

country, with its headquarters in my state (Alabama), has within the last two years organized quite as systematic a medical force for the purpose of looking after the health conditions prevailing among their employees as may be found in any of our states; and from visits to the grounds occupied by this corporation I see very great improvement. This work will spread among the corporations all over the country. Dr. Campbell's paper should be sent to all of the large corporations in the country. I want to emphasize that the people need educating on sanitary lines as much as the managers of corporations. In formulating rules applying to railroad sanitation in my state I have made them applicable to the traveling public quite as much as to the employees. If people traveling on trains are ignorant of what is reasonably decent and clean, they ought to be required to learn.

DR. CHARLES C. BROWNING, Los Angeles, Cal.: Some work has just been completed by Surgeon Carrington of the U. S. Public Health Service in California south of San Francisco and in Arizona, concerning the influence of the movement of tuberculous patients on themselves and the traveling public. A great deal said with regard to the danger from the tuberculous patient doubtless is true; much is founded on sentiment and not on scientific data. Surgeon Carrington has spent several years in the Southwest and has been doing very thorough work in our particular section. I presume that the report will be available through the Department of Public Health.

DR. W. C. RUCKER, Washington, D. C.: The question of railway sanitation is a question of sanitation. When you have said that, you have said all. The sanitation of a vehicle is not different from the sanitation of a house. It is merely that of a house on wheels. The attempt to surround railway sanitation with something mysterious, something which stands off by itself, is wrong. The attempt to make the railroad companies and the other transportation interests of this country the goat whenever it comes to anything sanitary is equally wrong. In enforcing the interstate quarantine regulations I have dealt with a large number of railroads; and there has never been an order, a suggestion or a comment made to those common carriers by the U. S. Public Health Service which has not been acted on favorably and immediately. The railway companies, as has been said, in their sanitary methods are in advance of the people living along the right of way. Furthermore, when they are asked to furnish an example to people living along the right of way, they are invariably willing so to do. I do not believe that much education is necessary with regard to the railway interests of this country. I do agree that we should educate the general public how to travel on railroad trains; and, in order to do that, we must educate them how to live in houses. Not until people realize that cleanliness is our great bulwark against disease, whether it be in the home, the train or the ship, will they keep their environment clean. A speaker at the surgeon-general's conference the other day put the thing very aptly. He said that regulations had been made excluding from trains the common towel, that the common drinking-cup had been abolished, and that it would not be very long until the common brush and comb were taken from the train. He said, after that the next thing will be to abolish from trains the common hog.

DR. CHARLES J. HASTINGS, Toronto, Ont.: I would emphasize the importance of better safeguarding in transportation by water. Dr. McCullough has already drawn attention to this in his reference to the work being done by the international joint commission. We have had an excellent demonstration in Toronto of the necessity for prompt action along these lines. In 1911 we found that a large percentage of our cases of typhoid in the summer months was traceable to the boats that cross our international waters. On investigation we found that the water used was all more or less contaminated with sewage. When the order was first issued to the company to abate this nuisance forthwith, they treated it with a certain amount of indifference, I then wrote them that their boats would be tied up at the docks on their return if they did not give ample evidence that their crew and passengers were to be properly and efficiently safe-

guarded; this resulted in prompt action on their part. They are only permitted to take water from the center of the lake; they have installed tanks of sufficient capacity to meet their requirements for the balance of their trips. Most of these boats have been so equipped as to meet these requirements and, consequently, this source of danger has been practically eliminated. Hundreds of thousands travel annually over the international waters extending from Duluth to the mouth of the St. Lawrence, into which, by our primitive methods, we are pouring millions of tons of sewage every day.

DR. M. P. RAVENEL, Columbia, Mo.: A very excellent paper by Dr. J. O. Cobb of the Public Health Service appeared in *THE JOURNAL* of the American Medical Association several years ago calling attention to the fact that whether or not steamships on the Great Lakes took their water from the center of the lake, they got a certain amount of sewage into their water tanks, because the pipe through which the water is drawn opens out through the bottom of the ship, and when standing in port this pipe is filled with sewage. When the pumps are started to fill the tanks with water this sewage is first sucked up.

