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ORIGINAL ARTICLES.

ANTI-TUBERCLE SERUM.

THE TREATMENT OF CONSUMPTION BY SEROTHERAPY—
REPORT AND PRESENTATION OF CASES TREATED—
EXHIBITION OF SERUM, ETC.

Read before the St. Louis Medical Society.

BY PAUL PAQUIN, M.D.

ST. LOUIS, MO.

Preliminary Remarks.—It would seem superfluous to say a word here on the pathology of this affection. But the nature of the new treatment demands that we refresh our memory on some points of it before certain therapeutic questions to be dealt with presently may appear clear. The result of my observations and researches have convinced me beyond a doubt that tuberculosis, in the stage of lesions, particularly when pulmonary cavities, intestinal ulcers, etc., exist becomes a mixed infection, due to the introduction of various other pathogenic microbes besides the bacillus of tuberculosis in the specific wound. Myriads of germs of the air, water and food gain access to tuberculous lesions and complicate the primary disease to a very grave degree. The destruction of tissue by these germs, the production of new mixed poisons, perhaps more dangerous sometimes because of chemic combinations, are largely responsible for the irregular chills, fevers and some other pathognomonic phenomena to be seen in advanced tuberculosis. These complicated microbic disturbances which so greatly depress and harass the system are, perhaps, assisted in their nefarious work by the toxins generated in a weakened impaired digestive tube which, failing to digest the food properly, leaves it the prey of various toxic-ferment manufacturing microbes. It is well to bear these points in mind when considering the anti-tubercle serum as a therapeutic agent in tuberculosis, for it probably will not improve complicated cases.

On the other hand, in tuberculosis we should never lose sight of the natural vital resistance of the exposed or suffering individual. It is this *vital resistance* of nature that saves the minority who escape all the damaging influences of the disease, and the principles underlying it explain the serum therapy. To understand this vital resistance, its nature and its scope and increase it in medical practice, is to wield a powerful weapon against the foe. The cursory method of diagnosis, therefore, merely by the interpretation of physical signs is not sufficient to put the doctor in possession of all the important facts necessary for an accurate interpretation of tuberculous phenomena and the proper treatment. The microscope should be brought into play early and often, not only to discover the existence or absence of the bacillus of tuberculosis, but also to establish the differential nature and stage of the organic

lesions as far as possible and to realize the nature and extent of the mixed infection when it exists.

SEROTHERAPY IN TUBERCULOSIS.

I began the serious study of tuberculosis and experimentation in 1888, at the University of the State of Missouri at Columbia. During my service at that institution I had unsurpassed opportunities for studies in comparative pathology and experimentation. Early in my researches on tuberculosis, I became convinced that the equine species is, to a certain degree at least, naturally immune to the disease, the ass being less susceptible, possibly, than the horse, although I am by no means convinced of this. Later, following step by step the work of Metschnikoff on the theory of phagocytosis, Kitasato and others on the antiseptic properties of blood serum, I formed the conclusion that the chief and direct basis of immunity was lodged in the blood. When the Japanese scientist just mentioned and others, published that properly immunized blood serum was efficacious in the treatment of tetanus, revealing by this momentous discovery the great secret of nature's force in resisting this disease, the light began to dawn in my mind, as in that of every medical man doubtless, to the effect that the prevention and cure of contagions by the use of nature's own remedy was only a question of time. Not many years after, came the welcome announcement that diphtheria was curable by the use of a specially immunized blood serum. The press also reports that investigators in Switzerland and France are testing the blood serum of the ass. Now, I beg to report that by the same principle which underlies the antitoxic serum of Kitasato for tetanus, of Behring and Roux for diphtheria, horse blood serum may be rendered more antagonistic to tuberculosis than it is naturally. This I have accomplished, in laboratory experiments and the result obtained in treating consumptives in the first and second stages, and some in the third stage, indicates quite pointedly that serotherapy will perhaps master this dreadful plague. Indeed, I dared not hope for such universal improvements as were obtained. While in advanced consumption with cavities or other serious lesions impairing important organs gravely, I have not yet arrived at a point where I may formulate reliable deductions, a large per cent. of such cases very seriously involved, increased in six to eight weeks from five to sixteen pounds in weight without any tonic, and without any specially reconstructive diet, only the regular city hospital or poor house fare being admitted, certainly not over nutritious, whereas every witness case in the same ward, suffering with the disease in practically the same stages, untreated by blood serum continued to decline steadily or failed of improvement. Furthermore, the treated

