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Original Articles

SOME RESULTS THAT ARE BEING ATTAINED BY THE USE OF X-RAYS, WITH EXHIBITION OF PATIENTS.*

BY JOHN MCMASTER, M.D., TORONTO.

Case 1.—*Lupus Vulgaris.*—Mrs. L., age 31, had been afflicted with lupus for ten years. It had spread over all the face excepting the nose and forehead. Had tried a great many remedies with only incomplete cure, the trouble returned and extended its limits taking in new parts. It was very angry looking when I began the X-ray treatment almost two years ago. However, it was not deeply situated. I gave her eight treatments in all of about twenty minutes each, protecting the sound parts with lead sheets. She rapidly improved after the first treatment till the fifth or sixth, when there was evidence of inflammatory action. I persisted in the treatment, however, which made the face very sore and inflamed. Two months afterwards, without any other treatment, the patches had completely healed up. The skin was almost normal in appearance, and it has remained cured to the present time. I have, up to date, treated six cases of this disease. Five have apparently been cured and the other one is but little, if anything, improved. This last case is a difficult one to produce any impression upon with the X-rays. The cause of

*Read at meeting of Ontario Medical Association, June 5th, 1902.

failure I attribute to not having pushed the treatment far enough to produce decided X-rays burns. At this date of going to press (31st July) the intractable case has completely healed up. Treatment was suspended some two and a half months before the healing was finally completed.

Case 2.—*Rodent Cancer and Carcinoma.*—Mr. Mc., age 72, referred to me for X-ray treatment by Dr. Teskey, about the last of February. He had suffered for the past seventeen years with a slowly progressing rodent in the infraorbital region involving the tissues surrounding the right eye. He has always been able to give the sore the best of attention, and many efforts have been made to arrest the onward march of this inveterate foe of human flesh. I feel certain that it is solely to the persistent good treatment that this case received that it was not very much worse than it was, when exposures to the Roentgen rays were commenced. The use of escharotics and the actual cautery had checked its advancement in one direction only to have it start up in another. About three years ago an epithelioma made its appearance in the lower lip, and it was excised by Dr. Teskey, with an apparently successful result. In January last another growth began to make its appearance just below the point of the chin. Some little ulceration appeared, also in the cicatrix of the former excised growth. When the treatment was begun, I want to say, that Dr. Teskey considered the case in a very unfavorable light, the patient's health was failing, cachexia was evident and the outlook, I felt, was very bad. He received almost continuous treatment from the 28th day of February till the 20th March, both the eye and the chin being separately submitted to the action of the rays for twelve days, when exposures were made every second or third day to the eye, the chin receiving it every day. This went on till the 20th of March, when pleurisy with effusion laid the patient aside from that time till the middle of May. During the two months that he was confined to his room and home the eye was carefully attended to and it completely healed up. When I again saw him, on the 15th of May last, I was amazed at the condition I found. There was no trace of ulceration about the eye and the newly healed skin was soft and velvety like. At this time there was a little scaley-like spot on the side of the nose, and I considered it to be eczematous in character. It was weeping a little and I gave it short exposures on the 16th and 21st, that night the patient applied burnt alum to it and that caused an ulceration of the skin which has not quite healed yet. If I were mistaken about this being eczematous, and it turns out to be rodent in character, I am satisfied that the treatment will cure it. Now about the chin. What is this growth ? and what effect has the

treatment had upon it ? That it is cancerous there is little doubt, but whether epithelioma or carcinoma I am uncertain, but I consider it to be the latter. It received in all fourteen vigorous applications of the Roentgen radiations. There was very little appreciable effect upon it discernible when the pleurisy set in. But, shortly after, the beard dropped out, and the skin sloughed. He had a mild X-ray burn which healed in the usual time. The lump apparently diminished in size during this period, and I think lost, at least, part of its firm attachment to the bone and underlying structures. At the present he complains of some loss of control over the muscles of the mouth, but it cannot be observed. I may be disappointed in my expectations, but I am very hopeful at present, that a perfect cure will eventually be made of the case.

Case 3.—*Cancer of Breast.*—Mrs. B., age 47, referred for X-ray treatment by Dr. Riordan, by whom the left breast and glands of the axilla were removed. The neoplasm, I understand, was well advanced. The patient, although cachectic looking, recovered rapidly from the operation and the wound healed quickly. She was, however, very short of breath, and the appetite exceedingly poor. The wound had no sooner healed than there was evidence of the return of the malignant growth along the line of the sutures and at other parts adjacent. After a few treatments of twenty minutes' duration there was evidence that the nodules were lessening in size, and after seven or eight treatments the skin became sunburnt-looking. The treatment was continued till thirteen applications were given. The nodules disappeared and the skin became smooth. Her health was, however, failing, and the cachexia increasing. Severe jaundice intervened and the patient died, I believe, from cancer of the liver and probably other internal organs. At the time the treatment was begun it was pretty evident that the infection had invaded the internal organs. Nevertheless the case showed that the X-rays were effectual in dispersing the recurring external nodes. There was no injury, of any account, done to the parts exposed.

Case 4.—*Carcinoma Recurring after Operation.*—Mrs. F. This was a post-operation case resembling No. 3. It was referred to me for treatment by Mr. Cameron. The engorgement was pretty extensive, covering half the chest, and there were some of the glands, superficial ones, above the clavicle affected. She received in all thirteen treatments, 220 minutes' exposure. A somewhat severe though superficial burn resulted which healed up in a couple of weeks. The nodules along line of suture and enlarged glands under the skin disappeared and she left the hos-

pital a few weeks ago without any visible evidence of the disease.

At present I am giving treatment to several different types of cancerous growths, both external and internal. They are all progressing satisfactorily. A great number of cases, as you are aware, have been reported during the last year or two in the journals. I have collected and examined the statements made in some fifty-eight cases. Success appears to be achieved in the superficial growths. Time will settle the question of permanency.

Case 5.—Mrs. Y., age 43, the mother of three children, the youngest being eleven years. In her left breast she discovered a lump nearly as large as a hen's egg when first noticed. In a few weeks it rapidly got larger and there were shooting pains through the breast and side, running back into the shoulder. When I first saw it the mass was about four inches across by two and a half to three inches from above down. It was hard and situated in the gland. The nipple was a little retracted, but not very much. The breast was movable on the muscle beneath, and there was no evidence of any enlargement of the glands of the axilla. The lump was more or less firmly attached to the skin. Several physicians saw it and all believed it to be incipient cancer. X-ray treatment was begun on the 14th of March and was continued with some intermissions till the 5th of April. At this time there was distinct evidence of an oncoming X-ray burn. In three or four days more it developed. It proved to be quite extensive, involving the whole area exposed. The exposures were made wide of the lump by two to three inches. While the burn was difficult to heal it has not been very painful. No enlargement of the glands of the axilla has resulted. The injury has now healed and I present the case to you. There is a little lump in the breast still, but it is very small and can hardly be felt. It seems now to be detached from the skin and somewhat resembles a foreign body in the gland. The case, I thought, would be of interest because you see it during the treatment.

Case 6.—*Epithelioma.*—Mr. M., age 57, referred to me for X-ray treatment by Dr. F. H. G. Starr, College Street. The patient was very severely burned when eight years old, the whole of the right side of the body, thigh and arm being involved. After being confined to bed for two years he recovered. The burn was most severe over the right loin and over the crest of the ileum. From that time till the present he has suffered more or less from the breaking down and ulcerating of the tissues in the neighborhood mentioned. Under rest and local antiseptic treatment they would heal up, only to again break down. Last fall and winter the condition became serious.

An extensive sloughing ulcer developed with profuse sero-purulent discharge. A disagreeably offensive odor developed and the pain, which was present for a considerable length of time, became greatly intensified. It was of a burning, boring type and very hard to bear. I saw the patient for the first time on the 29th of April. At that time he had been in the hospital for almost ten days and frequent antiseptic dressings applied. They had failed to make any impression on the condition, which was about as follows: A large, ugly-looking, sloughy-like ulcer, one-half to three-quarter inches deep and three and three-quarters by five and a half inches. The edges were puckered and raised into hillocks at various parts, especially the anterior. The discharge was abundant sero-purulent, the serum being greatly in excess. The odor was so offensive and penetrating that it was with difficulty the dressing could be done. He had to be isolated, for the other patients were complaining.

X-ray treatment began on May 1st. Almost at once there was relief from the pain, antiseptic and deodorizing dressings were continued. By the end of a week the offensiveness of the odor had almost disappeared. The discharge was lessening. A great revolutionary change was coming over the tissues of the part exposed. At the end of two weeks the slough at the bottom of the ulcer had almost disappeared, the nodules around the edge preceded this in their departure. The cancerous character of the growth had entirely disappeared as far as one could see in three weeks, and healthy tissue taken its place. In all he has had up to the present fourteen treatments. They were vigorous ones, but not prolonged in duration, the average being about thirteen minutes. I present the case to you for the interest it presents from several points. It is difficult to determine to what extent the growth had infiltrated the structures. That it was extensive was evident. Beyond the growth at the posterior part and over the upper part of the hip for some three or four inches round, there was an unhealthy *necrotic* condition. This has, as you see, been replaced by healthy tissue. The exposures have therefore had a stimulating effect on this necrotic condition. The inference is that indolent, unhealthy ulcers might be stimulated into a healthy condition by the X-rays. What the result in the case will finally be remains to be seen. If the cavity fills up with healthy granulation tissues skin grafting will be attempted. As it is things are looking very hopeful for him now.

Case 7.—*Alopecia Areata*.—Miss C., a young woman, began to lose her hair in early childhood. It came off in patches here and there and would grow in again to fall out in other places. It kept doing this ever since it began, the patches getting larger

and more numerous. It had travelled completely over the scalp, and the return of hair has been getting less for some years. When treatment was begun on the 1st of February there was a fringe of hair around the forehead and around the sides with a few scattered spots over the scalp. None of her brothers or sisters, of which she has several, suffers from the disease. At different times she has tried treatment, but to no purpose. Between the 1st and 14th of February she received twelve treatments for about twenty minutes each from a powerful tube, energized by a coil. It produced no apparent affect till about ten days after the last treatment, when the hair remaining quickly dropped out. Shortly after the scalp became sore and a mild X-ray burn resulted. With considerable attention and inconvenience the injury got well in about a month from its first appearance. The scalp became clean and smooth and shortly after hair began to appear in spots here and there over the head. The return of the hair has been disappointing and I think the treatment unsuited at this stage in the disease. I am sure that you will be pleased that the modesty of the lady did not prevent her from allowing you to derive whatever benefit you may from her condition.

Case 8.—*Sarcoma.*—During the past year I have read of the cure of this most malignant neoplasm by the use of X-rays, and through the kindness of Dr. Ralph Hooper I have had an opportunity to give it a trial. Mr. B., age 31. The family history shows that his grandmother, on mother's side, had cancer. One of his mother's sisters and one of his father's are at present afflicted with it, while another of his aunts on his father's side died some time ago from an operation for the removal of a cancerous growth. Three cousins also are suffering now from the same cause. Inheritance, therefore, apparently plays a part in the etiology of this man's affliction. The growth began to appear last October in the glands of the neck beneath the sterno-mastoid muscle on the right side. These glands were removed on March 1st and 20th and careful microscopic examination of them made. This showed that they were sarcomatous in nature, of the adenoid type. The glands in the left side had also begun to enlarge and become tender. There was in addition a growth, at the upper and back part of the right nasal chamber. Pain was pronounced in the right side of the head in the region of the ear. He was deaf in this ear when first seen. A bloody ichorous discharge was coming from the right nostril, which was almost occluded. His health was declining, and his rest disturbed by the continuous pain. Treatment was begun on April 7th and continued every day for seven treatments. The treatments were

double, each side got an application, the right about twelve and the left about eight to ten minutes. This brought on a browning of the skin on the right side with slight indications on the left. Treatments were suspended with one exception for nine days. The pains were greatly relieved and the lumps diminished. A slight X-ray burn developed on the right side along the line of incision. This was healed completely about a week ago. Eight other exposures were given to such of the parts as were considered suitable—three or four to the lump between the two heads of attachment of the sterno-mastoid below on the left side; two or three to the parts surrounding the right ear, and three or four to the upper and outer walls of the antrum, reaching over to the centre of the nose on the same side. In all, sixteen or seventeen double treatments have been given. At first there was a pronounced diminution in the size of the lumps and a decided lessening of the pain. Scarcely any trace of the infiltration could be felt in the right side when the ulceration began. The pain, while not completely removed, has been materially relieved. His general health also improved. No treatment has been given to the sides of the neck for over five weeks, owing to the X-ray burn on the right side, and the evidence that the same was not far off on the other side. Renewed advancement and extension has been observed in both sides for the past ten days or two weeks, with a return of the pain. It is a difficult case to treat, the exact location of the trouble in the right side of the head being hard to get at, even if it could be accurately located. Mr. B. has kindly consented to allow me to present him to the association.

