of 10 symmetrical ink blots, 5 of which are simple variations of grey and black, 2 have a splotch of red color added, and 3 are multicolored. These cards are shown to the subject, one at a time, with the query,

"What do you see? What can it be?" As a general rule there is no limit to the number of responses that may be given, nor to the time taken by the subject for each picture. Löpfe, however, urges a limit of seven responses for each card, and Hertz advocates a time limit of 2 minutes (*1*). The test is easy to administer and rarely fails to arouse the interest of the subject, but it is difficult to score, chiefly because of its reliance upon subjective interpretation. The responses are customarily classified according to the following general categories:

(1) Whether the whole or a part of the figure determines the answer.

(2) Whether shape, color, motion, or combinations of these can be detected as attributes of the response.

(3) Whether the concept is animal, parts of animals, human figures, parts of human figures, landscapes, objects, and so forth.

(4) Whether the reply is original or is frequently given by other individuals.

(5) Whether the subjects see the picture as a whole first and then proceed to details, or vice versa.

(6) Whether general or detail responses alone are given.

In this investigation the Rorschach Test was treated as essentially an association test in which the stimulus is visual and the response verbal. Accordingly, reaction time was considered an important feature of the procedure. The method of administration was standardized as follows:

(1) The subject and examiner were seated opposite each other with the cards placed face down on the desk between them. The cards were arranged in numerical order, with the first card on top, the numerals appearing to the examiner's left in the upper corner on the back of each card. Thus when the card was turned over toward the subject, it would always be right side up for him.

(2) The examiner had before him a mimeographed sheet for recording responses, reaction time, and any other necessary notations. Of course, he also had a pencil with which to do the recording, and a stop watch. It was found most convenient to hold the watch in the left hand, more or less concealing it by resting the hand on the lap under the desk. When the watch was not in use, it could be easily slipped into the left hand coat pocket. As a matter of fact it did not make very much difference where the watch was placed, because the subject soon became aware that he was being timed.

(3) When all arrangements had been made, the subject was given the following explanation: "This is an experiment. It has nothing to do with your record in the institution. It is not a 'bug' test. In fact, you don't have to go through with it, if you don't want to. Do you have any objection?" If the reply was in the negative (very few refused), the examiner then said: "All right, I'm going to show you these cards (pointing to the cards), one at a time. There are 10 of them. On the other side of each is a picture, a figure. When I show it to you, I want you to tell me what you see; what it could be. Tell me the first thing that pops into your mind."

(4) Following these instructions, the first card was turned over toward the subject, face up, and the stop watch started. As soon as the subject gave his first response, the watch was stopped and the time recorded, together with the response. No time was taken on succeeding responses.

(5) The subject was permitted to give as many spontaneous responses as he cared to, but no prompting was given such as, "What else do you see?" When it appeared that no more answers were forthcoming, the examiner said, "All right, let's try the next one." The first card was then removed and the next in the series was exposed, duplicating the conditions of the first, and so on through the whole series.

After 500 examinations had been given, the primary and secondary responses for each card were tabulated in the order of frequency, using only the key words. For example, if the answer was, "The whole thing looks to me like a bat," bat is obviously the essential element of the reply, the remainder is superficial. In addition, the degree of common response was weighted by assigning an arbitrary value of 100 to the most frequent choice, both primary and secondary, and computing the remainder of them in terms of percentages of the most frequent. For example, if "bat" was given as the first response by 200 individuals and as a secondary response by 50 individuals, actually 250 individuals had given that particular reply to a given card. The last figure is, therefore, the absolute frequency and the one that would be used in assigning its weighted value. Assuming that "bat" has the highest frequency, then its weighted common value would be 100. Carrying the assumed example still further, suppose that, to the same card, 75 persons responded with the word "butterfly" as the first choice and 25 as second choice. The absolute frequency is, therefore, 100 and its weighted value is 100 divided by 250, the absolute frequency of "bat" (then multiplied by 100 to reduce to percent). In other words, the weighted common response score of "butterfly" is 40. The reader is referred to the Appendix for a complete tabulation of all responses given by more than one individual, together with the weighted value of each. Responses given by only one individual were considered as original.

Upon completing this phase of the study, each of the 500 tests was finally scored as follows:

(1) Reaction time for the first response to each card.
(2) The types of responses for each card including:
  (*a*) General, corresponding to Rorschach's G.
  (*b*) Detail, corresponding to Rorschach's D.
  (*c*) Small detail, corresponding to Rorschach's Dd.
  (*d*) Unshaded detail, corresponding to Rorschach's Dzw.
  (*e*) Form, corresponding to Rorschach's F.
  (*f*) Motion, corresponding to Rorschach's B.
  (*g*) Color, corresponding to Rorschach's Fb.
  (*h*) Animal, corresponding to Rorschach's T.
  (*i*) Animal anatomy, corresponding to Rorschach's Td.
  (*j*) Human, corresponding to Rorschach's M.
  (*k*) Human anatomy, corresponding to Rorschach's Md.
  (*l*) Abstraction—no corresponding Rorschach symbol; usually written out as "Abstraction."

(*m*) Other—no corresponding symbol; includes landscapes, objects, plants, etc.
(*n*) Common, or vulgar, corresponding to Rorschach's symbol V.
(*o*) Original, corresponding to Rorschach's symbol O.

(3) Totals for all ten cards according to the classification mentioned above, and in addition:

(*a*) The total number of cards analyzed by the detail to general method.
(*b*) The total number of cards analyzed by the general to detail method.
(*c*) The total number of cards producing general responses alone.
(*d*) The total number of cards producing detail responses alone.
(*e*) The total weighted vulgar score.
(*f*) The total number of secondary responses.

Carrying out the idea of making the test as objective as possible, interpretations of replies were frequently at variance with those commonly accepted. For example, Rorschach considers the reply "two clowns" as a kinesthetic answer, regardless of whether the subject says anything about movement or not (*3*). In the present study the clowns had to dance, bow, or go through some form of activity specifically mentioned by the subject to be designated as a motion or "B" response, otherwise the reply was simply scored as GF+M, "general", "form," plus "human." Naturally this convention cut down on the number of motion responses considerably, but justifiably. How is the examiner to know that the subject sees a dancing clown if he doesn't say so? Similarly, color had to be mentioned, either alone or in combination, to classify answers appropriately. If color, motion, and form were all included in the answer, no attempt was made to determine which was the dominant attribute. It was simply regarded as a compound form-color-motion response, thus reducing subjectivity to a minimum.

It was also found advantageous to record what part of the picture was seen at the time that the test was administered by marking an appropriate symbol for each response. Thus, if the whole picture served as a stimulus, a "G" was inserted, if a detail, "D," and so on. Usually if only a part of the ink blot is taken into consideration, the subject will say something like this, "This thing here looks like a crab-claw," which immediately lets the examiner know that a "detail" answer has been given. Occasionally it is necessary to ask the subject to locate the part of the card to which he is referring.

Originally it was intended to analyze only the test results, but it seemed that the computation of correlations between these results and certain other factors might prove more productive. As a consequence, information was obtained, from the clinical records of those who took the examination, covering age, marital status, offense, education, occupation, national descent, body build, continuity of the home, mental age,[2] educational grade status (Stanford Achievement

[2] The tests used were Army Alpha and Beta.

Test), the number of incorrect responses given on the Woodworth Personal Data Sheet, and psychiatric diagnosis. More data might have been included, but the limitations of the Hollerith statistical punch card, to which the data were transcribed, prevented any further expansion. As previously explained, 24 cases had to be dropped because of lack of information on one or more of the above factors. All subsequent analyses are, therefore, based on 476 cases instead of 500.

THE RELATIONSHIP OF AGE TO REACTION TIME

The relationship of age to reaction time was approached from two angles: First, correlation coefficients were computed between age and time; second, critical ratios were determined between the average age of individuals with a reaction time of 20 seconds, or over, and the average age of those with a reaction time under 20 seconds. The results for each card are presented in table 1.

TABLE 1.—*Correlations between reaction time and age on the Rorschach Test, together with critical ratios between reaction times of 20 seconds, or over, and those under 20 seconds*

Card number	Coefficient of correlation	P. E. of coefficient	Group A [1]		Group B [2]		Critical ratio
			Number	Average age	Number	Average age	
I	.044	.030	32	35.468	444	33.277	.146
II	−.009	.031	110	33.318	366	33.456	.009
III	−.026	.031	108	35.768	368	33.030	.256
IV	−.080	.030	82	33.902	394	33.325	.038
V	.023	.031	46	34.348	430	33.326	.072
VI	−.081	.030	191	32.081	285	34.324	.158
VII	−.034	.030	242	32.913	234	33.953	.074
VIII	−.039	.030	30	32.833	446	33.464	.048
IX	−.051	.030	239	33.148	237	33.702	.038
X	.045	.030	74	34.189	402	33.283	.066

[1] Group A includes individuals with a reaction time of 20 seconds, or over.
[2] Group B includes individuals with a reaction time under 20 seconds.

A study of table 1 reveals immediately that there is no statistically significant relationship between age and reaction time. The coefficients of correlation are less than four times the probable error in all instances. Likewise, the critical ratios are all less than 1.96, the lower limit of significance when N is 476, according to Fisher's test (*4*). Furthermore, the limit is still higher as the frequency diminishes.

RELATIONSHIP OF AGE TO TYPE OF RESPONSE

The relationship of age to primary common and original responses was analyzed by the critical ratio method, but failed to reveal anything of statistical importance, as may be readily perceived by the data in table 2. Since it would be impracticable to tabulate all the critical ratios computed, only the highest ratios for each card are

presented. Despite the lack of mathematical significance, it is interesting to note that the older men tend to give original responses and the younger men seem to show partiality toward the word "butterfly," wherever such a concept is applicable.

TABLE 2.—*Critical ratios for primary original and common responses, showing the greatest age differences on the Rorschach Test*

Card number	Responses showing greatest age differences						Critical ratio
	Highest average age			Lowest average age			
	Response	Number	Average age	Response	Number	Average age	
I	Original	42	36.071	Butterfly	136	32.757	.246
II	do	53	35.519	do	93	30.672	.334
III	do	90	34.222	do	11	27.954	.526
IV	Animal skin	86	36.046	Nothing	84	31.744	.316
V	Nothing	36	36.111	Butterfly	166	32.801	.252
VI	Original	65	35.077	Bear skin	22	28.090	.522
VII	do	79	36.551	Nothing	265	32.405	.300
VIII	do	61	34.385	Butterfly	10	32.500	.150
IX	do	91	35.137	do	11	26.591	.614
X	do	51	36.618	Rabbit's head	29	29.225	.744

The relationship of age to type of response was further investigated by computing critical ratios for various descriptive formulae typifying the primary responses to each card. For example, the word "bat," given in reply to the first card, is a general response, since it is dependent upon the shape of the whole figure. It is also an animal reply. Accordingly, the formula is GFA., meaning "general," "form," "animal" (form, because the shape of the figure provides the chief stimulus). Using this convention, the older men appear to have a fairly consistent, but statistically insignificant, tendency to choose the more unusual type of replies. One would expect such an observation, since the mature individuals tend to give original responses whose descriptive formulae are likely to differ from those of vulgar answers. The highest critical ratios obtained for each card are shown in table 3.

