by his son the next day that speech mistakes were very rare. The Sunday previous the patient was called on in church to make a speech and was able to get up without difficulty and tell the assemblage that he had been sick for a long time and did not wish to strain himself attempting to talk publicly. Even under this excitement the patient volunteers that he made no errors.

The tests made four weeks after operation in the repetition of spoken words showed an ability to repeat words with great precision. Following this there was a period during which quite marked difficulty was experienced in this act, but this soon passed away. In the last three weeks repetition has been excellent.

The ability to read aloud has perhaps shown the greatest improvement. Such titles as those on magazines could be read at the end of the eighth week with some difficulty but with much greater facility than previously. The patient says that within the last two weeks (from ten to twelve weeks after operation) he has been able to repeat names that have been on the side of wagons, headlines on newspapers, and various other names which before this time he was entirely unable to transfer into speech, and tests uphold his statements. Legends are read with little difficulty.

Spontaneous writing shows a distinct improvement. At present when asked to write short phrases on a given subject he is able to do this immediately and fairly legibly.

Perhaps the only improvement in writing to dictation has been noted in the time taken to write a short phrase. Twelve weeks after operation the patient, though unable to write legibly, is able, nevertheless, to write immediately and without the continual repetition necessary before. On copying words and letters the patient shows little improvement in legibility, but the response is almost immediate.

In the addition and recognition of numbers there is an almost normal state of affairs. The patient still shows his ability to tell time immediately and he is able to pick out of ten objects each one as it is named. Several weeks after operation there was some hesitancy in this act. The use of these objects has always been recognized fairly well, but it is only lately that the patient has been able to express very clearly the various words.

The symptoms of intracranial pressure have been as follows: Blood-pressure has decreased from 200 mm. by an irregular descent to 160. The pulse fell from 60 down to as low as 52 three weeks after the operation, and gradually and intermittently rose to what was its highest point thirteen weeks after operation, when it registered 84. There have been no vomiting spells or nausea. The eyesight and vision have remained the same.

The psychic state has shown a peculiar course. The patient was emotional to a high degree before operation; there was a comparative stability until about six weeks after operation, when there was an extreme exacerbation of the emotional state, and an inability to utter more than a few words without a crying spell. This condition passed off within the course of a few days, but after that there was a slight tendency toward a depressed feeling. A feeling of encouragement on the part of the patient, and a general return of his good health has been accomplished in the last two weeks by a period of mental stability, which has not been seen in him before. At the present, even now, he is quite easily excited, but in the course of a normal conversation one would not recognize this feature.

Certain features associated with the accumulation and absorption of subdural and extradural fluid at the seat of operation are perhaps worthy of consideration. The wound healed by first intention. Stitches were removed the third day. The final dressing was made on the tenth day. About five weeks after operation there was noticed on deep palpation over the trephine holes what seemed to be a slight accumulation of fluid which would give fluctuation on deep pressure. This condition persisted for a week, and it was impossible to tell whether this was due to accumulation under the dura or to one extradurally located. From palpation it was judged that the dura was lifted and made rather tense

under the trephine holes. This condition passed off after the eighth week. What is interesting to note is that associated with this probable subdural collection of fluid the psychic state was greatly disturbed and that the hand was in one of its periods of great regression at this time. Likewise, at this time, also, the aphasic symptoms showed an exacerbation which rapidly disappeared, hand in hand with the disappearance of the fluctuant accumulation.

CONCLUSIONS

The interesting points concerning this case have been:

1. The history, which suggested the hemorrhagic destruction of brain tissue with aphasic symptoms, followed later by an increase in the symptoms, which indicated a progressive, growing lesion.

2. The rapidity with which the motor and sensory disturbances became evident.

3. The drainage of the cyst by a subdural route made necessary, in our desire to avoid external drainage, by the jelly-like consistency of the brain tissue, which absolutely precluded the possibility of manipulative procedures in this region.

4. The accumulation of fluid under the dura at about the sixth week, as demonstrated through the trephine holes, and the associated psychic and sensory-motor disturbances.

5. The absorption of this fluid with a consequent improvement in the regressive symptoms noted with the previous accumulation.

6. The complete disappearance of the Jacksonian epileptic attacks and of the dragging of the foot, the striking improvement in the motility of the right hand, the marked diminution in the aphasic symptoms, and the betterment, often striking in character, of the sensory, stereognostic, apraxic, ataxic and position-sense disturbances.

