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A. H. WRIGHT, B.A., M.D. TORONTO, M.R.C.S. ENGLAND.

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THE PRESENT POSITION OF ANTISEPTIC SURGERY.*

BY J. WILLIAM WHITE, M.D.,

Professor of Clinical Surgery in the University of Pennsylvania;
Surgeon to the University and German Hospitals.

Read in the post-graduate course of the University of Toronto.
December 20th. 1890.

For several years it has been my custom in my lectures at the University of Pennsylvania to pass rapidly over the evidence in support of the antiseptic theory of wound treatment with the remark that the time for argument had passed, and it was merely necessary now to present such facts as might serve to make clear such principles involved and to emphasize the enormous benefit that has resulted from the application of those principles to practical surgery. It seemed to me that the theory of antiseptics rested upon a mass of correlated facts, experimental, clinical, and bacteriological, sufficient to establish it on a firm foundation, and that the only debatable ground remaining was that relating to the selection of methods and the improvement of details. I considered that the problem had been so scientifically stated, and its solution had been so thoroughly accomplished that, as regarded the general principles, no opposing views worthy of mention remained for discussion or refutation.

*A reply to Mr. Tait's recent criticism of Sir Joseph Lister's Berlin Address.

I also thought that the whole history of the development and establishment of this great theory, while including the admirable labors of hundreds of medical men in all parts of the world, and constituting one of the brightest chapters in the record of human progress, yet centered around the figure of the English-speaking surgeon whose name was identified with it from its incipency, in whose mind the grand conception first took practical and definite shape, and whose patient, unassuming, conscientious work in elevating his original thought into a working hypothesis and in transforming the latter into a theory of world-wide acceptance, seemed to me to present perhaps the best, and certainly the most important, example of the application of purely scientific methods to practical surgery to be found in the history of the profession.

These, I say, have been my views, stated more and more dogmatically to successive classes as time went on, and with less and less thought of possible error or of contradiction from respectable surgical authorities. Of course there are always persons in every profession and in every community whose brain-cells react to new thoughts and ideas as their grosser tissues to foreign bodies. A condition of irritation is set up, followed by the expulsion of the intruder or by its encapsulation and virtual disappearance. Vaccination for variola has to-day its dozens of bitter opponents; for other infective diseases, its hundreds of skeptics; the theory of evolution, which has revolutionized the natural science of this century, is still violently attacked;

and although the laws of gravitation and of planetary motion are now quite generally admitted, we have in Virginia a colored clergyman who still proclaims his belief in the sun's motion. As regards the antiseptic theory, we can usually afford to turn a deaf ear to this class of opponents, many of whom have about as much claim to speak with authority on surgical or scientific topics as the Reverend Mr. Jasper on astronomical subjects.

When, however, a noted surgeon, a successful operator and a vigorous controversialist, undertakes to traverse the whole line of thought and argument upon which my confident acceptance of the theory was founded, denies its basal facts, ridicules its logic, jeers at its methods, challenges its records and abusively attacks its author and his supporters; and when I find such views, so expressed, published and republished in the most reputable medical journals of the day, with little or no editorial censure, it seems to me proper that those of us who are teachers should once more review the evidence, consider the situation, and, according to our conclusions, publicly reaffirm or renounce our faith in the theory and practice of antiseptis.

On the 4th of last August, I had the pleasure of hearing Sir Joseph Lister deliver before the International Medical Congress at Berlin an address upon "The Present Position of Antiseptic Surgery." He evidently did not think it necessary in the presence of that vast audience, containing many of the most distinguished men in Europe and America, to defend or even to restate his position as to antiseptis, but devoted his time to noting the new light which had been thrown on the behavior of wounds by the results, on the one hand, of Koch's discovery of the method of cultivating microbes upon solid media, and, on the other, of Metchnikoff's researches into the phagocytic action of the migratory or amoeboid cells of the human body. According to Lister, Koch's work has rendered it possible to study with greater precision than ever before the habits and behavior of micro-organisms, and he instanced the discovery of the cholera microbe as a notable example of the results of this method. Detailing some of Metchnikoff's experiments to prove the antibacteric action of normal leucocytes, he called

attention to the explanation it offered of much that was hitherto mysterious in the relation of micro-organisms to wounds; the healing, for instance, of wounds like that made in the operation for hare-lip, the posterior edge of which is perpetually bathed in saliva containing septic bacteria. The destruction of these microbes by the leucocytes which people the lymph at the edge of the wound satisfactorily explains the rapid healing which we uniformly obtain after this operation. So, too, he thought, that in cases where fine silk ligatures are used unpurified and left in closed wounds, the phagocytic action of the normal tissues may destroy the microbes that have gained access to the interstices of the thread, and prevent their fermentative or putrefactive action on the discharges.

He then considered the question of drainage and of irrigation, pointing out the possibility of dispensing with both in many wounds, and suggesting that in the new light thrown upon the ability of normal tissues to protect themselves, contamination from atmospheric organisms may perhaps also be disregarded, provided no septic matter be otherwise introduced into wounds. In support of this, he noted the fact that it had been found that the free entrance of air containing microbes into the pleural cavity in cases of empyema had produced no harmful results in the days when the spray was irrationally depended upon to sterilize such air, and instanced the transformation of the purulent contents of the pleural cavity into a rapidly diminishing serous effusion, the closure of the external opening, the resumption of the normal functions of the pleura, the expansion of the contracted lung through atmospheric pressure,*

*This statement Mr. Tait criticises (if it can be called criticism) most violently, calling on the "shades of Newton and Torricelli" in mock dismay at the disregard of physical laws which he thinks it manifests. He misquotes Lister, who spoke of the closure of "the external opening." This Tait transforms into "closure of the affected cavity," and then says that "given a membrane to which the atmosphere has free access on both sides, on both of these sides the pressure of the atmosphere will be exactly the same"—a self-evident proposition, but one which has nothing to do with the condition of the lung and pleura after the chest wall has become imperious. He says, also, that when the closure of the pleural cavity is completed "the natural dimensions of the affected lung are *always* remarkably diminished." In contradiction of his whole position in this matter, I would refer to the following authorities: West, on Pneumothorax (*The Lancet*, 1887, vol. 2, p. 353); Williams, on the use of a Valvular Tube in Empyema (*British Medical Journal*, May 18, 1889); Reynolds, on Pneumothorax Consecutive to Emphysema (*Manchester Medical Chronicle*, October, 1889); Douglass Powell, on Variations in Intra-thoracic Pressure (*Transactions of International Medical Congress*, 1881, vol. 2); Donaldson, on Diseases of the Pleura (*American System of Medicine*, vol. 3, pp. 522, 559). The latter author says: "The dilatation of the lung is produced by the disappearance of the intra-pleural pressure and the pressure in the opposite direction from the bron-

etc., as a beautiful example of the reparative processes of nature when uninterfered with by mischievous agents from extrinsic sources. The contrasting course of those cases, in which, in pre-antiseptic days, the discharges escaping from the wound became infected and underwent putrefactive fermentation, is familiar to most of you.

He then emphasized the need for antiseptic rather than aseptic dressings in cases where large discharge is unavoidable, and concluded with a reference to the double-cyanide dressing which he has been using for eighteen months.

This address seemed to me as I listened to it to be another striking example of Lister's remarkable willingness to receive and profit by all new discoveries and all genuine advances bearing upon the antiseptic theory. So far as I know, he has never remained silent in the face of satisfactory demonstration that any portion of his method was unnecessary or illogical. As he gave up the spray when it became evident that it was not accomplishing its work, as he has from time to time discarded various antiseptics in the search for the ideal one combining permanency and certainty of action with absence of irritating qualities, so he now is willing to minimize the dangers of atmospheric contamination and to discard washing, irrigation, and even drainage in appropriate cases, although for years he has been conscientiously emphasizing their importance. Surely this is the true scientific spirit, as rare as it is admirable, and an additional evidence of the single-mindedness and absolute fairness of this great investigator.

On the 27th of last September there appeared in *The British Medical Journal* an article by Mr. Lawson Tait, consisting of an address delivered a short time previously, and entitled "The Present Aspect of Antiseptic Surgery; A Criticism of Sir Joseph Lister's Address at the International Congress."

Of the tone, taste and temper of this essay, I shall have but little to say. It would be difficult to characterize it properly and preserve the dignity and decorum which should belong to scientific discussion, but which are so conspicuously absent in Mr. Tait's paper. So far, how-

ever, as concerns our present purpose, it may be considered from two standpoints: 1st. As it denies the truth of the principles underlying the practice of antiseptics, and advances an alternative theory applicable to the treatment of wounds. 2nd. As it attacks the prevailing antiseptic methods.

1. THE PRINCIPLES INVOLVED. Mr. Tait draws an elaborate comparison between the phlogiston theory of Stahl and the antiseptic theory, asserting, to use his own words, that we have a perfect parallel to the former in "the septic theory of inflammation and fever which is the favorite hobby-horse of our own day." He adds, "everything at present has a septic origin and a septic inception, yet I venture to say that before the present generation has run out the word antiseptic will be all that is left to represent the strange structure, just as anti-phlogistic was the only word left to represent the phlogistic theory in the middle of the present century." He continues by asserting a want of logic in the use of the term "theory" at all, saying that "instead of the septic or antiseptic fact, Lister and his still more illogical disciples talk of the septic or antiseptic theory, whereas there is no theory about it at all, but an absolute and ludicrous logical error." He then opens his argument by denying that the cholera bacillus has been definitely isolated or that it can be cultivated with certainty and precision; and says that even if it has and if it is potent for production or reproduction, the fact that if a thousand people drink the same germ-infected water only a hundred or so will be affected, and that the majority of these will recover, shows that the facts about germs in the human body do not coincide with the facts of the germs in the gelatine flasks, and that, therefore, they cannot stand as the basis of a working hypothesis, far less of a theory.

It is difficult to follow the vagaries of this extraordinary paper; but if all this means anything whatever, it means, taking the cholera bacillus as a type, all deductions based upon bacteriological investigation are denied because the growth and reproduction of micro-organisms in the body are so influenced and altered by physiological and vital processes as to run a course somewhat different from that which they take in flasks or test-tubes. For the same gen-

chial surface." The whole question is, of course, a distinct digression, but is used by Tait in justification of his assertion that Lister "possesses crude notions of logical definition"!!

eral reason and because it will not immediately explain the difference among the clinical courses of various infective diseases, Mr. Tait rejects the phagocyte theory, apparently assuming that if it is true there should be a uniform destruction of bacilli of all varieties, one might as well deny the essential element of conception, the fusion of the ovum and sperm cell—possibly an instance of phagocytosis—because of the variations in the resulting animal. This position is, however, in harmony with his denial of the value of vivisection for similar reasons, and illustrates the working of a mind which he is pleased to consider "logical." The assumption that this is what he is clumsily attempting to say is also justified by several other paragraphs, which will serve at once to display his real ignorance of the teachings of Lister and to illustrate the character of his address. He says, "If the entrance of germs into a wound was the immediate and real cause of suppuration and of consequent poisoning, the device of the spray was the most completely logical appliance that could have occurred to the mind of man." "Even if the phagocytes are the means by which the tissues resist the omnipotent and ever present germs, it is the phagocytes and their conditions which must constitute the really important elements of the question: keep your phagocytes up to the mark and you need never bother about germs." "With the Listerian, one germ is as good as a thousand." "If it would gratify the phagocytes in any way, I would stuff the abdomen like a pudding with the germs or bacilli of decomposition, provided there was nothing present for them to feed upon." He finally, after more vituperation and self-glorification, sums up his position in the two following paragraphs: Lister's view was, "Keep out the germs, and you may leave blood-clot (and other matters) to take care of themselves." My view was and is, "Get out all decomposable matter and you can let the germs in freely." "There are two factors in the trouble, and it can be shown conclusively that one, the germs, are wholly inconsiderable without pabulum on which to feed: whilst the other, the pabulum, is sure to breed trouble because it is practically and mechanically impossible to keep the germs out; they exist already in the blood and elsewhere, and

are ever present, according to the best authorities."

This amount of quotation I was reluctantly compelled to make to elucidate his views, but we may now ask, "What are the *facts* in the case?"