DR. N. F. CAMPBELL, Chicago: One word about education. The railroad I am connected with issues a magazine—fifteen or twenty thousand copies a month—and we have an article on sanitation in that magazine. I don't believe that water-coolers can be kept clean by cleaning them out every two weeks. They ought to be cleaned out at the end of every run. You will always find them dirty then. I have had a good deal of trouble with dumps. Railroads have a lot of waste material, and they throw it all into one place as filling material. This causes all kinds of trouble, and I have concluded that they should not do that without taking extra care about it.

## LOCAL ANESTHESIA IN THE PREVENTION OF AFTER-PAIN AND SHOCK

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Immediately after a major operation under local anesthesia one is impressed by the well-being of the patient and by the diminished after-pain as compared with similar operations under narcosis. The inference that we have here the solution of the problems of after-pain and shock is easily made; but unfortunately most surgeons come to realize that these problems are not simple ones, and that local anesthesia is not alone adequate to solve them.

### I. AFTER-PAIN

After operations patients begin to feel pain at various periods, depending on the anesthetic used and on such other considerations as normal differences in the regions operated on, the state of tissue at the site, and the attitude of the individual toward discomfort and pain. The duration of anesthesia by an agent used locally can be determined approximately by experiment, but in an operation such data cannot be entirely trusted because of the variable factors mentioned above.

Generally speaking, we may consider that anesthetics interrupt the propagation or perception of painful impressions, and that the amount of painful impressions originated does not vary no matter what agent is used. If local anesthesia lasts an hour or two, the total after-pain is reduced by that much. In the case of ether anesthesia, the time between the infliction of the first wound and the return of consciousness deducts from the total after-pain. In many of the published observations on after-pain, a fallacy

to the discredit of ether anesthesia has been introduced from the fact that most operators use a preliminary dose of morphin with local anesthesia, but not with general. The effect of this narcotic may last after local anesthesia has worn off, but does not interfere with the clear consciousness of the patient that he has withstood the operation. For this comfortable state of mind, the local anesthesia is likely to get the credit. On the other hand, when the ether patient who has had no morphin awakens, his befuddled brain is impressed with pain impressions from the operated region. His sensitiveness is heightened, his orientation confused, and his vocabulary loosened.

If one compares a long series of patients who have been operated on for the same malady, some with local, some with general anesthesia and all with a preliminary injection of morphin, with a like series in which morphin has not been used, one finds that the difference between local and general anesthesia as to the amount of after-pain is not very great. If, now, a similar series of comparisons be made with novocain and gas, with and without morphin, one has a fair basis for comparing the different methods. Ether patients complain the most, but between gas and novocain patients there is not much difference when the duration of the novocain anesthesia is considered.

Patients who have been operated on at one time under ether anesthesia and subsequently for a similar operation under local anesthesia—as, for instance, when operated first on one side and then on the other for hernia, or for block dissections of the neck—when asked to compare the methods, declare invariably in favor of local anesthesia because they escape the ether. The difference in after-pain is seldom mentioned. In a few cases only, such as about the anus, and in the fingers and toes, is after-pain a prominent feature. If one places the two methods in this way approximately on equal grounds, one loses much of his enthusiasm for local anesthesia as a preventive of after-pain.

In considering after-pain with local anesthesia, one must consider the hyperesthesia which often occurs about the insensitive region. As I have previously pointed out elsewhere, this is an extreme hyperesthesia to touch which often lasts for days and is difficult to estimate or to control. Irritation by the end of a suture or from the sliding of a dressing may cause acute pain. Such pains are usually disregarded by the operator because he fails to comprehend them or to measure their importance. After experiments on myself I have more than once, when the bedclothes gently stroked an hyperesthetic area, sat up in bed and delivered eloquent remarks on the folly of self-experimentations. These things have received scant recognition in the literature, but they sometimes play an important part in the discomfort of the patient and must be added to the sum total of after-pain in operations under local anesthesia.