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A CLINICAL CONTRIBUTION TO THE DIAGNOSIS OF EPILEPSY *

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It may not be out of place at this time to make a further report on some studies of epilepsy that have engrossed my attention for several years. The subjects treated comprise the following:

1. The nature and character of the epileptic voice-sign.

2. The outcome of high-dosage administration of bromid for rapidly recurring petit mal.

3. The practical results in Roentgen-ray analysis of gastro-intestinal tracts of epileptics.

4. A short disquisition on the variations of the sella turcica in the recent state of epileptics as shown by Roentgen-ray analysis.

5. A graphic chart for recording the quantitative daily epileptic discharge in severe forms of epilepsy.

6. The differential diagnosis of psychogenic convulsions from genuine epilepsy, together with a plea for the establishment of a central laboratory of research into the nature and treatment of epilepsy.

THE EPILEPTIC VOICE SIGN

In 1907 I described what I called the epileptic voice sign, and through a method devised by Dr. Scripture

* Read before the National Association for the Study of Epilepsy, Baltimore, May 25, 1914.

we succeeded in making accurate records and charts of it. The defect was shown to be in the expressionless quality of the epileptic voice. It usually renders the frank epileptic incapable of singing beautifully or speaking well. When the voice defect is once pointed out it is obvious to any one. Instead of the continual rise and fall in melody the vowels and phrases run along on even tones. The speech of the epileptic may thus be designated as "plateau speech"; that is, the melody proceeds by even steps. There is also a tendency to monotony, that is, the successive sounds do not vary much from each other as in normal persons.

Although at the time of the report I expressed the opinion that probably the speech defect developed *pari passu* with the disease, I have since found that this is not the case, inasmuch as many epileptics that I have examined since my first report present the defect in a marked degree although but two or three seizures may have occurred. Again, I have recently examined a number of epileptic individuals in whom there has been an arrest of their disease for several years, and in spite of this prolonged arrest or cure, the voice sign persists nearly if not quite as marked as when the disease was active. One must therefore relegate the voice sign to a part of the make-up of the epileptic constitution, quite independent of the seizure phenomena *per se*. It is true that by appropriate exercises epileptics can learn to speak normally for a time, but the voice readily relapses to the epileptic type through negligence, and indeed, two of my private patients whose epilepsy was arrested for several years took a long and intensive training to remove this voice defect, but have relapsed to their former epileptic type of speech, although all epileptic manifestations have remained continually absent.

It is interesting to note that this voice sign is not the expression of a type of congenital feeble-mindedness so frequently postulated as the essential mental make-up of the pre-epileptic state of epileptics, which mental defect may be proved to exist in perhaps the great majority of the early epilepsies. To prove that the foregoing is true, I will state that in a study of ten selected cases from private practice the voice sign is present in all, although by various carefully given intellectual tests they in no wise suffer any deficit in the intellectual field. Indeed, two of the series were college graduates of no mediocre standing in their respective classes.

It may not be necessary to say that all extraneous causes for the presence of the voice sign such as station in life, bringing up, nationality and sedative treatment have been ruled out. Further, it may be said here that an analysis of the voice sign of some of the ordinary types of feeble-mindedness found in a series of children and adults has proved that their voice type was rather distinctive of another sort of defect entirely. If I were to hazard another guess at this late day, I should say that the voice sign is a part of the epileptic constitution that concerns a fault in the full elaboration of the functioning of speech in which the elemental adjustment of inhibitory control was absent. It is somewhat akin to the peculiarity shown in the awkwardness and lack of smoothness of other volitional movements, both voluntary and involuntary in character, that have so often been referred to by the older writers as the disorders of motility in epileptics independent of seizure periods such as was extensively studied by Reymond years ago. The voice sign is therefore psychophysical in the character and import.

While the epileptic voice sign has been incorporated in many text-books, I believe that it has not yet received all the attention it deserves at the hands of clinicians, especially now, when the necessity of sharper distinction between affect epilepsy or psychogenic convulsions and the genuine malady has grown to be of so much importance.