NOTE.—The scientific experiments carried on then and since, both in the laboratory and the field, will form the subject of a special paper. This will contain explanations and results as per records kept.

cases soon began to sleep better, to cough less, expectorate less, eat with relish and their night sweats diminished. In a couple of instances in the first and second stage, cough and expectoration ceased entirely in less than eight weeks, while all the general signs of good health reappeared. There is scarcely enough expectation in these to make microscopic analyses, and the germs are no longer to be found. I have also several cases with large cavities which have improved remarkably. I have brought here to show you, some of the worst which we have under treatment, that you may judge for yourself of the nature of the affection and its lesions. These bad cases with marked alterations of the lung tissue have gained in weight, a number of pounds in eight weeks and have improved in every way. Two of these were stretcher patients when brought to the city hospital. Both had been condemned as hopeless by several physicians. One of these weighs now more than he ever did at his best, when he was perfectly sound and healthy. We have not had any case of any kind under treatment longer than eight weeks, and obviously it is too early for me to express unqualified conclusions, particularly on the serious conditions which to be cured, demand that nature shall build new tissues to fill the gaps. But that serotherapy will prove eventually efficacious to arrest consumption, I feel almost assured.

None of the improvements can be ascribed to mental influences, as it was in nearly every case against the will of the patients that we injected them. For four weeks or more they fought and objected, and only after realizing themselves the benefits did they submit gracefully.

These results surely point to good grounds to hope for more success. Indeed, if in such a short time under such circumstances and in such surroundings one can put flesh and fat on a consumptive, while untreated witness cases under the same conditions continually fail, or at best hold their own, what may we not hope if consumptives in the first and second stages, at least, are placed in a modern sanitarium, or kept in their homes even and surrounded by all the cares and necessities for the rich reconstructive diet that should be granted such unfortunates? What may we not expect if we give them, furthermore, all the sanitary conditions that may aid nature to cure or arrest tuberculosis in any event?

RECORD OF CASES.²

Mike Morley, age 53, pulmonary tuberculosis in the second stage, has been ill seven years; family with history of tuberculosis. Left lung affected below the scapula at the back; dullness of the apex. Circumference of the chest in expiration 36, inspiration 37.5 inches. Coughed seriously and considerably. Expectoration was yellowish, blood tinged, sometimes pure blood. Bacilli of tuberculosis numerous. Began treatment Dec. 1, 1894. Weight 165 pounds. Lung vital capacity, 110 cubic inches of air. January 26, weight 170 pounds, an increase of 5 pounds in fifty-seven days. Lung vital capacity 110 cubic inches of air.

Charles Reck, age 48, began treatment Nov. 30, 1894; discharged January 3. Was brought to City Hospital on a stretcher; could barely rise on his chair to eat. During thirty-six days' treatment gained nineteen pounds. This man had tuberculosis of the lungs in the third stage,³ duration two years. Bacilli of tuberculosis profuse; cavity in the left infra-clavicular space; expectorated a considerable amount of blood and sputum.

Phil Hye, age 35, pulmonary tuberculosis, second stage. Coughed six years; was very emaciated; had dullness and softening in one or both apices. Chest during expiration

thirty inches; inspiration thirty-one. Tubercule germs present in abundance. Coughed constantly night and day; mucopurulent expectoration. Began treatment December 1; weight eighty-one pounds; was sleepless, January 26, weight eighty-nine pounds, a gain of eight pounds in less than eight weeks. Cough disappeared almost entirely; sleeps well. This patient was very weak on entering the City Hospital. He had been sent here from Texas, having been given up as hopeless, he said, by Dr. Jestus, city physician of El Paso, Texas, and Dr. Menger, of San Antonio, Texas. He was sent home to die, being considered hopeless. He stated that he had also been condemned as hopeless by a physician of Alexian Brothers Hospital of Chicago, where he had been under Koch's treatment. This patient is now around and about. He walked several blocks from the street cars to come to the meeting of the medical association, in the raw evening atmosphere and in muddy snow. He coughs little or none.