Fractures of the Femur.—My opportunities for the past twelve years, although not extensive, have impressed me with the fact that the results obtained in fractures of this bone are not often satisfactory. Probably no very great disability results from an inch or two of overlapping and slight bending at the fracture, or a good deal of bending with little overlapping with or without rotation. That they exist in nearly all cases I am convinced from fluoroscopic examination of quite a large number of cases extending over six years. No matter how skilful and careful the attending physician may be, perfect apposition and position of the fragments are not likely to follow. This is due to the inability of the operator to correctly adjust the fragments by the sense of touch, guided as he may be by a good eye and a full knowledge of the anatomy of the bone and muscles acting. It is not a question so much of keeping the fragments in proper position as it is one of getting them into proper position. The extensive swelling from laceration of the tissues by

the fragments or by the injury, the resulting inflammatory edema and the great depth of the muscular structures surrounding the bone all combine to render the ends of the fragments indistinct to the operator, so that the position must be largely inferred rather than actually determined. Out of all the cases that I have seen and examined, some 34 in number, I have yet to see any that was perfectly adjusted without the use of X-rays. To secure the best results the fluoroscope ought to be used after the reduction of the fracture, and the adjustment of whatever mechanical appliances are used for retention of the fragments. If this is done in all cases, I am satisfied, that there will result a great improvement in this class of fractures. The disability and shortening will not only be lessened but the delay in recovery and expense to the patient will also be curtailed.

I want to show you a number of skiagraphs which indicate, probably in an exaggerated degree, the character of many results. These skiagraphs were never intended for exhibition and I show them to you only to impress the necessity of making use of all available aid in this difficult class of fractures.

X-ray Burns.—In view of the great amount of X-ray work that is being done, it might not be uninteresting to say a few words, even if it is apart from the title of the paper, on the subject of X-ray burns. Besides the medico-legal aspect of the question which renders it in a way interesting, the practitioner may desire to know the danger his patient submits to when he sends him for an X-ray examination or skiagraph. The personal experience of any single operator being inconsiderable, I shall, therefore, give you, in a very brief form, what I have been able to glean from available records. At the outset one is struck with the fewness of the cases and the great publicity that has been given to these injuries. The recorded cases are exceedingly small in number and the unrecorded ones are not likely to be numerous. One would infer this from the fact that bad news travels faster and farther than good. The number of burns is every year diminishing, although the number of exposures is rapidly multiplying as time goes on. More satisfactory and better adapted apparatus, a more exact knowledge of the radiations and the technique required have been the means of bringing about this desired result. Omitting repeated exposures for therapeutic purposes, but including the experimental work done in the early stages, the journals of ten of the chief cities of England, Germany, Austria, France and the United States have furnished the records for the following statistics. Less than 175 burns, if we omit the cases occurring in X-ray operators have so far been reported, and less than half of these

have been serious. A very conservative estimate of the number of exposures producing these injuries has been made. The minimum number is placed at 1,000,000. This gives on an average less than one in 5,700, and covers the time from the discovery in 1895 to the present, nearly seven years. If we omit the past years and consider the current one only, the ratio does not exceed one burn in 75,000 exposures. So much for records. It seems to me, therefore, that we would be within the limits of safety if we tell our patients that there is not one chance in 20,000 of their getting a severe burn from an ordinary exposure, and not one in 10,000 of any injury resulting.

You will pardon me if I here relate an early experience that I had; there is a curious point of interest connected with it. About three and a half years ago a young man of about thirty years called at the office to make arangements to have a skiagraph of his head made. He stated that he was the subject of epileptic fits, taking from three to five weekly. I made the appointment, warning him that there was some danger of a burn on account of the time required for the exposure. He was willing to take the risk because he was getting worse and he was tired of taking "dope," as he called it, which had completely derived him of the virility of manhood. Besides, he hoped that the skiagraph would reveal the cause of his disability. I made two skiagraphs on different days of the same side of the head, the first with twenty minutes' and the second with thirty minutes' exposure, at a short distance. About three weeks after he called at the office and showed me his head. To my astonishment there was not a hair left on that side. It was as white and smooth as an ivory billiard ball. He wanted to know if it would grow in again. This was a difficult question for me to answer then, and I had to hedge a good deal. But what was more astonishing, he said that he had not had a fit since the exposure. I did not see him again for over two months, when he had as nice a crop of hair on the affected side as anyone could desire. In the meantime he had had only one fit. I might say that when I saw him, after the hair came off, there were no signs of inflammation, but he stated that the head was hot some time earlier and it had been a little red. How did this treatment act in suspending the fits? Was it due to the sedative action of the rays, or was it the counter irritant effect produced and which took a long time to subside, or what?

But, coming back to the subject of X-ray burns. These injuries, however produced, may, with a fair degree of accuracy, be grouped into four classes. (1) The dermatitis of X-ray workers. This class is by far the most numerous. The operator who does three or four hours' work daily for years, without pro-

tection, making examinations with the fluoroscope and doing therapeutic work, may count himself fortunate if he escapes unscathed. The dermatitis may be of three grades, simple, mild, or severe.

In the simple grade the skin is chapped, swollen and gathered into thickened folds across the knuckles. Stiffness exists, but sensibility is unimpaired. In the mild grade bleb-formation takes place and hemorrhagic-like points and shots appear in the skin and gradually work to the surface. The nails become affected through want of nutrition, they get brittle and longitudinal striæ appear upon them with cleavage between them in some parts. They get very thin later on and double up, and break under the least strain. In this condition they cause a great deal of inconvenience. If exfoliation takes place they reappear again in a modified form and but little, if any, permanent injury results to any parts affected. In the severe form there is exfoliation of the epidermis and nails, and deep ulceration takes place affecting the sheaths of the tendons. The nails are permanently destroyed and the joints damaged so that amputation may be necessary to limit the gangrene that ensues. I have experienced the mild grade myself and have seen all the varieties mentioned. This dermatitis is not confined to the hands only, it may affect the face, including the eyes, conjunctivæ, the shoulders, breast, or other parts.

The other three classes resemble burns of the first, second and third degree and result from one or more exposures at short intervals for skiagraphs, fluoroscopic examinations, or treatments for therapeutic purposes. They do not differ in their essentials from the three grades outlined above as usually affecting the hands of X-ray workers. In those of the first degree there is a transient erythema resembling a sunburn, followed by a slight exfoliation with hyperesthesia, accompanied by a sensation of warmth or burning, but no real pain. If hairy portions of the body are exposed there is depilation without signs of inflammation. In those of the second degree blisters follow or coincide with the erythema, which develops a very dark shade. This is a superficial gangrene. The blebs may or may not become purulent. It closely resembles a scald, but is less acute in character and often much slower in healing. Irritating treatment may drive it into a burn of the next or third degree. In this class a leathery slough appears involving the deeper layers of the skin and subcutaneous tissues. Unlike those of the second degree, they do not clear up in three or four weeks. They resist treatment in a remarkable manner and go on to deep ulceration of the underlying structures. Their stubbornness to recovery

makes them resemble a malignant infiltration. They are very painful during their progressing period. A case may last anywhere from five or six months to a year and a half, or longer. Amputation of the extremities has had to be resorted to; abortions, and dead-born children at term have followed this class of burns to the body. It is doubtful whether ever death has resulted from such burns, although it has been asserted as the cause in more than one case. Several suits for mal-practice have followed after some of these unfortunate accidents. In three cases the injuries came on five months after the exposure or later.

The inquiry naturally arises, can these undesirable lesions be avoided and the results that are desired be obtained without them. When the object of the exposure is for skiagraphy or fluoroscopic examination, the answer is, I think, unmistakably yes. But when the object is therapeutic action the question becomes different. The cure of the condition, be that condition either tubercular infiltration, external or internal, neoplasm, chronic skin disease, etc., may depend, and in all likelihood does depend, upon the destructive influence of the radiation. It amounts to the transforming of one pathological condition, not self-limited and possibly irremediable, by another pathological condition which is self-limited and from which a recovery can be made. To have complete command of the production or avoidance of these injuries requires a perfect knowledge of three things, two of which are entirely under the operator's control. (1) Apparatus; (2) technique; (3) idiosyncrasy. Under apparatus there is the character and volume of the current employed to energize the tube, the quality of the tube—hard or soft (low, moderate or high vacuum)—under technique come the position and arrangement of the exposure, distance and time of exposure, protection to the patient, etc. These things being measurable, mechanical and adjustable, are entirely under the operator's control. Idiosyncrasy is an entirely different factor. That there is a susceptibility to the effects of the energy, differing materially in different patients, cannot, I think, be doubted; what influences this susceptibility is being eagerly worked out. The hydroscopic condition of the skin or surface, the acidity or alkalinity of the secretions or exudate vasomotor irritability, anemia or plethora of the parts, resistance to the influence, any or all of these, or other factors, may enter into the composition of this condition. I have no doubt but what in a year from this time considerably more will be known upon this important matter. In closing I might be permitted to reproduce a remark as to the pathology of these lesions. The delay in their appear-

ance, their progressive character, and their resistance to stimulating treatment point to a disturbance or neurosis of the trophic nerves of the blood vessels and skin. Microscopic examinations of the excised tissues show that the smaller arterial branches are occluded and the appearances resemble an ordinary necrosis from inflammation. The severe lesions are rather atrophic ulcers than burns.

SOME USES OF THE X-RAY OTHER THAN DIAGNOSTIC.*

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That the X-ray has again come to the fore very prominently is evidenced in many ways. Medical journals supposed to be quite conservative in their views are devoting much space to a consideration of the ray and its actions, the lay press, the manufacturer of apparatus and the writer of books have not let the opportunity pass unheeded, and that the medical profession is thoroughly in touch with recent advances I can bear cheerful witness, from the fact that I am very frequently asked to express an opinion as to the possibilities or probabilities of radiotherapy in many morbid conditions usually of a class considered rather hopeless. Under these circumstances, when your committee did me the honor of asking me to make a few remarks upon the non-diagnostic uses of the X-ray I very willingly acquiesced in its desire.

When the medical world was first startled with the marvellous accounts of this somewhat unknown quantity, so well-named the X-ray, the number of those who hastened to avail themselves of its wondrous diagnostic possibilities was legion, and as a large proportion of these was thoroughly unqualified to employ such a mysterious and dangerous agency, many very unfortunate incidents were duly chronicled, and as a consequence a reaction set in and the X-ray quite naturally fell rather into disrepute. But in time the ray came to be diligently and intelligently studied and better known by those capable of using it properly, apparatus was perfected and technique improved and we heard less of X-ray burns and more about the true value of the ray, and to-day it is more popular than ever, and who dare predict its future !

*Read at meeting of Ontario Medical Association, June 4th and 5th, 1902.

In view of this renaissance of the X-ray, and in taking into consideration all that has happened in the past, it may not be altogether amiss just here to sound a note of warning against the indiscriminate and unskilful use of such a powerful agent, especially in the hands of those totally unacquainted with the subject of electricity in general and X-radiance in particular, for failure, disappointment, constant expense, not to mention actual and serious injury, will most surely beset their unhappy paths. As has well been remarked, "The X-ray is evidently a giant in chains; he must be careful who unchains it."

I will not attempt to detail all the conditions for which the services of the X-ray are now invoked, but shall content myself in dealing merely with some of the more important uses to which it is put where it has proved of value in authenticated cases recorded by reliable authorities. The X-ray as a therapeutic measure is still on trial, much remains to be known as to the range of its usefulness, and medical opinion is still far from unanimous as to the necessary technique to be employed in those cases in which it has been found suitable. But, after making all due allowances it may safely be stated that the X-ray has clearly demonstrated its great value not only as a mere palliative but as a curative agent.

Into the many curious, ingenious and often far-fetched theories of the curative action of the ray I do not propose to enter in this paper. Much has already been written upon this burning question and much more will yet be written ere a satisfactory conclusion is reached. But the fact remains that the X-ray is curative when properly applied in suitable cases. Much depends upon the apparatus employed, but much more upon the operator. If you will permit me to recount some of the effects produced by the X-ray you will the more readily see where it may be expected to be of service. One of the best known of these effects is the characteristic X-ray burn, and it is frequently stated that the ability of a tube to produce a burn is the measure of its curative power, and that the question of treatment is simply a question of burning to a greater or less extent. But this is an erroneous idea. The production of a dermatitis is not only unnecessary, but also most undesirable, and it can usually be prevented.

At the last meeting of the British Medical Association a member (Dr. Stopford Taylor) in discussing the question of effects drew the following conclusions from the actions of X-rays on lupus vulgaris:

"1. Rays applied to a moist surface lessened the discharge and changed it from a serous to a purulent character.

" 2. That normal epithelium developed very rapidly and healing very quickly followed.

" 3. That when applied to dry surfaces exfoliation of the epidermis took place and the part exhibited a dried and shrunken appearance.

" 4. That absorption of morbid products took place, resulting in a smooth, soft and pliant scar.

" 5. That an erythema of uncertain duration, depending not altogether upon the length of exposure or its strength, always accompanied these changes, and that unless this was permitted to disappear between each successive application of the rays an aggravation of the disease occurred." He regarded X-rays as a stimulant. (Quoted from *Journal of Advanced Therapeutics.*)

Dr. William J. Morton in an article in the *Medical Record* on " Treatment of Malignant Growths by the X-ray," under Conclusions says: " What is accomplished by the X-ray ? (1) Relief from excruciating pain and constant suffering, often immediately; (2) reduction in the size of the new growth; (3) establishment of the process of repair; (4) removal of the odor, if present; (5) cessation of the discharge; (6) softening and disappearance of lymphatic nodes; (7) disappearance even of lymphatic enlargements not directly submitted to treatment and often quite distant; (8) removal of the cachectic color and appearance of the skin; (9) improvement in the general health; (10) cure, up to date, of a certain number of malignant growths." (Abstracted by *Journal of Advanced Therapeutics.*)

From these quotations, which my own observations confirm, may be inferred the wide range of conditions which ought to be benefited by radiotherapy. A rapid glance at some of these must suffice, and quite naturally our attention turns to the skin. The well-known and early observed fact that the X-ray causes partial atrophy of some of the appendages of the skin is utilized in producing depilation where such should be thorough, *e.g.,* preliminary to the treatment of sycosis. In view of its other effects it is almost unnecessary to remind you that the X-ray is a parasiticide and hence is of value in the parasitic diseases of the skin, while its power to stimulate tissues and cause absorption is utilized in the treatment of chronic inflammatory affections such as indurated patches. It has hence been used with success in tinea tonsurans, favus, sycosis, eczema, acne rosaceæ, acne vulgaris, prurigo, ano-vulvar pruritis, nevus vasculosis, rodent ulcer. ulcers following burns, psoriasis, scrofuloderma. lupus vulgaris, lupus erythematosus; its action in causing the destruction of tissue of low vitality is also of great service in the treatment of epithelioma, *e.g.,* of eyelid or cheek.