These remarks apply especially when novocain in combination with epinephrin is the local anesthetic used, because of its evanescence. There are some cases in which local anesthesia may be used with confidence to prevent after-pain. Quinin, when properly used with full consideration for the possible hyperesthetic zones, is of great value on account of the duration of its effect. In major amputations, infiltration of the exposed nerves with quinin and urea hydrochlorid relieves after-pain and its consequences

with certainty. In the incision of inflamed areas on the extremities, such as felons, blocking with quinin will control the after-pain for a long time. In general it may be stated that, when all nerves leading to a part can be infiltrated with a lasting anesthetic, pain may be controlled. In regions in which nerve anastomosis is free, as about the anus, the pain is as likely to be increased as decreased by the anesthetic unless definite rules are observed. In operations for hemorrhoids, for instance, infiltration of a ring about the individual pile may be followed by exquisite pain, while infiltration directly into the pile itself will be usually followed by prolonged anesthesia. The reason for this is plain. The prolonged effect of quinin is due to the granular fibrin deposited about the nerve-endings and fibrils. Therefore, when a ring is injected about a pile, the skin is anesthetized for a long period only where there is a deposition of fibrin. The area within is anesthetized for a brief period only and when this brief period is ended hyperesthesia replaces the anesthesia, and if a ligature or suture has been placed in such an area, exquisite after-pain is the result. Sacral blocking with quinin in operations on the anoperineal region serves in most instances as an effective means of controlling postoperative pain for a long period. It is possible that such prolonged blocking of the nerves may affect the healing of the tissues.

Ford Rogers first used quinin and urea hydrochlorid purely for the control of after-pain, by injecting very painful areas during major operations under ether. For instance, if hemorrhoids are operated on at the end of an operation for other disorders, the pile is directly injected with quinin. In this way the prolonged after-pain is controlled. In major operations, generally, the nerves can be injected before they are severed. In order that such injections shall relieve the after-pain, however, they must be done with the same care and in the same manner as though the operation were being done under local anesthesia.

The greatest service of local anesthesia in the prevention of after-pain has been in teaching the operator which tissues are painful. After-pain usually results from the incision in the skin, which produces a burning or stinging sensation lasting some hours, and from the ligation of sensitive parts, which produces an intense burning or throbbing pain lasting from twenty-four to seventy-two hours. If, therefore, one avoids placing constrictions about painful tissues, there will be relatively little pain. This applies to stitching of such viscera as the gall-bladder, folding of round ligaments, ligation of nerves and particularly tight suturing of skin.

Fortunately, tissues that require firm suturing are insensitive and sensitive tissues do not require firm suturing. Fascia has no nerves, and if in the course of an operation requiring the opening of the abdomen the prefascial fatty tissue is elevated, the fascia proper is without pain. The parietal peritoneum must be coapted with the greatest gentleness, with fine sutures, using just sufficient force to bring it into contact. The fascia, when freed from the nerve-bearing fatty layer, may be sutured together firmly and under such tension as will relieve the strain on the peritoneal sutures. This line of sutures is the only one of consequence in securing firm union, a fact abundantly attested to in the various operations for hernia. If vessels requiring ligation have been severed the accompanying nerves must not be included in the

ligature. The importance of this can be best studied in ligating the superficial branches of the deep epigastric vessels in operations for hernia. If the vessels are picked up before they are cut they may be ligated without pain. This cannot be done with a heavy forceps, but with delicate instruments small vessels may be readily picked up without any surrounding nerve-containing tissue. Even slight constriction of nerves becomes painful when the effect of the anesthetic passes off.