TABLE 3.—*Critical ratios for responses to Rorschach Test classified by representative formulae in comparison with age*

Card number	Formulae of responses showing greatest age differences						Critical ratio
	Highest average age			Lowest average age			
	Formula[1]	Number	Average age	Formula[1]	Number	Average age	
I	D. F. HA.	15	37.500	G. F. A.	358	32.947	.308
II	G. F. M. A.	17	38.676	D. F. A.	82	32.256	.486
III	G. F. H.	186	35.295	D. F. HA.	50	31.700	.241
IV	G. F. A.	55	34.591	N.	84	31.744	.211
V	N.	36	36.111	G. F. A.	377	33.189	.218
VI	D. F. HA.	10	36.500	N.	214	32.406	.236
VII	D. F. HA.	17	36.234	N.	265	32.405	.314
VIII	D. F. HA.	37	36.148	D. F. A.	355	32.993	.212
IX	D. F. HA.	57	35.921	D. F. AA.	41	32.774	.228
X	D. F. HA.	13	39.807	D. F. A.	297	32.415	.524

[1] Key to formulae: G.=general; D.=detail; F.=form; M.=motion; A.=animal; AA.=animal anatomy; H.=human; HA.=human anatomy; N.=nothing or no response.

Color, motion, unshaded detail, and small detail replies were so few in number that it was found impractical to make a study of these factors by individual card. This particular phase of the investigation will therefore be taken up later in connection with total scores.

RELATIONSHIP OF AGE TO ANALYTICAL METHOD

It seems that delinquents, as a whole, analyze the cards either by giving generalizations alone or details alone. However, those who proceed from general to detail observations, or vice versa, again tend to be the more mature individuals, but not to the point of mathematical significance. A coefficient of correlation of .115 $\pm$.030 was obtained between the age and the number of cards interpreted by the general to detail method. An almost identical correlation coefficient, .119 $\pm$.030, was determined between the age and the number of cards construed by the detail to general method. There is, apparently, no correlation between age and the number of cards analyzed by generalizations or details alone, the coefficients being .018 $\pm$.031 and .013 $\pm$.031, respectively.

RELATIONSHIP OF AGE TO TOTAL SCORES

The coefficients of correlation between age and the various total scores failed to reveal any statistically significant findings. However, just as in the case of the individual cards, there is a directional tendency for mature men to give original responses and for the younger men to give responses in common. The weighted common score brings this out to a little better advantage than the unweighted, as indicated by the slightly higher correlation coefficient. Of course, this difference is not sufficient to recommend the use of weighted common scores. The older men also tend to give a greater number of secondary responses, which, in turn, means that they are more likely to have higher total scores on all succeeding categories. This is particularly noticeable for the total human and for the total other responses, and least noticeable for total animal, abstract and unusual responses. The coefficients of correlation are presented in table 4.

TABLE 4.—*Relationship of age to total scores on Rorschach Test*

Total scores	Coefficient of correlation		Total scores	Coefficient of correlation	
	r	*P. E.* of *r*		*r*	*P. E.* of *r*
Common (or vulgar), unweighted	−.022	.031	Color	.104	.030
Common (or vulgar), weighted	−.130	.030	Animal	.000	.031
Original	.191	.030	Animal anatomy	.096	.030
Secondary	.156	.030	Human	.159	.030
General	.118	.030	Human anatomy	.098	.030
Detail	.012	.031	Abstract	.027	.031
Form	.125	.030	Other	.149	.030
Motion	.077	.030	Unusual [1]	.014	.031

[1] Small details, unshaded details, etc.

Critical ratios were also computed between the average age of individuals giving motion, color, abstract, and unusual responses and the average age of those who did not give such responses, on the chance that this procedure might bring out some variations of statistical significance. It failed to do so. The average age of the 68 individuals who gave motion responses is 35.000 years, and of those who did not, 33.162 years, yielding a critical ratio of .136. The average age of the 28 individuals who gave color responses is 36.428 and of those who did not, 33.236, yielding a critical ratio of .224. As for the unusual and abstract responses the differences in average age (between those who gave such responses and those who did not) are so slight as to be negligible, viz, .535 years in the first instance and .390 years in the other, with critical ratios of .034 and .028, respectively. Only 28 individuals gave unusual responses and 43 gave abstract answers.

SUMMARY

1. This is the first of a series of articles dealing with the relationship of various personal factors to the Rorschach Test as applied to 476 delinquents admitted to the U. S. Northeastern Penitentiary from July 1, 1935, to June 1, 1936.

2. The present study deals with the relationship of age to Rorschach Test results.

3. As far as delinquents are concerned, the age factor within the range of 17 to 77 years is of no statistical significance in Rorschach Test performance.

4. Certain sub-significant tendencies do exist, such as the inclination for older men to choose original responses and for the younger men to select vulgar replies. The older men also tend to give more secondary, form, human, and miscellaneous responses (inanimate objects, botanical terms, etc.) than the younger subjects.

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APPENDIX

COMMON RESPONSES AND WEIGHTED VALUES

NOTE.—Any response given by two or more individuals to a given card was considered as common (or vulgar). The degree of common response was determined by combining both primary and secondary choices of similar responses to get the absolute frequency. The word having the highest absolute frequency was given an arbitrary value of 100. The remainder of the values were computed as percentages of the absolute frequency of the response having the assigned value of 100. Thus, for card number 1, the most frequent choice was the word "bat." It was given as the first response by 189 individuals, and as a secondary choice by 52. The absolute frequency is, therefore, 241, and the weighted score value 100. The next most frequent was "butterfly," given as a primary reply by 145 subjects, and as a secondary by 48. The absolute frequency is, consequently, 193, which is 80 percent of 241, the absolute frequency for the word "bat." The weighted value is, therefore, 80. Decimal points were disregarded in calculating the percentages. Below are listed the common responses for each card, in alphabetical order, together with their weighted values.

CARD NO. I

Aeroplane	1	Bugs	1	Legs, pair of	1
Animal	1	Butterfly	80	Lobster	1
Bat	100	Clouds	1	Map	6
Bat, flying	1	Crab	5	Map of U. S	1
Bear	2	Dog	1	Moth	3
Beetle	1	Eagle	4	Nothing	19
Bird	5	Emblem	1	Skeleton, human	2
Blot	1	Flower	1	Skin, animal	1
Blot, Ink	1	Fly	1	Skin, bear	1
Body, lower part of	1	Hide	1	Tree	1
Body, part of human	2	Insect	2	Turtle	1
Bone, pelvic	1	Island	1	Woman, shape of	2
Bug	2	Leaf	3	X-ray	1

CARD NO. II

Animal	4	Cat, face of	2	Heads of two dogs	3
Animals, two	9	Cave	2	Hide of an animal	3
Bat	6	Clowns, two	7	Hole in the ground	3
Bear	8	Crab	2	Lamp	3
Bears, two	95	Dog	3	Map	2
Bears, two dancing	3	Dogs, two	10	Men, two	3
Bears, two fighting	3	Dogs, two, nosing each other	2	Moth	3
Bears, two, with snouts together	2	Elephant	3	Nothing	100
Bears, two, standing together	9	Elephants, two	3	Penis, head of*	3
Bird	4	Face	3	Rabbit	3
Body, human	3	Faces, some	3	Rabbits, two	2
Body, part of	5	Fly	2	Rectum*	5
Bones, set of, pelvic	2	Head, dog's	3	Skin of bear	4
Butterfly	95	Heads, bear	3	Vagina, woman's*	2
		Heads, dogs'	3		

CARD NO. III

Animal	3	Fish	1	Men, two (sketch of)	2
Bat	1	Frog	2	Men, two (at a table)	1
Bird	4	Gaston and Alphonse	1	Monkey	2
Birds, two	9	Guys, two	1	Monkeys, two	13
Body, part of	3	Human beings	1	Nothing	79
Body, lower part of	1	Icicles	1	Pelvis	3
Bones	2	Insect	1	People, two	10
Boys, two colored	2	Kidneys	1	Persons	1
Bow tie	2	Ladies, two	1	Person, inside of	1
Butterfly	14	Lion and tail	1	Skeleton, human	18
Cartoon	2	Lungs, pair of	4	Shines, two	1
Chest, X-ray of	1	Lungs, picture of	2	Something	1
Clowns, two	6	Man	5	Spider	1
Crab	5	Men, two	100	Spine	3
Dogs	1	Men, two (like a cartoon)	3	Stomach	1
Face	1	Men, two funny	2	Stomach, lower part of	1
Feet, animal's	1	Men, two (pulling a crab apart)	1	Turkey	1
Feet, woman's	1			Turkeys	1

* Includes unprintable synonyms.

CARD NO. IV

Animal	2	Fur of animal	1	Rug, bear	1
Back of man	1	Head of buffalo	2	Shadow	1
Bat	6	Head, snail's	1	Skin	13
Bird	1	Hide	100	Skin, animal	33
Bone, back	1	Hide of animal	25	Skin of animal being dried	1
Bug	4	Hide of bear	3	Skin of animal hung up to dry	1
Butterfly	9	Hide from fur-bearing animal	1	Skin, bear	13
Caterpillar	2	I don't know anything	1	Skin of fox	1
Fish	7	Insect	4	Skin of lions	2
Fish, devil	2	Monkey	1	Skin, tiger	2
Fish, jelly	1	Nothing	63	Spine	4
Fly	2	Pelt	1	Tree	2
Frog	2	Pelt of animal	6	Tree, stump of	2
Fur	1	Rug	3	X-ray	1

CARD NO. V

Animal	2	Eagle	5	Moth	15
Bat	83	Eagle in flight	1	Nothing	17
Bat, big	1	Face	1	Rabbit	1
Bat, flying	3	Faces	1	Skin	3
Bird	12	Fly	2	Skin of animal	3
Bird, flying	3	Hide	8	South America	1
Bug	1	Insect	3	Spider	1
Bug, flying	1	Leaf	1	Wings, pair of	1
Butterfly	100	Leg, cow's	1		

CARD NO. VI

Animal	2	Fish, craw	1	Nothing	100
Back, some one's	1	Fish, deep sea	1	Pelt, animal	1
Bat	4	Frog	1	Rug	2
Bear	1	Head of animal	1	Skin	5
Bug	1	Head, snake's	2	Skin, animal	18
Butterfly	7	Hide	32	Skin, bear	12
Caterpillar	1	Hide of animal	7	Skin, hung for drying	1
Crab	5	Hide, bear	1	Spider	1
Dog	1	Hide, drying	1	Spine	1
Face	1	I don't know what it is	2	Turtle	1
Fish	2	Insects	1	Worm	1

CARD NO. VII

Bird	1	Head, wolf's	1	Pelvis	1
Bridge	1	Heads, dogs'	1	People	1
Bug	1	Heads of two women	1	Rabbits, two facing each other	1
Butterfly	7	Hide	1	Skin, torn	1
Cloud	2	Hide of animal	1	Smoke	1
Clouds	27	Ice, sheets of	1	Snow	1
Comic sheet	1	Islands	2	Stomach	1
Dogs, two	1	Land surrounded by water	1	Tail	1
Face, animal's	1	Leg, hind of rabbit	1	Tails of animals	1
Face, ape's	1	Legs, rabbit	1	Vagina	1
Face, dog's	1	Lungs	1	Women, two	3
Faces	5	Map	3	Women, two, old	2
Faces, false	1	Monkey	1	X-ray	1
Faces, two	1	Mountain	1		
Head of animal	1	Nothing	100		

CARD NO. VIII

Anatomy, part of human	1	Butterflies, two	1	Nothing	7
Animal	5	Chest, human	1	Opossums	1
Animal on the side	1	Chest, X-ray of	1	Peak, top of	1
Animals	3	Coyote	1	Person, inside of	1
Animals jumping	1	Dog	1	Rat	1
Animals, two	100	Dogs, two	1	Rats, two	6
Animals, two colored	1	Faces	2	Ribs	7
Back bone	5	Flower	2	Rocks	1
Bear	2	Foxes, two	2	Rodents	1
Bears	2	Head, animal	1	Sheep	1
Bears, two	14	Heads, frog	1	Shoulders, two	1
Bears, two polar	1	Heart	1	Skeleton	5
Beavers, two	1	Insects	1	Skeleton, part of	1
Birds, two	1	Kidneys	1	Spine	17
Body, diagram of	1	Lions	1	Squirrel	1
Body, inside of human	2	Lions, two	1	Squirrels, two	1
Body, human	1	Lizards, two	1	Stomach, inside of	1
Body, part of	2	Lungs	1	Tiger	1
Body, X-ray of	1	Man, skeleton of	1	Tree	8
Bones	1	Men, two	1	Wolves, two	2
Buffalo	1	Mice, two	1	X-ray	2
Bulls, two	1	Mountain	6		
Butterfly	11	Muskrats, two	1		