The evidence necessary to prove the definite etiological relation of a particular micro-organism to a specific disease in man is as follows: The organism must be unmistakably recognizable at different periods of its growth; it must be isolable: it must be capable of cultivation alone and free from association with other organisms; it must be invariably associated with the disease in question; it must be capable by inoculation of producing that disease; it must retain this power through an indefinite series of cultures. If these conditions were fulfilled in but a single instance, it would be sufficient to demonstrate the folly of the general attack on all germ theories contained in Tait's paper; but at least five well-known examples may be mentioned of indisputable relation of cause and effect between specific pathogenic microbes and infective disease. Since 1879, when Koch first demonstrated the connection between definite micro-organisms and various wound diseases, the evidence has steadily accumulated. Ogston in 1881, Rosenbach and Cheyne in 1884, Passet in 1885, Zuckermann in 1887, have shown that the various staphylococci have as distinct a causative relation to acute suppuration as has the yeast plant to the alcoholic fermentation. They can be found in and cultivated from the pus in every recent abscess; they invariably produce suppuration when pure cultures are injected, even to the twentieth generation. Their effect may or may not be aided by the ptomaines which they produce, but as the amount of ptomaines is directly proportionate to the number of microbes present, and as the ptomaines are never produced at all in the absence of the microbes, the question as to the relative importance of the two has, as Senn long ago said, but little interest for the practical surgeon, and can have none at all for the "purely unscientific person" that Mr. Tait with truthfulness represents himself to be.

Another example is to be found in malignant pustule, the specific cause of which, the bacillus anthracis, is readily cultivated in different media

and produces the disease when inoculated in the smallest possible quantity.

Fehleisen in 1883 showed that erysipelas depended upon a streptococcus, inoculation of which when quite pure produced the disease in six out of seven cases, the exception occurring in a person who had recently had an attack of erysipelas and was scarcely more than convalescent.

Acute osteo-myelitis has until recently been thought to be due to the ordinary microbes of suppuration, but the researches of Becker and Krause (1883) and others have made it probable that a specific micrococcus is the essential element of the disease.

Tubercle furnishes the last of our examples of microbe disease, and we have just learned that to Koch, who in 1882 discovered the tubercle bacillus, we possibly owe the equally brilliant and infinitely more important discovery of its antidote.

In the face of this collection of facts, of such transcendent importance to surgery and to the world at large, we can afford to pass by without further mention the bacilli of tetanus, typhoid fever, and glanders, the micrococci of lobar pneumonia and of gonorrhœa, and the microbes of cholera and of gangrene, although it is quite clear to all persons capable of weighing scientific evidence that it is a question of time only when our knowledge of these microbes shall be as definite as of those I have enumerated.

In the face of this evidence, we may assume that Tait's general and contemptuous rejection of *all* surgical theories dependent upon our knowledge of germs is not warranted by the facts in so far as suppuration, erysipelas, tubercle, anthrax, and osteo-myelitis are concerned, and therefore that there is no *a priori* ground for rejecting *every* theory involving a belief in the potency for mischief of micro-organisms.

It is more directly to the point, however, to inquire into the evidence in favor of the germ theory of septic wound disease, and here we must briefly consider some very elementary questions. Mr. Tait takes great pains in one portion of his paper to emphasize the fact that "such bacilli as cause decomposition and such as have specific properties split out from dead organic matter some horrid things," *i.e.* in other words, that they act as ferments, causing that form of fermentation which we know as putre-

faction. Mr. Tait is as usual inaccurate in his statement—as the *micrococcus erysipelatosus*, for example, which is undoubtedly a microbe with specific properties, does not cause any putrid change; but he would have been correct in asserting that all organisms produce changes in the materials in which they grow, which means that they all cause *some* kind of fermentation.

The antiseptic treatment of wounds might, under Mr. Tait's ruling, be described as a treatment directed against the causes of putrefaction in wounds; but a more accurate definition expands it, as Mr. Cheyne has suggested, so as to include treatment directed against the cause, not merely of the putrefactive fermentation, but of all fermentations. Accepting this very liberal definition, our scientific evidence leads us to the adoption of the antiseptic theory by the following steps, each of which is as demonstrable as the single rule of three or the *pons asinorum*:

Fermentation (whether putrefactive or otherwise) in organic substances, such as blood clot or serum or pus, or the discharges from wounds, depends upon the access to these substances of micro-organisms. The proofs of this fact are twofold. Experimentally, it is shown by the certainty with which easily decomposable substances like blood, urine, or beef tea, may be kept indefinitely sweet by simply protecting them from germ contamination. Clinically, it forms the basis of all subcutaneous surgery; explains the difference between simple and compound fractures; and, taken in conjunction with another fact, *viz.*, that the fluids and tissues of the healthy living body are practically sterile, it also explains the difference between the behavior of a case of arterial occlusion affecting a portion of the surface of the body and producing gangrene or sloughing, and a case of similar occlusion affecting an internal organ and producing atrophy and retrograde metamorphosis.

The last fact I mentioned—the sterility of the blood and tissues—is denied by Mr. Tait, who says "the germs exist already in the blood and elsewhere, and are ever present, according to the best authorities." The elaborate and carefully conducted experiments of Hauser, Watson Cheyne† and others completely contra-

*Archiv. f. Experiment. Pathologie und Pharmacol. bd. 20 p. 102. (Brit. Med. Jour., March 1, 1888.

dict this statement, which is really the foundation of Mr. Tait's argument. As we have seen, the evidence that germs cause fermentation is undeniable, and it is equally true that germs can be excluded from wounds by antiseptic precautions, or can with less certainty be destroyed after they have gained access. This statement rests, on the one hand, upon microscopical evidence (microbes being demonstrably absent from the discharges of properly sterilized wounds and as constantly present in suppurating or sloughing wounds); and, on the other hand, upon a mass of clinical testimony familiar to every member of the profession. A portion of this testimony, in spite of its triteness, it is necessary to recapitulate in order to complete the argument: The germ theory of fermentation is undisputed; fermentation in wounds can therefore be prevented by the exclusion of germs; it has been shown microscopically that these can be kept out (asepsis) or can be destroyed (antiseptis): practically, therefore, it only remains to show the effect upon patients, with operative or other wounds, of excluding or destroying germs to show the value or lack of value of antiseptis and the antiseptic theory. By looking back a few years to the very beginning of the employment of antiseptics, we can obtain the most striking and convincing evidence of the effect of treatment directed almost exclusively, though then very imperfectly, against the introduction of bacteria.

The record of the work of Prof. Lister may well begin our series of examples. In Glasgow, in 1864, 1865, and 1866, Mr. Lister's mortality in a series of operations of all sorts was 45.7%, largely from septic diseases. About this time he began to employ, gradually, some antiseptic methods in his treatment of wounds and during operations. In 1867, 1868, and 1869, his mortality fell to 15%. At Edinburgh, having greatly improved the details of his system, we find that from 1871 to 1887 he treated 553 grave surgical cases, with a mortality from septic disease of only .36%, a diminution in the death rate which, when we remember that these different results were obtained by the same man operating upon the same class of patients, and for the same injuries or diseases, is so striking as to be in itself conclusive. Still later, an opportunity was afforded to compare Mr. Lister's results with those

of a colleague, Mr. Spence, working in the same hospital, but declining to employ antiseptic methods. The total results of their major operations showed that Mr. Spence lost just about three patients where Mr. Lister lost one, while the deaths from infective diseases were 2.4% among Spence's cases, and one-third of 1%, or eight times less, among those of Mr. Lister. When we turn to the work of other surgeons, we find evidence, if possible, still more conclusive, of the value of these methods. Nussbaum has shown that during forty years in his clinic, under his own direction as well as that of his predecessors, among whom was Stromeyer, the deaths from wound diseases were so common that patients with even the slightest injuries often succumbed to them; that erysipelas and abscesses were matters of daily occurrence; that 80% of all wounds and sores were attacked with hospital gangrene, and that nearly all patients with compound fractures died; and he states that immediately upon the introduction of the antiseptic system, all these diseases vanished, and healing by first intention, previously almost unheard of in his service, became the rule instead of the exception. Prof. Volkmann, in an address before the International Medical Congress, which met in London in 1881, testified strongly and clearly to the results obtained in his own practice, selecting two subjects especially, compound fractures and major amputations, as evidence of the value in his hands of the antiseptic method. He said that the mortality after compound fracture had, during the long labors of the surgeons who preceded him, as well as during his own, reached the sad height of 40%. Immediately before he adopted the antiseptic method of treating wounds, his last twelve patients with compound fracture had all died of pyæmia or septicæmia. From that time up to the period at which he delivered this address, he had treated 135 compound fractures without losing a single patient from either of these wound diseases; 133 were cured; two died, one of fatty embolism of the lungs during the first few hours, and one, a drunkard, of delirium tremens. As to the amputations, he asserted that he now cured each year, with the antiseptic method, more cases of amputation of the thigh, for example, than during all the rest of his labors before the introduction of the method. In an article on the treatment

of compound fractures, Prof. Dennis, of New York, has compiled further evidence in this same direction. In the Pennsylvania Hospital, between the years 1839 and 1851, there were treated 116 cases of compound fracture of the leg and thigh; excluding those cases requiring amputation, there were 51 deaths, a mortality of 45%. In the New York Hospital, during the same period, there were treated 126 cases of compound fracture of the leg and thigh: excluding amputations, there were 61 deaths, a mortality of 48%. From 1860 to 1876 there were reported from the surgical clinics of Vienna and Zurich, by Billroth, 180 cases of compound fractures; excluding amputations, there was a mortality of 41% from septic disease. In the Obuchow Hospital Reports of St. Petersburg, 106 cases of compound fracture gave a mortality of 68%. In Guy's Hospital, from 1841 to 1861, there were reported 208 cases of compound fracture, with 50 deaths, a mortality of 26%. After the introduction of antiseptics, this death rate immediately fell to 4% from an average of 40 to 50%; and in this article of Dr. Dennis, in which he reports 516 cases of compound fractures, there was no record of death from septic trouble in any fracture of the extremities, which was the class of injuries included in the above statements. I might easily multiply such evidence as this a thousand-fold, but it seems unnecessary to repeat what has long been so familiar. And yet it is upon this evidence, which I have endeavored to condense, that the antiseptic theory rests. The facts and figures could easily be replaced by newer statistical matter, but I have selected these for the very reason that they show better than more recent experiences the wonderful changes wrought solely by the employment of antiseptics under circumstances otherwise unaltered—drainage having been previously used, the amount of "pabulum" in the wounds remaining the same, the operators and surroundings being just as in the days of gangrene and pyæmia. Mr. Tait endeavors to break the chain of reasoning by saying, (1) That the germs are everywhere and cannot be got rid of—a misstatement: and (2) that the presence or absence of sepsis depends on the presence or absence of "pabulum," *i.e.*, dead organic matter, blood clot, serum, etc. It has been one of the axioms of antiseptic surgery from the beginning

that scrupulous attention should be paid to hæmostasis and to drainage. No one has taught this more earnestly than Lister and his followers, and Tait's adoption of it as *his* "view" is evidence of his ignorance of the work of others. To be sure he says that Kæberle first taught him drainage in 1875, and gives due and deserved credit to Chassaignac for his work in this direction, but English and American surgeons have employed drainage fully and carefully since the early part of this century, and Syme (afterwards Lister's father-in-law), in 1826, made the importance of providing a free escape for the discharges from wounds the subject of one of his most important papers. It is easy to say that if you have nothing to decompose there will be no decomposition, for that is what it amounts to. "Get out all decomposable matter," he says, "and you can let the germs in freely," but in practical surgery this is by no means always possible. It is really to be regretted that Mr. Tait has not had an opportunity to see some general surgery, and particularly to follow Lister's practice at King's College Hospital. I am curious to know how he would interpret a case which I saw there in 1888, and described as follows in a letter to *The Medical News*. It was a case of operation upon a fractured patella, with elongation of the quadriceps by Cameron's method, in which there had been muscular spasm, followed by extensive oozing from the cut surfaces: "A large clot formed, producing considerable tension, necessitating the removal of the stitches, and causing at two points a slight separation of the edges of the wound. I watched this for ten days, and instead of the flush, the suppuration, the elevation of temperature and the alarming symptoms which would usually follow such hemorrhage into and about a great joint, the patient and the limb both remained perfectly passive, with absolutely no sign of either local or constitutional irritation, while the clot itself gradually contracted and the knee resumed its normal outline. During all this time there was literally not one drop of pus, and not a trace of offensive odor. A severer test of Prof. Lister's antiseptic methods could hardly be devised or imagined."

There was no lack of "pabulum" here, but it gave rise to no evil effects, while, on the other hand, I am sure that there is not a practical surgeon in the world to-day, no matter how

"humble" or "unscientific," who doesn't know what the result would have been if the germs had been "let in freely." The numerous successful cases of Schede's method of utilizing blood-clot in the filling of bone cavities are similar arguments and of a most convincing kind.