George Dobson, age 28 years, seriously ill two months previous to treatment; pulmonary tuberculosis in the second stage; had had hemorrhages occasionally; had dullness in right apex in infra-clavicular region; expectoration scant. Began treatment December 1; weight at that time 107 pounds; weight January 26, 117.5 pounds, a gain of 10.5 pounds in eight weeks. Vital capacity at the beginning of treatment, 100 cubic inches; vital capacity January 26, 150 cubic inches, a gain of 50 cubic inches.

John Smith, age 23, pulmonary tuberculosis, third stage; duration two years; mother had died of consumption. Lost thirty pounds in two years; affection below the left apex; large cavity; coughed particularly in the morning. Weight December 1, 145 pounds; vital capacity 170 cubic inches. Weight January 26, 154 pounds, a gain of 9 pounds in eight weeks. Vital capacity 180 cubic inches, a gain of 10 cubic inches.

Otto Maye, age 58, pulmonary tuberculosis. Had been suffering for several years. Appetite very poor; coughed considerably; had had slight hemorrhages several times in the morning. Bacilli of tuberculosis present. Weight at the beginning of treatment December 1, 135 pounds; lost flesh gradually until he reached 131 pounds on January 1. Is now gaining and has gained two and one-half pounds between January 1 and January 26. Vital capacity at the beginning of treatment 110 cubic inches, January 26, 160 cubic inches, a gain of 50 cubic inches. This patient is one of those that had an abscess during the process of treatment. He is now gaining.

Nicholas Robinson, age 61; pulmonary consumption in second stage; duration two and a half years. His mother died of consumption. Had had several hemorrhages; night sweats; coughed seriously at nights; expectoration considerable; specific germs present. Affection is in the infra- and supra-clavicular regions, both sides; dullness was quite marked; softening on one side. Weight at the beginning of treatment 119 pounds; weight January 26, 131 pounds. Has gained twelve pounds in about or less than two months. Vital capacity 150 cubic inches, December 1. Vital capacity January 26, 180 inches, a gain of 30 cubic inches. This patient was very weak; could not speak when he was brought to the hospital. He was given up as hopeless. Mild laryngeal tuberculosis existed. Was sleepless. Now sleeps well; coughs very little, has a good appetite and feels stronger.

John Cummings, age 49 years. Weight 90 pounds December 1; weight January 26, 106 pounds, a gain of 16 pounds in two months. Vital capacity December 1, 100. Vital capacity January 26, 110, a gain of 10 inches. This man had had frequent hemorrhages during last summer, and before that, and was almost bed fast. He was very emaciated. The bones almost protruded as a nurse expressed it. The bacilli numerous. The nurse was afraid of bed sores. Appetite was lost, coughed and expectorated a great deal; in fact, the case was despaired of. Is now improving continually, is up and about and able to go up and down stairs and feels in every way in better health; weighs one pound more than in his best health.

John Broderick, age 24; pulmonary tuberculosis in the third stage, duration over one year. Brother died of quick consumption; was very weak, emaciated, had a cavity in left infra-clavicular region, coughed continuously for two months previous to treatment. Weight December 1, 105.5 pounds. Weight January 26, 113 pounds, a gain of 7.5 pounds. Vital capacity 100 cubic inches before treatment. Vital capacity since, varied between 110 and 130 up to Jan. 26, 1895. This is one of the two cases that had an abscess in the back. He was almost bed fast when treatment began. Coughed a great deal night and day. Was very weak;

² While preparations for treatment began the last days of November, regular injections began on or the day before December 1.

³ Diagnosis of city physicians.

breathing was very short and labored. Now coughs very little. No more pains or distress. Is up and about and on detail duty.

Henry Riley, age 34. Weight beginning of treatment 115 pounds. Weight January 26, 124 pounds, a gain of 9 pounds in two months. Had pulmonary consumption in the second stage; duration one and one-half years. Tuberculosis in the family. Had night sweats, diarrhea, marked dullness in the right supra- and infra-clavicular region; appetite poor; coughed frequently at night; expectoration considerable. He was a very sick man, indeed, but is now improving rapidly, and is in fact on detail duty.