CARD NO. IX

Anatomy, human	1	Face, someone's	1	Mountain	1
Animal	8	Faces, animal	1	Nothing	100
Animal, water	1	Flowers	2	Person, inside of	3
Animals, two	1	Head, alligator	2	Rectum	2
Antlers, deer	10	Head, deer	3	Rectums, two	1
Back bone	2	Head, man's	1	Reindeer	1
Body, human	1	Head, moose	1	Rocks	1
Body, part of human	1	Head, sheep's	1	Sheep	1
Body, lower part of	1	Heads, animal	1	Skeleton	1
Body, X-ray of	1	Heads, two	3	Spine	3
Butterfly	6	I don't know	1	Stomach	1
Cloud	1	Kidneys	2	Tree	1
Clouds	3	Lungs	1	Trees	1
Colors, two	2	Man	1	Water	2
Deer	1	Map	1	X-ray	2
Dog	1	Map of Alaska	1		
Face, person's	1	Men, standing together	1		

CARD NO. X

Animal	4	Dogs, two	1	Moose	1
Animal, deep sea	1	Face	2	Nothing	49
Animal, jumping	1	Face, rabbit's	2	Octopus	2
Animals	8	Faces	2	Pelvis	1
Animals, sea	2	Fish	4	Pole	1
Animals, two	3	Fish, craw	3	Rabbit	9
Beetle	2	Fish, sea	2	Roots, tree	2
Beetles	1	Flowers	10	Sheep	3
Birds	5	Goat	1	Skeleton	2
Birds, two	3	Goat with whiskers	2	Snakes	1
Body, human	1	Grasshopper	3	Spider	14
Body, part of	2	Grasshoppers	3	Spiders	81
Back bone	1	Head, animal	1	Spine	6
Bone, neck	1	Head, deer	1	Spine, part of	1
Bugs	9	Head, goat	3	Squirrels, two	1
Butterfly	4	Head, rabbit's	35	Tree	2
Caterpillar	6	Horse, sea	2	Trees	1
Caterpillars	5	Insect	9	Tree trunks	1
Cave	1	Insects	25	Weed, sea	3
Cherries, two	1	Insects, two	3	Wish-bone	2
Crab	9	Lions, two	1	Wish-bone of a chicken	1
Crabs	100	Lobster	4	Worm	2
Crabs, two	7	Lobsters	5	Worm, tomato	1
Deer	7	Lungs	1	Worms	4
Dog	2	Men, two	2	X-ray	2

MENTAL DEFECTIVES AND EPILEPTICS IN INSTITUTIONS IN THE UNITED STATES, 1936

The accompanying summary of the results of the 1936 census of mental defectives and epileptics in institutions in the United States primarily for these classes of patients is taken from data issued by the Bureau of the Census. The figures are preliminary and are subject to possible correction later.

Movement of patient population.—Table 1 shows, for 1936, the movement of the patient population, by sex, in institutions for mental defectives and epileptics, that is, the number of patients at the beginning of the year, the number of admissions and of separations during the year, and the number present at the end of the year. Separate figures are given for State, city, and private institutions.

The figures presented in this table show that, in 1936, State institutions cared for a very large proportion of the total number of these patients in institutions conducted especially for these classes. The fact that the proportion of the total number of patients on the books of State institutions at the beginning and at the end of the year, respectively, was so much larger than the proportion admitted to or

leaving these institutions during the year indicates that, as a rule, the patients remain in State institutions much longer than in either city or private institutions. It is also probable that incurables form a much larger proportion of the patients admitted to State institutions than of those admitted to city and private hospitals for the care of these patients.

Significance of the data.—These statistics are of value chiefly in showing what provision has been made for the treatment of mental defectives and epileptics in special institutions, the types of these patients being cared for, and the relative importance of the different types. It should be clearly recognized, however, that the statistics relating to patients in institutions primarily for mental defectives and epileptics do not furnish even an approximate measure of the total number of such patients either in the country as a whole or in the several States. The institutions established for the care of mental defectives and epileptics contain only a small part of the total number of such persons; the vast majority of them live at large in the community. Also, many are inmates of prisons and reformatories, others are in almshouses, and some are in hospitals for mental patients.

TABLE 1.—*Movement of patient population in institutions for mental defectives and epileptics, by class of institution, 1936*

Class of patients	Number				Percent of total		
	Total	State institutions	City institutions	Private institutions	State institutions	City institutions	Private institutions
Patients on books at beginning of year	111,559	106,197	818	4,544	95.2	0.7	4.1
Male	58,465	55,692	431	2,342	95.3	.7	4.0
Female	53,094	50,505	387	2,202	95.1	.7	4.1
In institution	96,997	91,756	818	4,423	94.6	.8	4.6
On parole or otherwise absent	14,562	14,441	----	121	99.2	----	.8
Admissions during year	12,525	11,565	56	904	92.3	.4	7.2
Male	6,952	6,453	32	467	92.8	.5	6.7
Female	5,573	5,112	24	437	91.7	.4	7.8
First admissions	10,765	9,938	34	793	92.3	.3	7.4
Readmissions	831	756	22	53	91.0	2.6	6.4
Transfers from other institutions for mental defectives and epileptics	929	871	----	58	93.8	----	6.2
Separations during year	9,510	8,481	251	778	89.2	2.6	8.2
Male	5,711	5,191	126	394	90.9	2.2	6.9
Female	3,799	3,290	125	384	86.6	3.3	10.1
Discharges	5,353	4,785	70	498	89.4	1.3	9.3
Transfers to other institutions for mental defectives and epileptics	1,296	972	171	153	75.0	13.2	11.8
Deaths in institution	2,808	2,671	10	127	95.1	.4	4.5
Deaths while on parole	53	53	----	----	100.0	----	----
Patients on books at end of year	114,574	109,281	623	4,670	95.4	.5	4.1
Male	59,706	56,954	337	2,415	95.4	.6	4.0
Female	54,868	52,327	286	2,255	95.4	.5	4.1
In institution	99,374	94,212	623	4,539	94.8	.6	4.6
On parole or otherwise absent	15,200	15,069	----	131	99.1	----	.9

In collecting the statistics for 1936, separate schedules were used for reporting mental defectives and epileptics. In previous years

they were reported on the same schedules, and some patients were reported as both mentally defective and epileptic. This combination is not used for 1936, an entire separation of the two classes being made according to criteria for determining the primary cause of admission to the institution, submitted by committees of the American Psychiatric Association and the American Association on Mental Deficiency.

Table 2 shows the movement of patient population in State institutions, for both classes for 1936 and 1935, and for each class separately, by sex, for 1936. Most of the institutions show a few cases reported as neither mentally defective nor epileptic. There was a slight decrease in the number of admissions to the institutions during 1936 as compared with 1935; but as there was also a decrease in the number of discharges, the number of patients on the books at the end of the year exceeded the number in 1935.

The table shows that the number of mental defectives greatly exceeded the number of epileptics in institutions, and in practically all of the items for both classes the number of males exceeded the number of females. Of the patients on books at the end of the year, a higher percentage of the mental defectives were on parole (14.4) than of the epileptics (10.1). Of the separations during the year, deaths in the institution showed a higher percentage of the epileptics (47.3) than of the mental defectives (27.3).

TABLE 2.—*Movement of patient population in State institutions for mental defectives and epileptics, by sex: 1936 and 1935*

Class of patients	Total		Mental defectives, 1936			Epileptics, 1936			Neither mentally defective nor epileptic, 1936
	1936	1935	Total	Male	Female	Total	Male	Female	
Patients on books at beginning of year	106,197	108,227	86,783	45,344	41,439	17,813	9,666	8,147	1,601
In institution	91,756	89,760	74,508	37,878	36,630	15,944	8,422	7,522	1,304
On parole or otherwise absent	14,441	13,467	12,275	7,466	4,809	1,869	1,244	625	297
Admissions during year	11,565	12,067	9,009	4,986	4,023	2,350	1,369	981	206
First admissions	9,938	10,299	7,656	4,072	3,584	2,099	1,218	881	183
Readmissions	756	765	513	304	209	236	146	90	7
Transfers from other institutions for mental defectives and epileptics	871	1,003	840	610	230	15	5	10	16
Separations during year	8,481	8,564	6,243	3,872	2,371	1,968	1,202	766	270
Discharges	4,785	4,911	3,576	2,169	1,407	998	626	372	211
Transfers to other institutions for mental defectives and epileptics	972	1,018	921	662	259	30	17	13	21
Deaths in institution	2,671	2,547	1,704	1,013	691	931	552	379	36
Deaths while on parole	53	88	42	28	14	9	7	2	2
Patients on books at end of year	109,281	106,730	89,549	46,458	43,091	18,195	9,833	8,362	1,537
In institution	94,212	92,329	76,651	38,746	37,905	16,352	8,883	7,769	1,209
On parole or otherwise absent	15,069	14,401	12,898	7,712	5,186	1,843	1,250	593	328

FIRST ADMISSIONS

The term "first admissions" is here used to designate persons admitted to institutions for mental defectives and epileptics for the first time. Of the 10,765 first admissions to such institutions during 1936, 9,938, or 92.3 percent, were admissions to State institutions. Tables 3, 4, and 5 relate to first admissions to State institutions.

Table 3 shows, by sex, the number of first admissions to State institutions during 1936, distributed by States and classified as to whether mentally defective or epileptic.

The number of first admissions classified as mentally defective exceeded the number of epileptics in each of the 29 States showing both classes. Sixteen States and the District of Columbia reported no epileptics admitted to State institutions during 1936. Arizona, Arkansas, and Nevada have no institutions primarily for mental defectives and epileptics.

TABLE 3.—*First admissions to State institutions, by class and sex, by States, 1936*

State	Mental defectives			Epileptics		
	Total number	Male	Female	Total number	Male	Female
United States	7,656	4,072	3,584	2,099	1,218	881
New England:						
Maine	17	9	8	----	----	----
New Hampshire	42	29	13	----	----	----
Vermont	22	8	14	----	----	----
Massachusetts	452	242	210	99	57	42
Rhode Island	40	14	26	3	1	2
Connecticut	45	22	23	13	5	8
Middle Atlantic:						
New York	1,819	979	840	385	218	167
New Jersey	290	122	168	173	100	73
Pennsylvania	298	135	163	80	70	10
East North Central:						
Ohio	315	165	150	225	118	107
Indiana	187	93	94	114	71	43
Illinois	567	304	263	166	94	72
Michigan	509	319	190	125	80	45
Wisconsin	227	124	103	30	18	12
West North Central:						
Minnesota	200	96	104	61	21	40
Iowa	171	104	67	51	34	17
Missouri	102	56	46	40	17	23
North Dakota	71	44	27	----	----	----
South Dakota	51	34	17	9	5	4
Nebraska	163	90	73	27	18	9
Kansas	124	70	54	112	62	50
South Atlantic:						
Delaware	23	14	9	----	----	----
Maryland	126	68	58	----	----	----
District of Columbia	39	21	18	----	----	----
Virginia	173	73	100	56	33	23
West Virginia	32	13	19	13	9	4
North Carolina	51	33	18	----	----	----
South Carolina	34	18	16	----	----	----
Georgia	36	17	19	----	----	----
Florida	17	9	8	4	3	1
East South Central:						
Kentucky	67	39	28	----	----	----
Tennessee	34	22	12	1	----	1
Alabama	33	27	6	----	----	----
Mississippi	25	15	10	----	----	----
West South Central:						
Louisiana	124	82	42	38	21	17
Oklahoma	158	94	64	----	----	----
Texas	142	40	102	170	96	74

TABLE 3.—*First admissions to State institutions, by class and sex, by States, 1936*—Continued

State	Mental defectives			Epileptics		
	Total number	Male	Female	Total number	Male	Female
Mountain:						
Montana	36	17	19			
Idaho	37	19	18	9	6	3
Wyoming	46	25	21	16	10	6
Colorado	51	28	23	6	3	3
New Mexico	8	4	4			
Utah	75	44	31	5	5	
Pacific:						
Washington	82	41	41	24	16	8
Oregon	108	57	51			
California	387	193	194	44	27	17

Mental status.—According to the classification of mental defectives by mental status here used, an "idiot" is a mentally defective person having a mental age of not more than 35 months, or, if a child, an intelligence quotient of less than 25; an "imbecile" has a mental age of between 36 and 83 months, inclusive, or an intelligence quotient between 25 and 49; and a "moron" has a mental age of between 84 and 143 months, inclusive, or an intelligence quotient between 50 and 74.

