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BY

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AWAY WITH KOCH'S LYMPH !

HISTORICAL INTRODUCTION—ACTION OF THE LYMPH ON TUBERCULOSIS OF THE SKIN—ACTION ON TUBERCULOSIS OF JOINTS—ACTION IN OTITIS MEDIA TUBERCULOSA—ACTION ON TUBERCULOSIS OF LYMPHATIC GLANDS—ON TUBERCULOSIS OF LUNG AND LARYNX—IN PULMONARY TUBERCULOSIS—GENERAL REMARKS.

When, six months ago, the telegraph operator at Berlin touched the key of his instrument and flashed to all parts of the civilized world the joyful tidings that a cure for tuberculosis had at last been discovered, the people and the profession felt that the millennium in medicine had come. For days and weeks the public press devoted a liberal space to telegraphic messages, editorials, and interviews with medical men relative to the new treatment. For months the medical journals in all countries rivaled each other in bringing the latest reports from Berlin and other large medical centres in the way of telegrams, correspondence, editorials, and original contributions.

The first announcement of the discovery brought thousands of patients and doctors to the German capital, the former to be cured of their tubercular disease, the latter to receive instruction

and to make themselves proficient in all the details of the new treatment. No other event in the world's history ever attracted so much attention, and no discovery in medicine or surgery ever found such ready introduction and universal acceptance. The discoverer, the distinguished Koch, the father of bacteriology, had scored so many victories on this modern field of research that every word he uttered brought conviction. His views were promptly adopted by the most prominent physicians and surgeons in Germany and other countries, and the new treatment was applied everywhere by the best men in the profession as fast as the precious remedy could be obtained.

Within a few weeks the most enthusiastic and encouraging reports came from scores of prominent clinics and large hospitals. Within a few months volumes have been written on this subject; several special works on this treatment left the press and were translated into many languages. A new journal devoted exclusively to the treatment of tuberculosis with Koch's lymph has come into existence and has a good subscription list from the very start. It is true that some of the more conservative members of the profession were a little slow in accepting the new doctrine and practice, but the great majority followed the current set in motion by the great Koch and his many eminent admirers and devoted followers.

It was not long, however, before the glowing accounts of the results of the new treatment of tuberculosis came at longer intervals and in a more moderate tone, and were interspersed with the reports of cases from different parts of the world in which it proved a complete failure, and not in an inconsiderable number of cases it was charged with having caused a speedy fatal termination. Then came the timely warning of the veteran pathologist, Virchow, who showed by numerous post-mortem examinations of patients who died under this treatment that death was caused by dissemination of the disease from a local focus acted upon by the lymph. The evidences proving this source of danger have been rapidly accumulating, and contributed largely towards subduing the first enthusiasm and limiting the scope of administration of the remedy.

The disastrous consequences which followed the use of the lymph, perhaps often injudiciously and recklessly applied,

induced a number of medical societies to condemn its use, and led some of the local governments to restrain its further application by legal enactments.

Enough time has now elapsed to judge of the merits of the treatment of tuberculosis by Koch's lymph, or, as it is now called, tuberculin. It has been put to test in the treatment of all forms of tuberculosis.

Surgeons, physicians, gynecologists, obstetricians, dermatologists, otologists and ophthalmologists have given the new treatment a fair trial, and the accumulated experiences from all these sources have shown beyond all doubt that its indiscriminate use is attended by many immediate and remote dangers, and that most cases in which it appeared to prove beneficial at first have relapsed, and after weeks and months were no better, or even worse, than when the treatment commenced.

Men who first regarded the lymph as a specific in all forms of tuberculosis make this claim no longer. Many who were enthusiastic in their praise of what they observed from the use of the remedy in the beginning have now suspended its use. Hospitals and wards set aside for the special treatment of patients suffering from tuberculosis are now deserted. The market is over-stocked with a supply of Koch's lymph and Koch's syringes. Not only the profession but the public has become aware that the claims made for the remedy only a few months ago are unfounded. It is left for Koch, or some other investigator in the future, to discover a substance or agent which will answer the expectations that were at first entertained for the lymph.

Koch's lymph has been a deceptive bubble which for a short time commanded the attention and admiration of the whole world, but which has been ruthlessly pricked by the critical scalpel in the hands of the father of modern pathology. The treatment of tuberculosis with Koch's lymph and the numerous substitutes which have recently been forced on the attention of the profession will soon be only a matter of history. My "Away With Koch's Lymph!" is based upon my own observations made at the Milwaukee Hospital during the last four months' service in that institution prior to my removal to this city. The material is not large, but the careful observations made entitle me to give a

positive opinion and warn others against further experimentation with this remedy.

The lymph first used I received through the courtesy of Dr. J. S. Billings, of Washington, and when this was exhausted I received an abundant supply direct from Dr. Libbertz, through the influence of my distinguished friend, Professor von Esmarch. The tubercular nature of the lesions in all cases that came under my own care, if any doubt existed in this regard, was established by microscopical examination and search for the bacillus.

TUBERCULOSIS OF SKIN.

As lupus of the face was mentioned in the first reports from Europe as having been cured by Koch's lymph, I was exceedingly anxious to commence treatment with this form of surgical tuberculosis. In all the cases reported below the local and general reaction was typical and corresponded with the descriptions given by von Bergmann, von Esmarch and others.

Case 1. *Lupus of face and nose; tuberculosis of right tarsal and ankle joints; incipient tuberculosis of left wrist joint.*

Augusta Jehnki, aged forty-four, German, married, was admitted to the Milwaukee Hospital January 22d, 1891, with the following history:

Tuberculosis not hereditary in her family. Eighteen years ago the left nasal passage became partially obstructed, rendering breathing through that side of the nose difficult. The affection commenced, as near as she can remember, in the form of a papillomatous swelling, involving the mucous membrane of the ala near its junction with the skin. At first no pain and no discharge from the nose. The swelling slowly increased in size, softened in the center, leaving an ulcerated surface which was usually covered with a dry crust. As soon as ulceration set in the disease extended rapidly to all of the structures of the nose and later to the soft palate, pharynx, and face. In the course of a few years almost the entire nose and a considerable portion of the nasal septum were destroyed. The ulcerated surface healed over, the scars almost completely occluding the nasal apertures on a level with the skin of the face.

The patient states that after destruction of the nose the disease first extended to the right cheek and later to the left side.

On the left side the eye became involved, sight being almost completely destroyed. The upper lip became involved six years ago. The skin of the face never ulcerated extensively; circumscribed superficial erosions would form from time to time which healed under a crust, always leaving a thin red cicatrix. A year ago the right ankle and tarsal joints became tender and swollen.

On admission the patient presented a somewhat anæmic appearance, general nutrition impaired. No evidences of the existence of pulmonary tuberculosis. Remnant of nose covered with thin red glistening scar. Nasal apertures nearly closed. Both cheeks and upper lip swollen, the skin covering them exceedingly vascular with here and there small defects covered with thin dry crusts. Left cornea opaque throughout. Nearly the entire soft palate absent and sides of pharynx in a state of ulceration. Right ankle and tarsal joints present the typical appearances of synovial tubercular arthritis.

The following table shows dates, doses of the lymph administered, and its effect upon the temperature and pulse:

Number of Injections.	Date.	Dose in Milligrammes	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Jan. 23	3	98.9°	103.8°	98.2°	80 120
2	" 26	4	98.2	102	99	78 120
3	" 28	5	98.2	102.2	98	76 120
4	Feb. 3	4	97	101.6	97	74 116
5	" 5	4	97	98.4	96.8	82 92
6	" 7	5	97	92.2	97.6	82 90
7	" 10	10	98	102.2	97	88 120
8	" 14	8	97	101	97.4	76 104
9	" 17	4	98	99.4	98.4	80 96
10	" 21	8	98	106.6	98	82 105
11	" 24	6	97.8	99	97	72 90
12	" 28	6	97.4	92.2	97.6	68 85
13	Mar. 2	6	97.6	100.4	97.6	76 89
14	" 5	6	97.6	100.6	97.6	72 90
15	" 11	6	97.6	100.6	97	76 100
16	" 21	2	97	100.8	97	92 74
17	" 25	4	97	101.8	97	84 108

During the reaction following the first dose the left wrist-joint became greatly swollen and very painful, but this condition lasted only for a day. The swelling and pain in the right foot also were greatly aggravated during and for some time after the reaction. The cheeks and upper lip became the seat of an active inflammation which resulted in great swelling and transudation of a serous fluid which on drying left nearly the whole surface covered with

a yellowish crust. The local reactions gradually diminished in intensity, and almost ceased about the middle of February. The highest temperature, 106.6° F., was observed following the injection of eight milligrammes, February 21st. The temperature usually commenced to rise about three to four hours after the injection and reached the highest point about three hours later. The temperature was often found subnormal eighteen hours after the injection.