Ignorance of general surgery and highly specialized experience offer the only explanation of such astounding statements.

Mr. Tait deals habitually with a membrane, the peritoneum, which has a remarkable power of self-protection. Microbes gaining access to the abdominal cavity are exposed to destruction either by the serum which it copiously exudes, or by a possible phagocytic action of its enormous numbers of endothelial cells, or by both. I have thought, too, that possibly the extraordinary cases of cure of peritoneal tuberculosis after simple laparotomy and flushing of the abdominal cavity were due to the stimulation of the membrane (through removal of pressure or through contact with the irrigating fluid) to greater exudation and of its cells to greater anti-bacteric activity. It is merely a supposition, but seems as reasonable as any of the explanations I have heard offered. At any rate these properties are well known, and if one could anywhere in the body depend on the restriction of the amount of "pabulum" rather than on the exclusion of the germs it would be here.

Mr. Tait, after contemptuously disregarding *all* surgical theories, including that of antiseptics, ventures upon one of his own. He thinks the phenomena of sepsis due to the "dose" of dead tissue or "pabulum," and of the poison resulting from its decomposition, and with a momentary forgetfulness of his "humility" he actually advances this as an original "working hypothesis." It would sound very much to the general surgeon as if Mr. Tait had never heard of sapræmia, which is described by a "Listerian" as follows: "Sapræmia or putrid intoxication represents that form of septicæmia in which a preformed toxic agent is injected into the circulation and in which the maximum symptoms are reached as soon as the poison has become mixed with the blood. This form of sepsis may be caused by any microbe, otherwise harmless, or with only slight pathogenic properties, as the bacillus of putrefaction, which causes putrefaction in any dead tissue, as, for instance, a blood

clot or contused tissue; and the symptoms arise as the ptomaines are absorbed, and are appropriate to the amount absorbed, and subside with the cessation of absorption and their elimination through some of the excretory organs."

Mr. Tait's remarks against dosage are further evidences of his ignorance of Listerian work and teachings. He says: "With the Listerians, one germ is as good as a thousand." I suppose it is safe to class Mr. Watson Cheyne, whom I have just quoted, as a "Listerian." Indeed, he has for years been Lister's assistant and authorized mouth-piece. In Mr. Cheyne's lectures on "Suppuration and Septic Diseases,"* he not only asserted but proved experimentally that the number of bacteria introduced modified greatly the intensity of the symptoms and even the character of the disease. He experimented with cultivations of Hauser's *proteus vulgaris*, finding that one-tenth of a cubic centimetre caused immediate death; one-fortieth of a cubic centimetre caused death in six or eight weeks; smaller doses produced no effect. Similar observations have been made by Passet,† Pawlowsky,‡ and others, and are as well known as any in connection with antiseptic surgery.

It is evident that what is original in Mr. Tait's "hypothesis" is not true, and that what *is* true is not original.

2. THE PREVAILING ANTISEPTIC METHODS.—It seems apparent at any rate that, to put it mildly, Mr. Tait is not a safe or reliable authority on the general subject of surgical antiseptics, but towards the end of this paper he ventures on a specific fling at Lister's last surgical dressing. After asserting that "Listerism" is "as dead as Julius Cæsar," he adds: "The mischief probably is not at an end, for we hear that the last phase of this astonishing craze is that wounds are to be dressed with still a new contrivance, one as deadly and dangerous as any that can well be imagined—a double cyanide." I am especially interested in replying to this statement for the reason that, owing to the kindness of Sir Joseph Lister (who during the summer of 1889 gave me confidentially the various formulæ which he was using, and supplied me with the materials from his own manufacturers of gauze

* *Brit. Med. Jour.*, March, 1882.

† *Monatshfte f. Prakt. Dermatol.*, B. 6, No. 10, 1887.

‡ *Centralblatt f. Chirurgie*, No. 48, 1887.

and chemicals), I was the first surgeon in this country to employ the dressing in question, and because I now have a series of cases in which it has been used, large enough to justify publication. The history of the steps which led up to the employment of this material must be briefly mentioned, both to explain its selection and in reply to the charge of "perpetual shifting."

The aim of the surgeon after every operative wound is, of course, to secure union by first intention. Any persistent irritation is a source of trouble in wounds, and the different antiseptics which have been employed have not been free from the charge of contributing to the occurrence of excessive inflammation by their own irritant action. The typical antiseptic must, therefore, be as nearly as possible devoid of irritating properties. It must be germicidal—that is, it must possess the power of destroying the micro-organisms. It must have an inhibitory power—that is, it must prevent the development of such organisms. It must be stable—that is, it must not disappear from the dressings after they are made, or after they are applied to the wound, either by solution in the discharges or by volatilization.

In the old Listerian method, carbolic acid was the antiseptic employed; but this had the disadvantage of volatility as well as a great slowness of action as a germicide. Corrosive sublimate which succeeded it, was stable and acted rapidly, but was exceedingly irritating, and, in addition, was precipitated by the albumen contained in the serum of the blood. This precipitate, it was discovered by Sir Joseph Lister, possessed powerful antiseptic properties, with much less power of producing irritation; and he therefore devised a form of antiseptic dressing called "the sero-sublimate gauze," which consisted of gauze charged with a solution of corrosive sublimate in the serum of the blood. This, however, was difficult to manufacture, and produced a harsh and non-absorbent material which was mechanically objectionable. It was succeeded, in his hands, by a combination of chloride of ammonium and bichloride of mercury, known as sal-alembroth, which, while much less irritating, was so exceedingly soluble in the blood serum that whenever the discharges from the wounds were copious, it was washed out of the dressing, leaving them without antiseptic property. For these

reasons, Lister, in time, discarded this material, and employed for a considerable period a gauze containing 3 or 4%, by weight, of the biniodide of mercury. This was less soluble, non-volatile, powerfully antiseptic, but, again, extremely irritating, so that the least contact with the skin produced an intense erythema, even going on to vesication.

Lister was then led to look further for the ideal antiseptic, and finally to employ the double or mixed cyanide of mercury and zinc, which he is now using. Its most evident advantages are, first, that it is non-volatile; next, that it is almost entirely unirritating; thirdly, that it is insoluble in water and only soluble in 3000 parts of blood serum; and, finally, that, while it possesses but little germicidal value, its inhibiting power is so high that a 1-200 solution is sufficient to keep animal fluids permanently free from putrefaction. This combination of qualities is possessed by no other of the antiseptics which have been mentioned, and its deficiency in germicidal power is easily remedied by including in the manufacture of the gauze dressings which are impregnated with this material a small percentage (1 in 4000) of sublimate, enough to be germicidal, but too weak to be markedly irritating. As I have said, I was told the details of this method *confidentially* in the summer of 1889. The communication was confidential because, while Lister was experimenting with other dressings, notably the sal-alembroth, the announcement had been made by others that he was using them and they were extensively employed at a time when he was quite unprepared for publication upon the subject. Until November, 1889, therefore, I employed the double cyanide only in my private work, but since that date, when Lister published his own conclusions on the subject, have also used it after nearly all my operations at the University Hospital. I present herewith in tabulated form the results of the most important of these operations, exclusive of dozens of minor cases which, while as a matter of fact they often test severely the efficacy of any surgical dressing, might be expected to get well under almost any form of treatment.

I have grouped the cases roughly and have avoided unnecessary detail for the sake of economy of space, the main object in publishing them now being to establish the efficiency of the double cyanide dressing and its freedom from dangerous qualities.

TABLE OF SURGICAL CASES TREATED SINCE BEGINNING THE USE OF THE DOUBLE CYANIDE GAUZE.

(SEPTEMBER, 1889, TO DECEMBER, 1890.)

No. of Cases.	OPERATIONS.	MEMORANDA.	RESULTS.
13	Removal of cervical glands for tuberculous adenitis.	Wounds varied in length from two to six inches; in five cases, the dissection was most extensive, being carried along the cesophageal line; in four, caseation and suppuration already existed.	Except in the suppurating cases, union by first intention along the whole length of the wound. Drainage tube usually employed, but withdrawn during first two or three days. Fever rarely too after second day. No deaths.
2	Trephining of cranium.		
3	For compound fracture.	Wounds already infected by vulnereating body, and by dirty fingers; careful sterilization by 1:500 sublimate.	Union of scalp wounds by first intention, no pus, no fever, no deaths.
4	For epilepsy.	In every case operation performed on account of history of traumatism.	In three cases union by first intention; one death from suppression of urine and uræmia in an old alcoholic.
3	Abdominal section.		
8	For removal of uterine appendages.	In every case 1:1000 bichloride solution was used for hands and sponges, and when required, for irrigation. Tube used in three cases.	Union by first intention, except in two of the tube cases, in which stitch abscess occurred; no deaths.
4	For intestinal obstruction.	In two cases there was general purulent peritonitis and great distention. The obstruction in all four cases was from bands.	In two, union by first intention, and recovery; in the others, death within first 24 hours.
4	For peri-typhlitic abscess.	In two, removal of vermiform appendix; in two, evacuation of abscess and use of drainage tube.	One death in 24 hours, probably from ignorance of nurse, who neglected the drainage tube. In others, rapid recovery, without fever or other alarming symptoms.
1	For removal of tumor of abdominal wall, and cure of ventral hernia.	Operation very tedious and prolonged, involving much handling of tissues. Wound brought together by sutures <i>en étage</i> . Patient old and infirm.	Extensive "aseptic suppuration," <i>z.c.</i> , without fever, pain, or other symptoms, thought to be due to traumatism to the thick layer of subcutaneous fat. Recovery with good, firm cicatrix.
4	Hypogastric section and cystotomy.		
1	For exploration.	No satisfactory explanation found for violent and persistent vesical symptoms, which had lasted for 20 years.	Rapid healing, no suppuration.
4	For removal of calculus.	Three stones weighing over two ounces. One small oxalate calculus.	All recovered without suppuration.
1	For prostatictomy.	Very extensive operation, removal of large portions of the prostate.	Death on eighth day from uræmia and suppression of urine. Kidneys almost completely disorganized.
1	For exploration and drainage.	An enormous prostate with absolute retention. Patient old and feeble.	Lived a year in comparative comfort.
5	Excision of varicose long saphenous vein.	Veins extremely long and tortuous. Patient disabled. Incisions 18 and 19½ inches in length.	Rapid union. No suppuration.
6	Excision of breast, with removal of axillary glands.	In all, complete removal of breast, opening of axilla, and removal of axillary glands.	Not a single suppurative case. Average time of healing and discharge from hospital, 11 days. Average number of full antiseptic dressings, three.
7	Arthrectomy of knee.	In all of them, most extensive removal of synovial membrane, ligaments, cartilages, and osseous foci of disease. All tubercula.	In all, rapid primary union of skin wound. In two, persistent suppuration in track of drainage tube, but final healing. In one at this date (eight months after operation) reopening of sinus. In others, apparent cure.
8	Removal of foreign body from knee-joint.	A portion of needle found partly within, partly without synovial cavity.	Primary union under first dressing.
9	Removal of superior maxilla.	All three, cases of malignant tumors.	Primary union of skin incision; all recovered from the operation.
10	Removal of both superior maxilla, with a portion of the malar bone.	For osteoma of both maxilla.	Primary union of skin. Entire recovery from the operation.
11	Removal of a portion of the inferior maxilla.	For osteo-sarcoma.	Primary union of skin. Prompt recovery.
12	Excision of elbow.		
1	For tuberculous arthritis	Patient had already undergone several operations upon other joints.	Union by first intention under two dressings, except in track of drainage tube. Entire union in three weeks. All movements of elbow preserved.

TABLE --Continued.