As the mental defectives admitted to institutions consist largely of those who are unable to make adequate social adjustments, the proportions of idiots and of imbeciles among the first admissions of mental defectives are probably much higher than among the total mental defectives.

TABLE 4.—*First admissions of mental defectives to State institutions, by sex and mental status, 1936*

Mental status	Number			Percent distribution		
	Total	Male	Female	Total	Male	Female
Total	7,656	4,072	3,584	100.0	100.0	100.0
Moron	3,606	1,844	1,762	47.1	45.3	49.2
Imbecile	2,389	1,273	1,116	31.2	31.3	31.1
Idiot	1,126	631	495	14.7	15.5	13.8
Unclassified	535	324	211	7.0	8.0	5.9

Type of epilepsy.—The classification of epilepsy as symptomatic and idiopathic is that of the American Psychiatric Association, "symptomatic" signifying cases in which the attacks result from a definite underlying disease, and "idiopathic" signifying attacks resulting from unknown causes. It may be noted that epileptics of the idiopathic type far outnumbered those of the symptomatic type among first admissions to State institutions.

TABLE 5.—*First admissions of epileptics to State institutions, by sex and type of epilepsy, 1936*

Type of epilepsy	Number			Percent distribution		
	Total	Male	Female	Total	Male	Female
Total	2,099	1,218	881	100.0	100.0	100.0
Symptomatic	579	350	229	27.6	28.7	26.0
Idiopathic	1,281	726	555	61.0	59.6	63.0
Unclassified	239	142	97	11.4	11.7	11.0

DEATHS DURING WEEK ENDED MAY 7, 1938

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

	Week ended May 7, 1938	Corresponding week, 1937
Data from 87 large cities of the United States: [1]		
Total deaths	8,125	[2] 8,489
Average for 3 prior years	9,017	
Total deaths, first 18 weeks of year	158,609	178,339
Deaths under 1 year of age	529	[2] 531
Average for 3 prior years	536	
Deaths under 1 year of age, first 18 weeks of year	9,756	10,988
Data from industrial insurance companies:		
Policies in force	68,836,988	69,591,303
Number of death claims	12,167	13,214
Death claims per 1,000 policies in force, annual rate	9.2	9.9
Death claims per 1,000 policies, first 18 weeks of year, annual rate	10.0	11.3

[1] Figures for the weeks ended Apr. 23 and 30, 1938, include data for 87 cities, except as to the items "total deaths" and "deaths under 1 year of age" for the corresponding weeks of 1937, which are for 86 cities.

[2] Data for 86 cities.

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

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937
New England States:								
Maine	4	1	------	1	133	3	0	0
New Hampshire	0	0	------	------	61	28	0	0
Vermont	0	3	------	------	133	------	0	0
Massachusetts	2	1	------	------	361	763	1	6
Rhode Island	0	0	------	------	1	74	0	0
Connecticut	5	7	1	1	80	333	1	0
Middle Atlantic States:								
New York	38	41	[1] 4	[1] 7	3,754	1,664	4	6
New Jersey	18	14	7	4	934	1,814	2	0
Pennsylvania	28	16	------	------	2,925	1,530	4	3
East North Central States:								
Ohio	5	24	------	57	1,801	2,096	2	5
Indiana	9	13	1	11	670	609	0	5
Illinois [2]	36	36	8	21	1,599	296	3	3
Michigan [2]	15	8	------	------	3,890	195	1	4
Wisconsin	4	10	32	14	2,833	44	0	0
West North Central States:								
Minnesota	2	4	1	1	239	15	1	3
Iowa	2	4	3	2	348	8	0	0
Missouri	9	21	15	32	437	39	1	3
North Dakota	1	1	15	1	170	2	0	1
South Dakota	2	1	------	------	------	------	2	0
Nebraska	4	4	------	1	215	14	0	4
Kansas	8	2	2	1	462	41	2	0
South Atlantic States:								
Delaware	2	0	------	------	27	28	0	0
Maryland [2 3 4]	6	7	5	8	116	446	2	2
District of Columbia	2	3	------	------	15	104	0	2
Virginia [2]	13	3	------	------	353	496	3	6
West Virginia	3	1	33	20	455	39	1	9
North Carolina [2]	12	18	2	7	1,724	237	2	5
South Carolina	6	6	94	115	169	74	0	2
Georgia [4]	5	8	------	------	282	------	0	4
Florida [4]	8	7	4	------	137	------	0	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937
East South Central States:								
Kentucky	7	2	9	5	286	382	6	11
Tennessee [2]	7	9	19	97	134	98	3	5
Alabama [4]	7	8	35	47	352	11	8	5
Mississippi [2]	7	2	----	----	----	----	0	0
West South Central States:								
Arkansas	10	5	27	50	240	11	1	1
Louisiana	9	12	5	17	13	11	3	1
Oklahoma [5]	0	2	25	14	178	60	0	1
Texas [4]	27	32	159	230	110	758	3	8
Mountain States:								
Montana [2]	1	0	----	----	42	10	0	0
Idaho [2]	0	0	9	35	65	22	0	1
Wyoming [2 6]	0	1	----	----	19	28	0	1
Colorado [6]	22	6	----	----	209	25	3	1
New Mexico	2	1	1	2	14	72	0	0
Arizona	1	6	32	52	19	66	0	0
Utah [2 3]	2	0	----	----	293	40	0	1
Pacific States:								
Washington	0	1	----	----	48	62	0	2
Oregon [2]	6	4	18	30	25	15	0	0
California [4]	24	31	42	76	640	212	3	3
Total	381	386	608	959	27,121	12,870	62	115
First 19 weeks of year	10,035	9,258	40,333	268,978	613,134	153,122	1,542	3,110

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938
New England States:									
Maine	0	0	11	17	0	0	0	0	28
New Hampshire	0	0	21	5	0	0	0	0	1
Vermont	0	0	9	7	0	0	0	0	35
Massachusetts	0	0	423	233	0	0	0	2	134
Rhode Island	0	0	12	48	0	0	0	0	32
Connecticut	0	0	111	169	0	0	1	1	155
Middle Atlantic States:									
New York	0	0	727	910	0	0	8	6	519
New Jersey	0	0	95	241	0	0	3	0	189
Pennsylvania	0	1	293	479	0	0	10	3	162
East North Central States:									
Ohio	1	0	286	501	4	0	14	5	240
Indiana	2	1	80	129	26	21	5	1	6
Illinois [2]	0	1	393	628	39	43	17	1	132
Michigan [2]	1	2	398	721	0	9	1	6	296
Wisconsin	0	0	131	285	5	1	0	1	187
West North Central States:									
Minnesota	0	0	149	163	8	21	2	6	12
Iowa	1	0	91	161	20	31	2	0	28
Missouri	0	1	125	24	16	0	2	3	34
North Dakota	0	0	36	23	5	5	0	0	29
South Dakota	0	0	23	40	5	1	0	0	27
Nebraska	0	0	47	76	5	7	0	0	13
Kansas	0	0	83	201	11	9	0	1	149
South Atlantic States:									
Delaware	0	0	7	2	0	0	0	0	15
Maryland [2 5]	0	0	74	33	0	0	7	2	70
District of Columbia	0	0	18	10	0	0	1	0	11
Virginia [2]	0	0	21	18	0	0	6	7	80
West Virginia	0	0	30	48	0	0	5	3	84
North Carolina [2]	2	0	22	22	2	0	8	4	388

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938
South Atlantic States—Con.									
South Carolina	0	0	3	----	0	0	3	1	90
Georgia [4]	0	1	7	9	1	0	5	13	106
Florida [4]	1	0	3	7	0	0	8	2	32
East South Central States:									
Kentucky	1	0	46	36	14	0	0	7	49
Tennessee	0	0	20	17	2	0	3	3	25
Alabama [4]	1	1	6	8	1	0	6	4	57
Mississippi [3]	1	5	5	6	0	0	1	3	----
West South Central States:									
Arkansas	1	0	6	16	2	1	3	1	34
Louisiana	0	0	13	18	0	0	9	14	44
Oklahoma [5]	0	1	18	21	12	1	1	3	36
Texas [4]	1	1	63	93	17	6	12	7	270
Mountain States:									
Montana [2]	1	0	10	17	8	18	1	0	82
Idaho [2]	0	0	3	19	14	1	1	0	10
Wyoming [2 6]	0	0	4	7	0	5	4	0	7
Colorado [6]	0	0	47	24	3	15	2	3	40
New Mexico	1	0	29	21	0	0	0	4	19
Arizona	0	0	5	16	12	0	1	2	24
Utah [2 3]	0	0	21	10	0	0	1	0	60
Pacific States:									
Washington	0	1	25	22	22	6	2	1	145
Oregon [3]	1	0	37	45	19	25	1	1	20
California [4]	0	3	197	177	25	24	14	8	366
Total	16	19	4,284	5,783	298	250	170	129	4,572
First 19 weeks of year	375	395	109,484	129,276	9,805	5,987	2,374	2,119	81,119

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended May 14, 1938, 19 cases as follows: Illinois, 1; Maryland, 3; Virginia, 2; North Carolina, 1; Montana, 2; Idaho, 1; Wyoming, 5; Utah, 1; Oregon, 3.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended May 14, 1938, 25 cases as follows: Maryland, 2; Georgia, 8; Florida, 1; Alabama, 7; Texas, 6; California, 1.
[5] For the week ended May 15, 1937, and subsequently, figures for Oklahoma City and Tulsa are included.
[6] Colorado tick fever, week ended May 14, 1938, 5 cases as follows: Wyoming, 1; Colorado, 4.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
March 1938										
Alaska	0	0	131	----	----	----	0	8	0	2
New Hampshire	0	0	6	----	----	----	0	60	0	0
April 1938										
Idaho	2	3	35	----	77	----	0	44	70	3
Iowa	4	8	11	----	925	----	1	880	196	5
Michigan	10	33	7	1	17,574	----	0	1,934	33	14
New Hampshire	0	0	----	----	----	----	0	42	0	2
New Jersey	3	57	39	1	5,766	----	2	553	0	13
Tennessee	16	22	215	46	1,823	9	2	133	10	9
Wyoming	0	2	----	----	192	----	0	30	9	0

Summary of monthly reports from States—Continued

March 1938

	Cases
Alaska:	
Chickenpox	24
Impetigo contagiosa	7
Mumps	63
Septic sore throat	7
Undulant fever	1
Whooping cough	11

April 1938

	Cases
Chickenpox:	
Idaho	65
Iowa	337
Michigan	1,948
New Jersey	2,667
Tennessee	156
Wyoming	101
Conjunctivitis:	
Idaho	6
Dysentary:	
Iowa (bacillary)	9
Michigan (amoebic)	2
Tennessee (bacillary)	9
Encephalitis, epidemic or lethargic:	
Michigan	2
New Jersey	1
Tennessee	1
German measles:	
Iowa	11
Michigan	350
New Jersey	113
Tennessee	2

April 1938—Continued

	Cases
Hookworm disease:	
Tennessee	1
Jaundice, epidemic:	
Michigan	8
Lead poisoning:	
New Jersey	1
Mumps:	
Idaho	245
Iowa	107
Michigan	1,320
New Jersey	1,445
Tennessee	469
Wyoming	41
Ophthalmia neonatorum:	
New Jersey	13
Tennessee	1
Paratyphoid fever:	
Michigan	1
New Jersey	2
Tennessee	2
Puerperal septicemia:	
Tennessee	2
Rabies in animals:	
Michigan	1
New Jersey	26
Rabies in man:	
Tennessee	1
Rocky Mountain spotted fever:	
Idaho	2
Wyoming	6

April 1938—Continued

	Cases
Septic sore throat:	
Idaho	7
Iowa	15
Michigan	20
New Jersey	26
Tennessee	20
Wyoming	4
Tetanus:	
Tennessee	2
Trachoma:	
Michigan	1
Tennessee	4
Trichinosis:	
New Jersey	2
Tularaemia:	
Tennessee	2
Undulant fever:	
Iowa	5
Michigan	13
New Jersey	6
Tennessee	3
Vincent's infection:	
Idaho	5
Michigan	11
Tennessee	1
Whooping cough:	
Idaho	58
Iowa	100
Michigan	1,272
New Jersey	748
Tennessee	190
Wyoming	64

PLAGUE INFECTION IN GROUND SQUIRREL IN BAKER COUNTY, OREG.