But the action of the X-ray is by no means confined to the surface, carcinoma of the stomach, and of the cervix uteri, and many cases of sarcoma have been most favorably reported upon, and many inoperable cases of malignant disease, and also tuberculous joints.

The X-ray has also proved of service in conjunction with the Finsen and other light treatment and in situations where that light could not well be applied, such as the otherwise inaccessible nasal and oral cavities. I have made use of its marked analgesic action in a case of neurasthenia with marked dyspeptic symptoms consisting of great discomfort in the epigastric region interfering greatly with sleep. Under the influence of the X-ray directed over the solar plexus the patient fell asleep during the treatment, and on returning to his home went to bed at once and slept soundly through the whole night, a thing which he had not done for many months.

These are only some of the uses of the X-ray, and by no means are they all that could be recounted. But there is yet another use, and one of great importance, viz., the directing of the attention of the medical profession, even at this late date, to the possibilities of static electricity as a remedial agent. Many of those who are now using the X-ray are energizing their tubes by means of the static machine and will not limit it to such use but will be led to investigations which will amply reward them for any attention directed thereto.

Among the cases at present under my treatment by the X-radiance are lupus, epithelioma of tongue twice excised, lymphadenoma, scleroderma, goitre, nevus vasculosis. The case of lupus, well illustrating the progress of treatment, has kindly consented to appear before you. The case is of twelve years' duration and has undergone about all the classical treatment in vogue to date, without avail. He has been under X-ray treatment since Feb. 19th., 1902, and has received thirty-eight such treatments.

I cannot more fittingly bring this fragmentary paper to a close than by quoting again from a recent article by a man already referred to who has done more than any other one man to popularize—in its best sense—the use of the X-ray, diagnostic and therapeutic, Dr. Wm. J. Morton, of New York. (The article is abstracted in the May 31st issue of the *Philadelphia Medical Journal,* from *Medical Record.* He concludes as follows: (1) Radiotherapy broadens our conception of the possibilities of the therapeutics of modern medical science; (2) the X-ray has a general application for the relief of pain; (3) as to technique, a standardization as to the apparatus and its capacity,

as to duration and frequency of treatments and distance of the tube, is recommended to operators; (4) the X-ray has a curative effect in internal cancer and other internal diseases; (5) for superficial diseases a medium soft tube may be used, for internal cases a hard tube. The hard tube is applicable, however, in all cases; (6) X-radiation is recommended prior to any operation, to clear the tissue of cancer particles and foci, and to circumscribe the disease; (7) X-radiation is recommended after operation to preclude a recurrence; (8) X-radiation may be recommended in place of an operation, and may be preferable to one of the reasons that operation secures but a comparatively moderate percentage of permanent recoveries, and because up-to-date X-ray procedure shows a continued improvement in cases, and a percentage of cures which will undoubtedly compare favorably with surgical operation; (9) there is danger to the patient or uncertainty as to what might be accomplished when the X-ray is employed by immature operators; (10) in X-radiation we possess more nearly a solution of the problem of curing cancer than by any other method of treatment."

THE USE OF X-RAYS IN CANCER, LUPUS AND HODGKIN'S DISEASE.*

By F. W. Hett, M.D., Berlin, Ont.

During the last few months various reports upon the application of the Roentgen rays upon malignant growths have appeared in medical journals and since this is an interesting question before the profession to-day, I will try and present, as briefly as possible, my results and opinions. It is but recently that relatively few believed the statements of those who were in a position to demonstrate the therapeutic powers of the X-rays, and our literature has almost been barren of reports and not infrequently unfavorable criticisms have been given.

On March 6th, 1902, at the meeting of the general section of the New York Academy of Medicine prejudice was overthrown and doubts were removed by the modest paper of Dr. Francis H. Williams, of Boston, and an animated discussion and exhibition of patients that were cured by New York operators, amongst whom were Drs. A. B. Johnston, Charles W. Allen and Morton.

* Read at meeting of Ontario Medical Association, June 5th, 1902.

Various theories have been advanced how the X-rays destroy malignant growths, but no definite conclusion as yet has been reached. It seems to me that it is not a destruction of the neoplasms which really occurs, because necrosis, providing the rays are properly applied, does not take place in the cells, for, on the contrary, the cells seem to have an increased, instead of a diminished, vitality, and it is this process which takes place and restores the tissues to their normal condition. This is seen in superficial cases. In deeper cases atrophy of the cells takes place, and it does not necessarily follow that a growth is entirely removed, for, although the size may be considerably diminished, a firm, small benign mass may remain.

X-rays are electro-static in character, but its vibrations are intensely higher. Sir Wm. Crookes estimated the vibrations of X-rays from 288, 220, 376, 151, 711, 744 to 2,305, 763, 009, 217, 693, 952 per second, whereas the vibrations of electricity range from 33, 048, 576 to 34, 359, 738, 368 per second. In the X-rays we are using a vibratory force of a tremendous rapidity and penetrative power—X-rays are really invisible. The light that is seen is the result of the decomposition of the molecules of air around and inside of the tube. It is a well-known fact that oxygen is set free by X-rays, and it is probably this factor which produces a change in the neoplasm and embryonic cells by producing disintegration.

It is not known exactly what the difference is between a cancer cell and an epithelial cell, or between a sarcoma cell and a connective tissue cell, but this is known, that the difference as regards activity is comparatively great and as regards constitution comparatively slight. Malignant cells represent a tendency to return to a more primitive form.

What interests physicians, however, most is not how malignant cells are destroyed, but whether they can be destroyed by this force, and if so, what progress is being made in this direction, consequently I will not dwell further upon the theories, though at the same time the X-ray operator should be acquainted with the nature of the Roentgen rays as much as possible, for, when we know the nature of the tissues we deal with and also the power and nature of our remedy, we are then not working in the dark, but more upon an intelligent and scientific basis.

Report of Cases.

Case 1.—T. D., age 55, consulted me on July 14th, 1901. Four years previously he was afflicted with an epithelioma of the eyelid which invaded the eye. Had an operation performed and

the eye removed. Recurrence took place which destroyed the ethmoid, vomer and nearly all of the orbicular portion of the upper maxilla. He then had caustic pastes applied which removed part of the growth, but the growth spread in other directions. It invaded the upper portion of the nose, and at the time he first consulted me very little of the normal tissue of the upper half of the nose seemed to be left. It looked as though simply the skin was stretched over the growth. He requested me to operate on him and remove his nose altogether, but his appearance was bad enough without being minus his nose, so I thought it expedient to try the X-rays. A low tube was first used and 5 to 10 minute exposures were given at a distance of four to six inches until August 19th, when an erythema developed which was worse than I desired. A high tube at ten inches was then used for five minutes every second day until September 1st, when treatments were discontinued. The inflammatory condition gradually subsided, and his nose took on a normal condition, and such it is at the present time.

Case 2.—M. H., age 60, consulted me on September 15th. Eight months previously he had a part of his upper jaw removed for carcinoma. Examination revealed a recurrence of the growth on the zygomatic surface of the upper jaw which extended into the ear. The pain and suffering were severe. Gave fifteen minute exposures with a low tube and also curetted the growth. After the ninth treatment pain was considerably relieved. Daily treatments for a month produced no apparent results than the relief of pain. The patient lived in the country and presented himself in a careless way off and on for another month, then became discouraged and ceased treatment.

Case 3.—G. W., age 73, recurrent cancer on lower jaw, consulted me on November 10th. This tumor was almost as large as a fist, and offensive. Gave twenty minute exposures with a low tube at a few inches distance. Treatment was continued for three weeks. The pain was but slightly relieved and no effects on the growth or odor were discernable. Treatments were discontinued and the patient died within six weeks afterwards.

Case 4.—Mrs. C., age 66, consulted me on January 19th, 1902. On December 26, 1900, she had an operation performed and a growth on her left breast removed. The pathological examination by Dr. H. B. Anderson revealed adeno-carcinoma. When I first saw this lady the cachexia was well marked and she was considerably emaciated; the arm and hand were very much swollen and edematous and she had very severe pains. Examination of the axillary glands revealed very much enlarged lymphatic glands. The picture of the above case is one well known to every

surgeon who recognizes the case beyond his reach. This patient was seen by Dr. Cairnes, of Formosa, Dr. Houspergen, Berlin, and Dr. Howitt, of Guelph. We looked upon the case as entirely hopeless. X-ray treatment seemed a dream, but we resolved to give her the benefit of the doubt, so twenty minute exposures daily with a low tube at six to eight inches were given. In about a month a burn developed and then a high tube was used at ten inches. That was partially protected and the tube focused more from the side and treatments continued. In about six weeks the burn was completely healed, and since then ten minute exposures have been given daily and are still applied. The results in this case are indeed gratifying. Pain was soon relieved and the patient has gained considerably in weight and the cachectic condition has been completely removed. She is active and smart and feels like a new person. There is still some induration of the glands and some swelling of the arm, but everything points to a complete resolution. The results are so gratifying to me that I have no hesitation in expecting a complete cure.

Case 5.—Mrs. B., age 46, cancer of cervix extending into uterus and involving vaginal wall. Four months ago the cervix was curetted and also thermo-cautery applied to all the parts. It was found that the growth extended very close to the walls of the bladder. The operation gave but very little relief and in a number of weeks severe vesical tenesmus set in. On March 19th the X-rays were applied through the abdominal walls. A high tube at ten inches was given for twenty minutes daily. The patient had taken morphia, which caused constipation and added a great deal of distress to the vesical irritation. The patient was not able to be treated every day, so she was treated when she felt strong enough. Altogether forty treatments have been given. The pain has been considerably relieved, as well as the vesical irritation, and she now feels moderately comfortable. Beyond that nothing can be said.

Case 6.—A. O., age 40, lupus vulgaris larger than the size of a ten-cent piece at side of nose; duration, eight years. Had two operations performed and recurrence took place. Consulted me January 8th. Applied the X-rays low tube, ten minute exposures. Knowing that it takes months to heal these cases with the X-rays I applied caustics also. After the slough came away a healthy granulating surface presented itself so the rays were kept up for two weeks more. Then planted a few small skin grafts, and in ten days afterwards it was all healed up. Since then there has been no recurrence. I believe if caustics are used in combination with the rays the same results can be obtained in a much shorter time.

Case 7.—G. F., age 12, Hodgkin's disease; was kindly referred to me by Dr. Moore, of Hawkesville. Diagnosis corroborated by Dr. Noecker, Waterloo. The disease was of two years' standing. The left cervical group of glands very much enlarged, as seen on photo. Spleen enlarged and anemic cachectic appearance strongly present. X-rays were applied on April 31st and continued for three weeks, when erythema developed. Since then the rays have been applied to the spleen. The enlarged glands have disappeared and nothing but small, hard nodules are felt. After five weeks' treatment the neck is almost normal in appearance. The results are very gratifying, indeed, and a complete cure is expected in a very short time.

Conclusions.

The advantages are: (1) It is painless; (2) it leaves small scars, thus doing away with disfigurements; (3) it destroys diseased tissue, but not the normal; (4) it relieves pain; (5) it removes odor; (6) removes the dread of an operation.

From my own results and those of others X-ray workers we know positively that we have a therapeutic agent in the X-rays which is of very great value. If we have a remedy which will cure three forms of malignant diseases we may safely work upon the X-rays as being another great blessing to mankind and a triumph to science. Although the rays are applicable at present only to superficial cases, we may confidently look forward to much better results when the apparatus is perfected and the technique perfectly mastered and doubtless the time will come when internal growths will be removed with as much confidence as external neoplasms at the present time.

KERNIG'S SIGN IN SCIATICA.

Magri (*Rif. Med.*, April 9th, 1902), in view of the statement made by some authors that Kernig's sign is pathognomonic of meningitis, reports the case of a man suffering from sciatica who presented this sign in a typical way, and yet who had no symptoms of meningitis. As the man died soon after admission from a severe attack of typhoid a necropsy was made, and the diagnosis of simple sciatica confirmed. The meninges, beyond being a little hyperemic, showed no trace of inflammatory mischief, and the sciatic nerve itself was healthy. The author looks upon Kernig's sign in this case as an example of instinctive protection of the limb so as to avoid pain.—*British Medical Journal.*

Physicians' Library

Diseases of the Nose, Pharynx and Ear. By HENRY GRADLE, M.D., Professor of Ophthalmology and Otology, Northwestern University Medical School, Chicago. Handsome octavo of 547 pages, profusely illustrated, including two full-page plates in colors. Philadelphia and London: W. B. Saunders & Co. 1902. Cloth, $3.50 net. Canadian Agents: J. A. Carveth & Co., Toronto.