I was forced to abandon the treatment at the end of March, as the patient had become greatly emaciated and extremely anæmic, and the local lesions which in the beginning of the treatment had apparently undergone marked improvement had relapsed, presenting about the same conditions as when the treatment was begun. The skin covering the lupus remained red throughout, and showed no signs of fading when the patient left the hospital. During the latter part of February the susceptibility to the action of the lymph appeared to have been nearly exhausted, as injections of six milligrammes produced only a slight rise of temperature, but this returned later as the last injection of four milligrammes, March 25th, was followed by a temperature of 101.4° F.

Case 2. *Lupus erythematosus of right cheek and external ear.*

Dora Presentin, widow, aged forty-nine, entered the Milwaukee Hospital February 5th, 1891, for the purpose of submitting to a course of treatment with Koch's lymph for a lupus of the right cheek. No hereditary tendency to tuberculosis in her family. General health excellent. The skin affection commenced in the middle of the right cheek when she was twelve years old. She first noticed a prickling smarting sensation at the site of an elevated red patch about the size of a dime. This was treated by applications of preparations of iodine without benefit. The cuticle exfoliated leaving a raw surface which became covered with a thin dry crust. At the age of fourteen, the sore healed, and with the exception of a prickling sensation at times, remained well for three years, when the sore spot again inflamed and the same conditions returned, and from that time the affection continued to extend over the right cheek, and during the last few years it has involved the lobe of the ear on the same side. Like in the preceding case, great improvement has always taken place during the summer

months. The right cheek and external ear are of a bright red color, the disease evidently being limited to the superficial layers of the skin, as there is little or no swelling of the affected parts. Occasionally thin crusts form over circumscribed patches where exfoliation has taken place. She was at once treated by injections with Koch's lymph with results shown in following table:

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reactiof.	Temperature after Reaction.	Pulse before and during Reaction.
1	Feb. 5	2	98.4	99	98.3	76 80
2	" 7	4	98.3	100.2	97.3	82 90
3	" 10	4	98.5	99.9	98.3	74 80
4	" 14	4	98.4	102.7	97	80 100
5	" 19	2	98.4	100.3	98.4	74 100
6	" 21	2	98.3	99	99	74 80
7	" 24	4	98.4	100	97.5	76 88
8	" 28	6	97.5	99.1	98	68 84
9	Mar. 2	8	98.4	101.1	98.4	78 93
10	" 5	10	98.4	101.2	97.9	84 90
11	" 10	10	98.4	99.9	97.5	68 90
12	" 13	10	98.1	98.9	98	69 72
13	" 16	10	99.1	102	98.4	75 82
14	" 20	10	98.4	99.5	98.4	72 76

The local reaction was always prompt in this case even when a small dose was used. The whole surface of the lupus became acutely inflamed, the copious transudation on inspissation forming an almost continuous, thin yellow crust. The intensity of the local symptoms gradually subsided, but the surface remained red and vascular to the end of the treatment, so that when she left the hospital the improvement, if any, was very slight. I have examined the patient on several occasions since she left the hospital, but no material change has taken place in her condition. The general reaction in this case was much milder than in the preceding one, and with the exception of becoming more anæmic and having lost several pounds in weight the treatment left no further ill effects.

Case 3. *Lupus hypertrophicus of face; tuberculosis of submaxillary and cervical glands.*

Edward Rohrer, aged fifteen years, came to the hospital to undergo a course of Koch's treatment for lupus of the face February 21st, 1891. His mother died of lupus of the cheek and pulmonary phthisis when he was three years old. Out of a family of nine children, six have died of some form of tuberculosis. Soon after the patient was born a nodule was discovered

in the centre of the right cheek. This was removed by caustics, but the resulting ulcer never healed. The disease extended quite rapidly over the entire cheek and later attacked the nose, the greater part of which was destroyed; finally it reached the left eye, the sight of which was completely destroyed when he was five years old. At the time he presented himself for examination and treatment the left submaxillary and cervical lymphatic glands were enlarged, showing conclusively that the tubercular lesion of the face had given rise to secondary glandular infection. The soft tissues of the nose had nearly disappeared, the mucous membrane of the nasal passages swollen and in places ulcerated, the lining of the external apertures covered with a dry crust. The whole face, forehead and both lips enormously swollen, the skin a dusky hue, and in spots covered with dry crusts; the swollen parts were very hard to the touch, the infiltration evidently extending beyond the structures of the skin. Numerous hard nodules could be felt over the whole infected area; no trace of eyelashes and eyebrows on either side. All of the eyelids slightly ectropic and otherwise distorted. Appetite good, general condition fair.

Before treatment was commenced the temperature was 97° F. He received the first injection of one-half of a milligramme of tuberculin the day he came into the hospital, which in four hours brought the temperature up to 101.2°, and it had not returned to normal after twenty-four hours. During this time he complained of headache, pain and a sense of burning in the affected parts, which had become much more swollen and red. The same profuse transudation appeared on the surface as in the other cases, forming a thin yellow crust which covered the greater part of the surface. The following table gives the number of injections and their immediate general effects:

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and after Reaction.
1	Feb. 21	$\frac{1}{2}$	97	101.2	100.2	81 99
2	" 23	1	100.2	100.3	97	99 120
3	" 28	2	97	99.4	98	90 106
4	Mar. 2	3	98	103	97.8	78 108
5	" 5	3	97	102	98.4	78 102
6	" 9	3	97.8	102.5	98	75 105
7	" 12	3	98.8	100	98.6	90 106
8	" 16	3	99.4	101	99.7	88 102
9	" 21	3	98.2	101	97.4	80 102
11	" 25	3	99.2	100.4	98	90 98

The enlarged glands became more swollen and tender after the first injections; later the local reaction ceased. During the first three weeks the condition of the face appeared to be undergoing a decided change for the better. As the local reaction diminished and the crusts exfoliated, the swelling diminished considerably and the hardness partly disappeared, and, at the same time, the skin presented a more natural appearance. During the latter part of March, however, improvement came to a standstill and the parts gradually returned to their former conditions. The treatment has been continued until recently, and when I saw the boy a few days ago I became satisfied that his general health and strength had failed greatly since I first saw him, and the face showed no improvement whatever.

* Case 4. *Tuberculosis of skin in both infra-patellar regions.*

Mary Howard, aged forty-three, married, housewife, was sent to the Milwaukee Hospital to be treated for an affection of the skin in both infra-patellar regions. No hereditary predisposition to tuberculosis in the family. General health excellent. Six months ago, without any apparent cause, she experienced pain and tenderness in the skin in the region of the left knee-joint at a point corresponding with the lower margin of the patella. A few days later she discovered two or three nodular swellings in the skin which slowly increased in size until they became as large as a split pea. The skin covering these swellings assumed a bluish color, when softening in the center of each nodule occurred, which resulted in the formation of small ulcers covered with flabby granulations. New nodules made their appearance in the same neighborhood and passed through the same stages. In two or three places several of these nodules became confluent, forming indolent ulcers the size of a nickel. Some of these ulcers healed, but the new skin never assumed a healthy color, remaining very vascular and of a brownish tinge.