Under date of May 10, 1938, Senior Surg. C. R. Eskey, in charge of plague-suppressive measures, San Francisco, Calif., reported that plague infection had been demonstrated in tissue from one *Citellus oregonus* found dead April 23, 1938, 7 miles northwest of Hereford, Baker County, Oreg.

CASES OF VENEREAL DISEASES REPORTED FOR MARCH 1938

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,946	6.72	307	1.06
Arizona [1]				
Arkansas [2]	1,438	7.02	356	1.74
California	2,432	8.95	1,533	2.49
Colorado	237	2.21	103	.96
Connecticut	256	1.47	141	.81
Delaware	278	10.65	44	1.69
District of Columbia	232	3.70	113	1.80
Florida [3]	2,142	12.83	305	1.83
Georgia	2,314	7.50	367	1.19
Idaho	58	1.18	31	.63
Illinois	2,150	2.73	1,151	1.46
Indiana	373	1.07	54	.16
Iowa [2]	404	1.58	191	.75
Kansas	260	1.39	79	.42

See footnotes at end of table.

Reports from States—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Kentucky	963	3.30	422	1.45
Louisiana	682	3.20	63	.30
Maine [2]	43	.50	49	.57
Maryland	1,252	7.46	333	1.98
Massachusetts	635	1.43	463	1.05
Michigan	1,656	3.43	641	1.33
Minnesota	339	1.28	223	.84
Mississippi	2,780	13.74	2,405	11.89
Missouri	478	1.20	91	.23
Montana [2]	66	1.22	36	.67
Nebraska	59	.43	67	.49
Nevada	62	6.14	32	3.17
New Hampshire	21	.41	14	.27
New Jersey	1,045	2.41	329	.76
New Mexico	147	3.48	34	.81
New York	4,550	3.51	1,792	1.38
North Carolina	3,916	11.21	678	1.94
North Dakota	28	.40	40	.57
Ohio [2]	2,099	3.12	402	.60
Oklahoma [2]	314	1.23	231	.91
Oregon	96	.93	149	1.45
Pennsylvania	1,903	1.87	261	.26
Rhode Island	114	1.67	51	.75
South Carolina [2]	383	2.04	302	1.61
South Dakota	34	.49	21	.30
Tennessee	1,274	4.40	289	1.00
Texas	986	1.60	318	.52
Utah	9	.17	18	.35
Vermont	18	.47	23	.60
Virginia	1,519	5.61	363	1.34
Washington	384	2.32	304	1.83
West Virginia	447	2.40	112	.60
Wisconsin [2]	46	.16	101	.35
Wyoming [2]	3	.13	3	.13
Total	42,871	3.33	15,435	1.20

Reports from cities of 200,000 population or over

Akron, Ohio [1]				
Atlanta, Ga. [1]				
Baltimore, Md	757	9.17	225	2.73
Birmingham, Ala	336	13.67	79	2.80
Boston, Mass	243	3.07	174	2.20
Buffalo, N. Y	144	2.43	71	1.20
Chicago, Ill	1,052	2.95	753	2.11
Cincinnati, Ohio [1]				
Cleveland, Ohio [1]				
Columbus, Ohio	103	3.37	22	.72
Dallas, Tex	470	16.23	79	2.73
Dayton, Ohio [1]				
Denver, Colo	194	6.54	134	4.52
Detroit, Mich	867	5.01	333	1.92
Houston, Tex. [4]	313	9.35	48	1.43
Indianapolis, Ind	38	1.01	36	.95
Jersey City, N. J. [1]				
Kansas City, Mo	81	1.92	4	.09
Los Angeles, Calif	670	4.68	377	2.63
Louisville, Ky	463	14.29	136	4.20
Memphis, Tenn	572	21.42	59	2.21
Milwaukee, Wis. [1]				
Minneapolis, Minn	81	1.66	59	1.21
Newark, N. J	398	8.59	141	3.04
New Orleans, La	49	1.02	40	.83
New York, N. Y	2,974	4.07	1,240	1.70
Oakland, Calif	69	2.28	47	1.55
Omaha, Nebr	35	1.59	14	.64
Philadelphia, Pa. [1]				
Pittsburgh, Pa. [1]				
Portland, Oreg	62	1.98	82	2.61
Providence, R. I	58	2.24	30	1.16

See footnotes at end of table.

Reports from cities of 200,000 population or over—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly cases rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Rochester, N. Y.	64	1.90	43	1.28
St. Louis, Mo.	345	4.13	168	2.01
St. Paul, Minn.	44	1.56	30	1.06
San Antonio, Tex.	143	5.69	69	2.74
San Francisco, Calif.	208	3.10	210	3.13
Seattle, Wash.	182	4.79	132	3.48
Syracuse, N. Y.	91	4.18	27	1.24
Toledo, Ohio [1]				
Washington, D. C. [2]	232	3.70	113	1.80

[1] No report for current month.
[2] Incomplete.
[3] Only cases of syphilis in the infectious stage are reported.
[4] Reported by Jefferson Davis Hospital.
[5] No report during present fiscal year.
[6] Reported by social hygiene clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 7, 1938

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	174	151	55	6,995	711	2,354	21	427	27	1,418	----
Current week	109	89	38	7,470	497	1,649	32	374	37	1,307	----
Maine:											
Portland	0	----	0	2	3	2	0	0	0	8	29
New Hampshire:											
Concord	0	----	0	0	0	1	0	0	0	0	6
Manchester	0	----	0	0	1	4	0	1	0	0	22
Nashua	0	----	0	0	0	0	0	0	0	0	8
Vermont:											
Barre	0	----	0	0	0	0	0	1	0	0	3
Burlington	0	----	0	0	0	0	0	0	0	1	10
Rutland	0	----	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	0	----	2	109	23	113	0	8	2	25	224
Fall River	0	----	0	0	3	4	0	1	0	8	20
Springfield	0	----	0	23	0	5	0	1	0	9	30
Worcester	1	----	0	1	5	20	0	2	0	15	55
Rhode Island:											
Pawtucket	0	----	0	0	0	1	0	3	0	0	22
Providence	0	----	3	0	3	9	0	2	0	16	54
Connecticut:											
Bridgeport	1	----	0	0	0	6	0	0	0	0	28
Hartford	0	----	0	2	2	25	0	1	0	2	48
New Haven	0	1	0	4	1	1	0	0	0	10	34
New York:											
Buffalo	0	----	1	3	13	42	0	5	0	10	154
New York	35	6	2	2,097	95	331	0	76	3	308	1,437
Rochester	0	2	0	22	6	24	0	0	0	1	72
Syracuse	1	----	0	51	3	3	0	0	0	3	53
New Jersey:											
Camden	1	----	0	33	3	5	0	0	0	3	37
Newark	0	----	0	14	6	8	0	6	0	50	101
Trenton	0	----	0	1	5	3	0	4	0	1	44
Pennsylvania:											
Philadelphia	3	13	5	338	35	116	0	29	1	32	493
Pittsburgh	6	5	5	89	10	38	0	9	2	16	148
Reading	0	----	0	3	5	2	0	0	0	0	25
Scranton	0	----	----	10	----	5	0	----	0	0	----

City reports for week ended May 7, 1938—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								
Ohio:											
Cincinnati	3		0	3	7	12	0	6	0	5	106
Cleveland	1	18	0	275	8	55	0	15	4	58	180
Columbus	1	1	1	56	2	11	0	3	0	3	62
Toledo	0		0	123	5	17	0	8	0	8	61
Indiana:											
Anderson	0		1	78	1	2	2	1	0	1	13
Fort Wayne	0		0	12	3	8	0	1	0	1	26
Indianapolis	2		0	286	10	14	0	2	0	0	98
South Bend	0		0	117	0	2	0	0	0	0	8
Terre Haute	0		0	4	0	3	1	0	0	0	24
Illinois:											
Alton	0		0	1	0	4	0	0	0	1	1
Chicago	9	2	0	565	37	202	0	44	5	63	659
Elgin	0		0	9	2	6	0	0	0	3	10
Moline	0		0	4	0	3	0	0	0	1	7
Springfield	0		0	12	0	3	0	0	0	2	21
Michigan:											
Detroit	2		0	588	11	136	1	14	0	105	235
Flint	0		0	133	4	42	0	4	0	19	24
Grand Rapids	0		0	136	0	10	1	0	0	2	26
Wisconsin:											
Kenosha	0		0	67	0	2	0	0	0	0	6
Madison	1		0	247	0	5	0	0	0	14	18
Milwaukee	0		0	93	3	30	0	2	1	63	106
Racine	0		0	267	1	4	0	0	0	9	10
Superior	0		0	7	0	1	0	0	0	0	8
Minnesota:											
Duluth	0		0	5	0	4	0	0	0	7	20
Minneapolis	1		0	199	7	16	7	4	0	3	90
St. Paul	0		0	5	3	15	0	0	0	1	66
Iowa:											
Cedar Rapids	0			8		2	0		0	3	
Davenport	0			1		8	0		0	0	
Des Moines	0		0	12	0	17	8	0	0	0	18
Sioux City	0			40		7	0		0	4	
Waterloo	0			59		4	0		0	7	
Missouri:											
Kansas City	1		2	19	5	14	1	3	0	1	90
St. Joseph	0		0	10	1	0	0	0	0	0	11
St. Louis	8		1	4	5	64	0	13	0	1	168
North Dakota:											
Fargo	0		1	3	1	0	0	0	0	3	9
Grand Forks	0			30		1	0		0	0	
Minot	0		0	7	0	0	2	0	0	1	8
South Dakota:											
Aberdeen	1			0		1	0		0	11	
Sioux Falls	0		0	0	0	0	0	0	0	0	9
Nebraska:											
Lincoln	1			5		4	0		0	2	
Omaha	0		0	197	8	0	0	3	0	0	54
Kansas:											
Lawrence	0		0	37	0	0	0	0	0	0	2
Topeka	0		0	198	0	1	0	0	0	21	13
Wichita	2	1	1	28	3	1	0	0	0	6	18
Delaware:											
Wilmington	0		0	3	1	4	0	0	0	1	26
Maryland:											
Baltimore	0	7	2	23	19	63	0	13	0	43	234
Cumberland	0		0	7	2	0	0	0	0	0	9
Frederick	0		0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	0	2	2	8	9	20	0	7	1	5	180
Virginia:											
Lynchburg	1		0	4	1	3	0	0	0	2	12
Norfolk	0	5	0	36	3	3	0	0	0	2	29
Richmond	2		0	96	7	0	0	1	0	0	53
Roanoke	0		0	8	1	1	0	0	0	4	16
West Virginia:											
Charleston	0		0	1	1	0	0	2	0	0	12
Huntington	1			1		1	0		0	0	
Wheeling	0		0	83	0	3	0	1	1	3	15
North Carolina:											
Gastonia	0			55		0	0		0	3	
Raleigh	0		0	69	1	0	0	0	0	13	5
Wilmington	0		0	32	2	0	0	1	1	24	14
Winston-Salem	1		0	20	0	1	0	0	0	36	12

