I advised him of his great opportunity, for if he had the incentive to charge enough and an aim to earn his fee, with his qualifications, which I well knew, he could turn the tide in his own favor.

Would any reasonable man object to paying the doctor more for night than day work if asked? He has to pay the carpenter, the painter, the plumber who do overtime work at an increased rate, and why should he kick on the doctor? I have been surprised at the number of men who informed me that they did not discriminate between the fees for day and night work. A busy man at this rate burns the candle at both ends and quits at an earlier age without much to show for it. When one considers the number of unnecessary calls to which the physician is subject during his sleeping hours, he must feel that, with no difference in cost to the patron, it is a matter of slight concern whether he waits till night. An increase in the fee for this work would anticipate or postpone a sufficient number of calls to save the doctor much valuable time for his natural rest and keep him busier in the daytime. For the absolutely necessary work it would be a small man who would refuse double fee.

The question of custom and competition is advanced as a theory for low fees. How easy this can be corrected is exemplified by the statement of a physician from the southern part of the state to me only a few days ago. The subject of a fee schedule came up for discussion at a meeting of his county society, and an advance all along the line was agreed on. There were six towns in the county and between them a splendid large farming community. The new schedule was published in every newspaper in this county, duly signed by the members. He said there was some kicking for a while, but the new rates were soon accepted and had been in full force for some time. Organization, then, must be the solution of the question. The county and district societies should do as much for the doctor in this regard as they do in every other, and I am not so sure that a move in this direction by the state society for a minimum schedule which would be adopted by all its component parts would be in the right direction. It would do away with variations in schedules applicable to border towns and would be much more easily lived up to. I believe the competition element so far as fees are concerned in the selection of a physician is much overestimated. In time of drouth and depression, with poor crops and burdened farms, it might prevail, but certainly the drift at the present time of progress and prosperity is toward getting results, even if it does cost. Granting that non-members of societies or a few backsliders would keep up the old custom, this should not deter those who believe that a workman is worthy of his hire and by this very assumption attract those who believe with them. It was said of an old physician of my acquaintance that he had a large following, not because he knew more than any of his colleagues, for he really knew less than many of them, but because he charged large fees. If this kind of a bluff works, how much more effectual it must be if it is backed up by sincere effort, painstaking care, and a disposition to be worth the price.

My aim in bringing this subject up in this form is to unload a growing impression on my mind that the doctor in country practice in Nebraska is underpaid and that he himself is mostly to blame for it, that his schedule of fees has not advanced with the requirements of his education, of his needs and of his position, and that by

means of a well-directed effort, individually and collectively, there is no reason why results should not be accomplished which would not only be to his advantage, but would react favorably on his constituency.

FURTHER OBSERVATIONS ON ROCKY MOUNTAIN SPOTTED FEVER AND DERMA-CENTOR OCCIDENTALIS.*

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In view of the brief season during which Rocky Mountain spotted fever prevails, uninterrupted study of the disease is conditioned on the maintenance of the infection in experiment animals.

In a previous communication¹ my inability to preserve the disease by inoculation from guinea-pig to guinea-pig was referred to, and the hope was expressed that alternation of the infection between the monkey and the guinea-pig might result in the preservation of the virus.

This experiment has been entirely successful and Table 1 illustrates the life history of the virus since it was obtained from the patient, Bradley.

TABLE 1.

Number of animal.	Date.	Source, and Material Inoculated.
Monkey I	June 11	Patient, Bradley; defibrinated blood.
Monkey II	June 20	Monkey I; defibrinated blood.
Guinea-pig 12	June 27	Monkey II; fresh heart's blood.
Monkey IV	July 7	Guinea-pig 16; blood and organs.
Guinea-pig 16	July 14	Monkey IV; defibrinated blood.
Monkey V	July 22	Guinea-pig 16; blood and organs.
Guinea-pig 17	July 28	Monkey V; defibrinated blood.
Monkey VI	August 3	Guinea-pig 17; blood and spleen.
Guinea-pig 25	August 16	Monkey VI; blood and serum.
Monkey VIII	August 23	Guinea-pig 25; blood and organs.
Guinea-pig 36	August 30	Monkey VIII; spleen.
Monkey IX	September 6	Guinea-pig 36; blood and organs.