James McCafferty, age 48, pulmonary consumption, second stage; duration of cough several years; serious illness in last five weeks; spit blood five weeks previous to treatment; frequent diarrhea; dullness left supra- and infra-clavicular region. Weight at beginning of treatment Dec. 1, 106.5 pounds. Weight January 26, 129.5 pounds, a gain of 13.5 pounds in eight weeks. Vital capacity at the beginning 130 cubic inches of air. Vital capacity January 26, 160 cubic inches, a gain of 30 inches. Was a very sick man, unable to do anything. Is now on night duty at City Hospital, works from 11 P.M. to 6 A.M., a very trying duty for a tuberculous patient.

Thos. Morrison, age 42; pulmonary tuberculosis, second stage, duration over three years; had hemorrhages in 1891. Cavity in left apex. Pronounced dullness in right infra-clavicular region; tubular breathing over same region; appetite poor; cough and expectoration pronounced. Has been in the City Hospital for a couple of years. Weight at beginning of treatment, December 1, 156 pounds. Weight January 26, 158 pounds, a gain of 2 pounds. Vital capacity at the beginning of treatment 160 cubic inches. Vital capacity January 26, 170 cubic inches, a gain of 10 inches. This case does not improve as rapidly as others in worse condition.

John Hopkins, age 48; pulmonary tuberculosis advanced first stage, two years' duration. Mother died of consumption. Digestion bad; cough was getting continually worse; had lost much flesh. Weight Dec. 1, at beginning of treatment, 137.5 pounds. Weight January 26, 144 pounds, a gain of 6.5 pounds in about eight weeks. Vital capacity at the beginning of treatment 250 cubic inches. Vital capacity increased between then and now (January 26) to 260 and even 270 inches.

Conrad Hogan, age 32, pulmonary tuberculosis in second stage; family history good; had slight hemorrhages, night sweats; getting weaker daily; right apex involved and dull; coughed considerably. Weight at the beginning of treatment December 1, 135 pounds; weight January 26, 142 pounds, a gain of 7 pounds in those eight weeks. Vital capacity at the beginning of treatment December 1, 180 cubic inches. Vital capacity January 26, 200 cubic inches, an increase of 20 inches.

Henry Willer, age 46; pulmonary consumption, third stage; no family history of consumption; both apices involved; had had hemorrhages; had been ill five years. His disease had begun with pneumonia. Vital capacity at beginning of treatment 140 cubic inches. Vital capacity to-day is the same. Weight December, 133 pounds. Weight January 26, 132.5 pounds, loss of a half pound. This patient has not increased in weight but has declined less than previously and is stronger and better generally. Temperature is normal and he expresses himself as gaining. It is not a favorable case.

Nils Johnson, age 34; pulmonary tuberculosis third stage. Duration twenty months; dullness on percussion of the apices; tubular breathing; hemorrhage a year ago; expectoration not very pronounced. Weight December 1, at beginning of treatment was not reported. January 1, 156 pounds; January 24, 158 pounds, a gain of 2 pounds in twenty-four days. This patient is not a favorable case; has variable temperature and chills occasionally. It seems to be a mixed infection.

Nicholas Schappo, age 56; pulmonary tuberculosis, second stage, two years' duration; night sweats; left apex dull; coughed considerably at night, and expectorated very much; bacilli of tuberculosis in great numbers. Weight December 1, beginning of treatment 108 pounds. Weight January 26, 107 pounds, loss of 1 pound. Vital capacity December 1, 140 cubic inches. January 26, 150 cubic inches, a gain of 10 inches. This man is ageing and broken down generally and is not a favorable case although he more than holds his own. He has now stopped declining and I may say his lung capacity is better.

Conrad Opperman, age 47; pulmonary tuberculosis in the third stage, duration six months. Mother died of consump-

tion; has had night sweats; was exceedingly emaciated and very weak. Cavity in the right infra-clavicular region. Has diabetes (diagnosis of Dr. Ehrlich); coughed in the morning considerably; bacilli very numerous. Weight at the beginning of treatment December 1, seventy-nine pounds. Weight January 26, eighty-two pounds, a gain of three pounds against continual loss before. Vital capacity at beginning of treatment fifty cubic inches. Has varied since then between fifty and seventy. This man was a stretcher case, brought to the hospital helpless. Could not get up the steps for a long time. Even after some treatment he was very thin. Is now improved, coughs little and is in better health in spite of his diabetes or glycosuric condition. Bacilli much decreased in quantity.