City reports for week ended May 7, 1938—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								
South Carolina:											
Charleston	1	7	0	2	3	0	0	1	4	0	24
Florence	0	------	0	6	2	0	0	0	0	0	7
Greenville	0	------	0	5	1	0	0	0	0	11	5
Georgia:											
Atlanta	0	8	2	10	13	1	0	4	0	27	85
Brunswick	0	------	0	15	0	0	0	0	0	0	3
Savannah	1	1	0	20	0	2	0	1	0	4	33
Florida:											
Miami	0	2	0	16	2	2	0	0	0	3	26
Tampa	1	1	0	66	1	2	0	1	0	0	26
Kentucky:											
Ashland	0	------	------	3	------	0	0	------	0	1	------
Covington	2	------	0	3	1	1	0	0	1	1	9
Lexington	0	------	0	2	2	2	0	2	0	2	22
Louisville	2	------	0	99	4	11	0	7	0	12	85
Tennessee:											
Knoxville	0	------	0	35	3	5	0	2	0	2	30
Memphis	0	2	1	9	1	3	0	4	2	0	71
Nashville	0	------	0	36	5	8	0	0	0	10	45
Alabama:											
Birmingham	0	4	1	18	6	2	0	4	1	4	74
Mobile	0	------	1	7	3	0	0	2	1	0	------
Montgomery	0	------	------	51	------	0	0	------	0	5	------
Arkansas:											
Fort Smith	0	------	------	2	------	4	0	------	0	0	------
Little Rock	0	------	0	2	3	0	0	1	0	3	6
Louisiana:											
Lake Charles	0	------	0	0	2	0	0	0	0	0	8
New Orleans	7	4	1	7	6	2	1	8	3	1	136
Shreveport	1	------	0	9	4	2	0	0	0	0	30
Oklahoma:											
Oklahoma City	1	------	0	0	6	0	0	1	0	0	52
Texas:											
Dallas	1	1	1	13	7	11	0	3	0	18	84
Fort Worth	0	------	1	1	3	2	0	0	0	12	26
Galveston	0	------	0	0	1	0	0	1	0	0	21
Houston	4	------	0	0	3	4	5	5	3	1	90
San Antonio	0	------	2	0	3	0	0	8	0	0	64
Montana:											
Billings	0	------	0	0	2	0	0	0	0	1	6
Great Falls	0	------	0	1	0	3	1	0	0	10	12
Helena	0	------	0	1	0	1	0	0	0	0	2
Missoula	0	------	0	0	1	0	0	0	1	0	7
Idaho:											
Boise	0	------	0	0	0	6	4	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	1	0	1	0	0	0	2	11
Denver	5	------	0	100	8	14	1	7	0	9	85
Pueblo	0	------	0	5	3	2	0	0	0	7	18
New Mexico:											
Albuquerque	0	------	0	1	1	0	0	3	0	5	14
Utah:											
Salt Lake City	0	------	1	131	5	6	0	3	0	7	43
Washington:											
Seattle	1	------	0	0	7	2	0	7	0	46	117
Spokane	0	------	0	2	3	1	0	0	1	4	37
Tacoma	0	------	0	1	3	4	1	0	0	5	21
Oregon:											
Portland	0	3	0	10	7	14	3	1	0	1	85
Salem	0	2	------	0	------	0	1	------	0	0	------
California:											
Los Angeles	5	8	0	52	8	56	8	19	0	32	323
Sacramento	0	------	0	22	4	0	0	2	0	40	28
San Francisco	0	------	0	1	10	9	0	9	0	57	131

City reports for week ended May 7, 1938—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Georgia:			
New York	3	1	2	Atlanta	1	1	0
Pennsylvania:				Kentucky:			
Pittsburgh	1	0	0	Louisville	1	0	0
Scranton	1	1	0	Alabama:			
Indiana:				Birmingham	4	0	0
Indianapolis	0	1	0	Arkansas:			
Illinois:				Little Rock	0	1	0
Chicago	1	0	0	Texas:			
Michigan:				Houston	1	0	0
Detroit	1	0	0	New Mexico:			
Wisconsin:				Albuquerque	0	0	1
Milwaukee	0	0	1	Washington:			
Minnesota:				Seattle	1	0	0
St. Paul	1	0	0	Oregon:			
Missouri:				Portland	1	0	0
St. Louis	1	0	0	California:			
Maryland:				Los Angeles	1	1	0
Baltimore	2	1	0				
District of Columbia:							
Washington	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; San Francisco, 1.
Pellagra.—Cases: Charleston, S. C., 3; Atlanta, 2; Savannah, 3; Louisville, 2; Los Angeles, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended April 9, 1938.—During the 2 weeks ended April 9, 1938, 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 [1]	New Brunswick [2]	Quebec [3]	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2	8			1		11
Chickenpox		19	7	551	586	116	58	14	260	1,611
Diphtheria		9	3	61	6	6	2	1		88
Dysentery				1	1					2
Erysipelas		2		24	4	5	1	3	2	41
Influenza		58		30	85	4			68	245
Measles	1	28	1	498	1,069	2	4	22	51	1,676
Mumps		21	2		334	367	22	19	44	809
Paratyphoid fever		1						1		2
Pneumonia	5	13			64		6		27	115
Poliomyelitis						1		1		2
Scarlet fever		29	6	260	190	29	69	67	74	724
Smallpox								7		7
Trachoma									1	1
Tuberculosis	4	31	8	100	103	35	17	5	49	352
Typhoid fever		1		50	8	2		1	6	68
Undulant fever				2	4	3				9
Whooping cough		16	6	168	206	39	4		83	522

[1] 2 weeks ended Apr. 13, 1938.
[2] 1 week ended Apr. 2, 1938.
[3] 2 weeks ended Mar. 26, 1938.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29 1938	Week ended— February 1938 5	12	19	26	March 1938 5	12	19	26	April 1938 2	9	16	23	30
China:																		
Canton	C	14																
Hangchow	C	[1] 41																
Hong Kong	C	84	7		2													
	D	63	7		1													
Kwangchow Wan	C	62	12															
	D	26	10															
Macao	C	27	2															
Manchuria:																		
Dairen	C	6																
Mukden	C	2																
Nanking	C	120																
	D	14																
Shanghai	C	1,414	237	22	3													
Swatow	C	44	101	2														
Tientsin	C	8																
Dutch East Indies: Macassar	C				1										[3] 1			
India	C	11,344	6,802	5,326	9,330	1,772	1,783	1,635	1,528	1,765	2,718	3,401						
	D	5,787	3,737	2,644	4,602	920	933	818	822	871	1,285	1,514						
Allahabad	C									1		1	2	2			3	3
Assam	C	59	87	139	262	34	44	36	29	61	57	77	103	136	258	196	182	166
	D	25	53	56	141	15	28	23	14	28	32	38	40	60	125	100	94	90
Bassein	C										1			[3] 1	1	2		
Bombay Presidency	C	1,375	363	191	10		4			2	4	8		47				
	D	686	171	117	7		2			1	2	6		36				
Calcutta	C	83	80	69	122	45	60	72	49	68	118	184	204	158	134	122	128	92
Central Provinces and Berar	C	860	356	113	40	3	14	14	25	10	10	61	132	267	769	643	963	1,397
Chittagong	C							1		1					[3] 2			3
Delhi	C		1											1	1	1	22	4
Madras Presidency	C	826	1,204	2,654	3,914		452	236	269	251	231	154						
	D	389	431	1,178	1,804		236	111	119	127	123	83						

Madras	C	106	233	160	120	4	3	4	5	------	2	1	------	1	------	------	4	4
	D	43	34	40	29	2	2	------	2	------	2	------	------	------	------	------	1	3
Negapatam	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Northwest Frontier Province	C	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1
Orissa Province	C	147	91	39	77	3	23	19	37	29	20	31	22	29	54	56	------	------
Punjab	C	------	------	------	------	------	------	------	------	------	------	------	------	[3] 2	2	23	457	------
Rangoon	C	------	1	------	2	------	------	------	------	------	------	------	1	------	------	------	------	------
Sind State	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	------	1
Larkana	C	------	------	------	------	------	------	------	------	------	------	------	------	------	[4] 1	------	------	------
Vizagapatam	C	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------
India (French):																		
Chandernagor Territory	C	4	4	1	7	6	4	------	------	------	1	4	------	------	------	------	------	------
Karikal Province	C	------	------	------	1	2	2	------	------	------	------	------	8	------	------	------	------	------
Pondichery Province	C	1	------	1	3	------	------	------	------	16	10	1	------	------	------	------	------	------
Indochina (French):																		
Annam Province	C	37	364	94	63	61	151	72	54	1	2	4	6	------	81	65	76	229
Tonkin Province	C	4,179	2,342	509	59	12	27	2	14	1	8	29	17	88	109	121	425	300
Haiphong	C	577	44	1	------	------	------	------	------	------	------	------	------	------	1	------	------	------
	D	159	27	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hanoi	C	284	361	39	3	------	------	------	------	------	------	10	7	58	17	13	39	48
Japan: [5]																		
Hiroshima	C	5	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Kobe	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Okayama Prefecture	C	5	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Taku	C	3	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tokuyama	C	10	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tokyo	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Siam:																		
Bangkok	C	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Provinces	C	7	------	------	------	3	------	------	------	------	------	------	------	------	------	------	------	------

On vessels:

S. S. *Klungchow* at Hong Kong from Shanghai ..... 3 cases ..... Oct. 3, 1937

S. S. *Ranee* at Calcutta from Port Said and Blyth ..... 1 case ..... Dec. 31, 1937

S. S. *Karoa* at Rangoon from Calcutta ..... 1 case ..... Mar. 21, 1938

S. S. *Tsushima Maru* at Calcutta from Japan ..... 1 case ..... Apr. 16, 1933

[1] For 2 weeks.
[2] El Tor strain.
[3] Imported.
[4] Suspected.
[5] A report states that up to Sept. 30, 1937, cholera was reported in Japan as follows: Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938 5	12	19	26	March 1938 5	12	19	26	April 1938 2	9	16	23	30
Belgian Congo	C	[2]2		2								4		4				
Bolivia:																		
Chuquisaca Department	C				2				35									
Sucre	C				1													
Santa Cruz Department	C							[3]1					[3]1					
Tarija Department	C				54			3										
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	15	10			1		1	2			1		2	2			
Uganda	C	51	67	38	39	2	7	4	11		7	7		1				
	D	40	56	30	39	2	7	4	11		7	7		1				
Ceylon:																		
Colombo	C	1	1	1	1		1		1		1							1
	D	1	1	1	1		1		1									
Plague-infected rats		3								2	3							2
China:[4]																		
Dutch East Indies:																		
Java and Madura	C	223	311	247	297	63	89											
	D	220	311	247	296	59	90											
Pasoercean (vicinity of)	C		5	2	2			1	2									
Ecuador:																		
Chimborazo Province—Chimbo	C									10								
Colimes	C				1													
Guayaquil	C	2		2	4	2			3	2	1	2		7	1			3
	D	2		1	2	2				3		1		4	1			3
Plague-infected rats		2	3	2			3				1		1					
Parroquia Eloy Alfaro	C		1															
Egypt:																		
Asyut Province	C		1		1										[3]1			
Beheira Province	C			1														
Gharbiya Province	C				1													
Girga Province	C	1																
Hawaii Territory:[5] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector		3	4	8	1	1		1										
Kukaiau														2				