A few weeks before she came under my observation the same affection appeared on the opposite side and in about the same locality. At the time she entered the hospital about six nodules were found in the skin of the left infra-patellar region, some of them in a state of ulceration, others covered with dusky skin, while the most recent ones could be felt as circumscribed indurations in the deeper structures of the skin. The nodules below

the left knee, three in number, had not ulcerated. As the diagnosis was somewhat obscure fragments of granulation tissue were removed, stained, and examined under the microscope with the result that numerous tubercle bacilli were found within and between the giant and epithelioid cells. The ulcers were dressed with iodoform and treatment with Koch's lymph was at once commenced. The nodules and ulcers responded promptly to the injections, becoming swollen, vascular and tender after each injection. The temperature never reached quite 100° F., although the dose was gradually increased to ten milligrammes.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Feb. 3	2	98.4	99.8	98	74 82
2	" 5	2	98	99.2	97.8	72 80
3	" 7	3	98.8	99.6	98	68 84
4	" 10	6	98.2	99	98	68 84
5	" 14	6	98	99.2	98.2	82 88
6	" 19	6	98.4	99.6	99.2	84 108
7	" 21	8	99	98.6	99.4	84 100
8	" 24	8	98.4	99.6	98.2	72 98
9	" 28	8	98.2	99.2	97	84 66
10	Mar. 2	8	98.2	99	97.8	96 60
11	" 5	10	98.4	99	98.4	84 66

During this treatment the nodules covered with intact skin first became swollen, hard and painful, and then gradually disappeared. The ulcers soon assumed a more healthy appearance, the granulations becoming more vascular and firmer, followed by speedy epidermization. At the time the injections were suspended all of them had healed, and I flattered myself that a cure had been obtained, and allowed the patient to leave the hospital. Three weeks later I saw her again and found her in about the same condition as when the tuberculin treatment was commenced.

TUBERCULOSIS OF JOINTS.

It has been claimed by a number of eminent surgeons that in the absence of caseous foci and sequestra tubercular joints are amenable to successful treatment by lymph injections, and that in a fair percentage of cases not only a cure can be effected, but a perfect functional result obtained. The same authorities also maintained that in the event the disease had advanced to the formation of caseous deposits or sequestration the same treatment by limiting the extension of the tubercular process, would place

the parts in a more favorable condition for subsequent successful operative interference. Although my experience with Koch's lymph in this class of cases has been limited to three cases it has taught me that neither of these claims are well founded.

Case 5. *Synovial tuberculosis of knee joint; intra-articular injections of iodoform emulsion followed by Koch's treatment.*

Maria Gierswska, aged eighteen, born in Poland, housemaid, came under my care at the Milwaukee Hospital January 11th, 1891. No hereditary tendency to tuberculosis in the family. Patient is fairly well nourished, but somewhat anæmic. She has been a servant girl for several years and was required to do a great deal of scrubbing, and to this part of her work she attributed a pain in the right knee-joint which made its first appearance about two years ago. The pain was worse at night, but did not prevent her from following her occupation until six months ago. At that time she noticed that the joint was swollen and tender on pressure. The swelling increased rapidly in size and the movements of the joint became impaired. Examination of the joint revealed the presence of a copious effusion with thickening of the capsule. No circumscribed points of tenderness over epiphyseal extremities of the tibia and femur. Patient can walk without the aid of crutches.

On January 12th, the joint was aspirated and six ounces of synovial fluid in which small fibrinous shreds were suspended was removed, after which an intra-articular injection of a ten per cent emulsion of iodoform in glycerine was made. The patient was allowed to use the limb. In the evening the temperature, which had been normal before the injection was made, rose to 102.8° F., but was again found normal the next day. At the end of forty-eight hours the joint was swollen as much as before the aspiration. On January 17th aspiration and injection were repeated. No decided improvement had taken place, when the tuberculin treatment was commenced January 22d. The highest temperature produced by the first injection was reached at the end of two hours. On the following day the swelling had increased, the capsule was tense, and the joint tender and much more painful than after the iodoform injections. The injection of six milligrammes of tuberculin made January 26th was followed

at the end of twelve hours by a temperature of 105.8° F., the highest temperature recorded in this case.

The patient complained of headache and pain in the region of the stomach and spleen attended by diarrhœa.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Jan. 22	2	96.6	100.8	100	80 90
2	" 23	4	100	103	99	96 112
3	" 25	2	99	102.2	99	70 106
4	" 26	6	99	105.8	99	84 144
5	" 28	5	99	105	100.4	100 144
6	Feb. 3	6	98	105	99	82 140
7	" 5	2½	99	100.4	99.2	96 100
8	" 7	3	99	99.8	99	76 86
9	" 10	6	98.2	103	98	76 108
10	" 14	6	98	99	98	74 84
11	" 19	5	98	99.4	98.4	72 90
12	" 21	6	98.4	99.4	98.4	76 80
13	" 24	6	98.4	99.6	98	72 96

The local and general reactions in this case were pronounced, but both subsided gradually during the treatment. While in the beginning of the treatment the temperature rose to nearly 106° F., the last injection of six milligrammes was followed by only a little more than one degree of rise in the temperature. During the time the patient received this treatment, she lost much in flesh and became very anæmic. She left the hospital February 26th, and at that time the joint was not much swollen and I confidently expected a permanent improvement. She returned in two weeks, when the effusion had returned to about the same extent as when the treatment was commenced. As I had lost faith in the Koch remedy in the treatment of this class of tuberculosis, I returned to the treatment by intra-articular injections of iodoform.

Case 6. *Tuberculosis of left knee-joint.*

William Gabl, thirty years of age, laborer, became an inmate of the Milwaukee Hospital, March 9th, 1891. No history of tuberculosis in his family. Had been in good health until nearly a year ago, when, without injury or any other apparent cause, he was taken with a pain in the left knee-joint, and in less than twelve hours it became enormously swollen and exceedingly painful. He was forced to abandon his work and seek rest, which in a few days brought about a marked improvement; the swelling

disappeared almost completely, and the slight pain and soreness in the joint, which then existed, did not prevent him from following his occupation. From this time on, however, the knee was never entirely well, a number of slight attacks similar to the first, occurring during the summer months. Since November, he has been unable to work, the swelling remained permanently, being most marked at the upper recess of the synovial sac and on each side of the patella. The pain has never been severe when the limb is at rest, and until recently, the patient has been able to walk without the aid of crutches.

On admission the patient was anæmic and had lost about twenty-five pounds in weight during his illness. A physical examination of the chest yielded a negative result. The left limb is atrophic. The swelling of the knee-joint, which is considerable, appears to be due entirely to thickening of the synovial membrane, there evidently being no effusion in the joint. Patient can flex and extend the leg nearly as well as the opposite one. The temperature was normal before the first injection was given, but within six hours the thermometer registered 104.7° F. in the axilla.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Mar. 9	2	98.4	104.7	98.2	81 108
2	" 12	2	98.2	101.8	98.4	78 96
3	" 16	2	99	102.3	98	66 84
4	" 21	2	97.8	99.6	97.8	72 90
5	" 25	2	99	99.9	99	76 80

The local reaction was prompt after every injection, consisting of increased swelling, pain, and tenderness. After the fourth injection the physical signs pointed to the existence of a moderate effusion in the joint. During the febrile reaction, the patient suffered always more or less from headache, backache, and pain in the region of the spleen. As the general reaction appeared to have nearly ceased after the fifth injection, the Koch treatment was suspended to ascertain its ultimate effect upon the local lesion. As, a week later, no perceptible improvement had taken place, the joint was aspirated and about three ounces of a synovial fluid, in which minute fibrinous flocculi were suspended, removed, and an ounce of a ten per cent. iodoform emulsion

injected. The Bruns' treatment is being continued with a fair prospect of an ultimate recovery.