Fritz Arnold, age 59; pulmonary tuberculosis, second stage, duration two years. Tuberculosis in the family; coughed persistently; expectoration profuse; bacilli numerous; appetite bad. Weight at the beginning of treatment, December 1, 122 pounds. Weight January 26, 127 pounds, a gain of 5 pounds in eight weeks. Lung capacity December 1, seventy cubic inches. Vital capacity since has varied between 80 and 110. This is a broken-down constitution generally, but has improved in spite of it. Bacilli now scarce.

William Murray, age 41; pulmonary tuberculosis second stage, duration one year; family history good; is a drinking man; consolidation right apex; night sweats; blood in sputum; appetite poor; coughed a great deal; bacilli very numerous; expectoration profuse. Weight Dec. 1, 1894, 132 pounds. Weight January 26, 134.5 pounds, a gain of 2.5 pounds. Vital capacity at beginning of treatment seventy cubic inches. Vital capacity January 26, 120 cubic inches, an increase of 50 cubic inches.

Thos. Bennett, age 64; pulmonary tuberculosis, second stage; been coughing four months; very emaciated; affected with long standing gastritis; right supra-clavicular region involved, dull. Lung emphysematous; appetite poor; coughing considerable; sputum tinged with blood sometimes and contained bacilli of tuberculosis. Weight December 1, at beginning of treatment, 125 pounds. Weight January 26, 130 pounds, a gain of 5 pounds. Vital capacity keeps 110 cubic inches.

Martin Lemp, age unrecorded; tuberculosis first stage; bacilli numerous. Weight at beginning of treatment December 1, 131.5 pounds. Weight when discharged January 10, 151, making an increase of 19.5 pounds. Lung capacity increased from 170 at the beginning to 190 when discharged. This case was treated a little over a month and a half. He had been reduced greatly in strength and flesh, was unable to work and had to leave his family for the City Hospital. Has now returned to work. Have had no chance to examine his sputum since discharge, when no expectoration existed, to investigate the microbic question.

I purposely omit saying anything about the physical symptoms after treatment to date. This is a record to show general improvement to date, particularly to demonstrate that the great prostrating debility of consumptives (the very ground of tuberculosis as some term it) is the first thing to yield seemingly to the effects of serum.

The following are cases treated and reported by Dr. Cale:

Dear Doctor Paquin:—I inclose, herewith, reports of the cases of tuberculosis which have been under my care and treated with your immunized blood serum.

Case 1.—Charles J. M., aged 23 years; family history good; was in perfect health until seven months ago; since that time has had a cough, fever in afternoon and subnormal temperature in morning, loss of appetite, loss of weight, night sweats, etc. Small cavity in apex of left lung; large amount of expectoration; bacilli found in sputum in large numbers. Date of first treatment Dec. 22, 1894. The case has progressed nicely. Cough much less; expectoration less; no night sweats and gain in weight of three pounds in two weeks. During the last six days has gained two pounds, sleeps well; in fact all the symptoms have improved.

Case 2.—W. A. Buckley, nurse at the poor-house, age 33; family history good; attack dates back two years; cough, expectoration; pain in left side at base of lung, where a small dull area was found; loss of appetite and weight; had had night sweats for two months preceding December, 1894. Bacilli in sputum. Treatment during December and two weeks in January. No cough or any bad symptoms since

GEORGE W. CALE, M.D.