Paauhau Sector		1	5	2	8		2	1		1	2			2	1	1		3
Pauilo				18														
Pohakea Sector															1			
Maui Island:																		
Makawao District—Plague-infected rats				6														
Omaopio:[5]																		
Wailuku District—Puunene	D				1													
India	C	1,996	1,874	446	1,968	545	707	851	1,379	557	1,148	1,003						
	D	821	742	658	965	202	322	435	623	348	576	618						
Allahabad	C				1					1					1			
Bassein	C				2	1			1				1	1				
Bombay Presidency	C	82	59	51	24		7			13	11	8	15	17				
	D	48	36	37	13		2			6	9	2	11	9				
Central Provinces and Berar	C	582	592	390	486	232	190	156	260	98	413	225	570	259	250	176	93	43
Cochin	C		1															
Madras Presidency	C	80	175	160	330		54	64	39	21	5	19	24					
	D	41	84	84	174		30	24	15	15	1	10	10					
Mandalay	C				43						79		42					
	D				41						73		42					
Punjab	C											1						
Rangoon	C					1	[6]1		1	2			2		1			
	D					1	1		1		1		1			1		
Plague-infected rats												1						
Iraq: Baghdad—Plague-infected rats					1													
Madagascar. (See table below.)																		
Niger Territory. (See table below.)																		
Peru. (See table below.)																		
Tunisia: Tunis: Plague-infected rats				1				1		1								
Union of South Africa	C	[7]1			[7]1		[7]6		[7]7						[7]4			
Cape Province—Port Elizabeth	C															8		
	D													3				
United States:[8]																		
California:[8 9 10]																		
Fresno County[9]—Plague-infected fleas.																		
Placer County[10]—Plague-infected fleas.																		
Santa Cruz County—																		
Plague-infected fleas.																		
Plague-infected ground squirrels																1		
Nevada:[8] Clark County—Plague-infected fleas.																		

[1] Including plague in the United States and its possessions.
[2] Includes 1 case of pneumonic plague.
[3] Pneumonic.
[4] Information dated May 9, 1938, states that an outbreak of bubonic plague has occurred in Kochow District, and on Hainan Island, China.
[5] During the week ended Nov. 20, 1937, plague infection was proved in 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island, Hawaii Territory.
[6] Imported.
[7] For 2 weeks.
[8] Plague infection proved in insect hosts as follows: *California*—Fresno County, Oct. 7-Nov. 5; Santa Cruz County, Feb. 3-Apr. 13, 1938; *Nevada*—Clark County, Apr. 14-22, 1938; *Oregon*—Baker County, Apr. 23, 1938; *Washington*—Adams County, Mar. 7-30, 1938.
[9] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.
[10] For the week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels in Placer County, Calif.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

]C indicates cases; D, deaths; P, present[

Place	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938: 5	12	19	26	March 1938: 5	12	19	26	April 1938: 2	9	16	23	30
United States—Continued.																	
Oregon:[8] Baker County—																	
Plague-infected fleas.																	
Plague-infected ground squirrels																2	
Washington:[8]																	
Adams County—																	
Plague-infected fleas and lice.																	
Plague-infected ground quirrels										1							
Lincoln County—Plague-infected ground squirrels														2			
On vessel: S. S. *Ville de Tamatave* at Beirut C													1				

Place	October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Brazil:[11] Pernambuco State C		5				
Madagascar (central region) C	59	67	57	69	70	
D	59	65	56	65	56	
Niger Territory C		85	60			26
Peru C	9	12	6	7	10	
Ancash Department C		3				
Lambayeque Department C	1			1	2	
Libertad Department C	2	1			1	
Lima Department C	6	8	6	6	7	

[8] Plague infection proved in insect hosts as follows: *California*—Fresno County, Oct. 7–Nov. 5; Santa Cruz County, Feb. 3–Apr. 12, 1938; *Nevada*—Clark County, Apr. 14–22, 1938; *Oregon*—Baker County, Apr. 23, 1938; *Washington*—Adams County, Mar. 7–30, 1938.

[11] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths. Information dated Apr. 19, 1938, states that since Mar. 25, 4 deaths from bubonic plague have been reported in the Novo Exu District, Pernambuco State, Brazil.

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938 5	12	19	26	March 1938 5	12	19	26	April 1938 2	9	16	23	30
Algeria:																		
Algiers Department	C	1																
Constantine Department	C						1											
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil. (See also table below):																		
Bahia (alastrim)	C	11	6	9														
Santos	C		1															
British East Africa: Tanganyika	C		223		1	127	10		53					17				
Canada:																		
Alberta	C				2				[1] 3				[1] 8		[1] 7		[1] 2	
British Columbia	C				[1] 1		[1] 1											
Nova Scotia—Halifax	C											1	2					
Quebec	C		[1] 1															
Saskatchewan	C				[1] 1		[1] 6		[1] 7									
China:																		
Canton [2]	C		1	2	33	16	23	19	21	19	30	17	32					
Dairen	C		1					1				1						
Foochow	C	P	P	P														
Hankow	C				2	1	2						1	1				
Hong Kong	C	1	6	13	255	101	156	222	162	185	214	236	131	162	128	56	115	
	D				107	88	83	199	132	188	128	192	131	112	107	56	75	
Macao	C						2							1	1	1	2	3
Shanghai	C			1	7	1		6	3	4	1	2	2	2	6	3		
Tientsin	C			1														
Colombia (see also table below): Barranquilla	D	2																
Ecuador: Guayaquil	C	13	4	3	4				1						1			
Egypt: Port Said	C								3	1	5			4	2			
Eritrea	C	52	16		8	4	3			[3] 14								
France. (See table below.)																		

[1] For 2 weeks.
[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 100 cases of smallpox were admitted to hospitals in Canton, China.
[3] For 3 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938 5	12	19	26	March 1938 5	12	19	26	April 1938 2	9	16	23	30
Great Britain: England and Wales—																		
Chester County	C		1															
Kent County—Gravesend	C											2	1					
Leighton Buzzard	C									2								
Port of London	C												1					
Greece. (See table below.)																		
India	C	1,756	1,804	3,930	9,248	2,328	2,312	2,293	3,163	2,692	2,920	3,307						
	D	429	408	958	2,645	570	547	629	821	673	713	750						
Allahabad	C				1									1			1	
Assam	C	45	37	56	95	18	19	15	38	38	34	57	18	29	66	48	24	57
Bassein	C				1											1		
Bombay Presidency	C	154	130	570	1,130	523	607	531	731	834	842	753	983	743				
	D	33	41	165	316	150	161	173	190	177	169	185	199	138				
Bombay	C	41	73	269	690	222	249	233	246	264	234	212	164	142	130	91	95	
	D	23	30	119	350	125	132	146	142	129	135	127	100	83	65	65	51	
Calcutta	C	20	24	69	235	56	106	120	149	194	185	261	208	147	228	123	127	143
	D	14	13	43	177	27	77	76	93	132	106	166	161	107	164	115	91	97
Cawnpore	C				14	5	4	4	5	2	1	4	6	4	7	6	5	9
Central Provinces and Berar	C	26	7	15	51	39	46	55	90	53	83	38	75	124	117	110	92	64
Chittagong	C				3			1			2		2	1				
Delhi	C	1		6	9	6	1	5	1	3		3	5	3	3	7	4	9
Karachi	C		2	4	18		4	6	2	2	4	6	5	2	3		5	11
Madras Presidency	C	304	213	245	899		245	221	218	182	195	204	184					
	D	51	26	51	172		50	41	38	29	37	31	28					
Madras	C	74	50	88	359	76	71	58	43	52	64	69	64	58	57	46	42	38
Negapatam	C				6						2	4	2	3		7	1	
Northwest Frontier Province	C	154	380	417	748	32	39	46	43	29	31	34	61	8	14		10	54
Orissa Province	C	193	206	353	831	198	188	248	306	224	303	318	446	278	357	149		
Punjab	C	162	404	1,035	1,641	250	181	281	240	249	149	201	237	104	63	146	106	
Rangoon	C	3	5	6	66	12	16	5	9	21	23	24	9	6	4	4	8	
Sind State	C	78	164	436	643	127	64	124	167	79	180	159	104	172	194	121	158	199
Visagapatam	C									1		1		1	1			
India (French):																		
Chandernagor Territory	C									1								
Karikal Province	C									1								

Indochina (French) (see also table below):																		
Tonkin Province	C			26	135	135	130	160	282	116	195	227	137		251	188	222	
Haiphong	C		2	36	169	45	52	27	24	12	9	19	5		15	2	8	
Hanoi	C			1	5	3	8		4	2	3	8	3		18	4	9	
Saigon-Cholon	C				1			1					1			1		
Iran	C		2		4	6							2					
Iraq	C				13				8							1		
Baghdad	C						1											
Mexico (see also table below):																		
Chihuahua	C										1							
Durango	D	1				1			1	2						1		
Mexico, D. F	C	5	11	2	2		3				1	1						
Monterrey	C		1	1	5			1									1	1
San Luis Potosi	D	1																
Torreon	C			2	7													
	D	5	4	7	4	1		1										
Vera Cruz	C			1														
Morocco. (See table below.)																		
Nigeria	C	156	29	136	104		57											
Lagos	C										1		2	1	2			
Nyasaland	C	31	11	3	3													
Panama Canal Zone: Colon	C	2																
Portugal (see also table below):																		
Lisbon	C	3	3	2	4	1		1	2	5	5	1	1					1
Portuguese East Africa. (See table below.)																		
Salvador. (See table below.)																		
Siam	C				76				26	67		8	9			1	2	
Sierra Leone	C	10							[1] 4		[1] 4							
Southern Rhodesia	C	4	121	114	13	2	16	3		2	5							
Straits Settlements: Singapore	C				[1] 1													1
Sudan (Anglo-Egyptian)	C	64	88	64	282	22	25	9	7	34	2	18	4	18	12	3	7	19
Union of South Africa. (See table below.)																		
Venezuela: Puerto Cabello.[3]																		

[1] For 2 weeks.

[2] Imported.

[3] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello; information dated Feb. 21, states that 4,000 cases of smallpox (alastrim) were reported in Barquisimeto, Lara State, Venezuela, and that smallpox is present from Barquisimeto to Valencia and Marcay.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

On vessels:

S. S. *Castalia* at Suez from Karachi and Bombay	1 case	Oct.	5, 1937
S. S. *Egra* at Rangoon from Calcutta	1 case	Nov.	16, 1937
S. S. *Anhui* at Singapore from Hong Kong	1 case	Jan.	19, 1938
S. S. *Rizwani* at Kamaran	1 case	Jan.	19, 1938
S. S. *Tai Seun Heng* at Sandakan from Hong Kong	1 case	Jan.	23, 1938
S. S. *Suisang* at Penang from Hong Kong and Singapore	1 case	Jan.	26, 1938
S. S. *Hong Siang* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Jan.	26, 1938
S. S. *Trave* at Singapore from Hong Kong	1 case	Jan.	27, 1938
S. S. *Muinam* at Singapore from Hong Kong	1 case	Jan.	29, 1938
S. S. *Tatsuta Maru* at Honolulu	1 case	Feb.	4, 1938
S. S. *Circassia* at Aden from Bombay	1 case	Feb.	16, 1938
S. S. *Chantala* at Akyab from Chittagong	1 case	Feb.	18, 1938
S. S. *Empress of Japan* at Honolulu	1 case	Feb.	21, 1938
S. S. *Tilawa* at Singapore from Hong Kong	1 case	Feb.	21, 1938
S. S. *Seringa* at Calcutta from Port Said	1 case	Feb.	24, 1938
S. S. *Yuen Sang* at Singapore from Hong Kong	1 case	Feb.	28, 1938
S. S. *Cathay* at London	1 case	Mar.	4, 1938

On vessels—Continued.