From the foregoing it would seem that by the use of quinin and urea hydrochlorid, after-pain could be controlled with certainty. Unfortunately, this drug by its mode of action brings with it its own limitations. The prolonged anesthesia is due to the deposition of granular fibrin (often erroneously referred to as edema). Anesthesia lasts until this fibrin is absorbed. The amount of fibrin formed depends on the strength of the solution, the length of time it acts, and the character of the tissues injected. Moderate injection of the skin produces a prolonged certain anesthesia. An excess produces a retardation of the healing of the wound. In loose tissue, as of the neck and preperitoneum and in muscle, exudate is excessive, and an indurated mass results which may disturb the line of suture. In the peritoneum and in the neck the thickened masses may cause the patient some apprehension, and about the anus they give an uncomfortable feeling of fulness. It is only in conditions in which prompt healing is not imperative that quinin can be used to secure its fullest effect as an agent to control after-pain. These conditions are found in anal operations and in the opening of abscesses, particularly appendiceal, pleural and pulmonary. The control of pain is perfect in nerves exposed during the course of operations. Experience alone enables the operator to approximate the effect he desires to produce. Imperfect as it is, however, quinin alone at the present time offers any hope for the control of after-pain.

With this, I believe, rests the problem of after-pain. Local anesthesia may teach us to perfect our technic so that after-pain is reduced to a minimum, but it cannot prevent it. The cheerful squirting of a few syringe-fuls of local anesthetic solution in the neighborhood of a carelessly handled wound is entirely futile. The skilled operator who by study or intuition has learned delicacy of manipulation is able to decrease greatly the after-discomfort incident to the operation. Local anesthesia contributes to well-being after operation, not chiefly by preventing after-pain at the seat of operation, but by eliminating the effects of ether. Schlesinger is no doubt speaking from experience when he expresses the opinion that we are just beginning our studies of the use of local anesthesia in the amelioration of after-pain.

## II. SHOCK

The use of local anesthetics prevents the transmission of impulses to the brain during the time of operation and for a variable period afterward. What effect the transmission of the pain during the operation may have on the subsequent well-being of the patient is not easy to estimate. Intense after-pain, as after unskilful ligation of hemorrhoids, or tight sutures in other sensitive tissues, may produce intense pain for prolonged periods, but shock does not follow. On the other hand, shock may follow operations on regions not particularly sensitive.

The kind and source of the pain must, therefore, be a factor in the production of shock; but because of the close association of the various types of nerves the importance of painful impulses in the production of shock is not definitely known. We do not know what shock is; we know only something of the conditions under which it occurs. It is difficult, therefore, to estimate the value of local anesthesia in the prevention of shock. Besides inhibiting pain the anesthetic may inhibit afferent impulses which are not perceived as pain, but which produce the state we call shock. If this be true local anesthesia might be a factor in the prevention of shock or might even prevent it entirely.

Enthusiasts have, in fact, stated that with local anesthesia there is no shock. This is not true, and as the experience of the enthusiastic advocate of local anesthesia increases, his statements become more conservative. There can be no doubt that shock is diminished, but whether this is due to the merits of local anesthesia or to relief from the ill effect of general anesthesia is still a question. If big operations are done under local anesthesia, even when there is no pain, one can now and then feel his patient wilt under him. This may occur without the patient suffering pain or mental agitation or loss of blood, and when intoxication from the anesthetic used is not likely.

This may be best observed in block dissections of the neck for carcinoma of the lip and tongue. A case in point may be cited. The patient (man aged 56) came to the table perfectly calm. The operation proceeded without pain. Everything was being removed but the common and internal carotid, the sympathetic and vagus. As efforts were being made to get a ligature on the jugular high up, the patient began to lie flatter on the table. When asked if he was feeling it, he replied, "No, not a bit," but came back with the question, "Are you about through?" Is he receiving impulses from the field of operation not interpreted in terms of pain? Is it a feeling of anxious apprehension and if so would gas at this point save him? Anticipation of this state by the use of gas in the latter stages of the operation does not prevent the collapse. I believe his apprehension is due to impulses he got which were not fully blocked off—perhaps a tugging on the jugular within the skull. At least it occurs in individuals who deny that they experienced either pain or fear.