Case 7. *Tuberculosis of hip-joint.*

Maggie McDermott, aged fifteen, was admitted to the Milwaukee Hospital, February 28th, 1891, to be treated for an affection of the left hip-joint. Her father died of pulmonary tuberculosis five years ago. With the exception of the usual diseases incident to childhood, the patient considered herself in good health until a year ago, when she was taken with pain in the region of the left hip joint. From that time on she has walked with a decided limp, but continued her work as a servant girl until a few months ago. The pain was always worse at night and after undergoing unusual exertion. The greatest pain is referred to the region in front of the hip-joint, but at times she complains also of a pain about the inner aspect of the knee-joint on the same side. Her general health is not much impaired. An examination of the hip-joint reveals all the characteristic signs and symptoms of tubercular synovitis following a primary focus in the neck of the femur. Extension was made by weight and pulley; at the same time she was subjected to Koch's treatment with results shown in the accompanying table.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Mar. 2	2	99	100.1	98	78 92
2	" 5	4	98	103.3	99.6	80 102
3	" 12	4	99	103.5	100.4	90 112
4	" 16	4	98.4	100.6	99	84 100
5	" 21	4	99	101	98.4	84 92
6	" 23	4	97.4	99.4	99.6	80 108
7	Apr. 3	4	98.2	100	99.4	92 104
8	" 6	4	98	100	98.2	94 100

The injections until towards the last always were followed by an aggravation of the local symptoms which usually lasted until the end of twenty-four to thirty-six hours. Rest in bed and extension had a prompt effect in diminishing the pain and tenderness, but the tuberculin injections appeared to have no influence in arresting the progress of the disease and had to be abandoned, as the patient's general condition had undergone a decided change for the worse since their use had been commenced.

OTITIS MEDIA TUBERCULOSA.

Case 8. *Pulmonary and laryngeal tuberculosis; tuberculosis of middle ear on both sides, and of the mastoid process on the right side.*

Charles W. Mueller, aged thirty-five, German, farmer by occupation, came under my care at the Milwaukee Hospital, December 10th, 1890. Tuberculosis is hereditary in his family, and he gives a history of pulmonary tuberculosis dating back for a year and a half. About six months ago he became hoarse, a symptom which gradually increased in severity until he came to the hospital, when his voice was a mere whisper. Two months later his ears became affected, the first indication of this trouble being a roaring, buzzing noise attended by slight pain and followed by increasing deafness. The patient is considerably emaciated, but his appetite and digestion have been good. Examination of the chest reveals extensive infiltration of the right apex of the lung with a number of small cavities. The laryngoscope shows numerous nodules at the base of the epiglottis and upon the vocal cords, cedematous infiltration, and at some points minute foci of caseation and ulceration; drum of the ear on both sides perforated and covered with fungous granulations; on the right side, over the mastoid process and a considerable distance above and behind it, the skin is reddened and undermined by an extensive tubercular abscess.

The abscess was incised and its interior, which was lined with a thick layer of granulation tissue, was scraped out with a sharp spoon, and after thorough irrigation was tamponed with iodoform gauze. Almost the entire external surface of the mastoid process was denuded of periosteum. Granulations taken from the interior of the abscess and from the external ear examined under the microscope contained numerous tubercle bacilli. The external ear on both sides was disinfected, iodoformized and loosely packed with absorbent cotton. Under this treatment some improvement was noticeable until the tuberculin treatment was initiated. This patient received the first dose of Koch's lymph administered in the Milwaukee Hospital. Gradually increasing doses were given until the maximum dose, twenty-five milligrammes, was reached, as both the local and general reactions were not well marked. As soon as the dose exceeded ten milli-

grammes a diarrhœa set in which it was found difficult to control and which greatly reduced the strength of the patient.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Reaction.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Jan. 21	2	99	102.2	98.6	84 96
2	" 23	4	98	101	99	80 100
3	" 25	6	98	100.8	98.4	94 100
4	" 27	10	98	102	99.2	86 106
5	" 29	15	97.2	102.6	98	82 98
6	Feb. 2	18	98.7	101.4	98.2	86 90
7	" 5	20	98.4	102.8	98.8	82 94
8	" 7	20	99.3	100.6	99.2	88 104
9	" 9	25	98.6	102.2	98.4	84 102

During this treatment the patient lost his appetite, which in addition to the exhausting diarrhœa contributed largely to the rapid loss of flesh and strength. He left the hospital March 12th and died a few weeks later. I have no doubt that the lymph treatment shortened his life a number of weeks and perhaps months.

TUBERCULOSIS OF LYMPHATIC GLANDS.

Case 9. *Tuberculosis of glands of neck; previous operation followed by relapse; tuberculin treatment; second operation.*

Clara Struebig, aged twenty, member of a highly tuberculous family, has been ailing since childhood with what was then denominated scrofula. Both corneæ are opaque and at nine different times iridectomy has been performed. She has been the subject of glandular enlargement on the right side of the neck for several years, and November last she came to the hospital, and I removed a whole chain of glands extending from the external ear to the clavicle. The upper glands were in an advanced state of caseation; in some of them the caseous material had undergone liquefaction, transforming the interior of the glands into tubercular abscesses. The wound healed kindly and the patient left the hospital much improved in her general condition.

Within a few weeks the glands on the opposite side of the neck commenced to enlarge, and when she again entered the hospital, February 14th, 1891, I found the deep glands underneath the sterno-cleido-mastoid muscle enlarged as far as the middle of the neck and the superficial glands in the supra-

clavicular space. On the right side the disease had returned in the lower portion of the neck where an uninterrupted chain of glands could be traced as far as the clavicle. As the Koch treatment was at that time being applied in all forms of tuberculosis, I was anxious to observe its effects on glandular tuberculosis, and as the patient was equally willing to submit to it, she received the first injection the day she entered the hospital.

The patient not being strong and somewhat anæmic, only one milligramme was injected, but even this small dose produced violent constitutional symptoms. The temperature rapidly rose from 99.4° to 102°, the enlarged glands became more swollen and tender, and pulse rate increased from 80 to 120. The patient spent a sleepless night and complained of a violent headache.

Number of Injections.	Date.	Dose in Milli-grammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Feb. 14	1	99.6	102	98	80 120
2	" 19	1	98.2	99	98.4	84 100
3	" 21	2	99	103	98.2	98 144
4	Mar. 2	$\frac{1}{2}$	98.4	99.4	97.6	74 88
5	" 5	$\frac{1}{2}$	98.4	100	99.2	81 90
6	" 9	1	98.4	101.5	98	90 116
7	" 12	1	98	100	98.5	81 104
8	" 16	$1\frac{1}{2}$	98.4	99.4	98	76 88
9	" 18	2	98.4	99.2	98.2	80 88
10	" 21	$2\frac{1}{2}$	98	100.6	97.8	72 110
11	" 24	3	98	100.2	98.2	88 100

During this treatment the patient's appetite diminished, frequent attacks of diarrhœa set in, which, with the periodical febrile disturbance following the injections, greatly reduced her strength. The third injection was followed during the febrile reaction by aching pains all over the body, but more particularly in the lumbar region. Glands that could not be felt before the tuberculin treatment was commenced, appeared as small, hard nodules under the skin, their number increasing almost with every injection. She remained in the hospital for a week after suspension of the treatment, when the glandular swellings decreased in size and her general condition commenced to improve. She left the hospital and returned after four weeks to submit herself to a second operation. The glands on both sides of the neck were removed, an operation attended by great difficulties, as the internal jugular had to be isolated to the extent of four to six inches. The wounds healed by primary intention, and

the patient returned to her home at the end of two weeks. Examination of the glands after extirpation showed that beginning caseation had taken place in glands not larger than a hemp seed. This early caseation was evidently caused by the action of the tuberculin.

Case 10. *Tuberculosis of cervical glands on both sides; incipient tuberculosis of right apex of lung.*

Lena Messman, aged twenty-two, entered the Milwaukee Hospital January 27th, 1891. Tuberculosis hereditary in the family. She has had a cough for several months which she attributes to a catarrhal affection of the pharynx. Six months ago she noticed a number of enlarged glands on both sides of the neck just below the angles of the lower jaw. The glands slowly increased in size and new ones appeared lower down and along the posterior border of the sterno-cleido-mastoid muscles. Her general health is materially impaired. Both tonsils enlarged and mucous membrane of pharynx the seat of a hypertrophic catarrhal inflammation. A chain of enlarged lymphatic glands on both sides of the neck extending from the angles of the jaw to the clavicles, the largest of the glands being about the size of a hazel nut, their size diminishing from above downward. On the right side most of the glands can be felt underneath the sterno-cleido-mastoid muscle along the course of the large vessels of the neck, while on the left side the superficial glands are affected. The patient came to the hospital with the expectation of having an operation performed, but as a physical examination of the chest left no doubt that the right apex of the lung was the seat of an incipient tubercular infiltration it was deemed advisable to give the tuberculin treatment a trial, to be followed, should it prove successful, by an operation later.