No. of Cases (Group)	OPERATIONS.	MEMORANDA.	RESULTS.
1	For bony ankylosis.	The ankylosis was the result of an old fracture; the arm was extended and useless.	Primary union throughout whole wound under two dressings; functional result, excellent.
13	Amputations.		
8	Finger.	Six, from lacerated wounds in crushing accident; two, from result of felon.	All healed by first intention under one dressing.
1	Forearm.	From tubercular arthritis of wrist and carpus.	Primary union under two dressings.
1	Arm.	In old ununited fracture at the upper third.	Primary union.
2	Foot.	One malignant tumor of foot, one for crush of foot, both choparts.	One, healed by first intention. Second, recent.
3	Leg.	All for railroad injury.	Primary union in all.
2	Thigh.	One for malignant growth of lower end of femur; one for tubercular osteitis of knee.	In one, antiseptic suppurative in track of drainage tube, which was left in situ for an unnecessarily long time. Final healing. In other, primary union under two dressings.
14	Radical cure of hernia.	All of these cases were strangulated, all were seen and operated on early. In the inguinal cases Barker's method was used; in the femoral, a modification of that method.	All recovered from the operation. In two, there were fever and suppuration along the track of the catgut drainage. In one there is already a return of the hernia. In the others the cure seems permanent.
3	Inguinal.		
2	Femoral.		
15	Parotid tumor.	Both cases were examples of tumors over the parotid, originating in the lymphatic rather than true tumors of the parotid itself.	Primary union in one. In the other, a little aseptic cozing for a week.
16	Osteotomy and refracture of bones of the forearm.	For angular deformity following badly treated fracture. Open wound.	Primary union under two dressings. Cure.
17	Myotomy of adductor, sartorius and tensor vagina femoris.	For contractures of long standing.	Primary union.
18	Removal of tumors.		
11	From scalp.	In eight cases the operation was for the removal of sebaceous growths. In three, included here for convenience, a painful scar was excised for supposed traumatic epilepsy.	In every case there was primary union, except (in three), along the track of the drainage tubes. In no case was there fever or suppuration.
7	From neck (exclusive of tubercular glands).	Hydrocele of the neck; two malignant growth of neck.	
4	From back.	Three fatty tumors; one large cyst.	
1	From thigh.	One large fatty tumor.	
2	From tongue.	One cyst; one malignant growth.	
2	From tonsils.	For hypertrophy.	There were no deaths.
10	Ligation of brachial at two points	For ruptured traumatic aneurism; old operation.	Some sloughing from pressure previous to operation. Slow healing afterward, with aseptic suppuration. Case ran a febrile course to entire recovery.
20	Sequestrectomy.	In these cases the cyanide gauze was used freely as packing, and was found to work excellently well. As the bone cavities slowly granulated, the discharges remained sweet, and were serious rather than purulent.	Recovery in each case.
2	Of femur.		
2	Of tibia.		
1	Of cranium.		
21	Ununited fracture.	Both of these cases were operated on by wiring. In the former the implantation of sterilized bone was tried, but was not successful.	One failure; one recovery. No suppuration or fever in either case.
1	Of humerus.		
1	Of tibia.		
27	Abscess.	In all of these, antiseptic irrigation with bichloride was used, and recently with peroxide of hydrogen, always followed by packing with either cyanide or iodoform gauze.	All recovered. Profuse suppuration ceased almost immediately, and the cavities rapidly closed during a moderate serous cozing.

TABLE—Continued.

No. of Cases Group.	OPERATIONS.	MEMORANDA.	RESULTS.
6	Acute.		
5	Chronic.		
2	Of bone.		
23	Perineal section.	In all, the retained catheter was used, and the wound was treated in accordance with the antiseptic methods described in this paper. Cyanide gauze packing was employed when necessary.	Recovery in every case but one, in which nephropylitis probably occurred. Exploratory nephrotomy was recommended, but refused, and the patient, a child, passed from under observation.
3	Rupture of urethra.		
2	False passage.		
	1 Traumatic stricture.		
24	Plastic operation.	Union by first intention in all except two, in which tension caused separation of line of flaps. In those, union by granulation took place.	Recovery.
1	To make upper lip.		
2	To make lower lip.		
1	To remove epithelium of cheek and lower lid.		
25	Anal and rectal operations.	In these cases, either the cyanide or the iodoform gauze was used in packing.	Recovery in every case. A febrile course. No suppuration.
8	For fissure.		
6	For hæmorrhoids.		
10	For fistula.		
	1 For rectal fibroids.		
26	Compound fractures, in which drainage and antiseptic dressings were used.	In these cases sterilized iodoform was used in addition to the gauze.	Recovery in every case. No fever. No suppuration, except in the last case when the injury was crushing, and the damage to tissues excessive.
3	Skull (included under trephining).		
1	Humerus.		
1	Humerus, and both bones and forearm.		
6	Tibia.		
4	Both bones of leg.		
3	Farsus and metatarsus.		

It will be observed that there are but five deaths in this list, two of them due to pre-existent and chronic disease; the other three were abdominal cases, operated on with the patients almost *in extremis*, with swollen bellies, intestinal paresis, and in one case with suppurative peritonitis. The surgeon who has not lost such as these in spite of his best efforts and most careful application of antiseptic and operative methods has, indeed, been fortunate.

I can truthfully say that in the whole list there have not been six freely suppurating cases, and that there have been no cases of septic trouble, and no deaths from any form of blood-poisoning.

The majority of these cases have been observed

from beginning to end by sections of the University class, and have been under the daily care of my residents at the University Hospital. Of most of them I have elaborate clinical reports, made by members of the third year classes, and handed in to my assistants at the completion of the case.

Upon others I have operated in private for well-known physicians. I am sure that all who have seen these cases, whether students or practitioners, will corroborate my statements both as to the harmlessness and the efficacy of the method in question.

I am glad to be able to give this positive testimony in favor of the latest Listerian method, which, while it may not be permanent (as there

are yet many opportunities for improvement before the *ideal* dressing is reached), is obviously undeserving the epithets of "deadly and dangerous," applied to it by Mr. Tait, without, I will venture to say, his having taken the trouble to watch its effect in a single instance, to calculate the quantity of cyanide in a single dressing, to consider the improbability of absorption, or indeed to give the matter any serious consideration whatever. For an example of the unscientific spirit which Mr. Tait justly claims for himself, and for absence of the humility which he unjustly pretends to associate with it, as well as for absolute recklessness of statement, commend me to the paragraph I have quoted about the cyanide dressing.

I must not be understood in my eulogies of antiseptis as meaning to depreciate efforts made to attain the surgeon's ideal condition of operative wounds, *i.e.*, perfect asepsis. There is no opposition between them. On the contrary, asepsis is the outcome of antiseptis, but I must confess to grave doubts of the efficacy of many of the means advocated to this end, and some of the testimony in relation to it. These doubts are founded on a comparison between published results and observed cases in the hands of some eminent European surgeons—the almost uniform effect upon my mind of such opportunities of comparison having been a distinct loss of confidence in the statistical reports. I saw, for example, a series of cases of excision of the breast, with pigmented irritable scars, with supuration, with dressings that were perceptibly stinking, shown to a distinguished surgical audience, the operator and lecturer being a vigorous advocate of asepsis as opposed to antiseptis, and having in his clinic elaborate apparatus for the sterilization of dressings by steam heat under pressure, admittedly the best of all the non-chemical sterilization methods yet discovered. These cases were in such marked contrast to what I had read of the results obtained at this clinic that the experience was a great shock to my faith in current surgical literature, a shock from which it has scarcely yet recovered.

It cannot be disputed in the light of modern science the operator has a two-fold duty, *viz.*, to prevent the entrance of living pathogenic microbes into the wound, and at the same time to preserve the vitality of the tissues themselves.

We have already spoken of the phagocytic theory of Metchnikoff*, and in addition we have learned through Waterhouse's experiments†, and through the clinical experience already spoken of, of the anti-bacteric power of the peritoneum. Bouchard and others have observed the destruction of bacilli by the spleen and their elimination by the kidneys, as in typhoid fever. Buchner and Subarsch‡ have shown the bactericidal power of blood-serum or of some substance such as the fibrin ferment contained therein. We have abundant reason, therefore, to believe in a general antagonism between the body cells and the micro-organisms of disease, even if, with our friend, Dr. William Osler§, we are compelled to consider the question of phagocytosis as still an open one. It follows that the theoretical propriety of non-interference with these tissues cannot be doubted, and Lister plainly admitted and accepted this new view when he said that the floating particles of the air having been shown to be less harmful than was supposed, we may possibly dispense with antiseptic washing and irrigation, "provided always that we can trust ourselves and our assistants to avoid the introduction into the wound of septic defilement from other than atmospheric sources."

When this method is adopted it is evident that all strong antiseptic solutions which might compromise the vitality of the tissues must be discarded; instruments, silk, ligatures, sponges, etc., must be sterilized by heat, hands must be washed clean in sterilized water (after previous chemical disinfection), and the same is true of the skin over the field of operation. If antiseptic solutions are used at all they must be very feeble—1:60 carbolic for instruments (after previous sterilization by heat), 1:10000 sublimate for sponges, etc.

In the meantime, however, while waiting for further improvement in this direction I have felt and still feel that it is safer in a large general clinic, with several assistants and with numbers of students actively participating in the operative work, to depend upon full antiseptis rather than upon asepsis, and I have in the cases above cited and in large numbers of others, not of enough

*Fortschritte der Medizin, Bd. 2, 1883, No. 17.

†Virchow's Arch., Bd. 129, heft 3, p. 312.

‡Versammlung Deutsch Naturforsch. und Aerzte; Heidelberg, 1889.

§Medical News, April 13 and 20, 1889.

importance to include in the table, employed the following methods, substantially based on those of Lister himself, as described to me in a private letter last January. They represent, therefore, the latest views made public before the Berlin address.

I need not detain you with a description of the preparation of the gauze itself. This can be found in detail in *The Lancet* for November 9, 1889, and January 4. of this year.

Immediately over the wound is placed a portion of the cyanide gauze, washed in a solution of carbolic acid to get rid of the bichloride of mercury, in the dressing in contact with the wound. For this purpose one part of carbolic acid to twenty of water is safer than any weaker solution. A very pure acid should be used, because, if impure, it is not completely dissolved, and the undissolved particles are needlessly irritating to the surgeon's hands. When a dressing is changed this piece of gauze is applied over the wound before the surrounding parts are cleaned with the carbolic solution. The carbolic acid soon flies off from the washed gauze, leaving nothing in it in contact with the wound but the unirritating cyanide.

By proceeding in this way it is not necessary to use "protective." The amount of unwashed gauze to be applied will depend upon the amount of discharge anticipated.

In the early stage of a wound, where we expect much sero-sanguineous oozing, it is desirable to use a considerable mass, say an inch in thickness, and extending on all sides beyond the wound. Further, it is well, where free discharge may occur, to place over the dressing a piece of thin mackintosh with the caoutchouc side (antiseptically washed) next the dressing. This is for the purpose of preventing the discharge from coming directly through the dressing. It should not, of course, overlap the gauze, nor need it even extend to its edge. When the part operated on is placed on a splint, as after resection of the knee, the padding of the splint is lined with such a piece of mackintosh.

It is unnecessary to purify bandages or elastic bands that are placed outside of dressings, but if a bandage is used in the interior of a dressing, as in bandaging a stump next the skin, it is purified sufficiently by soaking it thoroughly with a solution of corrosive sublimate 1:2000.

For purifying the skin 1:20 carbolic acid in 1:500 sublimate solution is used. The towels placed around the seat of operation are wrung out of 1:2000 sublimate lotion, and this is also used for the sponges during the operations. The carbolic solution is used for purifying the instruments before an operation. At the end of an operation, before beginning to stitch, the wound may be washed with 1:500 sublimate lotion, and irrigated with 1:4000 during the stitching.

But where a joint, such as the knee, is opened, the use of the strong sublimate solution, which is seriously irritating to the synovial membrane, should be avoided; and in that case it is better to irrigate through the whole operation with 1:4000. As to rendering wounds aseptic which have been infected, that is, speaking generally, a thing on which we can never reckon with absolute certainty; in recent wounds, like compound fractures, the chance of success is, of course, always greater the shorter the time that has elapsed after the infliction of the injury.

If the skin and wound are greasy, oil of turpentine is of great value for cleaning away the dirt, and the use of a nailbrush with carbolic and sublimate solutions, after the turpentine (or without it if there be no special occasion for its use), is very valuable. In many cases where septic sinuses are present, it is hopeless to try to extirpate the septic mischief; but very great advantage is gained by washing the cut surfaces in an operation under such circumstances with a solution of chloride of zinc, forty grains to the ounce of water. This is done once for all at the conclusion of the operation, and prevents putrefaction during the critical early day. The same solution is used where the wound communicates with a septic cavity, as after the removal of a portion of a tongue, or of a jaw; and under these circumstances it is also useful to apply iodoform to the cut surface after the chloride. In cases in which the septicly infected part is of very limited extent, as, for example, where a suppurating strumous gland has discharged without an antiseptic dressing, complete disinfection may often be obtained by applying undiluted liquid carbolic acid, after scraping away the degenerated glandular or other tissue with a sharp spoon.