All infected animals have run identical courses of fever, which are typical in this respect, that an incubation period of from two to four days intervenes between the time of inoculation and the onset of the regular febrile course. Commonly a moderate rise in temperature follows immediately on the inoculation and persists for one or two days, then falls near to normal for one or two days more, when the customary course sets in. This initial or primary fever probably is caused by intoxication from the large amount of material which is frequently injected. When a smaller amount of blood or emulsion of tissue is used this initial fever has not appeared.

Several facts are relied on in concluding that the disease transferred by these inoculations is spotted fever rather than some other infection which may have crept in during repeated passage. In harmony with the experience which was met in making cultures from man, no growth is obtained from the blood of infected animals, provided the cultures are made at a time when agonal or postmortem invasion by common bacteria has not taken place. If plates are inoculated with the heart's blood at the instant of death, it is customary to obtain no visible growth on ordinary media, yet this same blood proves infectious for other animals. Again, the rather frequent development of a

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¹ From the Pathological Laboratory of the University of Chicago.

1. The Study of Rocky Mountain Spotted Fever (Tick Fever?) by Means of Animal Inoculations, THE JOURNAL A. M. A., July 7, 1906.

hemorrhagic eruption in the monkey or guinea-pig, a manifestation which is identical in appearance, if not in distribution, with that seen in man, speaks for spotted fever rather than some other infection. This eruption is much more constant in the monkey than in the guinea-pig. In both animals it begins on the scrotum and foreskin. In the guinea-pig it may be found on no other part of the body, although it can be seen as a more or less generalized eruption occasionally. The external genitals of the female guinea-pig commonly become swollen and congested; recently, however, extensive hemorrhages have occurred in the skin of the labia in a number of females. But one female monkey has been used, and in her no cutaneous hemorrhages were discovered. It will be readily understood that the detection of a pink roseolar eruption in either the monkey or the guinea-pig is difficult. In the guinea-pig it can be recognized with certainty only in white-skinned animals. In both animals the hemorrhagic eruption, when it appears, is a late manifestation and it would seem to be related in some way to the virulence and duration of the infection. The disease may be so virulent that the animal dies before the eruption would appear, or so mild that it does not occur. The appearance of the hemorrhages does not necessarily presage a fatal issue; two monkeys and several guinea-pigs which had extensive hemorrhages into the skin have recovered.

A third fact which stamps this experimental disease as spotted fever consists of the identity of the course of fever with that produced in the animals by direct inoculation with human blood.

The essential anatomic changes, enlarged spleen and lymph glands, congested kidneys, etc., are identical with those seen in the animals first inoculated, and correspond with the changes found in man.

There seems to be no particular difficulty involved in perpetuating the infection, except in the matter of expense. Duplicate inoculations should be made and the blood or organs used for inoculation may be taken at any time after the fever has reached its high point. To await the death of the animal before making the transfer is to risk the loss of the culture; the animal may recover.

THE DISTRIBUTION OF THE VIRUS IN THE BODY OF THE INFECTED ANIMAL.

In my first experiments the infectiousness of the blood, in spotted fever, was demonstrated. It would naturally be inferred that the various organs are infectious at least to the degree in which they contain blood. On this account one would reasonably expect the spleen to be infectious and this has proven true in a number of inoculations. The testicles have been used for inoculation a number of times. It was thought that the testicles might be a point of predilection for the virus, in view of the severe hemorrhages which often occur in close proximity to them, i. e., in the scrotum. They were shown to be infectious in several instances, yet their virulence was not so great as to indicate any special concentration of the virus at this point. The scrotal hemorrhages may have no relation to the amount of infection of the testicles.