HIGH DOSAGE OF BROMID IN RAPIDLY RECURRING PETIT MAL

Several years ago I reported on a new and rather rare form of rapidly recurring petit mal epilepsy and gave the details of the bizarre attacks in persons affected by it. Inasmuch as no similar cases have been placed on record since that report, the subject may be thought of little general clinical importance, but two or three points about the disorder are worthy of comment. I have seen one other such case since my report. The attacks in this peculiar form of epilepsy, it will be remembered, were in most instances a simple awakening from sleep, and the attacks occurred a hundred or more times in a single night. The patient no sooner fell asleep than the attacks began, either day or night. In one case as many as 300 separate and distinct attacks occurred in a single eight hours of sleep at night.

The patients usually awaken from deep sleep; the eyes are opened widely; the pupils are dilated and irresponsive to light; the head is moved from side to side. There is an anxious and furtive look in the face. The face may be congested or very pale, and is usually the one or the other to an extreme degree. In a few seconds after the onset the patient executes some incredibly rapid movements of the hands or feet, but with no clear intent or purpose, such as is seen in somnambulistic states. For instance, the patient drums on the bed, executes kicks aimlessly in space, or beats his head, thigh or chest in a senseless way. He may spring in the air or turn somersaults rapidly. Sometimes patients exhibit attention when spoken to, but they most frequently make no coherent reply. Unless disturbed, the patient soon passes into normal sleep at the end of the attack.

In Case 1 the patient met an accidental death after the petit mal had ceased three months. In Case 3 the patient relapsed after a year or more of freedom from her disease; grand mal attacks recurred, and she died of tuberculosis two years thereafter. In Case 4 the patient remained well for three years and then relapsed.

CASE 2.—This case, about which I shall make more extended report, was that of a young unmarried man who came under observation and treatment when he was 21 years old. His disease had originated when he was 18. The family history was negative so far as could be learned. The first seizure was that of petit mal, a turning of the head to the left, and the body was rotated several times to that side. The second seizure was of sufficient physical violence to throw the patient from his bed. The usual and ordinary doses of bromid sedatives stopped the seizures for a time, but later they recurred several times a day, but were always more frequent at night. In a six months' period of observation this patient had over 600 attacks of the peculiar petit mal previously outlined in this paper, and twenty-three typical grand mal attacks. In the next three months under the high dosage of sedatives he had but three grand mal diurnal attacks and no paroxysmal awakening seizures. Three months after, all epileptic manifestations ceased entirely and they have not recurred since. Sedatives were entirely discontinued three months after, or nine months

after the high-dosage plan was installed. He has been entirely well for thirteen years; has a good position as traveling salesman, is married and has two apparently normal children. He is in robust health physically and mentally. The point of special interest in these cases is that the peculiar attacks were immediately increased by the ordinary doses of bromid (from 60 to 120 grains daily), but as the dose was increased from 120 to 180, or even to 230 grains daily, as in the case with recovery, detailed above, all attacks ceased.

The process of treatment was undertaken with the greatest care. The principle of high dosage of bromid may be stated as a form of hyperbromidism, bromid intoxication or poisoning. The drug was given in a steadily increasing dose, as that of iodid in specific disease. The patient had high rectal irrigation once or twice daily to reduce the amount of congestive catarrh, eliminate toxins induced by faulty metabolism or deficient oxidation, and for its diuretic effect. The patient was also given prolonged hot packs and baths at night for diaphoretic effect, and cold douches, sprays and cold drip-sheet treatment mornings to stimulate the peripheral sensory nerves and to preserve vasomotor tone. Vigorous deep massage was steadily maintained to cleanse the muscular circulation. The inordinate tendency to local stasis of circulation in the skin under such extreme sedation and its consequent depression of the skin function shown in acne, etc., was corrected by face packs, hot moist bran applications, and mild stimulation of ointment applied at night. Mouth and nasal cleanliness, occasional lavage of the stomach and large quantities of aerated Vichy water (two or three quarts daily) were necessary. Respiratory gymnastics were not forgotten.

The disorder might be considered as a paradoxical narcolepsy. While the condition is surely rare it is by no means the intractable form of epilepsy noted by Herpin and Delassauve. The recent case which has not yet been placed on record behaved in the same clinical manner as those above noted and was given the same treatment. The patient has now remained two years free from his paroxysmal awakening attacks, the last year without any sedatives, and has shown no other manifestations of the epileptic disorder.