S. S. *City of Auckland* at Halifax from Calcutta	1 case	Mar.	5, 1938
S. S. *Kaisar-I-Hind* at Yokohama from Hong Kong	3 cases	Mar.	6–7, 1938
S. S. *Van Heutsz* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Mar.	9, 1938
S. S. *Hai Hing* at Singapore from Amoy, Swatow, and Hoihow	1 case	Mar.	9, 1938
S. S. *Netuka Maru* at Moji from Dairen	1 case	Mar.	11, 1938
S. S. *Norviken* at Singapore from Hong Kong and Swatow	1 case	Mar.	13, 1938
S. S. *Kum Sang* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Mar.	16, 1938
S. S. *Haruna Maru* at Kobe from Hong Kong	1 case	Mar.	16, 1938
S. S. *Hinsang* at Sandakan from Hong Kong	2 cases	Mar.	22–24, 1938
S. S. *Kiturin Maru* at Moji from Dairen	1 case	Mar.	31, 1938
S. S. *Sirdhana* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Apr.	1, 1938
S. S. *Prosper* at Singapore from Hong Kong and Swatow	2 cases	Apr.	3, 1938
S. S. *Strithaird* at Fremantle	2 cases	Apr.	7, 1938

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Angola	C			7	19	29	
Argentina	C	3	1				
Belgian Congo	C	352	166	292	251	336	
Bolivia:							
Cochabamba Department	C					[1]4	
La Paz Department	C					[1]11	9
Potosi Department	C					[1]5	2
Santa Cruz Department	C					[1]5	
Tarija Department	C						1
Brazil: Puerto Alegre	C	4	2				
France	C		2				
Greece: Salonika	C		3	7	10	1	7
Indochina (French) (see also table above)	C	147	197	319	694	864	1,258
	D	28	43	91	188	189	237
Mexico (see also table above):							
Chiapas State	C					1	
Chihuahua State	C		21				
Coahuila State	C		17				
Durango State	C		17				
Guanajuato State	C		38				
Mexico—Continued.							
Mexico State	C			3			1
Mexico, D. F	C	5	17		8	4	
Michoacan State	C		59				
Nayarit State	C						
Nuevo Leon State	C		6				
Queretaro State	C	1	2			4	
Sinaloa State	C						
Tabasco State	C		1				
Tlaxcala State	C		3				
Vera Cruz State	C	1	25				
Yucatan State	C		1				
Zacatecas State	C		7				
Morocco	C	1	2				
Portugal (see also table above)	C	53	52	18	62	13	
	D	4	4	3	2		
Portuguese East Africa	C		3				
Salvador	C				16	2	
Union of South Africa:							
Cape Province	C			42			
Transvaal	C			41			

[1] For January and February.

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—															
					January 1938					February 1938				March 1938				April 1938		
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16
Algeria:																				
Algiers Department	C	38	89	13				13	11	8	5	5	11	15	36	13	13	16	13	4
Algiers	C	15								2		1	6	1	2					
Constantine Department	C	47	23	81	21		[1] 26	50	20	13	46	15	24	12	59	26	45	65	33	25
Bone	C	1		1					2		1		1							
Constantine	C	7						1		4	20		14	4			29	20		
Philippeville	C	2	1							1	1									
Oran Department	C		16	22	1		[1] 3		1	6	2	3	2	2		1	4	1	3	6
Southern Territories	C		2	1					1	13	1	1	2		13					
Australia: Brisbane	C						1									1				
Basutoland	C	3																		
Bolivia. (See table below.)																				
British East Africa: Kenya	C						1													
Bulgaria	C	13		5		14	1	3	6		2								1	1
Chile	C	305	286	196		25	24	17	19	11										
Antofagasta Province	C		4																	
Concepcion Province	C	4	2	1																
Iquique	C		1	1																
Linares Province	C	2	12	3		1	1						2							
Malleco Province	C	4	3	3																
Nuble Province	C	24	19	19		2	7		4	1	1	1	7	5						
Santiago Province	C	230	223	157		19	11	14	15	9	4	9	8	12						
Valparaiso	C	16	5	1		1	2	1	2		1		1	2		1		1		
China (see also table below):																				
Canton	C	3																		
Dairen	C	1	2	1																
Hankow	C	2							1	1										
Harbin	C							1												
Shanghai	C					1									2	8	16	58	27	
Swatow	C																			
Tientsin	C	1	7	4	1															

[1] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended— January 1938					February 1938				March 1938				April 1938		
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16
Chosen. (See table below.)																				
Czechoslovakia. (See table below.)																				
Dutch East Indies: Sumatra. (See table below.)																				
Egypt:																				
Alexandria	C	4	7	3	1	----	----	----	----	----	----	1	1	1	4	3	3	2	1	4
Aswan Province	C	----	----	----	----	----	----	----	----	----	----	----	3	----	----	16	----	----	2	----
Asyut Province	C	1	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	----	1	----
Beheira Province	C	----	----	----	----	----	6	3	----	----	----	1	9	----	12	21	----	7	12	----
Beni-Suef Province	C	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cairo	C	----	----	1	3	----	----	----	----	----	1	1	----	----	7	3	3	2	4	6
Dakahliya Province	C	----	----	----	----	----	1	----	----	----	----	30	19	----	17	10	----	7	5	----
Gharbiya Province	C	----	----	----	----	----	3	----	----	----	----	12	2	----	4	1	----	14	8	----
Minufiya Province	C	----	----	----	----	----	----	3	----	----	----	----	13	----	2	2	----	2	14	----
Minya Province	C	----	----	----	----	----	----	----	----	----	----	----	5	----	8	3	----	2	----	----
Qena Province	C	----	----	----	----	----	1	----	----	----	----	----	----	----	5	20	----	38	45	----
Sharkiya Province	C	----	----	----	----	----	----	----	----	----	----	7	----	----	7	5	----	----	----	----
Provinces	C	3	7	7	6	11	12	6	26	24	40	54	59	35	61	84	82	80	102	120
Eritrea: Asmara	C	----	2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Germany: Frankfort-on-Main	C	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Great Britain—England and Wales—Gloucester County	C	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	4	1	1	1	1	----	----	----	----	1	----	----	----	1	----	----	----	----	----
Hungary	C	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1
Iran	C	----	----	4	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----
Teheran	C	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C	----	2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mexico, D. F	C	17	18	20	----	12	1	----	----	----	4	3	5	3	5	8	2	----	----	----
Saltillo	D	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----
San Luis Potosi	D	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----
Tecamachalco	C	----	----	----	7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Torreon	C	----	1	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	----
Morocco (see also table below)	C	38	29	315	198	80	139	142	184	131	204	208	240	299	411	372	234	206	199	243
Casablanca	C	4	----	24	----	16	6	----	57	44	45	67	17	29	70	78	36	24	----	35

Netherlands: Rotterdam	C			[1] 1																
Nigeria	C	2																		
Palestine:																				
Haifa	C	16	5	8	2			1	1											
Jaffa	C	13	17	3			3	2		1	1	1		1	1	1				
Poland	C	53	68	141	54	98	78	87	79	112	76	93	150	145	161	207	176	130	145	125
	D	1	5	3	1	6	7	9	7	6	6	6	5	7	11	11	9	3	4	7
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C			1																
Straits Settlements: Singapore	C	1					1		1			1								
Switzerland	C	1																		
Syria: Deir-ez-Zor	C												10							
Trans-Jordan	C		1							2							3	1	1	
Tunisia:																				
Tunis	C	3	3	2	2					2		1	1	3	1		3	1	1	3
Provinces	C	132	161	57	12	26	80	62	104	37	32	83	59	100	41	75	45	57	63	
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C		1								1									
On vessels:																				
S. S. *Blackhill* at Philippeville	C							1												
S. S. *Empress of Japan* at Yokohama	C																		1	

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Bolivia:							
La Paz Department	C					[2] 18	5
Oruro Department	C					[2] 9	3
Potosi Department	C					[2] 5	8
China: Manchuria—Harbin	C				3	1	
Chosen	C	19					
Czechoslovakia	C						2
Dutch East Indies: Sumatra	C					[3] 33	
Greece	C	18	7	7			
Guatemala	C	2			3		1
Lithuania	C	6	7	2	12		49
Mexico (see also table above):							
Aguascalientes State	C		1		13		
Coahuila State	C		3				
Durango State	C		8				
Guanajuato State	C		22				
Guerrero State	C		2				
Hidalgo State	C	2	19				
Jalisco State	C		2				
Mexico State	C	19	42		8	7	

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Mexico (see also table above)—Con.							
Mexico D. F.	C	14	20		27	16	
Mexico City	D				5	4	
Michoacan State	C		11				
Oaxaca State	C		3		1		
Puebla State	C		9				
Queretaro State	C	2	2			5	
San Luis Potosi State	C	4			5	2	
Zacatecas State	C		6				
Morocco (see also table above)	C	39	47	914	638	1,118	1,545
Portugal	C	26	28	7	2	17	
Rumania	C	33	110	246	470	510	
Turkey	C	100	34	45	96	43	
Istanbul	C		4	2	3	10	
Union of South Africa:							
Cape Province	C	162	75	100	37	43	
Port Elizabeth	C				2	1	3
Natal	C		9	1		4	
Orange Free State	C	3	3	3	30	24	
Transvaal	C	5	1	1	12	4	

[1] Suspected.

[2] For January and February.

[3] Tropical typhus fever.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 26, 1937	Week ended— January 1938					February 1938				March 1938				April 1938			
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23
Belgian Congo:																					
Saratumba	C													[1]1							
Zongo	C										[1]7			[1]4							
	D										4			1							
Brazil: [2]																					
Federal District	D											1		1							
Minas Geraes State	D					1	2	7	6	16	9	26	17	26	10	10	9	1	2	2	
Para State	D							1													
Rio de Janeiro State	D							1	5	3	3	2	2	3	11	10	13	4	2	1	1
Santa Catharina State	D			1						1				1		2	7	1		8	
Sao Paulo State	C										P										
	D				1			18				1				1	1	1			
Colombia:																					
Boyaca Department	D	1		1																	
Cundinamarca Department	D						1					1	1				1				
Santander Department	D	3		3																	
Dahomey: Cotonou	C			[1]5																	
French Equatorial Africa: Bangui	D						1														
Gambia: Georgetown	C						[1]1														
Gold Coast [3]	C	4	[4]8	2	5	[5]4															[1]1
	D	1	3	2																	[1]1
Keta	C				1																[1]1
Ivory Coast:																					
Abidjan	C									1		[1]1									
Agboville	C														[1]1						
Anyama	C					1															
Gaoua	C			[1]1																	
Grand Bassam	C														2						
Spao Plantations (near Bingerville)	C														2						
Touba	C	[1]1																			
Nigeria	C	5	2	[1]1	1		1		[1]1												
	D		1				1		[1]1												

Paraguay: Asuncion	C	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Senegal	C	12	[6] 12	3	------	------	------	------	------	------	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------
	D	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Dakar	C	[7] 1	[7] 2	------	------	------	------	------	------	------	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------
Diourbel	D	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	[1] 1	------	------
Rufisque	C	2	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Thies	C	4	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Sudan (French)	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
San	C	------	------	1	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Toukoto	C	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

[1] Suspected.
[2] See also reports of yellow fever in Brazil in preceding issues of the PUBLIC HEALTH REPORTS for 1938 and 1937.
[3] During the week ended May 7, 1938, 1 case of yellow fever was reported in Gwaba, Gold Coast.
[4] Includes 2 suspected cases.
[5] Includes 1 suspected case.
[6] Includes 3 suspected cases.
[7] Imported.