UNDER DR. PAQUIN'S TREATMENT

RESULTS :

Spirometer Tests: First before Treatment:

SUBSEQUENT TESTS:	Monday	Wednesday	Friday
Month	Monday	Wednesday	Friday
	Monday	Wednesday	Friday

Remarks on Case:

Signed: _____ M.D. _____ Nurse _____

B. PAUL PAQUIN, D.D.

Name of Patient	Age	Sex
Where Treated		
Residence and Postal Address		
BEFORE TREATMENT.		
Weight	Stage	Duration
Nature of Case		
Blood		
Range of Temperature		
Microscopic Analysis		
Physical Condition		
Range of Respiration	Sphygmeter Tests	
Chest Capacity	Inches Inspiration	Inches Expiration
Appetite		
Cough		

TREATMENT

begin

Special: Constitutional Antixymotic, i. e., H. Blood Syrus

Special: Constitutional Analysis
(Constitutional Topics)

General and Accessory	Local Inhalation Hygienic Dietary
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Dates and Quantity of Injection and Daily Chart of Temperature: from 3 to 6 P. M.

[illegible]

Figure 42

RESULTS

Patient	Increase or Decrease in Comparet with	Months	Pounds Previous to Treatment:
James J. Tetterton			
Physical Condition			
Nerves			
Respiration	per Minute, against		at Beginning:
Vital Capacity Inspira- tion	Inches, against		before Treatment.
Chest			
Heart			
Lungs			
Esophagus			
Stomach			

The case referred to in above record was treated at the _____ Hospital
of Dr. Paul Paquin, assisted by _____ and was under my general supervision.

The treatment began with injections of 10 drops hypodermically in the back between the shoulder blades. In a few days we increased to 20 drops.

Then to 30, 40 and 60. Some were given as many as 70 drops once a day for awhile. To a few in private practice, I have injected as much as 150 drops at one sitting every day for several days. No reaction whatever followed these injections and the pain is no greater than during the usual injection of a morphin solution. There resulted no accidents whatever from over fifteen hundred injections in the various patients, as a whole, except at the City Hospital where two benign abscesses were produced. They were without doubt due to accidental infection by the syringe, probably the leather ends of the piston of the syringe used at the time, or the needle. Careful disinfection of the syringe will always prevent this occurrence. The serum is, in fact, innocuous, absolutely so, if well prepared.⁴

PROSPECTS OF SERO-THERAPY.

The future of the serum therapy in several infectious diseases seems assured beyond peradventure. We may have been too enthusiastic and may have expected more than we can now obtain, perhaps, and possibly the great enthusiasts may be painfully disappointed in their hopes for immediate or remote wonders from the sero-therapy in diphtheria, tetanus, etc., but the fact will always remain that this system is unquestionably rational and that eventually, all indicate it must yield success in therapeutics where all else must fail, for it is the one rational, truly physiologic treatment, the only treatment in my humble judgment from which can be derived positive beneficial results in the cure of infections. It is nature's own remedy. Man with the serum is using nature's own weapon of defense; he has found out how he may add power to the natural resources of the organization in the fight for human existence. This system of treatment is not a spontaneous eruption in therapeutics. It is not the explosion of over-zealous laboratory delvers with more enthusiasm than experience; it is the result of years of research in all the laboratories and the chief clinics of the civilized nations, particularly France and Germany. And it is not only yesterday that it appeared in practice. It was several years ago that Kitasato applied his antitoxin experimentally against tetanus. Diphtheria has been treated successfully a year or more. Syphilis is now, it is stated, treated experimentally with it, and lastly your humble servant begs to submit to your indulgent criticism the result of his meager labors, conducted under extreme difficulties, and without State or any outside financial aid. The future of sero-therapy in tuberculosis is, in my mind, very bright and very promising. The first, the second and the third stages of consumption have been benefited under unfavorable circumstances by even slightly immunized serum. Consequently, it is only fair to reason that with more strongly immunized serum, such as I have now ready to use, (I have only a limited quantity) much better and quicker results can be obtained, particularly if proper hygienic and dietetic conditions are obtained. Theoretically, it would seem that, if by the use of this serum constitutionally, the tuberculous processes may be arrested in a given case, injections directly in the pulmonary cavities where these exist, or the excision of a rib or two and the use of tubercle antitoxin directly into the wound, would prove practicable and useful to save life. It would seem, too, that such cases as hip joint

disease, which, according to statistics, is more successfully treated by the expectant therapy than active operation, could be safely operated after the arrest of the tuberculous process for, as Koenig has pointed out, it is the operation that disseminates the bacilli in such cases, so many of which terminate fatally after the usual surgical interference and the usual after treatment. And so in all surgical cases of tuberculosis, whether it invades the bones, the joints, the ovaries, the skin, the tendons or other organs, or several of them, if the serum will, by some means, stay the microbes, as I have every reason to believe it will, there is ground for congratulation on its introduction in therapeutics.