This volume is intended to present diseases of the nose, pharynx, and ear as the author has seen them during an experience of nearly twenty-five years. In it are answered in detail those question regarding the course and outcome of diseases which cause the less experienced observer the most anxiety in an individual case, questions to which an answer is not easily obtained from text-books. In the therapeutic part of the work the author has given detail only to those procedures which have withstood the test of critical experience. Topographic anatomy being a requisite for all surgical work, the author has wisely devoted liberal space to this branch of the subject. The numerous illustrations are exceptionally accurate in their portrayal of the pathologic conditions, especially so the two full-page colored plates. We know of no work of its size that is at the same time so useful a text-book and so excellent a work of reference.

Diphtheria. By WM. P. NORTHRUP, M.D., of New York. *Measles, Scarlet Fever and German Measles.* By PROFESSOR DR. TH. VON JURGENSEN, Professor of Medicine in the University of Tubingen. Edited, with additions, by WILLIAM P. NORTHRUP, M.D., Professor of Pediatrics in the University and Bellevue Medical College, New York. Handsome octavo, 672 pages, illustrated, including 24 full-page plates, 3 of them in colors. Philadelphia and London: W. B. Saunders & Co. 1902. Cloth, $5.00 net. Half Morocco, $6.00 net. Canadian Agents: J. A. Carveth & Co., Toronto.

This volume, the third in the series of English translations of the "Nothnagel System of Practical Medicine," needs no recommendation. Professor Jurgensen and Dr. Northrup are too well known for us to expect anything but the best. The

article on Diphtheria, entirely original with the editor, is fully in keeping with the high standard set by the other German articles which comprise the work. Dr. Northrup, having been associated with Dr. O'Dwyer at every step in the perfection of intubation tubes, is particularly fitted to describe this aspect of the treatment of diphtheria. Professor Jurgensen's monograph on Measles unquestionably is the most comprehensive contribution on that infection that has appeared, bringing out so fully the valuable Danish records of the Faroe Islands epidemic. His exposition of Scarlatina is unrivalled both for richness of clinical detail and exactness and clearness of statement. "Fourth Disease" and German Measles have been accorded spaces consistent with their importance. The editor has shown judicious decision in his extensive additions, making the work far and away the best and most up-to-date treatise of the subjects extant. The book is profusely illustrated, containing, besides a large number of text cuts, twenty-four full-page plates, three of which are in colors.

Desiring to make a practical, useful journal for the General Practitioner, the Editors respectfully solicit Clinical Reports from subscribers and others.

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CORONERS' INQUESTS.

The facts brought out in connection with the so-called "warehouse mystery" serve to emphasize the statements which we have previously made, that there is something faulty in the system which at present exists for the investigation of deaths occurring from other than natural causes. Some weeks ago a young man who had previously enjoyed good health was found dead in the cellar of a Toronto warehouse. The death was reported to a coroner, who, upon investigating the case, and having learnt that the young fellow had complained that he had not been well for a few days previous to his sudden demise and the absence of any known suspicious circumstances, granted a certificate of death, and without any *post mortem* the body was buried. A short time subsequently another employee of the same warehouse was found dead under almost identical conditions. It was difficult, if not impossible, to imagine that this second case was only a coincidence, and a thorough investigation into all the facts is now being made by a second coroner, aided by a large section of the detective force and a not inferior number of newspaper reporters. It will also be remembered that four or five years ago, without any *post mortem* examination, a certificate was granted

by a Toronto coroner for the interment of young Wells, who was supposedly killed by a weight falling upon him and crushing his skull. But for the fact that the victim carried insurance upon his life out of all proportion to his income nothing would probably ever have been further heard of the case, but this fact, together with other suspicious circumstances which subsequently came to light, resulted in the indictment of two men charged with his murder.

Now, we have no desire to reflect upon the coroners engaged in these two cases. Dr. Powell, who investigated the first of the two deaths in the warehouse, is, in our opinion, one of the best of the rather numerous body of men in Toronto who are judged competent to fill the office of coroner. He is a man of excellent professional qualification, of good judgment, and of much more than the ordinary store of common sense. Yet, acting under the system which now exists, he made what we must regard in the view of subsequent events as an unfortunate mistake in not ordering a *post mortem* examination and a complete investigation. We, of course, do not know by what process of reasoning Dr. Powell came to the conclusion that no investigation was necessary, but we feel that it should not be in the power of any coroner, except in cases where the cause of death is manifest, to issue a certificate for burial without satisfying himself absolutely by means of a *post mortem* examination that death was due to causes not requiring further inquiry.

The present system is all wrong. In the first place, it does not tend to add dignity to the office of coroner, that if upon being notified of a case of suspicious death, he is compelled to "step lively." Frequently more than one coroner is notified or indirectly learns that a certain death merits inquiry, the man first on the ground gets the job and the whole thing may narrow down, not to a man's professional fitness, but to his athletic prowess. Again, as the law stands at present, it is necessary for a coroner to make oath that in his opinion the circumstances surrounding the death are such as to invite further inquiry. Cases must frequently arise in which a large element of doubt exists. A coroner may feel that the cause of death is not exactly clear, yet he hesitates to swear that there is anything suspicious; and, further, he is

deterred by the fact that if an inquest be ordered and nothing apart from the ordinary brought out he is regarded as a man of little acumen, as an individual who does not hesitate to waste public monies, and if it happens frequently, as a general nuisance, anxious rather for the fees of his office than for the discovery of neglect or wrong-doing.

The office of coroner is, in our opinion, a most important one; it is to all intents a judicial position and the man occupying it should be as untrammelled in the exercise of his duties as the judge on the bench. The Canadian Government recently spent thirty thousand dollars in apprehending and convicting a murderer in the Yukon. Yet, in view of the cases above mentioned, it seems not at all unlikely that murders may have been committed, which, through lack of proper investigation, have been certified as deaths from natural or accidental causes, all for the purpose of saving the few dollars necessary for a *post mortem* examination and inquest.

There is no rule of which we are aware governing the appointment of coroners. It would seem reasonable that a man should be appointed coroner by reason of his fitness for the position, and further, we can see no more reason for a multiplicity of coroners than for a multiplicity of judges. The cause of justice would be greatly served by appointing but one coroner for each county or municipality, insisting that in every case of death where no physician was in attendance that a thorough and complete investigation should be held. This is so in England—but there human life is held in higher regard than with us.

CONSUMPTION AND SANATORIA.

What could better illustrate the fickleness of public opinion than the action of the Board of Health of North Toronto, which has ordered an institution in that district for the treatment of consumption to be closed under the plea that it is a nuisance. It is not long since another town voted a bonus to a similar institution to induce its location within its boundaries. But in the meantime the public has been educated, and with the advance of hygienic knowledge among the general public, so also has the North Tor-

onto Board learnt wisdom; and it has come to pass that what was once regarded as a desirable adjunct to a town is now considered a menace.

It is just doubtful if the residents living in the vicinity of the sanatorium which has been objected to and for years assailed are really as frightened as they pretend. An old gentleman came here from Ottawa, where for years he had been a practicing physician and had, we believe, devoted considerable attention to the study of tuberculosis. He believed that he had some knowledge which might be useful to his fellowmen and sought to do good by establishing an institution for the treatment of consumption. We supposed he was a philanthropist—at least we have no reason to think otherwise—although it does not always follow that because a man is anxious to establish an institution to dispense charity that he is necessarily a philanthropist. However, he succeeded in establishing his institution. Admittedly he did good; his patients improved on the pure air of the district upon which he picked, but unfortunately he picked upon a district previously utilized for the erection of human habitations. True, these habitations were not in as close proximity to his institution as are many houses in the city to the various hospitals where consumptives are treated, yet a great fear arose among the inmates of these dwellings: they might catch the disease; they knew it, they had read it "in print," and so they set about to compass his downfall. The law was invoked; the wise men of the local Board of Health considered his institution a danger to the public health—they, too, knew the facts; they probably also had seen it "in print." The fact that the presence of such an institution depreciated the value of surrounding property was never brought prominently forward. Perhaps such a claim would not hold good legally. The charge against him was for maintaining a nuisance prejudicial to the public health and for the protection of the public health which he in his simplicity tried to improve by the establishment of a consumptive sanatorium, the self same sanatorium has been compelled to close its doors.

Would it not appear that if, as we know, there was absolutely no danger to the community in the presence of this institution, that this man has been harshly and ungenerously treated? Would it not further appear that, if no danger existed, the law has in this instance lent itself to subterfuge?

Editorial Notes

CANADIAN MEDICAL ASSOCIATION.

Intending delegates to the thirty-fifth annual meeting of the Canadian Medical Association, to be held in Montreal on the 16th, 17th and 18th of September, should take note of the following additional information issued from the Transportation Department:

Owing to a clerical error relating to points East of Montreal, the announcement should have read:—If ten (10) or more delegates are in attendance from Quebec City, Megantic and East thereof, holding Standard Convention Certificates, delegates from such points will be issued tickets, free, for return.

A side trip, *via* the Richelieu and Ontario Navigation Co., has been arranged for to Quebec City from Montreal at $4.00 for the round trip.

The time limit for delegates attending from points West of Fort William has been extended to the 12th of October, permitting delegates from the West to arrive home by that date.

Delegates may go and return by the Richelieu and Ontario steamers in the usual way by asking for that route and obtaining a Standard Convention Certificate.

The Entertainment Committee, of which Dr. H. S. Birkett is Chairman, has arranged the following programme: Tuesday, a garden party; Wednesday, the Grand Trunk Railway has invited the members of the Association to inspect the Victoria Bridge and will take them to Lachine, where a lunch will be served. In the evening there will be a smoking concert in the Victoria Rifles' Armoury.

A fine list of papers has been promised, which in addition to clinics in the various hospitals and the Pathological Museum, will comprise a programme which will prove both interesting and instructive.

Any further information may be secured by applying to the Local Secretary, Dr. C. F. Martin, 33 Durocher St., Dr. J. Alex. Hutchison, Chairman of the Transportation Committee, 70 McKay St., Montreal; or to George Elliott, 129 John St., Toronto, General Secretary.

THE TREATMENT OF SUMMER DIARRHEA.

The warm weather has begun again in good earnest and the city clinics are again crowded as of old with all grades and stages of summer diarrhea. While, statistically, the diarrhea

plague may not be so great as during some other summers, the number of cases is great enough and the discomfort of the babies trying enough to fill the children's dispensaries with wailing and weeping.

A short summary of practical treatment is in order. Treatment may be summarized in three words (1) diet, (2) quiet, (3) medicine,—and the arrangement of these items is perhaps anticlimacteric, as diet is the most vital item in the list. Regarding diet it is best to give to a fairly strong baby with ordinary summer diarrhea (slight fever with 8 or 10 greenish foul stools per day) only boiled water for 24 to 36 hours,—till the passages have improved. When the parents need "doctoring" as well as the children, the baby may receive boiled barley water (carefully strained, sweetened and salted) or rice-water. Oatmeal water is less desirable from its recognized tendency to relax the intestinal muscle. Should the child remain unimproved for a longer period than 36 hours, of course, nutriment must be given, but even then it should be only albumin water (with a drop or two of lemon juice) and barley water. Sufficiently supplied this diet will run the case quite well for even several weeks—till milk (meaning by this the best grade of bacteria-free milk) may be gradually introduced. Next is quiet and fresh air. Babies suffer as much in diarrhea when tumbled about by their nurses as adult patients suffer when walking around. They should lie peacefully on the couch or in the cradle and make none except necessary movements. Playing about the floor should not be permitted. Fresh air is essential, however gotten. Suburban trolley cars could be utilized by the city dwellers more than they are on fine days. If the weather be rainy or temporarily chilly a steamboat trip is not desirable. The patient may cure his diarrhea but get bronchitis instead. Cool bathing is useful, and light, cool clothing very important. Thirdly, regarding more specific medicinal measures, *primum non nocere*. Mild cases need no medicine. More severe cases need only a primary purge of castor oil, which is far better than triturate tablets of calomel, as it has a secondary "binding" influence,—an influence which most observant mothers have found out for themselves. Severe cases may profit by bowel irrigations. The profession is now veering back to the ground of a dozen years ago and beginning to say that bowel irrigations have been much overdone and are rarely required. The truth as usual lies between the extremes. Bismuth with pepsin and sodium bicarbonate, or bismuth with castor oil, (5 minims of castor oil to 20 grains of bismuth repeated, *p.r.n.*) may be finally required to complete the cure. Opium should

be avoided except in the severest choleroid cases, when the pain may be excessive without it.—Ed. *Pediatrics.*

SIR FREDERICK TREVES ON M'BURNEY'S POINT.

Any deliberate utterance concerning diseases of the vermiform appendix by a surgeon so favorably known as Sir Frederick Treves must command attention, more especially at the present time, when he has but recently operated successfully on the British King for perityphlitic abscess and when that occurrence has led to its being proclaimed to the world by some of our English contemporaries that Sir Frederick's experience in appendicular disease is probably greater than that of any other one man. Hence attention is likely to be fastened with uncommon keenness on his Cavendish Lecture on "Some Phases of Inflammation of the Appendix," delivered on June 20th and published in the July number of the *West London Medical Journal.* This was abstracted at length from the *British Medical Journal* in our issue for *July 12th, page 75.*

One of the features of appendicular disease to which the distinguished author devotes particular attention is that of its supposed frequent expression by special tenderness at McBurney's point, on which some stress has been laid—more by others than by Dr. McBurney himself, we believe—as an aid in the early diagnosis. He quotes as follows from Dr. McBurney's articles in the *New York Medical Journal* for December 21st, 1889, and in the *Annals of Surgery* for April, 1891: "I believe that in every case (of appendicitis) the seat of greatest pain, determined by the pressure of one finger, has been very exactly between an inch and a half and two inches from the anterior spinous process of the ileum, in a straight line drawn from that process to the umbilicus;" "the point corresponds very accurately in the living subject to the base of the appendix;" and "no other acute disease presents this feature."