The occurrence of shock is a rare thing outside of traumatic accidents (whether or not produced by surgeons). When shock does occur in the hands of a competent operator it affects patients suffering from metabolic disturbances or from lesions which make extensive traumatism necessary, such as deeply seated adherent tumors, the removal of which is attended by injury to sensitive tissue. Of course it is difficult to estimate accurately the mental state of the patient. We can only judge by what he tells us and by what we can see. Patients who do not admit pain and seem to suffer no mental agitation sometimes return to bed weary and in perspiration. It has always seemed to me that the removal of tissues abundantly supplied by sympathetic nerves is more apt to be followed by this condition which we may call mild shock. In laparotomies under local anesthesia, explorations about the duodenum and gall-bladder or pressure on the kidney often make the patient look pale and weaken. When asked if it is causing pain he replies, "No, but it makes me feel sick." Unfortunately,

regions most abundantly supplied by sympathetic nerves have not as yet been successfully blocked with local anesthetics and it is useless to speculate on what would happen if we could. True, many operators have attempted blocking of the rami communicantes, but with uncertain success. We are compelled to admit, therefore, that with respect to the shock-potent regions near the solar and sacral plexuses we have as yet no information which will enable us to determine how much could be done to prevent shock if we could block them off.

In desperate operations in which shock is to be expected, we are forced to resort to general anesthesia at least for that portion most likely to produce shock, namely that portion concerned with irritation of sympathetic nerves.

In the prevention of shock local anesthesia stands in much the same relation that it does in the control of after-pain. It eliminates the ether. Ether is not only unpleasant to the patient, but it injures and in some instances endangers him. No attempt will be made here to study the chemical effects of ether. I may say, in passing, that it is a lipoid solvent and dissolves out the cement substance between the cells to which it has access. These changes resemble those due to physical fatigue and perhaps to stimulation through the nerves. The profession is slow to convict a recognized procedure of danger or deficiency until it is sure it can get along without it. It is questionable if we should have discovered chloroform liver necrosis if we had not had ether. My own studies on the chemical effect of ether on living tissue convince me that ether is capable of harm to a degree second only to chloroform. In the vast majority we operate on patients under local anesthesia in order to save the discomforts of ether; in some instances we employ it to avoid the dangers of ether. We use local anesthesia, therefore, because it adds to the comfort and safety of the patient—both of which are attained chiefly by the elimination of ether.

Local anesthesia fails us in the essential steps in those operations which are attended by shock. Apprehension for the operation has much to do with the resistance of the patient, we admit, and hence, with the result of the operation. Sometimes, back of all that causes both apprehension and resistance, there is such a factor as constitutional disease. The effect of fear may be eliminated in some patients by local anesthesia, but it is eliminated in a greater number by the assurance that they need not go to sleep. It is the fear of that sleep that injures the patient. Nothing does so much to tranquilize a patient as the assurance that ether will not be necessary. In the desperate cases we cannot give this assurance, but it helps somewhat to say that we will go as far as we can and then give a little gas (and then ether *voce dulci*). In this way we shorten or avoid the ether, which is the essential thing. Also we must be gentle and considerate in our demeanor and in our operative technic.

Too little attention has been paid to the preparation of the patient. A case in point may illustrate this. An exceedingly nervous patient with a goiter was told that it could be removed under local anesthesia. She became much agitated and declared that she wanted to hear nothing of local anesthesia. She wanted to be asleep and know nothing about it. The anesthesia was not mentioned again. She was put to bed and told to let me know when she was ready

for the operation. She was placed on bromids and after five days informed me that she was sufficiently rested to have the operation the following day. She was given 10 grains of veronal in the evening. When visited in the morning she declared she felt fine. She received morphin 1/8 grain, atropin 1/150 grain. After she was placed on the table she was told that local anesthesia would be proceeded with. She made no comment and there was not a particle of trouble with the operation.