Number of Injections.	Date.	Dose in Milli-grammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Jan. 27	1	99.4	99.8	98.4	84 96
2	" 31	2	99	104	98.2	88 120
3	Feb. 3	6	98.2	102.6	98	84 98
4	" 5	5	98	103.8	98	92 124
5	" 9	6	98	103.8	98.2	88 124
6	" 12	5	98.2	101.7	98.2	72 114
7	" 14	4	98.2	99.8	98.2	100 120
8	" 13	4	98	100.4	98	96 112
9	" 19	4	98	100	98.2	98 106
10	" 21	5	98.2	99.6	98.4	100 106

During the febrile reaction which was always most marked about six hours after injection the cough was aggravated; at the same time the patient complained of soreness of the throat, pain in the chest and back; but after the first few injections the enlarged glands became more swollen, painful and tender. During this treatment the patient lost so much flesh and strength that operative interference was out of question. She remained in the hospital a week after the treatment had been suspended, but only partly regained her former strength, while the glands that could be felt were more numerous than when she entered the hospital, while those that had been previously enlarged presented more marked evidences of caseation and liquefaction of the tubercular product.

TUBERCULOSIS OF LUNG AND LARYNX.

Case 11. Otto Anderson, aged twenty-eight, was admitted to the Milwaukee Hospital January 26th, 1891. A brother died of pulmonary tuberculosis. He has had a dry hacking cough and occasional attacks of hæmoptysis for a year and a half. Six months ago he became hoarse, and this symptom has gradually increased until now he is not able to speak above a whisper. Physical examination of the chest reveals a small cavity in the right apex, and fine and coarse râles as far down as the lower border of the third rib. The sputum contained an abundance of tubercle bacilli. The laryngoscope showed that the surface of the vocal cords was freely studded with miliary tubercles, which at some points had broken down, resulting in small excavated ulcers lined with pale, flabby granulations; epiglottis nearly same condition and œdematous.

As the patient was treated at the same time by iodine inhalation it is somewhat difficult to estimate the value of the local action of the tuberculin on the laryngeal affection. During the commencement of the treatment, the laryngeal difficulty was aggravated, the tendency to cough increased, and the secretions from the larynx and pharynx more abundant and viscid. After the third injection, the ulcerations presented a more healthy appearance, the granulations were smaller and more vascular. The number of tubercle bacilli in the sputum was greatly increased.

Number of Injections.	Date.	Dose in Milligrammes.	Temperature before Injection.	Temperature during Reaction.	Temperature after Reaction.	Pulse before and during Reaction.
1	Jan. 26	2	98.4	101	98.4	72 98
2	" 28	6	98.6	99.4	98.4	72 80
3	" 30	9	98.4	99.6	98.3	72 74
4	Feb. 2	9	99	101	99	66 92
5	" 5	10	99.8	100	98.4	76 80
6	" 7	15	98.4	101.4	98.8	74 100
7	" 10	10	98.4	100.6	98.6	72 82
8	" 18	8	96.6	99.8	98.2	71 80
9	" 24	10	99	100.6	98.2	82 92
10	" 28	10	98.4	100	99.2	84 90
11	Mar. 3	10	98.4	100.2	97.8	86 99
12	" 5	15	98	101.2	98	88 90
13	" 9	15	97.6	99.6	98.2	72 82
14	" 12	20	98	100	98.2	72 98
15	" 17	15	98.2	100	98	82 94
16	" 20	15	98.4	100.2	98.4	74 84
17	" 25	20	98	99.5	98.2	76 90

This patient received more tuberculin than any of the cases previously reported, but notwithstanding the large doses employed the general reaction never was well marked and the patient did not lose in weight during the treatment, although at times the injections increased the tendency to diarrhoea. The improvement of the laryngeal lesion, which was apparent during the beginning of the treatment, now came to a standstill; no attempt at healing of the ulcers was observed, and when the patient left the hospital a week after the last injection was made the subjective and objective symptoms were about the same as when he entered.

PULMONARY TUBERCULOSIS.

During the time the above cases of surgical tuberculosis were under my own care at the Milwaukee Hospital, forty-three cases of pulmonary tuberculosis were treated in the same institution by the same method by my colleague, Dr. E. Kováts. I desire on this occasion to thank him for the permission to use his material in the preparation of this paper. I had frequent opportunities to examine these cases before, during, and after treatment. The length of time the treatment was continued varied from one week to three months, on an average probably about four weeks. The doses ranged from one-half to eighty milligrammes; as a rule, they seldom exceeded five milligrammes. The injections were made every second or third day. An eruption of the skin resem-

bling scarlatina was observed in several cases; in others herpes labialis appeared soon after injection. A general feeling of malaise, nausea, vomiting and diarrhoea were among the more common severe symptoms following the use of the remedy.

Case 1. Joseph Stark, thirty years old, admitted to the hospital January 1st, 1891. Has for several years been suffering from a chronic affection of the nose, which, upon careful examination, is found to be of a tubercular character. Has been ill for six months, and has had two attacks of hæmoptysis, one two months ago, the other two weeks before admission. Physical examination of the chest reveals infiltration of both apices. During the treatment he had an attack of hemorrhage from the lungs, and on another occasion a profuse diarrhoea followed the tuberculin injection. On left side the disease extended, but the general condition appeared to be somewhat improved when the patient left the hospital at his own request.

Case 2. Joseph Minz, aged thirty-five, entered the hospital February 5th, 1891. The history of pulmonary disease dates back four months. Dullness on percussion over left apex anteriorly, and fine crepitation on deep inspiration; same physical signs over posterior portion of right apex. During the treatment dullness and diminished respiratory sounds over the lower lobe of left lung appeared, showing that dissemination of the disease was hastened by the action of the tuberculin. When he entered the hospital the temperature was 102° F., which was always followed by a decided increase four or five hours after each injection. The dose was gradually decreased from five to one milligramme. The dullness over the affected areas increased and respiration became more difficult. He left the hospital decidedly weaker, and local conditions were more extensive than when the treatment was commenced.

Case 3. Franz Kakuska, laborer, aged thirty-five years, was admitted March 3d, 1891. Dates his sickness back to an attack of pulmonary hemorrhage two years ago. Left apex extensively infiltrated. As he experienced no improvement after the injections he left the hospital at the end of two weeks.

Case 4. Ernest Stahlke, twenty-five years of age, admitted March 11th, 1891. Frequent pulmonary hemorrhages, beginning tuberculosis of larynx. Extensive disease of left lung with

formation of cavities. Small doses produced decided reaction, both local and general, but the treatment was followed by speedy aggravation of all symptoms, which induced the patient to leave the hospital after a brief trial.

Case 5. M. Fergusson, aged twenty-two years, farmer, came under treatment March 3d, 1891. He claims to have been in good health until three weeks ago. Diffuse infiltration on both sides and over a large surface, with high temperature. The patient insisted on being treated with Koch's lymph, and received one milligramme every second day for a week. The temperature was increased by the injection, and remained continuously high, and the patient left the hospital much weaker than when he entered; at the same time the cough was much more troublesome, and breathing more difficult.

Case 6. Adam Meinhard, aged twenty-four, farmer, was admitted to the hospital February 15th, 1891. His father died of pulmonary tuberculosis a few years ago. Has been suffering from a dry, hacking cough and slight pulmonary hemorrhage since last fall. Beginning infiltration of left apex indicated by slight dullness, fine, dry, crepitant râles, and prolonged expiratory sounds. Small doses of tuberculin during the early part of the treatment produced intense local and general reaction. Sputum contained no bacilli. The dose was gradually increased to twenty milligrammes. At first the patient lost two pounds in weight, but later gained eight pounds. The patient was discharged as cured, and reported himself as being in good health several weeks after he had left the hospital.

Case 7. N. A. Nelson, thirty-two years of age, was admitted to the hospital February 19th, 1891. Has been ailing for a year and a half with symptoms of pulmonary tuberculosis, with occasional attacks of hæmoptysis. Has been hoarse for several months owing to a well-marked laryngeal tuberculosis. Left apex extensively infiltrated. The treatment was continued for four weeks with no improvement of local or general symptoms.