Sir Frederick remarks that tenderness in the right iliac fossa is a very conspicuous symptom of appendicular inflammation of all grades, and adds that, as the point under discussion is about at the centre of the fossa, it may be the centre of the tender area. "Beyond this," he says, "I do not think the sign is of any clinical value." He has been at some pains to convince himself that the point in question does not correspond to the situation of the base of the appendix, founding this conclusion on an elaborate investigation undertaken at his instance by Dr. Arthur Keith, lecturer on anatomy at the London Hospital. In Sir Frederick

Treves' summary of Dr. Keith's observations, McBurney's point is treated as practically the same as Monro's point, although the latter is stated to be situated on an average in the young male adult at a distance of about 2.6 inches from the iliac spine. Monro's point is thus defined: "The spino-umbilical line runs from the anterior superior iliac spine to the navel. The point at which it crosses the outer edge of the rectus is called 'Monro's point' (Merkel)."

Monro's point, according to Sir Frederick Treves, "has the advantage" over McBurney's of "a more precise localization," and the structure peculiar to the right side which comes more or less precisely beneath it is the ileocecal valve. The base, or opening, of the appendix, he adds, "lies on an average rather more than one inch below the opening of the ileum." Apparently the investigations on which these statements rest were made upon the cadaver, and while we may admit that Monro's point "has the advantage" of "a more precise localization," viewed from the dissector's standpoint, it must be borne in mind that the topography of such movable structures as the intestines is apt to be much distorted by changes that take place after death, and dissections of the cadaver can hardly be accepted as offsetting the observations of so competent an anatomist as Dr. McBurney, made largely, we may assume, on the living subject.

Sir Frederick finds that, so far from tenderness at McBurney's point being peculiar to appendicular inflammation, it is "common in healthy persons, and in subjects of colitis involving the cecum such tenderness may be quite acute." We can understand that typhlitis may often be accompanied by such tenderness, but we doubt if it is "common in healthy persons," and we must certainly question the soundness of Sir Frederick's intimation that the fact that the eleventh dorsal nerve enters the sheath of the rectus beneath Monro's point accounts for the alleged tenderness in healthy persons, for the nerve is underlain by such yielding structures that pressure on it would have to be firm indeed to elicit the degree of sensitiveness that we expect to find in appendicular inflammation. On the whole, we do not think that the idea of the diagnostic value of tenderness at McBurney's point has been demolished.—Ed. *New York Medical Journal.*

THE DOG-DAYS AND HYDROPHOBIA.

To the very hot weather that comes so often at the end of July and the beginning of August, the traditional name of "dog-days" has been given, almost from time immemorial. In recent

years the name has given rise, in the popular mind at least, to the idea that dogs are much more liable to go mad during these months than at any other season of the year. The term dog-days, however, is only our English equivalent for the Latin phrase, the days of the dog star, when Sirius, called by the Romans also Canis, the dog, is in the ascendant—the heliacal rising of this star occurring between July 20th and August 15th.

Words are usually supposed merely to convey ideas; as a matter of fact they sometimes dictate a new sense that is totally unjustified by their etymology, but that often usurps the place of the original signification intended. Dog-days is one of the most striking examples of this tyranny of words as it is called with regard to which the student of philology knows, that he must be ever on his guard because of its liability to mislead the incautious into unwarranted assumptions of word-meanings. This season of the year has had a bad name for special unhealthiness ever since the time of Hippocrates, but the dog-days were not in olden times supposed to be any more unhealthy for animals than for man and any possible special effect on dogs was not even thought of.

It is perhaps a good thing that there should be one season of the year, at least, during which the public takes to heart somewhat seriously the idea that hydrophobia is an ever-present danger in modern life, because of the number of dogs that are allowed to run at large through the streets of our cities. There is very little excuse for the presence of dogs in cities at all; except as a means of encouraging daily exercise in " the childless old," they have no good reason for being. Very few are watch-dogs in even the most liberal signification of that term. Most of them are spoiled pets, living unnatural, unhealthy indoor lives, waxing overfat, affording children and their elders opportunities for and training in the practice of tyranny. Meantime, every year, because of the unwarranted freedom allowed them, there is a distinct and by no means trivial human mortality from hydrophobia and an immense amount of worry and anxiety over dog bites.

As the result of the popular notion with regard to the greater risk of hydrophobia during the dog-days, the family physician finds many false impressions to correct at this time. Even the slightest scratch from the tooth of a dog, or the tingling of a cut on the hand after a dog has licked it, is apt to be exaggerated by the neurotic into a dangerous inoculation that may to their excited minds have a fatal ending. Such people may actually worry themselves sick for the time being, if they are away from the influence of a physician in whom they have confidence. While

an inoculation with canine saliva may, as is true of any saliva, even human, prove a ready source of purulent infection, needless to say there is never the slightest danger of rabies, unless the animal inflicting the wound actually has the disease. It is not a dog bite in itself, but the bite of a dog suffering from rabies that is dangerous. One of the special dangers in these cases is the ill-advised use of strong antiseptics, with the idea of prophylaxis. It is after slight dog bites on the fingers that the use of bandages dipped in carbolic acid have caused gangrene, and any physician who suggests even a 3 to 5 per cent. carbolic solution as a wash in such cases, must be careful to warn mothers and nurses of the danger of a wet dressing.

Another cause of anxiety during the dog-days when thoughts of hydrophobia are uppermost, is the possibility of an old bite causing rabies. The newspapers take advantage of the interest in the subject to give stories of persons bitten five, or ten, or even twenty years before, dying from hydrophobia. Such cases are either fabrications or errors of diagnosis. The infection of true rabies may perhaps lie dormant in the tissues for several months, though we believe there is not much evidence of the genuine disease having developed more than six months after the bite of a rabid animal. There are certain cases of pericarditis, however, in which the presence of the effusion within the pericardium gives rise to an irritation of the recurrent laryngeal nerve at its origin from the vagus. Some of its fibres are distributed to the muscles of deglutition and its irritation, therefore, causes a spasm of the constrictor muscles of the pharynx; even the thought of swallowing may bring this on, and the condition exactly resembles the set of symptoms that develop in true hydrophobia. The muscular spasm extending to the laryngeal muscles also may even give rise to the harsh sounds in the throat that in true rabies are popularly supposed to be barking, and this completes the illusion as to hydrophobia. If the pericarditis fails to be recognized, and it is a disease that is confessedly often missed, a history of a dog bite will readily give rise to the thought of long-delayed rabies. The pericarditis in these cases, however, has no connection with the dog bite. Nervous individuals may be assured a few months after a bite has occurred that all danger of the development of rabies is over.

Meantime the recurring wave of popular interest in hydrophobia because of the dog-days should be taken advantage of by physicians to create and extend a public opinion against our present loose habits with regard to the freedom allowed dogs. They are dangerous from many other points of view, besides that of rabies. They are the hosts of certain animal parasites

of human beings. Their uncleanly habits in nosing over excrementitious material in the street, make them eminently undesirable playmates for children, who permit them familiarities that may prove a source of disease. It is generally conceded now that they may be conveyors of certain of the ordinary infectious diseases. By the proper spread of knowledge in these matters, the popular philologic misconception of the dog-days may thus be made a source of good to the community that will help on the great cause of disease prevention better than any mere attention to hydrophobia could accomplish.—*Journal American Medical Association.*

News Items

LORD STRATHCONA has donated $10,000 to Laval University, Quebec.

ONE hundred and eight babies died in one week in July in Montreal.

THE Ontario and Quebec Boards of Health will take extra precautions regarding the spread of smallpox from the lumber camps the coming winter.

THE Ontario pharmacists will take a decided step in advance when they secure an improvement to the Pharmacy Act with regard to safeguards surrounding the sale of poisons.

DR. C. H. CHRISTIE, graduate of Bishop's College, has been appointed surgeon on the S.S. *Nyanga,* which left England on the 8th of August, bound for the West African coast.

DR W. H. GROVES, formerly of Toronto, has been appointed surgeon of the *Torquah,* the vessel selected for the Hon. Joseph Chamberlain and colonial party at the naval review at Spithead.

THE Executive Health Officers of Ontario will meet at Berlin on the 9th and 10th of September. A special report on vaccination will be submitted. Dr. P. H. Bryce, Toronto, is the secretary.

DR. THOMAS CHRISTIE, who represented the county of Argenteuil in the Dominion Parliament, died at Lachute, Que., on the 5th of August. He was graduated M.D. from McGill University in 1848. He had attained to the age of seventy-eight years.

DR. HORSEY, the Liberal member of Parliament for North Grey in the House of Commons, was recently accidentally killed by the bursting of a fly-wheel in the Owen Sound Cement Works.

DR. J. A. S. BRUNELLE, Professor of Surgery in Laval University, Montreal, died suddenly on the 7th of August at his summer residence, Mountain View, N.Y. Dr. Brunelle was born at St. Hyacinthe in 1852, and for the past twenty-seven years had been visiting physician at the Hotel Dieu Hospital, Montreal.

Selected Abstracts

ACUTE ANTERIOR POLIOMYELITIS.

The febrile symptoms at the onset of acute anterior poliomyelitis (R. T. Williamson in *The Practitioner*), the relation of the lesions to the anterior arteries of the cord, the vascular changes, the occasional occurrence of epidemics, and the result of experiments on animals, all appear to suggest the explanation that the disease is due to a toxin produced by the action of a micro-organism, the exact nature of which remains to be discovered.

Treatment at the onset should be rest in bed, on the side or in the prone position rather than on the back. Mild purgation and diaphoresis are of value, but the warm bath is not advisable; sodium salicylate may be of service during the febrile stage. Later, electrical treatment, massage and gymnastics should be tried; and after some years, when there is no hope of further improvement, orthopedic surgery should be considered. Tendon transplanting or grafting has been used with success.—*Archives of Pediatrics.*

GENESIS OF PULMONARY TUBERCULOSIS.

Ribbert (*Deutsche Med. Wochenschr.*) is convinced more than ever that hematogenic tuberculosis settles by preference in the apices of the lungs. The circulation in this part of the lung is defective, and, as Freund has shown, the lung is also frequently compressed by the premature ossification of the first costal cartilage. Another reason for the localization of the bacilli at this point is the defective ventilation which allows the bacilli entering the lungs from the blood to remain there undisturbed. Tuberculosis of the bronchial and tracheal glands is in the largest majority of cases due to extension of the disease from the lung apices. Tuberculosis of the apices is probably of secondary origin, although it may be possible that it is a primary inhalation tuberculosis. Inasmuch as

the primarily infected gland is not a favorable culture medium for the bacilli, they die and the gland heals unless the infection is severe or the subject predisposed to tuberculosis. All prophylactic measures should, therefore, be directed toward affecting a cure of the infected gland before there has been a sufficient infection of the blood to cause secondary tubercular foci, which invariably occur in the lung apex.—*The Medical Standard.*

CONGENITAL SPASTIC DIPLEGIA (LITTLE'S DISEASE) IN TWINS, WITH AUTOPSIES.

Twin sisters, aged seventeen days (Rolly, *Deutsche Zeitschr. f. Nervenheilk.*), were taken into the author's hospital. The father was syphilitic; the mother had given birth to fourteen children. The first of the twins was born spontaneously; the second with instruments, and was greatly asphyxiated. Both children showed the typical picture of a congenital spastic diplega. Both cases came to autopsy. Macroscopically, the findings in both cases were unimportant. The microscopical study of the central nervous system showed in both cases an enormous overgrowth of the neuroglia and the blood-vessels. There are only five cases in literature of such sclerotic changes in the brain in cases of congenital diplegia without paralysis. In three cases porencephalus was observed, and in one case hydrocephalus externus and internus. Of etiological interest is the probable inherited syphilis. Great stress is placed by Little on the difficult labor and asphyxia, which were present in only one of these children, and consequently could have played no part in the disease of the other.—*Maryland Medical Journal.*

ORIGIN OF ANGINA PECTORIS.

The clinical histories and histological studies of heart and aorta in several cases are given by U. Benenati (*la Riforma Medica*, May 3, 5, 6 and 7, 1902), as illustrating his idea of the neurotic origin of angina pectoris from syphilitic aortitis. Characteristic findings were: Lesions of the aortic plexus, hyperemia of the myocardium, no change in the coronary arteries, diffuse arteritis of the aortic vasa vasorum and of the vasa nervorum, vacuolation of the ganglion cells. The writer concludes that while, in general, the vascular origin of angina pectoris cannot be denied, cases occur which undoubtedly are due to lesions of the aortic or coronary plexus, and the cases cited are thought to justify the belief that in syphilitic angina pectoris, in which a coronary stenocardia might be considered probable, there exist changes in the aortic plexus and in the nerves of the heart. This alteration of aortic or cardiac plexus may be in the nature of a neuritis, or may be due to

changes in the vessels of the nerves, the functional effects of which would be equivalent to a lesion of the nerve proper. Such changes in the nerves or vasa nervorum are caused by a terminal obliterating endarteritis, pericellular infiltration, or embryonic gummata which irritate the vessels. These changes can, in the large majority of cases, be controlled by energetic specific treatment; hence the importance of early etiological diagnosis.—*Med. News.*

THE PATHOGENESIS OF BRONCHIAL ASTHMA.