I have recently learned to value peroxide of hydrogen very highly as an antiseptic, especially

in suppurating cases and am using it more largely than ever before.

This address has already assumed an inordinate length on account of the necessity for free quotation, but I cannot conclude it without a protest against the tone of Mr. Tait's paper and against the personal virulence of its references to Lister. There is, unquestionably, room for legitimate differences of opinion as to the treatment of operative wounds; there are many problems relating to the principles involved which are yet unsolved; the precise comparative value of the different factors, which taken together, have given modern surgery its scientific exactness, is yet to be determined; argument and discussion are not only excusable but highly desirable and, conducted in a proper spirit, could scarcely fail to be productive of great benefit to surgery and humanity. But this is not to be brought about by invective or by personal detraction. Mr. Tait discloses his real animus when he complains that for twelve years he has been "ignored" by Lister, and his controversial writings show that he probably belongs to that class of persons who feel far more deeply injured by neglect than by assault.

It is doubtless true that he and his work carried on in a special line and under special conditions, have not in the consideration of the whole subject been elevated into the prominence which he thinks they deserve; but how many of us in this world are taken at our own valuation, either personally or professionally?

Lister's work, since he took his first degree in 1852, has been of a character to command the respect and admiration of the scientific world. Receiving the first prizes in botany and anatomy when he passed the M.B. examination, he won the gold medal and scholarship in surgery in the final examination. His papers on the minute anatomy of the skin, the physiology of the lacteal current, the contractility of the iris, the microscopic anatomy of involuntary muscular fibre, the relations of the inhibitory system to the visceral nerves, the regulation of arterial contraction by the nervous system, the early stages of inflammation, the coagulation of the blood, etc., etc., stamped him at once as an original investigator of the first rank, and as one of his biographers says, "would have sufficed to make his career memorable if he had never

applied antiseptic measures to the treatment of disease." I have heard Prof. Louis Agassiz years ago, and later Prof. Joseph Leidy, say that, viewed from the standpoint of abstract science, his work had been of the very highest order, and the appreciation of his labors by the best minds in our own profession has been enthusiastic and almost universal. Nearly every great surgeon in the civilized world has put on record his admiration for Lister's teachings, his acceptance of the general principles involved, and his sense of almost personal obligation to the author of the antiseptic theory.

That Mr. Tait should speak of such a man as having "lived in the clouds of his spray for the last twelve years," as "wanting in logic," having "crude notions of logical definition," making "illogical blunders," "falling away from his own faith," promulgating an "absolute and ludicrous logical error," etc., and should make a boast of having "laughed at" and "ridiculed" him and his doctrines and disciples, is, it seems to me, evidence of his unfitness by temperament or training (or from lack of the latter) for the serious discussion of broad surgical principles. I am quite sure that the vast majority of general surgeons will be found to have no sympathy with either his views or his manner of expressing them, and it is a relief to find that in his own special line there are operators of equal eminence who repudiate both. In an address on "Abdominal Surgery, Past and Present," recently delivered before the Medical Society of London, its president, Mr. J. Knowsley Thornton said: "I am not ashamed still to use the spray and all the precautions which have advanced my results in ovariectomy to 1.88% mortality,* and I find increased practice and a steady adherence to methods which have yielded me good results in the past, increase in like ratio my success in all abdominal operations. Every operator of prominence improved his results enormously as soon as he adopted Listerism; then having learnt how to be surgically clean, he has found for himself ways of attaining this end with more or less success by methods differing from those of Lister. The sum and substance of it all is, that if we had never had Lister to teach us true cleanliness, we should never have used antiseptics, flushings, or drainage tubes to attain it. The

*As against Banck's 4 and Tait's 3.3%

great advance is due to the antiseptic system, the minor details are merely the different ways of attaining the same end—asepticity. Time alone will show what is worth retaining and what we may safely cast aside.”

Selections.

PEROXIDE OF HYDROGEN.—This is a drug which has been gradually and steadily gaining in favor, which has not been bolstered upon the profession by means of the false statements of dealers, or the still more misleading reports of unscientific enthusiasts, but which has yielded to each, who has faithfully tried it, results so constant and so satisfactory that he has learned to depend upon it.

As ordinarily found in the shops, peroxide of hydrogen is a 3.2 per cent. solution, yielding fifteen times its bulk of oxygen. This solution is far more potent than is water charged with fifteen times its volume of oxygen, since in the peroxide preparations the gas is given off in its nascent state, and is peculiarly powerful in its chemical affinities.

There is abundant evidence as to the value of peroxide both from the clinical and the experimental standpoint. The number of those who have reported excellent results from its use is very large, and to this must be added the testimony of the bacteriologists, who find in this drug a potent and almost immediate germicide. It is devoid of septic properties, its worst effect being, when used in a too concentrated form, to cause some local pain and irritation. It is applicable to all cases where there is pus, and when the discharge is foul and profuse is unequalled in the effect it produces. In suppurating otitis media, in purulent conjunctivitis, the aurists and ophthalmologists have long prized it as one of their most valuable medicaments. In the sloughing inflammations following scarlet fevers and diphtheria the laryngologists place great confidence in its powers. The surgeon, however, in whose work it would prove generally valuable, has been most chary in recognizing its virtues. There are reasons for this. The preparation is unstable; in past time it has frequently been impure, and unscrupulous or ignorant pharmacists may palm off on the profession preparations which have lost their power and

become absolutely inert. At the present time peroxide of hydrogen can be obtained pure and of full strength (3.2 per cent. solution).

Its use in a great variety of sloughing and suppurating cases has given results better than those obtained from any other germicide, bichloride of mercury not excepted. Where the discharging area is represented by a surface of granulations, the drug can be applied by means of an atomizer; this enables a small quantity to reach every portion of the infected surface. In the case of a suppurating fistula or cavity, the peroxide may be injected by means of a syringe. Immediately following its application to a purulent surface an active effervescence goes on, and every particle of pus which it reaches is destroyed. Not only this, but the microbes, the active agents of pus formation, are also devitalized, so that a large surface can sometimes be rendered aseptic by one or two thorough applications. Even if this result is not reached, the discharge is greatly lessened, and it is by no means uncommon to see a case, the pus from which could be counted by drachms, so favorably affected that the dressings contain but a few drops of purulent matter.

The strength in which the fifteen volume solution is used will vary with individual cases. It can be employed without harm in full strength. Where this is painful, one, two, or four parts of water may be added.—*University Med. Magazine.*

THE CURABILITY OF GALLOPING CONSUMPTION.—The announcement by so well-known a physician as Dr. McCall Anderson that acute phthisis, or galloping consumption, is curable, excites a good deal of surprise and quite as much incredulity, yet Dr. Anderson reports in the *British Medical Journal* seven cases of this character, of which five recovered. Acute phthisis is considered by Dr. Anderson to have two forms, acute tuberculosis and acute pneumonic phthisis. Some of his cured cases were of the tubercular character. The treatment advised is given in detail, and contains no especially new feature. “The principal indications,” he says, “are: 1, to keep up the strength; 2, to keep down the fever; and 3, to treat any special symptom or complication which may arise. 1. Two thoroughly-trained and reliable nurses are indispensable, one for day and the other for night duty; for without admirable

nursing no hope of improvement can be entertained; and the hygienic and other surroundings of the patient should be satisfactory, so that we need not be surprised that, when the disease occurs in the homes of the working classes it is almost necessarily fatal, and that hospital patients have the best chance of recovery. The patient must be fed constantly on fluid food (soup being avoided if diarrhoea is present) both day and night, and stimulants (from 3j. to ʒx.) are required early in the attack, but should be given in small quantities, frequently repeated and along with the food. In fact the dietetic treatment should correspond with that of a case of fever presenting symptoms of a similar degree of severity. 2. At bedtime a subcutaneous injection of sulphate of atropine (gr. $\frac{1}{100}$ to gr. $\frac{1}{60}$) is given. This checks perspiration when present, acts as a sedative to the system, indirectly helps to reduce the fever, and diminishes the secretion from the lungs. 3. Remedies are given with the view of lowering the temperature. This is a point of the utmost consequence, because the majority of the patients die consumed by the fever. Some benefit is derived by allowing the sufferer to suck ice freely, by giving the food and drinks iced, by sponging the body with iced vinegar and water, or even by using iced enemata. But our main reliance is upon one or more of the following methods: (a) Niemeyer's antipyretic pill or powder every four hours, containing gr. j. quinine, gr. $\frac{1}{2}$ to gr. j. digitalis, and gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$ opium. The proportion of opium may even have to be increased beyond this if there is much diarrhoea. The effect of the digitalis must be carefully watched, and it must be omitted for a time if the pulse becomes preternaturally slow and irregular and the secretion of urine very scanty. (b) The administration daily—particularly before the temperature tends to be highest—of from ten to thirty grains of quinine, given as suggested by Liebermeister, either in a single dose or, at all events, within an hour. (c) The application of iced cloths to the abdomen for half an hour every two hours so long as the temperature exceeds 100°. The application of iced cloths is made in this way: The night-dress is pulled up over the chest so as to avoid any possibility of its being wet, and, for a similar reason, a folded blanket is placed across the bed under the patient's body. The

usual bedclothes are arranged so that they reach up to the lower part of the chest only, which latter is covered by a separate blanket in order to prevent unnecessary exposure while the cloths are being changed. Two pieces of flannel are employed, each being sufficiently large when folded into four layers to cover the whole of the front and sides of the abdomen. One of these, wrung out of iced water and covered with a piece of dry flannel, to protect the bedclothes, is applied, while the other is lying in a tub of iced water at the side of the bed. The pieces of flannel are changed every minute, or so often that they still feel cold when they are removed. The changing of the flannel, particularly when two persons are in attendance, one to remove the bedclothes and the flannel, the other to apply the piece which is freshly iced, can be accomplished in a few seconds."—*Med. Record.*

HERNIA OF THE FALLOPIAN TUBE.—At the Leipsic Obstetrical Society, Dr. von Tischendorf read notes of an interesting case of femoral salpingocele. The patient was an elderly woman, with symptoms of strangulated femoral hernia. The sac appeared, before operation, to contain omentum. When opened, no omentum was found, but the left Fallopian tube much enlarged on account of œdema. It bore, close to the ostium, a prominence of the size of a cherry, caused by dilatation of its walls. This prominence fitted into a corresponding depression in the hernial sac. Both tubes and sac were removed; recovery was uninterrupted. Dr. von Tischendorf could only find four cases of the kind reported in medical literature, and of these, two occurred many years since.—*British Medical Journal.*

Prof. Da Costa thinks that the exclusive use of a "milk diet" in typhoid fever is overdone. The stools should be carefully watched to see that the milk does not disagree. His plan is to use three pints of milk and one pint of broth in the twenty-four hours, given alternately, with a mid-day meal of arrow-root, or other thickened food. It should be given every two hours during the day, and every three hours at night. In very light cases it may be given every four hours at night; but under no circumstances should nourishment be used less frequently.—*Coll. and Clin. Record.*

THE
Canadian Practitioner

A SEMI-MONTHLY REVIEW OF THE PROGRESS
 OF THE MEDICAL SCIENCES.

Contributions of various descriptions are invited. We shall be glad to receive from our friends everywhere current medical news of general interest.

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TORONTO, JANUARY 1, 1891.

THE CANADIAN PRACTITIONER.

We are glad to be in a position to state that the present prospects for our journal are exceedingly bright. We are deeply indebted to our numerous contributors for their valuable assistance during the past year. It is only fair to say that we depend largely on the staff of the medical faculty of the University of Toronto for material purely scientific and medical in its nature. Beyond this we do not pretend to know any particular schools or cliques, but prefer rather to represent the views of all parties who are desirous of raising the standard of medical education in this country.

It will be our pleasure, as well as our privilege, to publish in our various issues of the early months of the present year the addresses which were recently delivered at the University post-graduate course. We have reason to know that this will be highly appreciated by our readers who were not able to listen to these lectures. We cannot of course do justice to those addresses which were largely demonstrative in their character. Those who were not able to be present have suffered a loss, which, to us, seems very considerable, and for which we cannot provide an adequate remedy. However, we will do our best to give our readers as full a report as possible of what has proved to be probably the best course of medical lectures ever delivered in Canada.

We will continue to devote a large portion of our space to reports of cases in hospitals and private practice, as well as reports of various medical societies in Canada and United States. Our selections will be chosen with care by men specially qualified in the various departments of

general and special surgery and medicine. It is no easy task to keep fully abreast of the times in all directions, but we have a number of assistants whose ability and energy warrant us in saying that we are not likely to overlook anything in the medical world which is likely to prove useful and interesting to our readers.