Besides the use in the treatment of tuberculosis, we have a promising means of protection of those exposed, by the practice of periodical injections of antitoxic serum, which may render the susceptible immune, for awhile at least. As a prophylactic the antitoxic serum should prove very useful in the preservation of families tainted by inheritance, or exposed to the germs from their birth.

In closing, allow me to summarize the opinions arrived at after my few years of investigation and observations, and the recent incomplete practical tests of my colleagues and myself.

1. Sero-therapy in tuberculosis has proved, so far, efficacious.

2. Blood serum of horses seems naturally antagonistic to the germs of tuberculosis, but can not in its natural state serve in treatment with much good, as it is too slow and it takes enormous quantities of it too, to produce useful results.

3. Horse blood serum may be rendered more strongly antagonistic to the tubercle germ by the proper treatment of the animals by a proper technique.

4. A horse treated properly three months may yield serum with immunizing power that will probably prove sufficient to arrest consumption in the first stages in three or four months, and sometimes less; and in the second stage in four to six months or a year.

5. Discrimination should be made in the selection of cases, and judgment exercised to exclude from the favorable class all those seriously complicated bacteriologically, certain cases complicated otherwise pathologically, and other patients which practice alone will suggest.

6. Inasmuch as hospitals for consumptives are needed any way, the success has been sufficient already to warrant the hope that in the near future such institutions shall be built on modern principles of hygiene, for the exclusive treatment of tuberculosis. Sero-therapy, with the adjunct treatments promises better success than ever obtained before. I do not designate this serum as a *cure* or a *specific*, but a valuable new remedy.

TECHNIQUE.

As to the technical features of the preparation of the anti-tubercle serum, I have little to say at present. The profession realizes that success with the serum therapy depends on accurate and delicate laboratory and experimental manipulations which few are fully equipped to undertake. The preparation of the toxins, the measurement of their potency, the dosage for the realization of various degrees of immunity; and, finally, the inoculations of immune animals and the subsequent tests of the therapeutic value of the serum

⁴ Since reading this paper we had a harmless rash in a few cases.

extracted, are all questions of great moment, and which necessarily involve special training. Commercialism might, at any moment, by some failure or accident throw discredit on the new treatment, were I to explain fully before advancing my researches to a point where a larger number of improved cases and greater benefits, can be shown the details of procedure in the production of the agent. As yet only a small quantity of serum is on hand—not enough to offer to the profession, having under treatment some thirty cases whom I have promised and wish to inject for some time to come. The production of the serum is costly, and above all it takes months to get the best material. I have reason to believe, however, that it will be possible to shorten the time that has been found necessary to strongly immunize the horses now in use.

THE EARLY DIAGNOSIS OF CARCINOMA OF THE STOMACH, WITH THE BACTERIOLOGY OF THE STOMACH CONTENTS.

BY FENTON B. TURCK, M.D.

PROFESSOR OF DISEASES OF THE STOMACH AND INTESTINES, POST-GRADUATE MEDICAL SCHOOL; ATTENDING PHYSICIAN TO THE COOK COUNTY HOSPITAL, CHICAGO.

(Continued from page 319.)

After the study of sixteen cases Rosenheim (*Berl. Klin. Woch.*, Dec. 24, 1888) concluded that the chemic insufficiency of the stomach in carcinoma ventriculi is not due to the cancer itself, but to the attending atrophy. He divided the pathologic changes into three stages: inflammatory, interstitial and atrophic; adding that these stages may be present at the same time; and Ewald (*Berl. Klin. Woch.*, Dec. 3, 1888) holds that the disappearance of HCl is not due to carcinoma directly, but is merely a disturbance of the functions of the secretory glands.

The post-mortem changes often veil the pathologic changes, unless well marked and permanent lesions occur. It is best, if possible, to secure specimens during an operation for carcinoma of the stomach as far remote from the tumor as possible. In three operations I secured several sections—one for carcinoma planum (anterior wall) where a large area was removed, leaving a border of tissue not infiltrated by cells from the carcinoma; the other two were carcinoma of the pylorus. The sections were cut with a Valentine knife in the fresh state and placed on a slide; 50 per cent. solution of glycerin with a little oil of cloves prevents the change.