Benedetto de Luca (*Rif. Med.*, December 6th to 10th, 1901), after discussing the various theories on the above question, says that in order to produce asthmatic attacks the re-action power of certain bulbar centres, especially the vasomotor, must be excited, the attacks themselves depending essentially on the special excitability of certain bulbar centres to various stimuli. Usually asthma attacks neuropaths whose nerve centres are very irritable, but non-neuropaths may be attacked. In the neuropaths the asthmatic attack may be the clinical equivalent of some other neurosis. The essential pathogenetic fact in a fit of asthma is the narrowing of the bronchial calibre, caused partly by circulatory disturbance in the mucous membrane and partly by spasm in the muscles of the broncial walls. In a complete attack both conditions must be present. The diaphragmatic spasm is a secondary result of the dyspnea, and must be classed with the similar spasm of the other accessory muscles of respiration. The bronchial secretion does not play any marked part in the pathogenesis of asthma, and the same applies to the spirals of Curschmann and the Charcot-Leyden crystals.—*British Medical Journal.*

GASTRO-ENTEROSTOMY.

Ferrier (*Rev. de Chir.*, April, 1902), who advocates the posterior in preference to the anterior method of gastro-enterostomy, gives the details of twenty-two cases in which he practised the former with a single death as a direct result of the operation. This favorable experience he attributes to the care taken in the preparation of the patient before the operation, and also during the after-treatment. Much importance is attached to frequent lavage of the stomach for some days before the operation, and also when dealing with very feeble patients, to the injection of artificial serum. After the operation the stomach is washed out from time to time, the author not hesitating to do this whenever the patient presents a dry tongue, suffers from acid or bilious

eructations, or is feverish. Endeavor is made to establish buccal antisepsis by means of mouth washes and gargles with the view of preventing infection of the parotid glands and septic pneumonia. From the beginning of the period of after-treatment it is useful, the author states, to give enemata in order to favor the evacuation of gas and fecal matter. Diarrhea, which often follows the operation, particularly in enfeebled and cachectic subjects, and which, when it occurs late, is a very unfavorable symptom, should be treated by washing out the stomach and large intestine and by the administration of bismuth and laudanum. To heal such condition by purgative would, it is held, be very dangerous practice. The author states that in none of his cases were any indications observed of the so-called vicious circle.—*British Medical Journal.*

BLOOD-COUNT IN VARIOLA AND VARICELLA.

The analysis of the results of numerous observations showed to E. Weill and A. Decos (*Jour. de Physiol. et de Pathol. Gen.*, May 15th, 1902) that varicella does not present any profound modifications in the cellular elements of the blood, differing in this respect from variola. In the latter disease the blood has the following features: The red blood-cells are diminished in number and nucleated red-blood cells are almost always to be found. There is a constant hyperleucocytosis. The polymorphonuclear leucocytes are diminished in number and the mononuclear leucocytes are increased. There is an augmentation in the number of the large mononuclear leucocytes with pale nucleus. Myelocytes are always present, and in a marked proportion. In contrast to the distinct changes in the blood of variola, the blood of varicella shows the following characteristics: The number of red blood-cells is normal and there are no nucleated red blood-cells. There is little or no leucocytosis. The polymorphonuclear leucocytes are normal or slightly increased, while the mononuclear variety are normal or slightly diminished. The large mononuclear leucocytes with pale nuclei are normal or even diminished in number. Myelocytes are absent. The authors conclude from the above observations that the blood-count in varicella differs markedly from that in variola, and that the examination of the blood is of eminent value in the diagnosis of these two affections, particularly when very difficult in the beginning of the disease.—*Medical News.*

Special Selections

EXAMINATION OF THE SPUTUM.*

BY HERMANN LENHARTZ, M.D., HAMBURG.

Affections of the air passages and lungs are usually accompanied by expectoration. Under expectoration is included all secretion discharged through the mouth by hawking and especially by coughing. Between expectoration and coughing there exists, as a rule an immediate relative dependence in so far as violent coughing usually promotes profuse, and less frequent and mild coughing slight, expectoration. There are, however, many exceptions to this rule.

Coughing is often very intense, still "nothing is loosened," because little, or only very tough, secretion is present; or expectoration is slight even in violent coughing, because the patients at once swallow the greater portion. The latter is the rule with children (up to the sixth or seventh year), and often the case in weak elderly people or seriously ill (typhoid, pneumonia, delirious, etc.) patients. On the other hand, large amounts of sputum are not infrequently raised by slight coughing or even by simple contractile movements of the chest (bronchoblenorrhea, bronchiectasis).

The sputum is usually of great semiotic significance, for it may furnish information in regard to the pathological processes occurring within the respiratory apparatus. It is clear, however, that in addition to essential constituents, the sputum will also contain a number of unimportant elements added to it during transit through the air passages. To the former may be referred such constituents belonging to the anatomical structures and which may be thrown off in inflammatory and necrotic processes; also such as occur only in disease as etiological factors or sequelæ of an especial disease. To the second group belong such elements which, *e.g.*, gain entrance to the sputum from the oral cavity or are added to it outside the body through the agency of unclean receptacles—spit-cups, etc.

For the proper judgment of the essential constituents of the sputum an accurate knowledge of the anatomical structure of the respiratory tract is absolutely necessary. For this reason a short histological sketch will first be given.

* From advance sheets of a "Manua of Clinical Microscopy," by Prof. Hermann Lenhartz. Authorized translation by Henry T. Brooks M.D., by courtesy of the publishers, The F. A. Davis Co., Philadelphia.

The nasal mucous membrane in the movable part of the nose is covered with lamellated squamous epithelium, and in the pars respiratoria with ciliated columnar epithelium. Likewise, the mucous membrane of the larynx, trachea and larger bronchi is covered by stratified ciliated epithelium, which is interrupted by mucus-secreting goblet cells. Only the posterior surface of the epiglottis, the anterior surface of the arytenoid cartilage and the true vocal cords are covered with lamellated squamous epithelium.

The epithelium of the bronchial mucous membrane gradually loses lamella until in the finer branches only a single layer of ciliated epithelium is present, which is continued to the beginning of the bronchioles. The ciliated epithelium, however, gradually passes over into an epithelium composed of a mixture of cubical and large nucleated and non-nucleated cells, which even in the neighborhood of the alveolar ducts consists chiefly of the large polygonal, flat, so-called respiratory epithelium. It has been determined by embryological research that the epithelium gradually becomes flattened only after respiration has become established. In still-born children cubical epithelium only is found in the alveoli.

Smooth muscle fibres accompany the bronchial tube down to the alveolar ducts and form a delicate ring at the point of origin of the alveoli. Besides these muscle fibres, the wall of the alveolar ducts is rich in elastic fibres, which are arranged as circular fibres and also surround the opening of each alveolus and from there send out branches which support the whole alveolus. By the immediate contiguation of neighboring elastic fibre rings, the alveolar septa are formed. The respiratory portions of the lungs are divided by connective tissue into small and minutest lobules; in the intertubular fibrous stroma are found black pigment and minute carbon granules which have been deposited there by respiration and the lymph current.

In spite of the achievements of physical diagnosis, the essential parts of the expectoration often first decide the diagnosis. Sometimes the characteristic feature is recognizable with the naked eye, sometimes only by aid of the microscope. For example, a stinking sputum mixed with tissue shreds often at once reveals the existence of pulmonary gangrene, while physical phenomena on the part of the lungs may, perhaps, be but slightly developed; on the other hand, microscopic examination of a stained preparation of the sputum may assure a diagnosis of pulmonary tuberculosis at a period in which percussion and auscultation will not permit a diagnosis of this disease. Since such cases are by no means of rare occurrence and the sputum presents many other

peculiarities which, as will subsequently be learned, direct the physician to a correct diagnosis, the semiotic significance of the expectoration is not to be lightly regarded.

The above-mentioned examples suffice to indicate that the macroscopic as well as the microscopic character of the sputum should be considered during examination. The former reveals the gross composition of the sputum of mucus, pus or blood; its amount and form and its odor and reaction; the other as to the essential elementary constituents and insignificant admixtures. Sometimes the macroscopic examination is of greater significance, sometimes the microscopic. Not infrequently the results of macroscopic examination render finer examination superfluous. Every careful examination of the sputum should, therefore, begin with thorough investigation of the macroscopic characters.

A reliable examination is possible only when the expectoration is received unmixed with other matter in a clean vessel. The ordinary glass sputum tumblers are preferable to the covered porcelain cups, because they permit rapid and ready observation of the quantity, color and stratification of the sputum. In some instances it may be desirable to receive the sputum in a glass cylinder partly filled with water in order to quickly determine the form and gravity, *i.e.*, the air content of the individual sputa. In general it is advisable to secure the sputum alone without the addition of water. The patients not confined to bed or house should be advised to carry with them the Dettweiler's sputum glass.

After the expectoration has been inspected in the sputum glass, it is more thoroughly examined by spreading it upon a porcelain plate, one-half of which is blackened with asphalt varnish. Small quantities only should always be taken from the sputum glass so that the secretion may be spread upon the plate in the thinnest possible layer. For examination the individual sputa should be drawn apart by two preparation needles (which, under certain circumstances, should not be made of metal) and the characteristic macroscopic features, subsequently to be described, carefully scrutinized. Each portion that has been examined is washed off and each new portion examined in the same manner.

Attention should generally be directed to the following points:

1. *The Quantity of Sputum.*—This varies within wide limits, from occasional sputa, to one or more litres in 24 hours. The largest amounts are observed in bronchorrhea, pulmonary abscess and gangrene and in ruptured empyema. In the latter

condition the amount expectorated may amount to 4 or 5 litres. In severe hemoptysis, also, the quantity is not infrequently quite large.

2. The color, which is dependent upon the admixture of mucus, pus, blood and serum. Accordingly, there is obtained the important division of the expectoration into mucoid, purulent, serous and bloody sputa, and according to the nature and relative proportion of admixture, into muco-purulent or purulent-mucoid, muco-hemorrhagic, etc., sputa. The color of the sputum is more light and transparent the greater the content of mucus or water, and the more opaque the more richly cellular it is, whether the majority of cells present are red blood corpuscles or pus cells.

The most common forms of expectoration are the following: Simple mucoid sputum, sputum crudum of the ancients, is of glairy or greyish-white appearance and sometimes of liquid, sometimes of tenacious, ropy consistence. According as it is raised easily or only after severe coughing, its air content varies. It occurs in every acute catarrh of the upper air passages and in bronchial asthma, also in chronic naso-pharyngeal catarrh in which, however, it is of tougher consistency and sometimes mixed with dried scabs.

In the muco-purulent expectoration, the sputum coctum of the ancients, it must be determined whether it is of homogeneous character or whether its composition of mucus and pus can be recognized at a glance by the gross separation of these constituents. The first, thoroughly mixed, muco-purulent, yellowish-white sputum, in which the mucus content is in excess, is observed during the decline of every simple catarrh of the upper respiratory tract; the other is encountered in many cases of chronic bronchitis and especially in pulmonary phthisis. Here, however, the excess of pus is usually distinctly manifest; consequently, the sputum is designated as purulent mucoid.

This occurs in two forms, the characteristic differences of which depend upon whether the pus coalesces or sinks to the bottom as separate, isolated, individual sputa. In the first case the fresh expectoration presents the gross composition of purulent "balled," yellow or yellowish-green sputis and mucus; only after some time separation occurs; the pus sinks to the bottom and coalesces to a more or less homogeneous mass, while the mucous layer separates above into an almost colorless stratum, or else the thinner mucus layer is traversed by denser threads.

This type of sputum is most frequently observed in bronchiectasis and in blenorrhea, but also occurs in those forms of

chronic pulmonary phthisis which are associated with severe general bronchitis, etc.

While this type of purulent mucoid sputum is not characteristic of any one disease process, the observation of the second is of more definite diagnostic significance. From ancient times "coin-shaped" (nummular) sputa have been looked upon as an important manifestation of phthisis. Such significance is also attached to it to-day, for this phenomenon is observed almost exclusively in this disease. The findings are most distinct when the contents of a cavity only is expectorated and the catarrhal phenomena are in abeyance. The nummular sputa are often of great volume, so that nearly half to one tablespoonful is expelled by a single expectoration; their color is usually dirty yellow or yellowish-green.

Pure purulent yellow sputum is most frequently expelled in pulmonary abscess and perforated empyema, but it also occurs in broncho-blenorrhea; the pus usually separates into two layers, an upper serous and a lower purely purulent stratum.

Bloody expectoration occurs in bright red and not rarely somewhat frothy form, in hemorrhages from pulmonary cavities, or from aortic aneurysm which have ruptured into the trachea or a bronchus, and mixed with mucus, in the cases of foreign bodies in the air passages. Bloody sputa grossly mixed with mucus or pus are regularly observed after subsidence of a severe phthisical hemorrhage. More uniformly blood-stained, purulent sputa occur in phthisical subjects with severe infiltration; on the other hand, occasional streaks of blood may be mixed with ordinary "naso-pharyngeal sputum" from the pharynx, especially when violent paroxysms of coughing are present. Dirty brownish-red sputum discolored by decomposition of the blood coloring matter, is observed in pulmonary gangrene. Of more frequent occurrence than the latter is the thoroughly incorporated muco-hemorrhagic "rust-colored" rubiginous sputum observed in pneumonic patients, which is of pathognomonic interest. When resolution of the inflammation is retarded, it sometimes assumes a deep yellow or grass green color, owing to the transformation of the blood coloring matter, or it changes to a brownish or prune-juice color when the dreaded complication of (inflammatory) edema is added to croupous pneumonia. Pure bloody or tenacious mucoid sputum mixed with blood is observed in pulmonary infarction; it frequently resembles exactly the sputum of pneumonic patients.