The distribution of the virus among the organs of an infected monkey (VIII) was recently determined. The animal was exsanguinated from the carotid to deprive the organs of as much blood as possible. Each organ was then ground with sterile sand and suspended in physiologic salt solution. Identical weights of the dif-

ferent organs were not used, but approximately the same mass was employed in each case. A further attempt at uniformity was made by rendering the different emulsions of approximately the same density. Five cubic centimeters of each emulsion were injected intraperitoneally into guinea-pigs, which varied in weight from 350 to 550 grams. Table 2 shows the results.

Number.	Material inoculated.	Result.
35	Mesenteric, inguinal and axillary lymph glands.	Death in 18 days.
36	Spleen.	Death in 7 days.
37	Bone marrow.	Death in 6 days.
38	Testicles.	Death in 15 days.
39	Liver.	Death in 8 days.
40	Kidney.	Death in 7½ days.
41	Medulla oblongata.	Recovered.
42	Cerebral cortex and adjacent white matter.	Death in 12½ days.

In the fatal cases cultures of the heart's blood were sterile except in the case of guinea-pig 37, in which a few colonies of a staphylococcus developed. The technical difficulties in preparing the bone marrow increased the opportunities for infection. It is thought very probable, however, that the animal died of spotted fever because of the duration of the course.

Those organs seemed to be the most infectious which contained, naturally, the most blood, i. e., the liver, spleen, and bone marrow (?). In these organs exsanguination still leaves rather large quantities of blood. The kidney, however, was fully as infectious as the organs which were much richer in blood. It is possible that the kidney becomes the repository of a larger mass of micro-organisms, by virtue of its excretory function. It is realized that this experiment does not give an exact measurement of the degree of infection of the different organs, and that the results, at the best, can be considered no more than approximate.

In another experiment an attempt was made to determine the minimum fatal dose of the blood of the infected monkey, the blood being taken six days after inoculation. The injections were intraperitoneal (Table 3).

Guinea-pig.	C.c. of Blood.	Result.
30	0.5	Death in 14 days.
33	1.0	Death in 7½ days.
31	1.5	Death in 7½ days.
32	2.0	Death in 13½ days.
34	3.0	Death in 6½ days.

Plate cultures of the heart's blood were sterile in all cases. In this experiment the minimum fatal dose of the blood of the infected monkey on the sixth day of the disease was in the vicinity of 0.5 c.c. Guinea-pig 30, which received this dose, died on the fourteenth day, whereas, animals which live so long ordinarily recover. Guinea-pig 32, which received 2.0 c.c., showed unusual resistance. The guinea-pigs weighed about 350 grams each. Other experiments indicate that subcutaneous and intravascular inoculations have a similar degree of virulence.

ACTIVE IMMUNITY.

I have not learned of an authentic example of a second attack of spotted fever in man, hence it has seemed somewhat probable that one attack renders the body immune. This has been found to be true in a recent experiment on the monkey.

On June 20, 1906, Monkey II was inoculated with the blood of Monkey I, the latter having just died as the result of inoculation with the blood of the patient, Bradley. Monkey II ran a typical course of fever, showed a macular eruption of the perineal skin on the eighth day, and extensive hemorrhages of the scrotum.

perineum, back and extremities on the eleventh day. The temperature returned to normal on the twelfth or thirteenth day, hence the eruption became hemorrhagic as convalescence was about to begin. The animal regained its former health and activity.

Recently this animal was again inoculated with the blood and tissues of an infected guinea-pig (No. 36). The total mass of fluid injected was 8 c.c. With the exception of some indisposition on the following day, the injection produced no apparent effect. For a few days the temperature was slightly higher than before, but during this time and since the monkey has shown no indisposition and has been as active as before inoculation.

By way of control another monkey of the same size (No. IX) was inoculated with the same amount of material, the same quantity and by the same route. Between the third and fourth days the temperature began to rise, and until it was killed (7 days), it ranged between 105.1 and 106.3. The conjunctivæ became reddened, the animal shivered at frequent intervals and sat, inattentive and with head drooping, continuously. On the fifth day the supraorbital skin showed reddened patches, and on the sixth day a roseolar eruption was visible on the scrotum. The blood and tissues were used for further experiments.