GASTRO-INTESTINAL ROENTGENOSCOPY

Last year Dr. Bushy and I undertook to analyze thoroughly the gastro-intestinal tract of a small but select group of epileptics, and a report was made at the American Neurological Association in Washington. We found an abnormal position of the various parts of the gastro-intestinal tract present in every case examined. We were not then, nor are we yet, able to explain the genesis of these defects in epileptics. We presume, however, that it is not greatly dissimilar to that inducing the same condition in other persons not suffering from epilepsy. I believe that every case of beginning epilepsy ought to be thus analyzed whenever a markedly disordered digestion is in clinical evidence. In a few instances we demonstrated that the abdominal belts as ordinarily applied were entirely useless to replace abdominal viscera; neither the prolapsed splenic nor hepatic flexures were altered in the least by such appliances. It may be possible that the binders applied in the Trendelenburg position may be of service in this respect.

A point of considerable practical moment following these Roentgen-ray examinations has been a more or less definite indication to just what parts of the abdomen one should apply kneading and massage movements over the great intestine. I have found this therapeutic procedure of the greatest value, particularly when there has been a tendency to stasis in the

ascending colon. One must remember that in not a few such cases of ptosed colon disorders but a little functional aid is all that is frequently needed. This view probably accounts for many simple practices being efficient, for a time at least, in restoring a relatively normal function of the colon in constipated persons. After all, the functional test of efficiency is the final proof of the value of any treatment for colon stasis. The outcome in such cases is the more easily rationalized if we know the relative position of the viscera as shown by Roentgen-ray examination of the intestinal tract. It may be added here that the reexamination of two cases of colon stasis several months after an improved functioning of the bowels had taken place showed no essential change of position in the structures which had been previously analyzed by the Roentgen ray. However this may be, we still believe that Roentgen analysis of the defective digestive tracts of epileptics is of both diagnostic and therapeutic value. It is an excellent supplement to the chemical and bacteriologic tests already in use. Close attention to the digestive tract forms a prominent part of any comprehensive hygienic plan of treatment in epilepsy.

VARIATIONS OF THE SELLA TURCICA

The foregoing subject leads us naturally to the next, a Roentgen study of the variations of the sella turcica as shown in the recent state in some epileptics. In a general way one may state that Roentgen-ray work on the head, particularly to gain valuable information of a positive nature, has not been much improved on, and our Roentgen knowledge of the variations in the cranial viscera has had no such advancement as that of the abdominal viscera. There is little opportunity as yet for us to make parts of the brain denser than others so the different parts of the cranial content may be made distinctive. It is true, however, that improved Roentgen technic has made possible an excellent examination of the entire bony envelope of the brain both inside and out. Even large tumors or abscesses in the brain, though they may be of considerable density, are infrequently recognizable by Roentgen ray. It seems therefore that a great step must still be taken before we shall discover a method of Roentgen analysis of actual brain alterations, such as minute focal or general gliosis of cortical tissue which has been postulated as the morbid anatomy of the epileptic brain. The idea is, however, within the scope of possibility.

In the meantime a new question in Roentgen analysis of the epileptic cranium has arisen: what rôle the ductless glands play in the development and continuance of epilepsy itself, and particularly the pituitary gland. The remarkable impetus the whole subject of the function of the pituitary gland and the modifying influence which its abnormal functioning has on the rest of the body received great acceleration from the admirable work of Cushing in this special field. The interest in the different functions of the various glandular structures embraced in the pituitary has caused not a little inquiry about the bony envelope of the gland itself, the sella turcica. In such an investigation one must not neglect the commonness of variation in the epileptic cranium, a fact emphasized again and again in anthropologic studies of such individuals. Nevertheless many of us have noted rather remarkable changes in the posterior clinoid processes. They often hook over so as to nearly close the sella cavity; in a small clinical material of a score of cases now in my hands but three or four of this number present this pronounced sella

variation. It is, of course, impossible for one to say just what influence this bony variation may have on the posterior lobe function. Certain it is that the cases showing this condition of the sella present no physical abnormality or variation in the epileptic state different from those not possessing it. Two of my patients who showed marked alteration of the sella were given pituitary extract hypodermic medication without any apparent alteration of the epilepsy for the better.

One cannot help but think that any such empiric medication must come to naught, especially in view of the fact that one neither knows the real nature and pathology of the disease, nor the nature and function of the pituitary secretion. Even if the pituitary secretion were the proper one to be supplied in the epileptic state, any of the present methods of administration must be considered too crude in practice when compared with that by which Nature supplies the same secretion in daily bodily metabolism. This statement is true in spite of the much overworked parallelism of thyroid medication in cretinism and allied states of myxedema. Again, a pure and properly prepared pituitary extract of the posterior lobe is probably not on the market today.