Many who believe they are following the anoci-association method of Dr. Crile content themselves with a little aimless squirting of local anesthetic into the patient's skin and a little more into a perfectly nerveless fascia. They begin the operation before the anesthetic has had time to act. They overlook the skill and gentleness and the avoidance of ether which the originator brings to the method. The imitator is perhaps not alone to blame, for Dr. Crile himself evinces a greater faith and achieves better results than anyone else who is experienced with local anesthetics. After several years' study of the action of quinin both clinically and histochemically I am unable to understand Dr. Crile's faith. What quinin will achieve in the peritoneal fascia, aside from making the healing of the peritoneum uncertain, was not ascertained by my experiments. Without giving details of technic he states in describing his operation for thyroidectomy: "Before the wound is closed the entire raw field is infiltrated in every part with quinin and urea hydrochlorid." The raw field, in so far as infiltration is permissible (excluding the trachea, vessels and vagus nerve), is composed largely of muscle. This tissue causes no after-pain and when infiltrated with quinin exudes a reddish fluid which does not coagulate and tends to prevent wound-healing for a long time. These facts have caused me to avoid the use of quinin in thyroidectomies.

All this is looking only at the simpler phases. In those operations in which shock is likely to follow, local blocking has as yet offered nothing. The nerve distribution to the viscera is such that a deposit of anesthetic solution in their vicinity is uncertain and in the presence of adhesions and inflammatory exudates an effect on the nerves is out of question. In those instances in which it is applicable, a wait of from fifteen to twenty minutes is required before the action is complete. This delay is not without moment. True, Dr. Crile seeks to hasten its action by pressing on the area infiltrated, which, theoretically, should delay its action.

When operating with local anesthesia while the patient is asleep with gas, the operator is unable to determine whether or not the tissue is anesthetized. Bloodgood has called attention to this point. Unless the infiltration is perfect it misses its point. The gas is to serve only to prevent the patient from knowing that he is being operated on.

Dr. Crile, in speaking of the elimination of shock, admits that the patient does not always escape a dangerous depression. If, however, this depression results fatally it makes little difference whether or not there are changes in the brain-cells. By emphasizing the changes in the brain-cells, Crile removes from the term "shock" its purely clinical meaning, and substitutes an unproved histologic hypothesis. We know, as yet, too little about the termination of the nerves transmitting pain to be sure that changes found in a given nerve-cell are due to such transmitted stimuli.

Nor has an unquestionable proof of the relation of nerve-cell changes to the clinical picture called shock, yet been advanced. Local anesthesia to date has eliminated shock from those operations which can be done under its influence. In the larger operations, however, except those about the neck for carcinoma and in carcinoma of the rectum, it has not, as yet, been fully successful. In many operations, by reducing the period of anesthesia, it has reduced the tax on the patient's resistance. In the grave abdominal operations it has, so far, contributed but little. The visceral nerves, when irritated by inflammation or by the invasion of new growths, are exceedingly sensitive, and no safe method has yet been devised to prevent the transmission of these impulses to the brain. In these cases all that local anesthesia can do is to make the abdominal wall insensitive, and it seems likely that this is but a small factor in the production of shock. The prevention of shock in these cases must depend on the deftness of the operator, and his ability to judge conditions correctly in order that he may manage them with the least traumatism, in the shortest time, with the least loss of blood.

Rialto Building.

## DISCOVERY OF BACTERIUM TULARENSE IN WILD RABBITS AND THE DANGER OF ITS TRANSFER TO MAN

PRELIMINARY NOTE \*

WILLIAM B. WHERRY, M.D.

AND

B. H. LAMB

CINCINNATI

We wish to record our recent demonstration of *Bacterium tularense* in a fatal epizootic among wild rabbits, and to emphasize again the fact that this disease is probably widely distributed among rodents and probably transferred to man more frequently than heretofore recorded. We have demonstrated this virus in two severe cases of conjunctivitis accompanied by lymphadenitis, high fever and marked prostration. The first case of human infection has already been reported by us.<sup>1</sup> This case came under the care of Dr. Derrick T. Vail<sup>2</sup> of Cincinnati, who has reported the details of the clinical course of this case. The second case is still under the care of Dr. Robert Sattler of Cincinnati, and will be reported by him.