Not infrequently the sputum presents a raspberry-jelly-like appearance in neoplasms of the bronchi or lung tissue, and the

same character of sputum is occasionally observed in hysteria (E. Wagner).

Purely serous sputum is whitish fluid, transparent and is characterized by its high albumin content. Owing to the difficulty with which it is expelled, it is often mixed with air in the form of large or fine bubbles. It is most often observed in ordinary pulmonary edema, less frequently in the "expectoration albumineuse" following paracentesis of the pleura, in valvular lesions and tumors of the chest cavity. In inflammatory pulmonary edema it is more or less blood-stained and then resembles "prune juice" (see above).

3. The tenacity of the sputum is chiefly due to admixture of mucus. The sputum is usually extremely tenacious in pneumonia, asthma and neoplasms. It is so coherent that it is often necessary to cut off the portion to be examined.

4. The odor is usually "stale;" in fetid bronchitis it is more or less offensive, in gangrene putrid fetid. According to Leyden, the pus discharged from a ruptured empyema often smells like old cheese.

5. The reaction is usually alkaline.

Macroscopic Examination.

If the sputum be spread upon a plate in the manner above described, a number of peculiarities may be seen with the naked eye.

1. *"Rice Bodies"* (*"Linsen"*)—These bodies, the "famous corpuscula oryzoidea" of the ancients, are found in the muco-purulent sputum of consumptives and especially in and between the nummular masses at the bottom of the vessel. They are smooth, whitish-yellow, opaque, flattened or biconvex bodies varying from a pin-head to a lentil in size. They can readily be isolated by means of a needle or pincette and spread by slight pressure into a transparent layer between a cover-glass and slide. It is advisable to employ for examination only a small fragment no larger than the head of a pin. Small, mucus-covered crumbs of bread may be mistaken for these bodies. Usually, the difference can be noted when pressure is made upon the cover-glass. The genuine "rice-bodies" can be crushed like cheese; the bread crumb slides from under the cover-glass. Dittrich's plugs (see below) may also resemble "rice bodies." The microscope will decide the question. The "rice bodies" are of great diagnostic value, because they contain elastic fibres and tubercle bacilli.

2. *Fibrin Coagula.*—These occur in almost every case of

croupous pneumonia from the third to the seventh day of the disease, *i.e.*, during the stage of hepatization. They are slender, yellowish-white or yellowish-red threads, 2 to 3 mm. thick and 1-2 to several ctm. long. They are not infrequently decidedly dendritic.

(The author found in a typical case of pneumonia a tree-like branching coagulum 12 ctm. in length. The shorter threads are seen on careful examination much more readily than the longer ones, because the latter are not rarely rolled upon themselves. By shaking with water in a test tube, the coagula can sometimes be found more easily. The number of coagula is very variable. It is not rare to find 20 to 30 or more in 24 hours. Their fibrinous character is shown by their swelling and solution in acetic acid.

The coagula appear in a highly characteristic form, as "bronchial trees," in croupous or fibrinous bronchitis. Under such circumstances they are usually few in number, but sometimes attain such a size that it may safely be concluded that a large portion of the bronchial tubular system is occluded. These tree-like, coagular are usually white, but are occasionally tinged a whitish-red. They most frequently appear in tubular form, less often as solid or flat, smooth, formations. It is by no means rare for the trunk as well as the branches to show protrusions which are no doubt partly due to air. Occasionally the contents of the tubes themselves is bloody or mixed with blood; more frequently, however, they are filled with air. They are a constant accompaniment of the above-mentioned disease, which frequently occurs idiopathically or primarily, less often in diphtheria. They are easily overlooked by the inexperienced, because they often do not appear in the sputum as distinct coagula, but rolled up in a more or less dense coil; they are recognized by the experienced by their peculiar resemblance to meat fragments. By shaking in water, the coils can readily be unraveiled and the branching, tree-like coagulum brought to view. If on examination of the sputum neither these coils nor isolated thread-like forms are found, it is then advisable in every case of croupous bronchitis or pneumonia to carefully wash the sputum in a sputum glass.

3. *Curschmann's Spirals.*—In the glassy-slimy or tenacious-serous, slimy-foamy expectoration of asthma patients, there are found with more or less regularity small flocculent or fine cylindrical structures which are characterized by their greyish-white or whitish-yellow color and a spiral twisting or transverse marking which is frequently recognizable even with the naked eye. For a more detailed description, etc., see "Sputum in Bronchial Asthma."

4. *Dittrich's Plugs.*—In the yellow or greenish-purulent sediment of the sputum of fetid bronchitis and pulmonary gangrene (less often in chronic abscess of the lung and in phthisical sputum), there are usually found numerous whitish-yellow, smooth, pin-head to bean-sized granules, which can readily be "fished out" with a needle. They have an extremely offensive odor, are of cheesy consistency and can readily be crushed. In addition to myriads of bacteria, common to the oral cavity, they contain numerous fat crystals and occasionally monads.

5. Large fragments of tissue are found almost exclusively in pulmonary gangrene. They appear as greyish-yellow or discolored, occasionally distinctly black, shreds embedded in mucoid pus. Their nature can be determined only by the microscope, since they usually consist only of a connective tissue or, more rarely, of an elastic tissue stroma.

6. Calcified concrements, membranous remains of the echinococcus, etc., are rarely observed in the sputum. They will be considered in the appendix.

Microscopic Examination.

This leads to a satisfactory result only when a critical scrutiny of the sputum has previously been made, and it confirms many interpretations which a simple inspection of the sputum could render only probable.

In the microscopic picture there may be found:

1. *Red Blood Cells.*—After a true hemorrhage these appear not only unaltered in form but also in rouleaux. In the rubiginous expectoration they are seldom arranged in the form of rouleaux, but more isolated side by side. In old sputum, so-called red blood cell "shadows" are also observed.

2. *Colorless (white) Blood Cells,* pus corpuscles, constitute the majority of all the cellular elements observed in the sputum. Their size varies and likewise their form. Almost all of them are multinucleated and the majority present neutrophilic granules; only in the sputum of asthmatics are numerous eosinophile and quite numerous basophile leucocytes regularly to be found. W. Teichmuller ascribes to the increased number of eosinophile cells in the sputum of tuberculous subjects a favorable prognostic significance.

The leucocytes possess the property of taking up in their cytoplasm various substances. Coal pigment, altered blood coloring matter, etc., are frequently observed within these cells. Furthermore, it is not improbable that the majority of the cells designated as "alveolar epithelia" are variously altered forms

of leucocytes. The protoplasm very frequently shows fine or coarsely granular fatty metamorphosis, which is characterized by the strongly refractive index. Other cells likewise present considerable coarse granulation; here, however, the spherules show a decidedly dull appearance resembling that seen in crushed nerve substances. For this reason they were designated by Virchow as myelin droplets. These large dull spherules are also found outside of the cells. The shape of the cells containing them is sometimes round, sometimes ovoid, at other times somewhat polygonal. In addition to the droplets, one or several vesicular nuclei are visible.

Such cells can be seen in almost every sputum, even in sputum from the naso-pharynx of otherwise healthy individuals. Consequently, the interpretation of these cells as alveolar epithelium has been and is now justly combatted. Distinguished clinicians and pathological anatomists (E. Wagner, Cohnheim) has strongly emphasized the unreliability of the data asserted in support of their epithelial character. Nevertheless, at the present time there appears to be a decided tendency to accept as correct the view that they are epithelial in nature. When discussing the so-called "heart-lesion cells," we will again refer to this mooted question.

3. *Epithelia.*—Corresponding to the various kinds of epithelium present in the different mucous membranes lining the respiratory passages, there is found in the sputum, squamous, cylindrical and ciliated epithelium. The first is found in large numbers in naso-pharyngeal sputum (morning or choana sputum). Cylindrical cells are often met with, especially in the first stages of acute catarrh of the upper air passages and in violent paroxysms of coughing. Ciliated epithelium is seldom observed, but not so rarely as is generally stated. In the first days of acute catarrh (coryza and the like) and more so in a severe asthmatic attack, ciliated epithelium is frequently seen. The preparation must not be too rapidly gone over, because, as a rule, the ciliary movements can be observed only after the field has been watched for some time; furthermore, freshly expectorated sputa must be examined.

In the more chronic forms of bronchitis, cylindrical epithelium is rarely found, and ciliated epithelium almost never.

While the squamous epithelia almost always preserve their size and strongly refractive nucleus, the cylindrical and cylindrical ciliated present manifold morphologic changes. Sometimes they are greatly swollen and glassy, sometimes they are distorted in shape and provided with more or less large, tail-like prolongations. In addition, their protoplasm is, as a rule,

altered, more coarsely granular, fatty, etc.; the nucleus, however, is usually distinctly preserved.

The "alveolar epithelia" have been considered under Section 2. The author believes positive identification as extremely difficult. We usually understand thereby the large, oval or round, also polygonal cells, three to six times as large as a white blood corpuscle, which are found in almost every sputum. The usually large cell body is coarsely granular and contains one or several "vesicle-like" nuclei. Very frequently the protoplasm shows the fine, highly refractive fat droplets or dull translucent myelin spherules already described in connection with leucocytes. Not infrequently these are drawn out into peculiar shapes or have coalesced to form large droplets. The fat and myelin as well as the pigment granules taken up by the protoplasm are often so densely heaped together that the nuclei are obscured. We will refer to their origin and significance when discussing the so-called "heart lesion cells."

4. *Fatty Detritus,* formed by the fatty degeneration of cells, occurs frequently in the form of very fine and somewhat coarser fat droplets. They are found especially abundant when the sputum presents a purulent character. The detritus occurs, among other conditions, quite abundantly in pneumonic sputum, at the time of resolution of the exudate. It is of no especial diagnostic significance.

5. *Elastic Fibres.*—These are sometimes observed as isolated fibres, but are more frequently arranged in a delicate network (reticulum). They are distinguished from other similar elements, especially connective tissue fibres, by their dark, sharp outline—double contour—their high refractive index and their decided resistance to acids and alkalies. The inexperienced are liable to mistake fat crystal needles and foreign admixtures (wool and linen fibres) for them. Fat crystal needles liquefy and form fat drops on heating; while the elastic fibres remain unchanged.

Under certain circumstances the elastic fibres may be derived from remnants of food remaining in the mouth; as a rule, however, these fibres are coarser and show neither the serpentine contour nor alveolar arrangement characteristic of those derived from the lungs.

The elastic fibres occur most abundantly in the above-describe "corpora orizoidea." In crush preparations made from portions of these bodies they are quite distinctly shown, usually without addition of acetic acid. If these bodies are absent, the different portions of the sputum must be examined and small particles, about the size of the head of a pin, removed from the

dense, greenish, yellow masses and crushed between a cover-glass and a slide; or some 10 per cent. potassium or sodium hydrate (caustic) solution may be added to the sputum. Should these methods not succeed after several preparations have been made, some of the sputum—a tablespoonful—must be mixed with an equal amount of 10 per cent. caustic potash (or soda) and boiled until dissolved and then diluted with four times its volume of water and allowed to deposit a sediment in a conical glass. After 24 hours, the supernatant fluid is poured off and some of the flocculent sediment taken for examination. The elastic fibres lose some of their sharpness of outline by this method.

Aside from phthisis and the rare ulcerative process of the upper air passages as a result of syphilis, elastic fibres occur principally in pulmonary abscess, less often in pulmonary gangrene. In abscess they occur sometimes in small, white or greyish-yellow plugs or flakes of the tan-colored or purulent sputum, or, and this is to a certain degree characteristic, in long tissue shreds which, in addition to many dense bundles, always show a delicate alveolar recticulum.

In gangrene the elastic fibres are very frequently lacking. because they are dissolved (digested) by a trypsinoid ferment first described in this sputum by Filehne. Nevertheless, unquestionable exceptions have been observed by reliable authorities who, in addition to the connective tissue fibres mentioned by Traube, detected dense tissue shreds composed of elastic fibres in pulmonary gangrene. The author himself has repeatedly met them in gangrene of the lung, and in a meta-pneumonic pulmonary gangrene he observed for about eight to ten days the expulsion of 5 to 10 ctm. long, greyish-black tissue shreds in which the elastic fibres were very well preserved. On the other hand, he has never seen elastic fibres in bronchiectasis, in the sputum of which condition they are said to occasionally occur, unless gangrene had supervened.

6. *Fibrinous Coagula.*—The coagula visible to the naked eye in croupous pneumonia and bronchitis show distinct fibrin structure on microscopic examination. They consist of delicate and coarse highly refractive fibrillæ, which are usually arranged parallel in dense bundles, not rarely intertwined to form a dense, felt-like structure, and surrounded by a greater or lesser collection of leucocytes. Red blood cells are, likewise, frequently present in large numbers, and not rarely Charcot's crystals also.

The question raised by the fibrillary arrangement as to whether the appearance might not be due to closely approximated threads of ordinary mucus, is decided by the fibrin

reaction. If the threads dissolve by addition of acetic acid or are made more transparent, the diagnosis of fibrin is assured.