A solution after stain in 50 per cent. glycerin is used, for staining, and "irrigated" through according to the old method of Beale. (For making permanent mounts Price's pure glycerin is carried under the cover glass and ringed with cement.) There appears the pathologic changes of inflammation. No distinction between parietal cells and chief cells; cells loosened from their membrane; karyokinesis were illustrated; nucleus crowded to one side; gland cells swollen, closing the lumen; nucleus forced to one side; cells of the mouth and neck crowded together as in proliferation, and lying within the lumen; at other points cystic degeneration, mucoid metamorphosis of pathogenic cells, as shown by Ewald and Boas; leucocytes fill up about the neck and through to the surface of the gland; other points show marked interstitial changes; multiplication of

round cells; vessels engorged flush up to the surface of the mucous membrane, where a rich anastomosis occurs at the mouth and neck of glands. If it is not alone the product formed in the growth of carcinoma of the stomach that causes this inflammatory and rapid destructive process through the infection from growing pathologic and so-called non-pathologic microorganisms colonizing upon the surface of the mucous membrane offers a possible explanation of these changes. Within the lumen of the stomach all forms of germs find their way.

The master work of Miller ("Microorganisms of the Human Mouth," 1890,) has proved that the mouth may become an ideal incubator for at least twenty-five varieties. The nose and pharynx may become an excellent bed for colonization upon the walls. Food and water are by no means aseptic—if we prepare the stomach walls so that colonization may also exist, we have a process set up in proportion to the character of the colonies found—the culture bed and conditions present. In the healthy state the stomach does not seem to encourage colonization in the bed of mucus upon its walls, although germs find their way into its lumen. This will be brought out in another work in relation to gastritis. The predisposing cause seems to be the growing carcinoma—lessening resistance and furnishing a soil,—the inflammatory process, the result of the toxins of the colonizing microorganisms. Well-known pathologic germs produce their special toxins and even the lactic acid bacillus, as shown by Wurtz and Lindet (*La Semaine Med.* Paris, Sept. 9, 1892) produce in animals marked symptoms of diarrhea, distension of the abdomen and extremely rapid emaciation. They learned that cultures in bouillon are very active—toxin is formed having the same effect as the culture itself.

Through the kindness of Dr. Ryan, Louis S., age 40, Italian, was referred to my clinic November 27, complaining of "pain in his stomach and back." No specific history. Family history negative. Experienced no difficulty until within nine months, when there appeared a distress after eating. Appetite remained good; insomnia at times and dyspnea at night. No vomiting. Alternating constipation and diarrhea.

Examination: Skin dry; some evidence of emaciation; mouth, gums inflamed at borders; tongue, light yellowish coat; nose and throat showed no marked lesions; chest organs intact; abdomen, muscles well developed; liver and splenic area normal; stomach, percussion shows slight distension; half moon space of Traube slightly increased; prevailing sound in stomach demonstrated the great curvature one and one-half inches above the umbilicus; no palpable tumor; colon dilated; tympanitis controlled with water and air gave the same results; rectum negative; genito-urinary organs negative.

Analysis of stomach contents two hours after ordinary meal: HCl+; total acidity, 40; Uffelmann's +; blood count 4,800,000. November 27, hemoglobin, 70; fasting stomach twelve hours after meal; reaction neutral. No remnants of previous meal; no stagnation.

Bacteriologic: Six slides stained for microorganisms, after removing mucus from them and mucous membrane with gyromele, four fresh slides unstained. A fine network of long rods appearing like mycelia but more angular. Short rods; colonies in groups attached, end to end and in pairs; streptococci in twisted chains; groups of micrococci; a few yeast germs but no *socius ventriculi* appeared in the field.

Bacteriologic cultures: Stroke culture on sterilized mucous membrane of the stomach of a pig; first stroke line colonies run together; second stroke more separated, especially at side of furrow of the line; pink colonies; grayish colonies spreading; yellow colonies; brown and a few black colonies raised;