Case 8. George Pemkert, aged thirty-seven years, came to the hospital January 26th, 1891. Apex and base of lung on right side seat of disease; over the base posteriorly the physical signs point to the existence of small cavities. Sputum contained numerous bacilli. Pulse 80, temperature towards evening 103° F.

Breathing difficult and cough distressing. Injection of one to three milligrammes every other day appeared to improve the general and local conditions, as the temperature became less and the pulse diminished in frequency and increased in force. The dose was gradually increased from three to ten milligrammes, with the result that all the symptoms became aggravated. A pneumothorax developed suddenly in the right pleural cavity, followed by an effusion. Later two pints of a serous fluid were removed by aspiration. After this only small doses of tuberculin were used until March 20th, when the patient was discharged as incurable. He died at his home the latter part of April.

Case 9. Robert Lewis, twenty-eight years of age, farmer, was admitted to the hospital January 1st, 1891. Has been sick for eleven months. During the month of August he had an attack of hæmoptysis. Distinct dullness over right apex anteriorly, and diminished respiratory sounds, while posteriorly over the same area could be heard fine crepitation towards the end of forced inspiration. Beginning infiltration in apex of left lung. During the beginning of the treatment the injections produced typical local and general reactions, but later they were followed by nausea, vomiting, diarrhœa, and loss of appetite; at the same time the local extension increased from day to day and the general condition became so alarming that the patient was advised to leave the hospital.

Case 10. Ben Walter, aged twenty-eight, came to the hospital to be treated by Koch's method, January 22d, 1891. The disease commenced two and a half years ago with pulmonary hemorrhage. Has had a cough ever since. A fistulous opening leads to the lower jaw which is the seat of a tubercular affection. Small cavities in left apex. Treatment was commenced with one-fourth of a milligramme of tuberculin, but the dose was gradually increased to ten milligrammes. The treatment was continued for several weeks, and when the patient left the hospital a decided improvement had taken place.

Case 11. Henry Hayden, aged twenty-six, entered the hospital January 26th, 1891. Has not been well since he had la grippe a year ago. Both apices the seat of symptoms indicative of a catarrhal affection. Hoarseness from the beginning of the disease. No expectoration. The dose of tuberculin gradually increased

from one to twenty milligrammes. Reaction slight. At times the injection followed by nausea and diarrhœa. Treatment continued for more than two months. At the time the patient left the hospital an examination of the chest showed a decided improvement in the local conditions, dullness having disappeared entirely and crepitation could be heard only over isolated circumscribed points.

Case 12. Albert Studenraus, aged twenty-seven years, druggist, came under observation January 1st, 1891. Five years ago he had an attack of pneumonia on left side from which he never recovered completely. The physical signs point to tuberculosis of left apex and posteriorly on same side dullness and crepitation over base of lung. Had a slight hemorrhage from the lung day after admission. The injection of tuberculin never produced general reaction, although the dose during the ten weeks he was under treatment was increased to eighty milligrammes. His weight increased from one hundred and twenty-six and a half to one hundred and thirty-three and three-fourths pounds. The dullness over base of lung disappeared completely and the physical signs over apex indicated great improvement.

Case 13. Edward Williams, twenty-nine years old, engineer, came under treatment January 15th, 1891. Had an attack of pneumonia ten years ago from which he did not recover for four months. Examination reveals diminished respiratory sounds and slight dullness over right apex; gained three and one-half pounds in weight. Dullness diminished, but bronchial râles over apex remained at time of discharge.

Case 14. Dennis Flynn, forty-four years old, farmer, was placed under Koch's treatment February 24th, 1891. Had a hemorrhage from the lungs five months ago, and has not been well since. Physical signs indicate recent infiltration of right apex. Temperature before treatment always above 101° F. As soon as the injection was increased to five milligrammes the febrile reaction became so intense that the dose had to be diminished to two milligrammes. Repeated attacks of hæmoptysis. The pulmonary affection and general condition of the patient were so much aggravated by the treatment that he was advised to leave the hospital at the end of two weeks, having lost during this time six pounds in weight.

Case 15. Fred Hadfield, twenty-four years old, suffering from advanced tuberculosis, was brought to the hospital February 2d, 1891. Tuberculosis hereditary in the family. Disease commenced six years ago with a tuberculosis of the ankle-joint which necessitated an amputation. Return of disease in the stump. Since January, 1888, has had five attacks of pulmonary hemorrhage. Almost the entire left lung affected, the lower portion of which was solidified and the seat of multiple cavities. Injections of tuberculin in doses of one milligramme were made at his urgent request every other day. The temperature, which was never less than 101° F., was always increased by the injection. Treatment continued for about three weeks. During this time the local conditions remained about the same, but the subjective symptoms were improved and the patient gained two pounds in weight. At the time he left the hospital, the temperature curves were about the same as before the treatment was commenced.

Case 16. Oscar Kurze, thirty-seven years old, machinist, was admitted to the hospital February 3d, 1891. The pulmonary affection commenced two years ago, but patient was able to follow his occupation until five weeks before he entered the hospital. Hoarseness for one year. Extensive infiltration of lung on right side with small cavities in apex. Laryngoscope reveals tuberculosis of larynx. During the four weeks he was under treatment, he gained six pounds in weight, but the local conditions remained about the same.

Case 17. John Wahlen, thirty-four years of age, shoemaker, was placed under the lymph treatment February 7th, 1891. Had two hemorrhages from the lungs, the first, five, and the second, three years ago. Pulmonary affection located in right apex. Incipient tuberculosis of larynx. Treatment continued several weeks, during which time he lost four pounds in weight; at the same time the local affection and all of the subjective symptoms were greatly aggravated.

Case 18. Albert Sprenger, forty years old, machinist, entered the hospital March 4th, 1891. He dates his pulmonary affection back to an attack of la grippe fourteen months ago. Physical examination reveals tuberculosis in apex of left lung with a focus at base of right lung. Temperature before treatment ranges between 99 and 100° F., and never rose afterwards above 101 F.,

although the dose of tuberculin was gradually increased to twenty milligrammes. He gained four pounds in weight and the local and general conditions appeared to be improved by the treatment.

Case 19. Eugen Bentzler, twenty-five years old, painter, came under treatment March 7th, 1891. Has not been well since he suffered from an attack of la grippe a year ago.

Infiltration of right apex and base of left lung. Patient gained seven pounds in weight and improved otherwise under treatment.

Case 20. Ferdinand Rossow, aged nineteen, clerk, entered the hospital March 16th, 1891. Disease commenced with an attack of pulmonary hemorrhage November last; since that time he has had a hacking cough.

Dullness and cavernous breathing over left apex; dullness and bronchial râles over base of left lung. Has high evening temperature. The dose of tuberculin never exceeded one milligramme. The patient lost four pounds in weight in the course of two weeks, and during the same time the extension of the pulmonary affection was rapid and the cavities increased in size.

Case 21. Theodor Freese, thirty-four years old, bricklayer, came under treatment March 19th, 1891. Pulmonary affection commenced November last, and two months ago he had an attack of pulmonary hemorrhage. The laryngoscope reveals a commencing tuberculosis of the larynx. Dullness and bronchial breathing over right apex. Pneumothorax on left side. Great dyspnoea; temperature 104° F. As the patient insisted on being treated with Koch's lymph, half-milligramme doses of tuberculin were injected every other day. This treatment had no effect on the temperature. The patient died April 2d, 1891.

Case 22. William Heath, twenty-three years old, traveling agent, came to the hospital to undergo treatment for an affection of the larynx March 23d, 1891. The laryngeal trouble commenced in May, 1890. Laryngoscopic picture presents the characteristic appearances of advanced tuberculosis of nearly all the structures at the entrance into the larynx. Infiltration of both apices. Evening temperature before treatment 103.4° F. One-half milligramme doses of tuberculin were employed, but they had no influence on the temperature, or in arresting the rapid progress of the laryngeal and pulmonary lesions.

Case 23. John Banner, aged twenty-three, wagon-maker, placed himself under Koch's method of treatment at the hospital March 25th, 1891, for tuberculosis of the larynx and right apex. He received three doses of tuberculin of one milligramme each during the course of one week, and then left the hospital without any signs of improvement.