McCoy and Chapin first described the disease in the California ground squirrel. Naturally we have been anxious to find the source of human infection in this locality. Through the kindly cooperation of Dr. J. H. Landis, Health Officer of Cincinnati, we have been able to do so. Dr. Landis heard that rabbits were dying in large numbers in the neighborhood of Vevay, Ind. (Switzerland County). Two men were sent down, November 12, to investigate the rumor. They could not find any evidence of extensive mortality among rabbits, but they shot three and found two dead on the M. farm about 6 miles from Vevay. These were dissected, November 13, and both of those found dead were proved to be infected with *B. tularense*.

RABBIT 1.—The external appearances were normal, excepting for the presence of many fly larvae in the nose and mouth and on the skin. None of these had penetrated the tissues, so it is presumable that the rabbit was found soon after it died. On dissection the subcutaneous tissues showed some injection.

There were many small irregular areas of hemorrhage into the skin covering the posterior aspect of the hind legs and rumps. The cervical glands were congested and firm on section. The spleen was a deep blue-black and about four times the normal size, and speckled all over with minute whitish foci of necrosis. The liver was congested and also showed numerous foci of necrosis. The lungs appeared normal excepting for a few patchy areas of consolidation of a deep brownish-red. The peritoneal cavity was full of a hemoglobin-tinged serous exudate.

Smears from the spleen stained with anilin (Hoffman's violet) showed numerous irregular, coccoid, encapsulated bodies resembling the involution forms of *B. tularense*.

Guinea-Pig 1 inoculated subcutaneously with an emulsion of the spleen of Rabbit 1 was chloroformed when dying on the third day thereafter. It showed the typical lesions which have been described by McCoy and Chapin, and by us.<sup>1</sup> *B. tularense* was isolated from the spleen of this guinea-pig on a slant of coagulated egg-yolk, while no growth appeared on control slants of plain nutrient agar and rabbit's blood agar.

RABBIT 2.—This animal showed marked post-mortem decomposition and was badly fly-blown. However, minute whitish foci of necrosis could be made out on the soft enlarged spleen and on the liver. An enlarged axillary gland was emulsified and injected subcutaneously into Guinea-Pig 3. This pig died in three and a half days, showing the typical lesions of infection with *B. tularense*.

We are anxious to help physicians in the discovery of further cases in man. It may be that physicians in country districts who have not the facilities for bacteriologic study may be willing to send us material from severe cases of conjunctivitis or lymphadenitis in man. These may well prove to be cases of this disease when there is a history of having shot or handled rabbits, squirrels or ground squirrels. A cotton swab, soaked in such exudations as can be reached, mailed to us by special delivery and accompanied by a note concerning the nature of the case will be reported on as soon as possible.

**Conservation in Evolution.**—Organisms have evolved by a trial and error method; they experiment organically, instinctively, and intelligently; above all, perhaps, in the mysterious antenatal life of the germ cells they experiment in self-expression—just as water vapour does in snowflakes, but far more subtly. What are called variations and mutations in biological language are the organism's experiments in self-expression, and these are the raw materials of progress. The organism proves all things, but the other side is that it holds fast that which is good. Great gains once made are not held lightly. Species become extinct and races perish, but important organic inventions are carried on by some collateral lineage. It was probably some ribbon worm that first manufactured hemoglobin—the all-important red pigment of the blood. Many backboneless animals of higher degree on different lines of evolution have not got it, but the invention was too good to lose; and everyone knows that it was retained on collateral lines, and that all backboneed animals from fishes onward have red blood. Or again, the most primitive and in a way most puzzling kind of locomotion is that of the ameba gliding in the pond. Is it not a most suggestive fact that our health from day to day and the development of our nervous system are absolutely dependent on this self-same ameboid movement?—J. Arthur Thomson, *Brit. Med. Jour.*

\* From the Laboratory of the Cincinnati Hospital.

1. Wherry, W. B., and Lamb, B. H.: *Jour. Infect. Dis.*, 1914, xv, 331.

2. Vail, D. T.: *Ophth. Rec.*, October, 1914.