We are pleased to know that our subscribers approve of the change by which the journal has become a bi-monthly publication. It has involved an increase of expense and work both to publishers and editorial staff, but such results have caused no regrets. We are well satisfied with our present position. We are receiving much encouragement from our patrons, for which we feel very grateful. We think we have good reason to say that our 16th volume for the year 1891 will be the best which the publishers of THE PRACTITIONER have yet offered to their subscribers. To all our friends, we have much pleasure in tendering our best wishes for a happy and prosperous New Year.

THE MEDICAL POST-GRADUATE
 COURSE IN THE UNIVERSITY
 OF TORONTO.

Since the re-establishment of the Medical Faculty of the University of Toronto, the interests of both physicians and students have always been considered by the authorities. Two years ago Dr. Osler kindly complied with the earnest desire of the Faculty, and gave a course of lectures on cerebral localization, which was largely attended by students and practitioners of Toronto and other places. Last year the formal opening of the new building of the Biological Department was accompanied by a course of lectures and demonstrations by Professor Ramsay Wright and a number of distinguished scientists from the United States, which was well attended and highly appreciated.

Influenced by the good results arising from these lectures, the Faculty decided this year to institute courses, more comprehensive in their character, to be given annually. After a definite decision was reached the time for preparation was rather short, and grave doubts were expressed by some as to the prospects of success. However, this Faculty does not do things in a half-hearted way. Subjects for discussion were chosen promptly; an equitable division of

labor was made; all worked with a will; an excellent programme was prepared; and at the conclusion of the proceedings it was a satisfaction to all concerned to know that nothing happened to prevent any of the numerous lecturers from appearing on the days specially assigned to them.

The Faculty was particularly happy in its choice of distinguished visitors. Professor Vaughan, the distinguished bacteriologist from Ann Arbor, was already well-known to many in this Province, and it was a matter of no surprise that he met such a large and enthusiastic audience on the second morning, when he gave his admirable lecture and demonstration on the etiology of typhoid fever. Dr. A. R. Robinson, of New York, happens to be a Canadian and a graduate of the University. Many of his contemporaries, who had been fellow-students in times past, were pleased to have the opportunity of meeting him and listening to his excellent lectures. Dr. Robert Abbe, of New York, and Dr. J. William White, of Philadelphia, delivered able addresses, which were highly appreciated by those who were present. It is only fair to add that the lectures and demonstrations given by various members of the teaching staff of the Faculty were especially interesting and instructive.

We are pleased to know that the post-graduate course is a fixture, and will be given annually. It certainly involves a vast amount of labor, and a considerable expense; but we know of no way in which scientific work is likely to do more good to the profession of our country, and we think that money spent in such a manner can scarcely be considered as wasted. As to the success of the course last month there can scarcely be two opinions; but we prefer to leave that aspect of the matter to those who were in attendance.

KOCH'S TREATMENT OF TUBERCULOSIS.

The experiments which are being carried on with Koch's lymph in the treatment of tuberculosis in various parts of the world are creating much interest. Many objections have been raised to Koch because he has kept his remedy a secret as far as its composition is concerned. Those who know him best defend him from any such charges. He is well known as one of the most conscientious and earnest workers in

scientific medicine that has ever lived. In keeping the composition of his lymph a secret for the present, he is acting on the advice of friends, some of whom are armed with governmental authority. There can be little doubt that the secret will be given to the world as soon as it is sufficiently elaborated to make it safe to do so. In the meantime, the lymph will be given to hospitals in all parts of the world as soon as it can be prepared. Already a fair amount has been distributed, and more will follow as soon as possible. A small amount was sent to two Canadian hospitals, the General of Montreal, and the General of Toronto. Unfortunately the first material sent to Toronto was destroyed in its passage. A small amount has been obtained by Dr. Bingham, of Trinity Medical School, and injections will be made on Monday, Jan. 5th.

Thus far we have learned that the remedy produces decidedly beneficial results in laryngeal tuberculosis, lupus, tuberculous joint diseases, and probably early pulmonary tuberculosis. It must in any case be used with caution, and in advanced phthisis it has generally done more harm than good. In some cases it has probably produced fatal results, especially when there are gross changes in lung tissues, or extensive ulcerations in the intestines. It is hoped that we will receive much definite information in the near future from Professor Ramsay Wright, who is now working in Koch's laboratories.

[NOTE.—Since writing the above, we have received interesting letters from Prof. Ramsay Wright and Dr. Jas. Thorburn, which will be found in this issue.]

POST-GRADUATE COURSE IN LONDON, ENGLAND.

The post-graduate course in London did not receive as much support last year as its friends thought it deserved. From a letter in the *Medical News* we learn that this year it is in a flourishing state, and that the members in attendance are large. It has not yet become popular with those residing outside of Great Britain, as is shown by the fact that the total number of such in attendance is only four, of which three are from Canada, and one from the United States.

Meeting of Medical Societies.

TORONTO MEDICAL SOCIETY.

Nov. 20, 1890.

The President, Dr. Spencer, in the chair.

Dr. George Acheson narrated the following cases:

1.—FRACTURE OF THE EXTERNAL CONDYLE OF THE HUMERUS.

A girl, *æt.* 6, fell down stairs and sustained a fracture of the external condyle of the humerus. The injury is very unusual. The treatment was to put the arm on a splint in the flexed position; good union was present in two weeks.

11.—DIFFUSE CELLULITIS OF THE ARM AFTER TYPHOID FEVER.

Boy, *æt.* 14, had been ill four or five weeks, when Dr. Acheson was called in. There was a swelling of the left arm from the shoulder to the finger tips. Temperature, 104.3; pulse, 140. It was thought that the boy had a relapse and that the condition of the arm was due to a thrombosis of the brachial vein. Next day the arm looked erysipelatous, red and brawny with a hemorrhagic spot at the inner side of the elbow; the cuticle was raised there, and there was a bleb containing serum. The following day, concluding that the condition was a cellulitis, several free incisions were made in the arm. Wet antiseptic dressings were applied. The temperature went down, and after a few days large sloughs came away about the elbow; the median nerve in one inch of its extent sloughed just below the elbow; the whole of the skin down the forearm was undermined. The question of difficulty was as to the cause of the condition, was septic poisoning introduced from without, or was there first a thrombosis giving rise to an abscess which had become diffuse. After the sloughs separated the arm did well. The future of the case is uncertain. During the convalescence Dr. Acheson allowed the patient to have bread and butter on one occasion—he had previously been on a milk diet. The temperature went up to 105, and there was a marked rigor; the symptoms simulated pyæmia; the arm, however, looked well. There was some pain and tenderness below the right costal margin,

and it was thought that the liver dullness was increased; an unfavorable prognosis was given. Next day, however, his condition improved, and during the days following the temperature remained about 101 in the evening, but he has had no more rigors, and the symptoms of pyæmia have disappeared.

Dr. McPhedran, who had seen the case, thought it undoubtedly erysipelatous in character. The second attack of pyæmia was peculiar, but a patient may recover from pyæmia. Phlebitis is very common after typhoid fever.

Drs. Atherton and Spencer took part in the discussion also, and Dr. Acheson replied.

Dr. R. A. Reeve showed a specimen of

NECROTIC SEPTA OF THE MASTOID PROCESS.

A young man a year ago had suppurative inflammation of the middle ear; one month after it was incised over a pointing place over the posterior inferior portion of the mastoid. When examined by Dr. Reeve one month ago, there was a free purulent discharge from the middle ear, and there was a cicatrix over the mastoid. Dr. Reeve surmised that the discharge came from the mastoid; there were no granulations seen in the middle ear, the drum was in part destroyed; the mastoid process was prominent, there was no swelling or tenderness over it; the discharge from the ear was offensive; temperature normal. An incision was made, and the mastoid cells chiselled open, and necrotic septa were scraped out, a large mass of succulent vascular mucous membrane was removed, the parts were thoroughly cleaned out, the antrum was scraped, the outer wall of the mastoid process was fully $\frac{3}{8}$ inch thick, this accounted for the absence of tenderness. There has been no discharge since the operation, only a slight secretion from the mucous membrane of the middle ear, so that the case promises to do well.

This furnishes one of the indications for opening the mastoid cells, *i.e.*, where there is prolonged offensive discharge from the middle ear, and indications pointing to the mastoid cells as the source. The advantage in the use of the chisel in such a case is great, the muco-periosteum was exposed and not injured, and free access to the cavity was obtained. It was cleaned out with peroxide of hydrogen. The patient is a painter, and suffered from naso-

pharyngeal catarrh before the symptoms of middle ear and mastoid disease began. The pointing over the mastoid in the first instance began over the position of the emissary vein.

Dr. B. E. McKenzie exhibited a patient with

DOUBLE HIP-DISEASE.

Boy, *æt.* 8, with history of trouble since three years for age. He has not walked since trouble began. In January, 1888, there was no active disease in either hip: a good prognosis was given, tendons of the flexors and adductors were cut to relieve deformity, and plaster of Paris applied; after three weeks the plaster was removed, and a double Thomas splint substituted. Now the patient is allowed to have the splint off in the day time, and is permitted to attempt walking. At night the splint is re-applied.

Dr. Doolittle narrated the history of a case of

HYSTERIA IN THE MALE,

and Dr. McPhedran then read a paper on

SIMPLE ULCER IN THE DUODENUM,

which appeared in THE CANADIAN PRACTITIONER for December 16th, 1890, page 564. In the discussion which followed, Dr. Spencer referred to a case diagnosed as a duodenal ulcer in a man *æt.* 26. Invalided from the Hudson Bay Company fifteen months ago, he had been living on poor food for a long time, and had symptoms of dyspepsia. He had profuse bleeding from the bowel, and complained of pain between the zyhoid cartilage and the navel, also suffered from vomiting. The pain came on almost immediately after meals. Under treatment he improved. After a hearty meal one night all his symptoms returned. Dr. Spencer asked Dr. McPhedran for his views concerning treatment.

Dr. Garrett stated that he had made a *post mortem* examination in a case of sudden death, and discovered a perforating ulcer of the duodenum; the patient had exhibited no symptoms of gastric trouble before death.

Dr. McPhedran, in reply, referred to the difficulty in being sure of one's diagnosis in these cases, the number of latent cases reported is numerous. The treatment is similar to ulceration of the stomach, but more difficult; the digestion is good and the patient anxious for

food, and it is difficult to restrain them. The active treatment is necessarily limited. Pepper prefers the administration of nitrate of silver in small doses long continued, but it probably does no good. The anæmic condition should be treated; it has been found that in animals cicatrization does not go on if there be anæmia. Constipation must be overcome by enemata.

Hospital Reports.

HIP-JOINT DISEASE—OPERATION—DEATH.

Under the care of I. H. Cameron, M.B., in the Toronto Hospital for Sick Children.

C. I., *æt.* 6, admitted into the Hospital for Sick Children March 4th, 1890, with the following history: For three months previous to admission she had been complaining of pain in the knee; this was of sufficient severity at times to make her cry out. It was noticed that she was lame when she walked; she never complained of any pain in the hip. She had never suffered from any serious illness and her general health had always been excellent. The parents are living and healthy; the mother's sister died of chest disease. The patient is one of a family of five children, of whom two are dead, one died of "brain fever" at twelve months, the other died of a "head disease," very similar in character, at three months. There had been no miscarriages.

On admission the child looked healthy; she was well nourished; her temperature was 99.4; she had pain in the knee; on firm pressure over the knee, however, she did not complain of being hurt, whilst on pressure over the left hip she at once said it hurt her; there was no swelling nor fluctuation about the hip joint; the pelvis was slightly tilted downwards on the left side; the left leg was abducted and there was apparent lengthening on that side; there was no flexion and no lordosis. The child was placed in bed with the affected limb secured at rest between sandbags, and extension applied. During the latter part of April a swelling was noticed over the hip joint, anteriorly and to the outer side; fluctuation was detected on deep palpation; she complained of pain when moved. The treatment by rest and extension was continued. During the summer she went to the Lakeside Home, and

her general health while there was excellent while the tenderness about the hip diminished; she returned to the hospital in the city in September. A careful examination was made on October 30 and measurements noted. The fluctuating swelling over the outer part of the hip had increased slightly, and had become more superficial; there was no tenderness on palpating this; there was no flexion and no lordosis; the pelvis was tilted; the affected limb abducted, and there was apparent lengthening; the limb was neither everted nor inverted; measurements proved the limbs to be of equal length, with the exception of increased circumference ($\frac{3}{4}$ inch) of the left thigh over the region of the swelling; there was no disparity between the measurements of the length of the limbs. The amount of extension since admission has been four pounds, applied by means of a stocking drawn over the knee and secured by a roller bandage. Measurements were again made on November 27th, when it was found that the swelling had increased somewhat in size, the circumference of the left thigh at the point of swelling being $1\frac{1}{2}$ inches greater than that of the right thigh at the same level; the general health continued good.