From this experiment it is evident that one attack in the monkey confers an active immunity, and on the basis of reasonable analogies one may conclude that man probably acquires a similar immunity.

A similar acquired immunity has also been demonstrated in the guinea-pig. Its duration, beyond the period of two months for the monkey and three months for the guinea-pig, has not been determined.

THE LIFE HISTORY OF *DERMACENTOR OCCIDENTALIS*.

On account of the suspicion which attaches to *Dermacentor occidentalis* as the carrier, or a carrier of Rocky Mountain spotted fever, its life history is important. The following brief notes concerning this question are given by way of recording the changes which were observed under artificial conditions. No description of minute morphologic changes will be given at this time.

May 20, 1906, a fully developed female was placed in a cotton-stoppered test-tube.

June 21 (about), the tick began laying eggs, of which several hundred (estimated) were eventually deposited.

June 28 or 29 hatching began and continued for a week or ten days, resulting in six-legged larvæ of minute size.

July 12, the tube with its contents was placed in a tick-proof cage with a guinea-pig. The larvæ took hold readily for the most part, but did not feed continuously. They increased slightly in size. Eventually all remained attached to the skin for several successive days, grew to a length of 1 to $1\frac{1}{4}$ millimeters, and became swollen and of a uniform dark slate color. On August they began to drop from the guinea-pig, moved to a safe place, and went into a quiescent state, appearing as if dead.

August 5 they began to molt, throwing off a snow-white pellicle, and came out as eight-legged nymphs. After 7 to 10 days the molting of the brood was almost complete. When they first appeared they approximated the size of the well developed larvæ.

When again placed with a guinea-pig or monkey they seemed to feed intermittently for a time, but eventually attached themselves firmly and underwent a great increase in size, some reaching a length of about $\frac{3}{16}$ of

an inch. With the increase in size the color again changed to that of a uniform gray-brown or slate color. It required from 6 to 10 days for this development to take place after the ticks were placed with an animal. On August 30, practically all the ticks which remained alive had undergone this change.

As they reached the condition mentioned they were removed and placed in ventilated boxes where they went almost immediately into a second quiescent stage. In about 10 days molting again began, a white mantle being thrown off, and the mites emerged as adult ticks, with the marking which one finds under natural conditions in the early months in Montana.

The experiment was carried on entirely at room temperature, and the various stages may not correspond in point of time with those taking place under natural conditions.

Under natural conditions, in the Bitter Root Valley, the adult ticks begin to disappear during the latter part of June. This probably means that the males, and those females which have not found a host, die, whereas the fully developed females deposit their eggs. Locally, knowledge of the further history of the tick was limited, or nil. It is certain, however, that during the warm summer days, the conditions are favorable for the hatching of the eggs, and for the development of the larvæ, provided a host is reached. Inasmuch as a crop of adult ticks is not observed in the fall, it is possible that the second molting stage, mentioned above, represents the hibernating stage of the mite. It is well known, locally, that the first few warm days of the spring bring out the ticks. These few warm days apparently would be sufficient to bring to completion the second molting stage. On the other hand, it must be admitted as possible that the second molting stage is completed in the late fall, and that hibernation begins at once with the animal fully developed, the first few warm days of spring being sufficient to arouse him.

Observations of a more complete nature will be made at a future date.

OSTEOPLASTIC RESECTION OF THE COSTAL ARCH IN ORDER TO REACH THE VAULT OF THE DIAPHRAGM.*

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Of all the regions within the abdomen the vault of the diaphragm is the most difficult of access, principally owing to the unyielding character of the lower portion of the thorax.

Various methods have been devised to overcome the difficulty. In cases of subphrenic and intrahepatic abscess or cysts of the convexity of the liver, one or more ribs have been resected, the pleural sac traversed or pushed up and drainage in a straight direction arranged for.

For the same purpose Lannelongue did resection of the eighth to the eleventh costal cartilages or of the respective ribs—a rather extensive additional operation.

Micheli¹ worked out on the cadaver an operation

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.
1. Tenth Italian Congress of Surgeons, 1895.