THE QUANTITATIVE DAILY EPILEPTIC DISCHARGE

For some time I have been interested to determine and measure the amount of dynamic loss to the epileptic in his seizures, this to be measured by a quantitative scale in order that it may be chartered in a graphic curve. The idea is the more interesting when the epileptic attacks are frequent and vary in character so that the ordinary record, wherein single attacks are reported, is often misleading to one hastily viewing them. In many such cases I have employed a chart similar to the one shown here. We find recorded here by daily analysis the urine tests for albumin, indican scale, the total solids, urea, and the number of hours of exercises the patient indulges in. The seizure record is made in a graphic chart by giving a definite small percentage value to the slightest psychic episodes which the patient has and then gradually grading the severer attacks to the largest percentage for the grand mal attacks. By this scheme one gains a much clearer relationship of the amount of epileptic discharge that

obtains than by the ordinary employment of numerals for the seizure attack. I hasten to add, lest some one may ask for the individual interpretation of the scheme, that I am not ambitious to say just what this chart proves in any causal relationships in the curves.

DIFFERENTIAL DIAGNOSIS

Since the interesting and perturbing advent of the psychanalytic school, epileptologists have experienced another partition of their clinical garment of epilepsy as an established disease entity. There has been a special rendition of the petit mal type. Out of this group more especially has been built up the so-called affect epilepsies, or better, the psychogenic convulsions of the neuropathic. It may seem surprising to many of the uninitiated that inasmuch as the so-called genuine epilepsy is generally recognized as an organic disease, the psychogenic seizures should be in any way compared with the former. It largely

goes to prove on what slender basis an organic disease entity may be postulated when its integrity depends on group symptoms or a syndrome without exact knowledge of its underlying pathology. I venture to say that even many skilled clinicians to-day depend largely on the description of the seizure type for a final diagnosis of the disorder. Only in a secondary way do they take cognizance of the primary epileptic constitution and the secondary deterioration of the malady as well as the physical stigma of the disease. It may seem that the latter

statements appear superfluous, but it should be borne in mind that not a few of us have seen many institutional cases in their very beginning when the diagnosis has been by no means easy. In my institutional life with epileptics I often wondered why many treatises on epilepsy devoted so much time and space to the differential diagnosis of epilepsy; I have since learned better. Given a poor description of some sort of convulsive attack by an excited and distraught relative, one has need of the keenest intuitive powers and the most careful examination before making a certain diagnosis. To us extramural physicians, therefore, the advent of the psychogenic type of seizures is especially perturbing. While nearly all old text-books emphasized the infrequent but certain occurrence of epileptoid convulsions, and, indeed, even true attacks

Chart showing a method of graphic tabulation of daily record of albumin, indican content, total solids, urea output of the urine, and hours of exercise contrasted to a graphic curve of the epileptic state in which the latter is estimated on a basis of percentage or scale. The slightest attacks, psychic in character, are given a value of 50 per cent., while the severest, grand mal attacks, are valued as 100 per cent. The method is of greatest use in recording epileptic states of maximum severity in which one or more attacks occur daily.

emotionally induced in the otherwise frankly epileptic, these statements gradually lost place in modern works until to-day it reappears in many clinical studies almost like a new fact, that many attacks in epileptics are emotionally induced. For some time the situation has been made the most of by many quacks in dealing with many excitable and neurotic epileptics. Any one having much to do with epileptics, especially one living in close contact with them in colonies and institutions, daily witnesses true epileptic attacks psychically induced. Many types of peculiar seizures are also seen which are not epileptic at all but possess many characteristics akin to genuine hysteric convulsions. No two neuroses, any more than two organic nervous disorders, are mutually exclusive. A luminous essay might easily be made from a study of the various psychoneuroses seen in epilepsy. Many phenomena now classed as epileptoid or epileptic manifestations such as the epileptic twilight state, day dreams, temporary absences following emotional affects, frights, panics, distractions, pure phantasies and a notable criminal disposition shown in cruelties and assaults, may all be shown in part if not wholly to be due to outbursts of incompletely repressed affects. There can be no doubt that many such symptoms compared with the same occurring in pure psychoneurotics are in no respect dissimilar in manifestations or cause. Not a few of the so-called reflex and traumatic epilepsies of the past have been but thinly disguised psychogenic convulsions. One must bear in mind that in such cases the ordinary so-called stigmas of hysteria are absent, but even tongue biting and incontinence of the bowels and urine may occur and yet the disorder be psychoneurosis. I have seen two cases of the latter sort proved out by observation and treatment. However, true that in the majority of epileptics tongue biting and passing of urine in the attack may be good evidence for an organic or genuine epilepsy, one needs to remember that such symptoms *can* occur and the case not be one of epilepsy.