Case 24. John Giegerich, aged twenty-four, bookkeeper, entered the hospital January 24th, 1891. Disease commenced with hæmoptysis six years ago. Spent one year in Colorado without much benefit.

Large cavity in upper lobe of left lung and beginning infiltration of right apex. The dose of tuberculin increased gradually from one to ten milligrammes. Large doses produced nausea, bloody sputa, but the temperature during reaction never rose above 101° F. Treatment was continued with small doses for over two months with the result that the subjective symptoms improved somewhat, but the local lesions remained unaffected.

Case 25. Mary Brockmayer, aged twenty-three, came to the hospital January 22d, 1891. Disease commenced September, 1890. Large cavity in upper portion of left lung; beginning infiltration of right apex. The evening temperature was high before treatment was commenced, and the patient left the hospital at the end of two weeks decidedly worse in every respect than when she entered.

Case 26. Mrs. Wendland, aged thirty-three, housewife, became an inmate of the Milwaukee Hospital for the purpose of being treated with Koch's lymph for advanced pulmonary tuberculosis. Only small doses were employed to satisfy the patient, who insisted on being treated by this method. The treatment had no effect in arresting the rapid progress of the disease, and the patient died during the second week.

Case 27. Mrs. Krœhnke, aged forty-three, was admitted to the hospital January 24th, 1891. Pulmonary affection commenced two and a half years ago with hæmoptysis. Cavity in right apex. Under the tuberculin treatment the objective and subjective symptoms were greatly aggravated, and the patient left the hospital in a critical condition at the end of three weeks.

Case 28. Ella Berg, aged sixteen, was admitted to the hospital January 29th, 1891. Pulmonary disease had existed for two

years. Dullness over left apex as far as the fourth rib, cavernous breathing over this space. Over base of lung on same side moist bronchial rales. Injections never exceeded three milligrammes. Rapid emaciation, increase of fever, and aggravation of subjective symptoms necessitated suspension of treatment. The patient left the hospital at the expiration of two weeks and died a few days later.

Case 29. Carrie Mathieson, aged twenty-four, milliner, came to the hospital January 31st, 1891.

Has not been well since she suffered from la grippe a year ago. Since then has had two attacks of pulmonary hemorrhage, the first in July, the second in December, 1890. Extensive infiltration of left upper portion of lung with cavities in apex. Under the tuberculin treatment she failed rapidly. She left the hospital at the end of three weeks, and died at her home a few weeks later.

Case 30. Minna Bartel, twenty-five years old, housewife, sought hospital treatment February 3d, 1891. Duration of disease seven months. Advanced pulmonary tuberculosis with secondary tuberculosis of larynx. Tuberculin treatment was tried faithfully for a number of weeks with decidedly unfavorable results.

Case 31. Augusta Avery, twenty-four years of age, housewife, was admitted to the hospital January 27th, 1891. Disease commenced with a pulmonary hemorrhage July 4th of the preceding year. Copious hæmoptysis four weeks before she entered the hospital. Slight dullness and diminished respiratory sounds over right apex anteriorly. Small doses of tuberculin produced no rise in temperature, but when ten milligrammes were injected the temperature during reaction reached 101.4° F.

About this time patient complained of soreness in the pharynx, and on inspection a number of nodules varying in size from a hazel-nut to that of a walnut could be seen, the mucous membrane covering them in a state of intense inflammation. As no improvement was perceptible in the conditions of the lung, and at the same time both wrist-joints became swollen and painful, the treatment was suspended.

Case 32. Minna Feldt, aged twenty-two, housemaid, was admitted to the hospital January 24th, 1891. Claims that duration of disease does not extend over four weeks. Three weeks

ago hæmoptysis. Examination reveals incipient tuberculosis of right apex. Tuberculin injections in increasing doses continued for several weeks had no effect in arresting the progress of the disease.

Case 33. Christine Stromberg, aged twenty-six, housewife, entered the hospital January 24th, 1891. She fixes December 8th, 1890, as the day when her pulmonary disease commenced. Incipient tuberculosis of right apex. Tuberculin injections caused but slight reaction. Local condition somewhat improved when she left the hospital four weeks after admission.

Case 34. Maria Niebuhr, twenty years old, milliner, came under treatment February 2d, 1891. Had an attack of whooping-cough a year and a half ago, and has had a cough ever since. Dullness and fine bronchial râles over left apex and coarse bronchial râles over base on same side. Evening temperature high. Local and general condition aggravated by the tuberculin injections.

Case 35. Amanda Sundermann, aged twenty, housemaid, entered the hospital March 12th, 1891. Has been ill since October, 1890. Beginning tuberculosis in upper portion of right lung. Largest dose of tuberculin used eight milligrammes. Some improvement until she came down with an attack of la grippe while in the hospital.

Case 36. Max Seibel, twenty years old, was admitted to the hospital January 26th, 1891. Advanced pulmonary tuberculosis with high evening temperature. The injections of tuberculin increased the temperature curves and hastened the fatal termination.

Case 37. Herman Zuehlke, aged thirty, admitted to hospital January 31st, 1891. Tuberculosis of larynx and infiltration of both apices and base of left lung. The tuberculin injections were followed on three different occasions by hæmoptysis, and on that account treatment was suspended and patient advised to leave the hospital.

Case 38. Joseph List, twenty-three years old, came to the hospital January 31st, 1891, to be treated by injections of Koch's lymph for advanced pulmonary and laryngeal tuberculosis. The suffering and debility were greatly increased by the injections, and the patient was advised to return to his home. He died a few weeks after he left the hospital.

Case 39. J. Biedermann, thirty years old, entered the hospital February 3d, 1891. Duration of pulmonary disease one year. Part affected, right apex. Tuberculosis of larynx commenced several months ago. Tuberculin treatment proved very dangerous in this case, as the local lesions extended rapidly, and the debility increased after every injection. Patient discharged at the end of two weeks.

Case 40. D. Haget, forty-three years old, presented himself at the hospital for the Koch treatment January 26th, 1891. Cavity in upper portion of right lung with commencing infiltration of left apex. Treatment continued for three weeks when the patient left the hospital in a critical condition at his own request. Death three weeks subsequently.

Case 41. Charles Wagner, aged twenty-eight, brass finisher, entered the hospital February 2d, 1891. Has had a cough for ten years and hæmoptysis in 1887. Limited infiltration of right apex. Tuberculin injections were well borne, and the patient left the hospital after four weeks' treatment, materially improved.

Case 42. Henry Pritchard, thirty years old, came under treatment February 3d, 1891. Extensive infiltration of right apex. The tuberculin injections hastened the local extension of the disease and produced such great prostration that treatment was suspended at the request of the patient. Death a few weeks after he left the hospital.

Case 43. Herman Rehm, nineteen years old, farmer, came to the hospital February 7th, 1891, for the purpose of undergoing treatment by Koch's lymph. Extensive infiltration of left apex; over base of left lung, dullness, fine and coarse bronchial rales. Noticeable improvement had taken place in the general condition of the patient when he left the hospital at the end of six weeks; at the same time the physical symptoms indicated that the local condition had undergone a favorable change.

The injections were made as a rule every other day in order to ascertain the full extent of the local and general reaction following each dose of tuberculin. The first dose never exceeded one milligramme, and in grave cases the treatment was commenced with one-half of this quantity. The dose was never increased, if the temperature during the reaction following it rose above 101° F., and if this result was reached in many cases the

dose was diminished, or the interval between the injections increased. It is therefore probable that in the grave cases the unfavorable symptoms following the injections were not so much due to the action of the tuberculin as to the intrinsic tendencies of the disease to aggravation. It is, however, an entirely different matter in the mild cases in which in spite of a careful increase of the dose the local and general symptoms underwent a rapid change for the worse, as in such cases the unfavorable results must be attributed to the action of the tuberculin and not to the intrinsic tendencies of the disease. The whole number of cases treated by tuberculin injections at the Milwaukee Hospital during the months of January, February, March and April is forty-three—thirty-two males, and eleven females. For the sake of convenience these can be divided into mild, medium, and grave cases.