An operation was performed on Nov. 27. Chloroform was administered and an incision made on the outer side of the thigh anteriorly, carried down to the neck of the femur, between the sartorius and the tensor fasciæ femoris muscles, after Parker's method; a cavity containing pus was opened up by the incision; a second opening was made into this cavity at its lowermost point on the outer aspect of the thigh, and the walls were then thoroughly scraped with the finger nail and the cavity flushed out with 1,000 perchloride of mercury. After the cavity was thoroughly cleansed, the joint was investigated. A roughened portion of bone was felt above the head of the femur, this was discovered after some searching; the joint at first seemed healthy; the neck was divided by means of a key-hole saw, and the freed portion of bone removed; considerable difficulty was experienced in accomplishing this, from the fact that the saw cut had been made beyond the attachment of the ligaments and had included the tip of the great trochanter. The articular cartilage on the head of the bone was eroded;

the cancellous tissue of the head and neck was soft and friable, and was broken up in the efforts to remove the bone; there was found a complete perforation at the bottom of the acetabulum, which would barely admit the tip of the little finger. The roughened bone was scraped with a Volkmann's spoon, some softened pulpified material was scraped from the internal surface of the capsule; the parts were thoroughly irrigated with 1-1000 perchloride of mercury, and the cavity stuffed with iodoform gauze, a drainage tube having been secured in position at the upper opening; a strip of iodoform gauze was brought out at the lower opening, the surface was dusted with iodoform and an antiseptic dressing of perchloride gauze and salicylic wool applied, a long splint from the axilla to the foot was secured in position.

During the operation, after the first incision was made, the limb was grasped below the knee in order that the femur might be rotated; something abnormal in the appearance of the knee was observed before manipulation was begun. On examination it was found that there was separation of the lower epiphysis of the femur; there was very evident movement at this point and soft crepitus; the deformity was slight and was readily reduced. The operation lasted two hours and a half. The patient was sent back to bed. After the operation the patient suffered severely from shock; the pulse at the wrist was barely perceptible; hot bottles were applied about her; brandy and beef tea were administered by the rectum, and later on brandy by the mouth; reaction set in but the pulse remained extremely weak. The following morning she continued very weak; she was, however, conscious and recognized those about her. The temperature had risen to 104° . It was thought that she was sinking. She died at 11 a.m., nineteen hours after the operation; the temperature immediately before death rose to 105.8 .

Remarks.—The case is put on record because of the following facts in connection therewith. The disease was apparently one of early hip joint trouble with the formation of an abscess. The amount of disease revealed at the operation was simply astounding; the extensive amount of disease in the head and neck of the femur and the acetabular perforation were quite unlooked for, and indeed there was nothing

to lead one to suspect the extent of the disease even after laying bare the articulation; only a small area of roughened bone was detected, and this after some searching, during which the question as to whether excision were indicated or not was doubtful. A point of interest in the case further was the separation of the lower epiphysis of the femur without any violence having been exercised on the limb; cases of a similar nature have recently been recorded. The fatal issue was quite unlooked for: the child was in apparently good health before the operation, and the method of procedure adopted was similar to that done every day in hip excisions. The child suffered very greatly from shock, and afterwards from excessive reaction, and this proved more than her vital powers were able to stand.

Correspondence.

PROFESSOR A. H. WRIGHT, *Secretary Medical Faculty, University of Toronto.*

MY DEAR PROFESSOR,—Since arriving at Berlin, I have been active in making myself *au courant* with the present position of the Koch treatment of tubercle. The telegraphic wires have been so busy that much that I am writing must be already well known to you, and yet I trust the summary which I now send of the case, both from its clinical and scientific aspect, will be of interest. Naturally, as my mission is to endeavor to find out the method of preparation of the lymph, I have been more concerned about the scientific aspect; but the papers are full of clinical reports from all over the continent, which demonstrate that much the same results are being obtained elsewhere as here.

I was somewhat discouraged on arriving to find that it is considered necessary to keep secret in the meantime the mode of preparation of the lymph; but the Minister of Education's speech, in which this was announced, also contained a sentence stating that eventually it may be possible to invite representatives from different nations to Berlin, in order that they may familiarize themselves with the nature of the remedy.

The observations as to the supposed nature of the lymph, which you will find below, indicate

that it is a product of the artificial culture of the bacillus, and I therefore concluded that the first step towards success in my mission would be making myself thoroughly acquainted with the newest methods in vogue in the Hygienic Institute here. Of course the Institute is crowded, but owing to the departure of Dr. Behring, whose experiments on diphtheria are described below, I shall be able to get a working place immediately.

How long the disclosure of the secret may be postponed, I am unable to say, but it is certain that it will only be entrusted to those who are known to the authorities here to be familiar with the latest developments of experimental bacteriology.

Before summarising the results of the treatment so far, a few words about the method of injecting the lymph may not be out of place. Generally the Koch syringe is used, consisting of a graduated glass tube holding 1 or 2 cc.; one end of this, over which the perforated needle slips, is drawn out, while the other fits into a nickel cap separated by a tap from a little rubber bag. Pressure on the latter forces out the lymph through the hypodermic needle. Some operators, like Prof. Ewald, however, use an ordinary hypodermic syringe, with an asbestos washer, which allows of disinfection. It is less liable to fall apart than the Koch syringe.

The original lymph is diluted as follows: 1 cc. is added to 9 cc. of 0.5 per cent. carbolic; this first dilution keeps admirably. Again, 1 cc. of this is added to 9 cc. of the same carbolic solution, and the syringe is graduated to deliver $\frac{1}{10}$ of a cc., which, in the second dilution, therefore, contain one mg. of the original lymph. The second dilution is kept in glass tubes, closed with a plug of cotton wool, and also keeps well without sterilization. The only other precautions taken against sepsis are that the skin of the back is washed with 3 per cent. carbolic before the insertion of the needle, and the needle itself carefully wiped off. Operators are warned not to insert the needle near the middle line, and to alternate to right and left sides with each injection. Prof. Rosenbach, of Breslau, found the skin of the abdomen more convenient, some slight local pain having prevented some of his patients from sleeping on the back; but attention to the foregoing precautions seems to show

that the back is, after all, the most suitable place.

As to the results of the injection and the character of the reaction, little requires to be added to what Koch has already published. Individual peculiarities are being noted. It has, e.g., been observed that during the menstrual period a dose of 3 mg. produced a stronger reaction than one of 7 mg. before the period. The temperature must be taken every two hours on account of the rapid fluctuations, and the injection should be given in the morning, so as to insure that the more violent part of the reaction shall be over before night.

The loss of appetite, fatigue, dragging pains, rise of temperature, seem to be always characteristic of the reaction. In some (surgical) cases a rise of blood pressure has been observed, whereas in some less favorable cases the pulse became very weak, rendering necessary a stimulating injection. Various observers describe a scarlet fever-like or measles-like eruption as not uncommon.

Prof. Frantzel describes almost magical results as succeeding the disappearance of the reaction in cases of pulmonary tuberculosis. The fever and night-sweats disappear, the cough becomes easier, the appetite improves, the patients gain weight, and the bacilli are altered in character and then disappear from the sputum.

Koch, in his paper, dwells on the circumstance that it is the tuberculous tissue, and not the bacilli, which the lymph attacks. Frantzel, however, shows that the bacilli suffer a reduction in size, and become broken up into two or four beads. This change, which, however, is not generally accepted, would appear to indicate the beginning of processes destructive to the bacilli; but that it does not affect all is indicated by the circumstance that the tuberculous material after injection is still virulent. Nor is the disappearance of the bacilli from the sputum an indication that they have been entirely removed from the lung. Continued observation must show whether this is only a question of persevering with the remedy sufficiently long.

As you have already learned in Koch's original article, which was reprinted in the *Philadelphia Medical News*, much smaller doses are tolerated in general than in local tuberculosis, and even with the latter it is desirable to make

sure that the glands are not involved before beginning with the larger dose.

Most observers recommend beginning with the 1 mg. doses, except in the case of lupus and local joint diseases. If the reaction is established, the same dose ought to be repeated on the second day after the injection, after which it has been generally observed to be safe to increase the dose on alternate days by 1 mg. On the other hand, Grabower found that in a case of laryngeal tuberculosis uncomplicated by glandular disease, the larynx was rapidly cleared of the tuberculous ulcers under doses of 10 mg. rising to 30. But Frantzel and Krause recommend very careful dosing in laryngeal cases, so as to guard against undue swelling. So far, however, the result in laryngeal cases appears to have been in the direction of the diminution of the swelling, reduction of the amount of secretion, exfoliation of necrosed patches, and substitution of these for healthy granulating surfaces. Oppenheim even records a case of complete cure. The dangerous swelling and œdema which might have been anticipated from the local action in lupus, etc., has only been observed by Krause in one out of a large number of cases, so that the curative lymph may be regarded as having given unexpected favorable results in laryngeal tuberculosis.

Sufficient time has not elapsed to allow an opinion to be pronounced as to the effect of the injection in joint cases: but one good result, a greater freedom of movement after disappearance of the local reaction, would already appear to have been attained in several cases.

The only cases which I have observed of the application of the treatment to meningeal tuberculosis show that it is contra-indicated. That would also appear to be the case where there is advanced diffuse tuberculosis of the intestine, and care, Billroth says, ought to be exercised in such cases where there is any suspicion of such. The general reaction may be so profound as, in the Innsbruck case, to be attended with fatal results. One of the most interesting questions is the nature of the histological changes brought about by the injection of the lymph. Dr. Kromeyer, who investigated an excised portion of lupus-tissue subsequent to treatment, shows that the inflammatory process surrounding the tubercles gradually brings about infiltration, and

eventual suppuration. He supposes this to be due to new chemical products formed in the tubercle as the result of the injection, which irritate the surrounding tissue in such a way that future doses of the lymph reach the tuberculous tissue with greater difficulty, and therefore cause less disturbance. Further researches of this character will be looked forward to with interest.

Some interest attaches to reports coming from the sanatoria for tuberculosis, such as Gorborsdorf, where the most careful treatment of a hygienic and dietetic character, with plenty of fresh air, is afforded the patients. The reaction in these would appear to be attended by neither so high a temperature, nor by so many unpleasant symptoms as in the case of hospital patients; but improvement of the lungs and larynx has been observed in more favorable cases, and improved subjective symptoms in more advanced cases. The reports of the next two weeks will be looked forward to with interest, when by the gradual increase of the dose it shall have approximated to that which excites reaction in a normal individual.

The importance as a diagnostic, on which Koch laid so great stress, is being also dwelt upon by various physicians. It is thought it will be of especial service in those very early cases where there is chlorosis with subfebrile temperature, but where there is no sputum to confirm the suspicion. The reaction frequently discloses the presence of bacilli, and allows of the prompt adoption of the proper dietetic treatment. Arming thinks it will sharpen the whole conception of scrofula, permit the separation of syphilis of the lung from tubercle, and, as there is absolutely no reaction in leprosy, allow of the distinction of cases of phthisis leprosa. The vexed question as to the varieties of lupus is being revived with the aid of the new diagnostic, but it is by no means settled. While some dermatologists, like Lewin, claim the identity of *L. erythematodes* with *L. vulgaris*, others, like Neisser, have failed to observe a reaction in the former, and Jassar thinks that while there is a reaction in both, it is different in character. The statement that a case of rhino-scleroma reacted requires confirmation, and it is generally denied that there is any effect on sarcomata and carcinomata. Of course the inevitable rebound

has occurred from the over-sanguine expectations of the public (over-sanguine in spite of the very guarded way in which Koch announced his discovery). Croakers who now realize that the lymph is incapable of creating new lung tissue have begun to undervalue the remarkable discovery. I have on my table the first pessimistic pamphlet which has appeared on the subject, a warning to physicians and patients by a German physician. He thinks that the lymph may turn out to be chiefly of use where the knife can remove necrosed products; that in pulmonary consumption it must be used with the greatest care even as a diagnostic means, in case of throwing too much lung tissue out of function; that the remarkable power which the lymph has of disclosing latent tuberculosis is not an unmixed benefit; but he closes with the excellent advice that it should be reserved entirely for the clinics in the meantime, where the results can be scientifically and continuously observed, and that no more should be issued to private physicians. It has probably been recorded in the Toronto papers that the Austrian Government has already made regulations with this end in view, and that private physicians who use the lymph must report each injection and its results to the authorities.