In the light of the foregoing it is easier now to make disposal of many reports of atypical and bizarre epilepsies, especially such as have been reported by Brush, Newmark and Sanger Brown. It is obvious, therefore, in a given case of epilepsy which shows none of the make-up of the epileptic constitution and no physical or mental deterioration from the malady, that one should consider such a case with the greatest care in the light of our knowledge of affect epilepsy or a psychogenic convulsant in a neuropath. One also should remember that a few cases of dementia praecox have epileptoid attacks. I meet such patients almost weekly. If time permitted I could cite many illustrations of the fact. At present I have no less than four cases of mixed types of convulsive attacks to diagnose differentially. In a brief statement it may be said that psychoneurotic episodes are differentiated from the ordinary types of so-called genuine epilepsy in that the former are symptomatic expressions of incompletely repressed and painful affects, having greater constancy, are often prevented or repressed purely by suggestion, may be displaced or prevented by psychoanalysis and are usually unfavorably influenced by sedatives. The amnesic episodes are purely functional, and intelligence tests show no defects. The promptness and completeness by which the affect epilepsies may be cured make one wish that ordinary epileptic states were more frequently of this less grave nervous disorder. I attempt a partial analysis of every

case of genuine epilepsy in the hope of removing many of the psychic elements that may act as irritants to the true disorder. It often fortifies the ground gained in the improved and arrested cases of epilepsy. Careful psychoanalytic studies in true epilepsy are still to prove a mine of valuable and practical facts. It may yield data of practical points in treatment.

I wish to emphasize the great importance of establishing a central laboratory for research in convulsive disorders, the organization of which I made the basis of an address several years ago in the New Haven meeting of this association. Almost every other grave and wide-spread disorder which afflicts humanity by the thousands has had its special private or state endowment, and its laboratories busy in research. In the general study for the betterment of such human scourges as cancer, tuberculosis and insanity the cause of research into the nature and prevention of epilepsy seems to have lagged far behind. I am sure that no one thing would advance human welfare more than such a central laboratory for intensive research into the cause and prevention of epilepsy.

I trust the foregoing clinical exposition is of sufficient moment to warrant my further report on the several subjects at this time, and that it will be of sufficient interest to stimulate further clinical research into the still obscure clinical manifestations of this strange disease.

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A CULTURE OF B. TUBERCULOSIS FROM THE BLOOD POST MORTEM OF A CASE OF MILIARY TUBERCULOSIS

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A careful review of the literature on tubercle bacillæmia has failed to show a single instance in which the tubercle bacillus has been grown from human blood. A few unsuccessful attempts to obtain such cultures are cited by Bergeron¹ in his review, which is dated 1904. Anderson² in 1909 made blood cultures from forty-eight cases of tuberculosis, all of which were negative. He was successful in obtaining three positive blood cultures from eight artificially infected rabbits, and this is the only recorded instance in which the tubercle bacillus has been cultivated from the blood of tuberculous subjects.

The reasons for such uniformly negative results are easily seen. Any one who has attempted to grow tubercle bacilli, even from material rich in organisms and uncontaminated, is familiar with the difficulty of getting the growth started. Complete aerobiosis, a carefully regulated temperature, carefully titrated mediums, and proper moisture are all necessary to induce Koch's bacillus to multiply on artificial soil. Cultures from the blood present several obstacles to the attainment of the above ideal conditions, chiefly the fact that the few organisms which might be present in the small amount of blood utilizable will in all probability be buried in a mass of red cells and fibrin if the blood is poured over solid mediums, and so be shut off from the access of oxygen in the air. Even should

1. Bergeron, André: Etude critique sur la présence du bacille de Koch dans le sang, Thèse 223, Paris, 1904.

2. Anderson, J. F.: The Presence of Tubercle Bacilli in the Circulating Blood in Clinical and Experimental Tuberculosis, Bull. 57, Hyg. Lab., U. S. P. H. S., 1909.