Mild cases,	8 males and 4 females.....	12
Medium cases,	10 males and 2 females.....	12
Advanced cases,	14 males and 5 females.....	19
		—
		43

Died in the hospital, one male and one female..... 2

Aggravation of all the symptoms during treatment:

14 males and 8 females.....	22
No improvement,	5 males and 1 female..... 6
Improved,	10 males and 1 female..... 11
Apparently cured,	2 males..... 2
Died, 2
	—
	43

Died soon after leaving the hospital:

4 males and 2 females, 6

Of the mild cases unfavorably affected by the treatment:

1 male and 3 females,	4
Of the mild cases improved, 4 males and 1 female.....	5
Of the mild cases apparently cured, 2 males,	2
	—
	11

The two cases that were apparently cured belonged to the mild type of the disease; no such result was obtained in any of

the thirty-one cases belonging to the medium or advanced form of the disease. In one of the cases that was apparently cured, the sputum contained no bacilli, and in the other there was no expectoration, consequently some doubt must remain as to the tubercular nature of the pulmonary affection.

In the cases of medium gravity the result of the treatment was as follows:

Aggravated	5
Not improved	2
Improved	5
	—
	12

In the grave cases the treatment was followed by serious results in	12
By no improvement in	3
By temporary improvement in	2
By death	2
	—
	19

GENERAL REMARKS.

Diagnostic Value of Tuberculin. Great diversity of opinion prevails at the present time as to the diagnostic value of tuberculin. The first reports of the use of this substance were unanimous in attributing to it positive diagnostic value. It was claimed that reaction only occurred in tubercular patients by the specific action of the lymph on tubercular tissue, and that the absence of increase of temperature after injection of the lymph decided the non-tubercular nature of the affection.

Leyden, Quincke, Ebstein, Weber and Biermer maintain that the absence or presence of reaction after the use of tuberculin must not be regarded as absolute proof of the existence or non-existence of tubercular disease in all cases.

Schultze, Finkler, Guttman, Schreiber, Lichtheim and Rumpf have great faith in the diagnostic value of the use of tuberculin in tuberculosis of the internal organs. The same discrepancy of opinion exists among surgeons as to the value of tuberculin injections in the differential diagnosis of surgical tubercular and non-tubercular lesions.

Bergmann relies on the reaction following the use of tuberculin in differentiating between tuberculosis on the one hand and syphilis and carcinoma on the other. Bardeleben and Köhler are reserved in their verdict as to the diagnostic value of the method.

Trendelenberg regards the febrile reaction following an injection of tuberculin as an evidence of the tubercular nature of the lesion, except in tuberculosis of the testicle. Esmarch is of the opinion that in doubtful cases the reaction following the use of the remedy is of great diagnostic value. Bramann and Mikulicz place great confidence in the presence or absence of reaction. König and Hildebrand have observed reactions in lesions resembling in appearance tubercular affections, but which by other diagnostic aids were shown not to be of a tubercular nature. Clinical experience has demonstrated that general reaction is produced by tuberculin in cases of actinomycosis and in certain forms of sarcomatous tumors, and that consequently this method of diagnosis cannot be relied upon in differentiating between tubercular lesions and these affections.

A number of the cases reported in this paper furnish conclusive proof that the susceptibility to general reaction varies greatly in different tubercular individuals. In some, intense reaction followed the use of small doses when the tubercular lesion was limited; in others suffering from extensive tuberculosis, large doses produced no rise in temperature. That in the latter class of cases the affection was of a tubercular nature there could be no doubt from the history of the cases, the appearance and location of the lesions, the subsequent behavior of the affection; and in some of the cases the presence of tubercle bacilli in the affected tissues was demonstrated.

I look upon the local reaction in affections of the lymphatic glands as a valuable diagnostic aid in differentiating by the use of Koch's lymph between tubercular and non-tubercular affections of these organs. If the enlargement of the lymphatic glands is due to a tubercular affection, the existing swellings not only become larger, more painful and tender a few hours after the injection of a dose of the lymph, but other glands that could not be felt before the injection become enlarged, and can be felt in the vicinity of those that were recognized before the use of the remedy. But even in such cases I regard inoculation-experiments

of greater diagnostic value than injections of tuberculin, yielding more positive results without exposing the patient to the risks of local and metastatic dissemination of the disease incident to the latter procedure.

If patients suffering from non-tubercular affections will occasionally, only, respond to the tuberculin test on the one hand, and on the other, in exceptional cases, individuals suffering from well-marked typical tubercular affections have proved themselves refractory to the action of tuberculin, it must appear evident that the use of this substance cannot be relied upon in making a positive differential diagnosis between tubercular and non-tubercular affections. If it can be shown at the same time that a single injection of tuberculin is not devoid of danger, and that implantation of the product of this disease in guinea pigs in the course of three or four weeks will yield results which will enable us to make a reliable diagnosis between tubercular and non-tubercular affections, it is apparent that the use of Koch's lymph as a diagnostic resource should be discarded or at least limited to exceptional cases.

Therapeutic Value of Tuberculin. It is now generally conceded that many cases of tuberculosis reported as cured have since relapsed; some of these have died, and others have been subjected to different treatment. In many instances, of course, the original report has not been supplemented by subsequent communication; as an absolute diagnosis, even by the use of Koch's lymph, is not always possible. It may be some of the alleged cures rest on a faulty diagnosis. This applies with special force to the two cases of pulmonary disease reported as cured in this paper.

Again, it must not be forgotten that tubercular affections not infrequently, under favorable local or general conditions or improved dietetic, hygienic or climatic changes, undergo a spontaneous cure, so that for nearly all methods of treatment so far suggested similiar exceptional results can be claimed. In not a single instance of the eleven cases of surgical tuberculosis that came under my own observation did the treatment result in anything more than a temporary improvement, and in several of them it was followed by local extension of the disease and serious impairment of the general health. The effect of tuberculin

proved more serious in the treatment of the forty-three cases of pulmonary tuberculosis. There can be but little doubt that in a number of the fatal cases, death was hastened by the treatment, and that in a number of the mild cases it contributed largely towards the rapid local extension of the lesion; while the tuberculin treatment of pulmonary tuberculosis can show no better results, it is difficult to ignore the fact that it has been productive of more harm than almost any other plan of treatment heretofore suggested, and on this score alone the verdict "Away With Koch's Lymph!" is timely and imperative.

Dangers Attending the Use of Tuberculin. Tuberculin when brought in contact with tubercular tissue produces coagulation-necrosis, and during this process a toxic chemical substance is produced, which, when it reaches the general circulation, causes the febrile reaction. The time necessary to reach this stage of its action is usually from three to six hours. The intensity of the reaction depends on the quantity of the toxic substance that is produced and finds its way into the general circulation. The general reaction is a septic condition of the organism produced by the toxic substance resulting from the action of the tuberculin on the tubercular tissue. The temperature and the other general symptoms continue until this toxic substance is eliminated through one or more of the excretory organs. The immediate danger attending the tuberculin treatment consists in the production and introduction into the circulation of a fatal dose of this toxic substance. That the fear of a fatal sepsis resulting from the action of Koch's lymph is not unfounded is shown by a number of such cases that have been reported. If the whole truth were known, this number would be greatly increased by unpublished cases.

The more remote dangers attending the tuberculin treatment have been pointed out by Virchow. The destructive effect of the tuberculin on the granulation tissue breaks down the wall surrounding the infected area and liberates the bacilli and their spores, an occurrence which can hardly fail in giving rise to local and general dissemination. The granulation tissue, the specific primary product of tubercular inflammation, is the wall of defense built up by the tissues to protect the adjacent parts and the organism against invasion. Any method of treatment which

interferes with this manner of defense clears the way for the enemy and secures victory for the invading army. If future research should lead to the discovery of a specific remedy for the cure of tuberculosis, it will be an antagonistic microbe to the bacillus of tuberculosis or a substance which, when brought in contact with a tubercular focus, will have an opposite effect on the tissues from that of Koch's lymph.

I have given Koch's lymph a fair trial and have carefully observed its effects, and have become firmly convinced both of the danger which attends its use and its utter inutility in curing any form of tuberculosis.

This paper has been written for the special purpose of placing myself on record as one who protests earnestly against further experimentation with this mysterious and dangerous fluid. A careful study of the voluminous literature on the use of Koch's lymph, and my own experience with it, have induced me to head this paper with the title it bears, "Away With Koch's Lymph!"