I trust you may soon be in possession of the necessary material in Toronto for observing its undoubted remedial effects in suitable cases.

I subjoin some notes on the more scientific side of the subject, and on the allied question of the securing of immunity from and treatment of other infectious diseases. The whole subject of the biology of pathogenic bacteria is being attacked with feverish activity just now, and most important results are to be expected.

As to the nature of the fluid, which as yet has been disclosed to no one except Drs. Libbertz and Pfuhl, who are engaged in manufacturing it, there are, as it may be supposed, many conjectures. Buchner, of Munich, in discussing the subject, recalls the similar differential action exercised on lupus tissue by the Cosmi paste, and supposes that in case of both remedies the normal tissue cells are possessed of a sufficient power of resistance to withstand being thrown into an inflammatory condition, while the morbid cells are not, and therefore

enter on those changes which lead to their subsequent necrosis and replacement by new tissue. The sum of such local reaction is necessarily greater when the tuberculous tissue is widely distributed, and therefore the comparatively insignificant reaction when the affection is merely local. The circumstance that Koch's lymph is not rendered inactive by sterilization shows it is not a toxalbumin; these toxic bacterial albumins lose their activity at about 60° c. Nor does it belong to the ptomaines or toxins, which are rather of the nature of nerve poisons; but it is more probably the protein of the tubercle bacillus itself, which in infected tissues gives rise to those processes of irritation which lead to the epithelioid and giant cells and the tubercles, and which, introduced in greater quantity, originates the more profound changes which lead to the necrosis of the affected parts.

Buchner has published some interesting researches lately on the nature of the bacterial products which lead to inflammation and pus formation. He believes that it is not the metabolic products of the bacteria which are so active in this respect as the protein of which they are composed. He has shown that by isolating the protein of *bacillus pyocyaneus* and introducing it in capillary tubes under the skin of rabbits, that this protein has a remarkable attractive "chemotoxic" action on leucocytes, which flock towards and into the open end of the tube, and he explains the inflammatory process due to invasion of bacteria in this way. Gluten-casein also, a body allied to the proteins of bacteria, which is certainly harmless when introduced into the alimentary canal, has the same attraction for leucocytes when introduced below the skin.

Heinz sends from the Pharmacological Institute in Breslau a suggestion as to a drug capable of increasing phagocytosis, and possibly therefore of helping in the elimination of the tuberculous tissue necrosed under the Koch treatment. He found that cinnabar introduced into the body cavity of Guinea-pigs was transported very much more rapidly to the spleen in animals which had been treated with potassium iodide than in those which had not been so treated, and that this is due to the increased activity and number of leucocytes.

Like Buchner, Neacki and Sahli also call attention to the fact that the disturbance following the injection of the Koch lymph recalls that following the introduction of an enzyme or pepsin-like body into the blood, and state that Hammerschlag had already succeeded in procuring from large masses of tubercle bacilli a toxic protein. They suggest that possibly in addition to the process of phagocytosis, the animal organism may possess another weapon against bacterial vegetation, viz., the formation of a local stream of active enzymes towards the invaded part.

That the blood-serum of immune animals possesses some such ingredient which is deleterious to the pathogenic bacteria to which they are immune, and also to the toxic products of these, seems to be thoroughly established by the recent work of Behring and Kitasato on immunity from tetanus and diphtheria.

Extremely interesting results have been arrived at by these gentlemen and by Prof. Frankel, of Königsberg. The latter believes that among the metabolic products of the *bacillus diphtherie* there are two albumins, one of which the toxalbumin, which is responsible for the pathogenic action of the bacillus, is destroyed at temperatures between 55° and 60° c., while another, which still exists unaltered in cultures heated to 65-70° c., confers immunity on animals into which it is introduced, both against virulent cultures of the bacillus, and against subcutaneous introduction of the pure toxalbumin. He demonstrates this by comparing the action of virulent cultures with those which have been filtered or heated up to 55° c. (and which, therefore, contain a mixture of two albumins), and with those which have been heated to 65-70° (in which, therefore, the toxalbumin has been rendered inactive). Frankel finds that cultures of the latter sort have no therapeutic value, *i. e.*, that when introduced into the body *after* a virulent culture, they do not interfere with the short course of the experimental diphtheria; in fact, the introduction of the immunity-conferring albumin would appear rather to reduce the power of resistance of the organism. Of course where the disease runs a longer course, it is quite possible that this method of combating the ravage of the bacillus would have a greater chance of success. Behring shows, in

addition to Frankel's results, that there are other ways of conferring immunity against diphtheria. The addition, *e. g.*, of iodine trichloride in $\frac{1}{3}$ per cent. solution to cultures of four weeks old, for sixteen hours, attenuates them and makes them capable of conferring immunity against virulent cultures. Again, the fluid found in the cavity of a Guinea-pig which has died from experimental diphtheria, is to a certain degree toxic; but animals which recover from the injection of it prove to be immune.

Not only is iodine trichloride capable of attenuating the bacilli during cultivation outside the body, but it has a therapeutic value, for if 2 cc. of a 1 per cent. or 2 per cent. solution be injected in a Guinea-pig or rabbit, from one to six hours after infection with a virulent culture, the animals become sick, but do not die, and if the wound heals they prove to be immune.

Experiments with a view to ascertain whether iodine trichloride might be used therapeutically on children have given *negative results*. Dr. Behring is still searching for a medium which will counteract the morbid process in man.

If the iodine trichloride be introduced *before* infection, it produces no effect; but if hydrogen peroxide [in a slightly acid (sulphuric acid) 10 per cent. solution] be so introduced (the proper proportion to the body weight varies with different animals), the animals prove to be immune. This is a remarkable instance of immunity due to the introduction of a simple chemical substance: it does not stand alone, for Kitasato asserts that previous treatment with iodine trichloride renders rabbits immune to tetanus.

Although, so far, these experiments have only a scientific value, they show that animals which are naturally or artificially immune are so, not only against virulent cultures, but against the toxalbumins formed by these. That this property resides in the blood-serum of the immune animals, Behring concludes from the following experiments: Blood taken from rats (which are naturally immune to diphtheria), into which a considerable amount of the toxalbumin had been injected, produces no toxic effects in Guinea-pigs, while blood from non-immune animals, under similar circumstances, produces serious illness. Again, mice which have been treated with the blood of rabbits rendered immune to tetanus, are not only themselves immune to cultures in-

duced before the treatment, but even mice which are already tetanised, and which would certainly die in a few hours, can be *cured* by the intra-abdominal injection of such blood.

The possibility of curing in this manner an acute infectious disease during its course is, therefore, placed beyond a doubt.

These experiments, which are being conducted on diphtheria, tetanus, and typhoid, have already advanced so far as to show that we are on the eve of great discoveries with regard to the treatment of other bacterial diseases besides tuberculosis.

It is quite possible that in another letter I may have to report to you further progress in this respect. I hope to familiarize myself in the Hygienic Institute here with the very difficult technique necessary for successful experimentation in immunity, as you have no doubt learned from my letter to the Vice-Chancellor. From all I can learn, this is a necessary preliminary stage to the chief object of my mission here.

I am, yours sincerely,

R. RAMSAY WRIGHT.

BERLIN, Dec. 15th, 1890.

DR. J. FERGUSON, *President Tor. Med. Soc.*:

DEAR SIR,—I am thoroughly at work in Berlin. On my arrival I was fortunate to meet Dr. Lennox Brown, who kindly introduced me to the following prominent investigators, *viz.*: Professors Krause, Frankel, Gerhards, Hærtie, Webber, Cornet, and others—as a personal friend and former assistant.

I have lost no time in getting into harness; I spend from four to six hours daily in the wards of the Charité Hospital, and examine all Dr. Webber's (Dr. Koch's assistant) cases, and do microscopic work. Besides this, Dr. Webber selects one or two cases which he goes over thoroughly with me, giving the history, etc., and the changes which take place under treatment. I also attend Dr. Krause's throat clinic for a couple of hours a day.

The town is simply crazy over "Koch's method"; every thing is tuberculosis. The results so far have been satisfactory, but it is premature to speak dogmatically until time has confirmed the present favorable impression.

There is no doubt, however, that "Koch's method" is an important factor in the treatment

of some cases, and a valuable means of diagnosis in others.

The injections in most of the clinics are made at 10 a.m. At first all were made in the back, but now many are made in the side, because if, by an accident, an abscess forms at the injected point, the patient may lie on the back without any discomfort. Koch's syringe is not universally used. Some prefer those made of asbestos. The reaction generally comes on in about eight hours, accompanied by a rise of temperature to about 101-103, general malaise, headaches, sometimes chills and vomiting. In pulmonary tuberculosis the cough and sputum are apt to be increased for a time, and more bacilli may be found.

The lymph causes inflammation and necrotic changes, and in some portions of the body, such as the knee-joint, the necrosed tissues may be absorbed. There are grave dangers connected with its use. There is especial danger in laryngeal cases, and in such it is well to be prepared for tracheotomy or intubation, on account of the swelling, which may cause stenosis. Most of the investigators agree that the lymph is useful for the purposes of diagnosis, especially in latent cases, whether old and quiescent, or incipient. The dose given at first is one milligram, which is gradually increased to a centigram, and finally to a decigram, which is called the "healing dose." The injections are made, as a rule, at intervals of two or three days. In all cases the symptoms arising from the previous injection must have subsided before a fresh one is made.

At an early date I hope to be able to give the society fuller information relating to this most important discovery of Koch. I have the honor to be, your obedient servant,

JAMES B. THORBURN.

Berlin, Dec. 12th, 1890.

Births, Marriages, and Deaths.

BIRTHS.

GORDON.—At 646 Spadina Ave., on Sunday morning, Dec. 21st, the wife of Dr. Gilbert Gordon, of a daughter.

ARTHUR.—At Algona Mills, on Dec. 18th, 1890, the wife of Dr. R. H. Arthur, of a son.

MARRIAGES.

JEFFS-BROWN.—On Christmas Day, W. H. Jeffs, M.D., Havelock, Ont., to Minnie, daughter of the late Thomas Brown, of Brown Bros.

GREENE-LINCOLN.—On Dec. 22nd, 1890, at Baltimore, Maryland, U.S., Dr. Eardley Herbert Greene, of Toronto, to Elsie, daughter of Wm. Lincoln, Esq., of Baltimore.

McFAUL-CARBERRY.—At Erin, on 17th Dec., Dr. A. M. McFaul, of Stayner, to Mary E., second daughter of Captain Carberry.

McSPADDEN-McBRIEN.—On Thursday, December 11th, 1890, Toronto, Capt. McSpadden, 12th Batt. Y.R., to Minnie, only daughter of the late A. N. McBrien, M.D., Newtonville, Ont., and niece of H. T. McBrien, M.D., Toronto, late of Oshawa.

BURWASH-CRANSTON.—At Arnprior, on the 10th December, 1890, Armon Burwash to Harriet Elizabeth Cranston, eldest daughter of Jas. G. Cranston, Esq., M.D., all of Arnprior.

DEATHS.

EMES.—On Tuesday, Dec. 16th, Annie A. McLellan, aged 38 years, wife of Dr. S. P. Emes, 41 Gwynne avenue, Toronto, formerly of Drayton.

SAVAGE.—At Weston, on Friday, Dec. 26th, 1890, at 12 p.m., Thomas Young Savage, M.D., aged 58 years.

GORDON.—At 646 Spadina Ave., on Sunday morning, Dec. 21st, the infant daughter of Dr. Gilbert and Minnie Gordon.

Miscellaneous.

The newly formed chair of Materia Medica and Therapeutics at Michigan University is filled by the election of Dr. John J. Abel as Lecturer for one year. Dr. Herdman has been made Professor of Nervous Diseases and Electro-Therapeutics, resigning his former position of Demonstrator of Anatomy.

CORRECTION.—In a former issue we stated that Drs. Geo. Ross and R. L. MacDonnell, of Montreal, had gone to Berlin. We understand that it is not correct; but that Drs. G. T. Ross and McConnell, of Bishop's College, have gone to Berlin to study Koch's methods.