While pneumonic fibrin coagula can be quite readily teased out (broken up) and used for crush preparations, the firm, occasionally laminated coagulum of bronchial croup offers a greater resistance to these procedures. Usually it is possible only to break up (tease) into smaller and smaller clumps, which, however, are only in a few places generally sufficiently transparent to show that it is composed of a homogeneous, glistening, net-like stroma. By addition of acetic acid the clumps are made to swell (the minute, fibrillary structure, however can be recognized only in sections made from the membrane which has been hardened in alcohol).

7. *Curschmann's Spirals.*—The microscopic description will be given when discussing the sputum of asthma, in which they are almost exclusively found. Occasionally they are also found in the sputum of croupous pneumonia and bronchitis, as well as in pulmonary edema.

8. *Crystals* : Charcot-Leyden crystals; fatty acid needles and rosettes; cholesterin plates and hematoidin or bilirubin crystals, much rarer, tyrosin, leucin and several others.

The Charcot-Leyden crystals are delicate, very sharply pointed octahedra, which occur in very variable size. They present a sometimes water-clear, transparent, sometimes a slightly yellowish-green, rhine-wine-like color; they occur either isolated or in dense collections, which here and there are jumbled together, or in uniform rows, following the mucus shreds. They usually present well-marked pointed ends. In some crystals a distinct transverse fissure is seen, others present at their margins or surface bulgings or a peculiarly undulated contour or the absence of a point. Others, again, show instead of the smooth surface, finely granular inequalities, which indicate beginning disintegration. Some disintegration forms can be explained as derivatives of the crystals only by the grouping of dim droplets.

The crystals were first found in the sputum by Friedreich in croupous bronchitis. On the other hand, Leyden had drawn attention to their frequent occurrence in asthmatic expectoration. Since Charcot saw the same kind of crystals in the blood and spleen of cases of leukemia, the crystals have received the names of both investigators.

As has already been briefly stated, the crystals are of very frequent occurrence in the sputum of bronchial asthma embedded in the spirals. They are by no means rarely observed in fibrinous bronchitis. The fact that the crystals occur especially in the old spiral formations, it is probable that they are in some way

connected with "regressive metamorphosis of the round cells" (Curschmann). In the author's opinion their development from cylindric (ciliated) cells is more probable. Salkowski's investigations are in harmony with this view. This authority, considering the optical (physical) and chemical characteristics of the crystals, concludes that they represent a crystalline mucinoid substance. The longer the asthmatic subject is free from paroxysms, that is, the more time allowed for the formation of the crystals, the more densely the spirals are studded with these crystals. The fresh mucous coagula which have remained but a short time in the moist warmth of the bronchi, show but few or no crystals. That they, however, could have developed in them, also, is shown by the experiments of Unger who, by allowing asthma sputum to remain in a moist chamber, was able to secure crystal formation which was previously absent. Consequently, the crystals which Curschmann justly designated as "accidental formations" otherwise resemble in every way the spiculate octahedra observed in the blood and spleen of leukemia as well as those in the stools. They are very unstable and difficult to preserve in preparations, but they preserve their characters for months in decomposing sputum. They are readily dissolved in warm water, acids and alkalies, but are insoluble in alcohol.

They may be permanently preserved by the following method: The thinly spread layer of coagulum containing the crystals is hardened in 5 per cent. sublimate solution for about five minutes, or for half an hour in absolute alcohol. Then stained in weak alcoholic solution of fuchsin (cleared in xylol) and embedded in Canada balsam. Fixation of the air-dried preparation for one hour in absolute alcohol and subsequent staining with Chenzinsky's eosin-methylene blue solution also gives very good results.

Fatty acid crystals occur chiefly in the form of margarin needles. These are delicate, transparent, usually very beautiful long, curved, needles which are seldom isolated, and usually appear arranged in dense broom or sheaf-like bundles. Here and there they lie in groups and appear in reticular arrangement so that they may give rise to confusion with elastic fibres, especially when their contour is very sharply defined and highly refractive. They are, however, never dentritic like elastic fibres. If the object glass be heated the needles rapidly dissolve. They then present "distended" places in their contour (where solution begins). By strong pressure upon the cover-glass such changes in form can also be produced without previous heating. Water and acids do not affect the needles; caustic alkalies dis-

solve them with difficulty. The needles are completely dissolved by ether and warm alcohol. The crystals are constantly present in Dittrich's plugs in fetid bronchitis and pulmonary gangrene. They also occur in the small yellowish fragments which are expectorated by many perfectly healthy individuals by simply hawking and have the odor and consistence of cheese. These formations are found in the stagnating secretion of the small mucous glands between the circumvallate papillæ and the epiglottis, as well as in the lacunæ of the tonsils.

Rosette fatty crystals are much seldomer found in the sputum. They appear as rosette-formed structures which may sometimes present great similarity to actinomyces. They never form large agglomerations, however, occurring usually only as isolated small rosettes. They have a dull yellowish color and are somewhat translucent. Heating of the preparation, ether and alcohol rapidly dissolve them and at once identify them as fatty crystals.

Cholesterin occurs in the well-known, small and large, rhombic plates, which are grouped together in large numbers, superimposed and isolated and not infrequently present notched and step-like margins. They are seldom observed in the sputum. They are most frequently observed in the pin-head sized to lentil-sized greyish-yellow masses seen in acute or chronic pulmonary abscess. The author twice observed these crystals in very stale-smelling, muco-purulent tuberculous sputum.

They are readily soluble in ether and hot alcohol; and insoluble in water, alkalies and acids. On addition of sulphuric acid, solution begins at the margins and produces a reddish-brown glistening edge until the whole is transformed into a similarly stained drop. If some Lugol's solution is first allowed to act upon them, the brownish crystals assume a bluish-red, green and blue play of colors.

Hematoidin crystals occur in the form of brick-brown or ruby-red rhombic plates or columns and as delicate bowed similarly colored needles. The latter rarely lie isolated; usually they are arranged side by side or superimposed in groups. They frequently appear as though they were in immediate contact with the platelets. They are seen radiating in the form of brushes or whisps from the four corners of the plates. As a rule, they are seldom observed. They are to be looked for in every case of pulmonary abscess. Here they are usually found in the grey or brownish-yellow granules, but also in the dense yellow pus. The author found them once in a perforated empyema and once in a case of croupous pneumonia with retarded resolution. Here attention was at once directed to

them by the peculiar saffron-yellow color of the purulent sputa. Ochre-yellow expectoration with numerous hematoidin (bilirubin) crystals is found in perforation of hepatic echinococcus into the lung with synchronous opening of the bile ducts, seldomer in perforation of old pleuritic exudates. In such cases the sputum is characterized by a gall-bitter taste. The crystals are met with most abundantly in small brownish masses found at the bottom of the sputum vessel.

The genesis of these crystals and their other features will be discussed when describing the characters of the sputum in cardiac valvular lesions:

Rare crystalline formations:

Tyrosin occurs in the form of delicate glistening, colorless conglomerate needles which usually form double whisps. They originate during proteid putrefaction induced by bacteria or ferments and are formed only in old pus foci perforating into the lung (von Leyden-Kannenberg). That a certain period of time is necessary for their formation is shown by an observation made in von Leyden's clinic, in which tyrosin was lacking in rapid emptying of the pus, while it was invariably present when the purulent matter had been retained (with exclusion of air) for some time.

Demonstration.—Some pus is allowed to dry upon a glass slide; the crystals which were previously in solution now develop in characteristic form and can usually be very distinctly seen, particularly at the margins.

Tyrosin is readily soluble in hot water and ammonia, and dilute hydrochloric and nitric acids; soluble with difficulty in acetic acid and is insoluble in alcohol and ether.

Leucin occurs almost constantly associated with tyrosin, but much less frequently than the latter. It likewise develops in connection with proteid decomposition by the action of unknown ferments in purulent sputum. It forms dull glistening spherules which occasionally show a distinct radiate or concentric marking, and are readily soluble in hot water, dilute acids and alkalies, and insoluble in ether, and are thereby distinguished from large fat drops.

Leucin can be demonstrated by allowing some of the pus to be examined, to dry upon an object glass or on evaporating by gentle heat.

Crystals of triple phosphate (ammonio-magnesian phosphate) in the well-known coffin-lid form; calcium oxalate in the form of envelopes (found by Unger in asthma and by Furbinger in diabetes), finally, calcium carbonate and phosphate

may be mentioned as unusual constituents of the expectoration (see Section V).

Vegetable Parasites in the Sputum.

Here the leptothrix buccalis and thrush fungi (soor, aphthæ) may be briefly mentioned, which may be present in the sputum as unimportant constituents. The morphological features of these forms of fungi have already been described in Section I. If long thread-like fungi are found in the sputum both of the just mentioned forms should first be thought of.

Very much seldomer there may be seen in the sputum the fungous elements belonging to the aspergillus (fumigatus) and mucor (corymbifer) which belong to the mold fungi already considered. These are scarcely ever seen in the healthy air passages, but may find location, although rarely, in diseased persons in whom decomposition processes in the lung tissue have developed, as a result of tuberculous caseation, or in connection with pneumonia and hemorrhagic infarction.

In the sometimes bloody-purulent, sometimes only muco-purulent expectoration, caseous fragments may attract attention. Microscopically, there will be found in addition to elastic fibres the mycelia and fruit hyphæ of molds.

Under certain circumstances attention should be directed to the elements of actinomyces. The simply muco-purulent, much seldomer bloody-mucoid, occasionally pure raspberry-jelly-like sputum shows here and there isolated minute gritty whitish or greenish-yellow granules, which on pressure under a cover-glass show, in addition to numerous dull or highly refractive, coccoid bodies, wavy, in part branching and segmented threads with club-shaped ends. Typical actinomyces (rosettes) with thick threads and clubs also occur. In addition, elastic fibres occasionally, always many fatty degenerated leucocytes and fat granule cells.

In addition to these, a great variety of fission fungi occur in the mouth, whose admixture with the sputum must be recognized as wholly insignificant. If it is desired to gain information in this direction, all that is necessary is to scrape the gums and back of the tongue with a spatula and examine microscopically the material thus obtained unstained. Cocci, bacilli and spirilla will then be seen in active motion, which in the latter especially is effected by independent movements, in the others only by virtue of Brownian molecular movements.

In the section on bacteria it has briefly been mentioned that diplococci of the same nature as Fraenkel's and Friedlaneder's

cocci occasionally occur in the nasal and oral mucus of healthy individuals. This fact must be borne in mind when an examination of the sputum for pathogenic bacteria is undertaken.

The following pathogenic bacteria are of especial importance:

1. R. Koch's tubercle bacillus. It occurs "in pure culture" in the lentil-shaped necrotic plugs (masses) which show by their content of elastic fibres their origin from lung tissue. Usually, however, they must be looked for in the yellowish or greenish-yellow pus. With very few exceptions it can be found in every purulent or muco-purulent sputum from a tuberculous subject. More frequently bacillary examination of a chiefly mucoid sputum gives negative results. That the bacilli occasionally occur in conjunction with (micrococus) tetragenus has already been stated.

2. Fraenkel's Pneumococcus.—This is of very frequent occurrence in the rusty sputum of pneumonia patients without offering any differential diagnostic basis.

3. Streptococci and staphylococci are not uncommon. To the former as is known, a certain etiological role in many forms of pneumonia can be attributed (Weichselbaum); the others are occasionally observed in pus from abscess or perforated empyema.

4. The glanders bacillus should be looked for when peculiar affections exist in coachmen, hostlers, etc.

5. Anthrax bacilli are observed in wool-sorters, rag-pickers, etc., as concomitants of pulmonary mycosis.

6. Diphtheria bacilli are of importance only in so far as they occur in the expectorated membranes found in secondary croup.

7. Influenza bacilli are found quite constantly in the purulent sputum of la grippe patients.

The methods of demonstration and the peculiarities of the microbes are given in Section 1.

Of the animal parasites there appear in the sputum echinococcus vesicles, distomum and cercomonas.

The first are found as well preserved vesicles or manifest their presence only by shreds of membrane or hooklets. They come either from the lungs, where they chiefly settle in the right lower lobe, or from a ruptured suppurated echinococcus, which, as a rule, is situated in the liver, or more rarely in the pleura.

The sputum is always bloody in pulmonary echinococcus, or when there is communication with the liver, bile stained, or ochre-yellow colored. The membrane shreds are characterized by their uniformly white color and their tendency to curl (roll up) at the margins.

Microscopically there is seen in finely teased older lamellæ perfectly parallel striation which is wholly characteristic for echinococcus membrane; in the younger and more delicate formations this striation is not usually distinct. In such cases the diagnosis must rest upon detection of the wreath of hooklets and isolated hooklets which are obviously positive evidence of the existence of echinococcus.

The scolices are rarely found and only in an injured state; the hooklets, whose resistance power is much greater, are oftener seen. Not infrequently it is necessary to centrifuge the sputum.

The contents of the vesicles is a perfectly clear watery fluid which is free of albumin, but contains succinic acid and sodium chloride.

Distomum pulmonale (Balz) usually manifests its presence in the air-passages by a slightly, tenacious mucoid light, or dark red expectoration in which the blood is present punctiform or in streaks or very decidedly in excess of the other constituents; severe hemoptysis is rare.

Microscopically, there are observed in addition to white and red blood cells and numerous Charcot's crystals, unquestionable parasite ova, which can be recognized even with a hand lens as brown points. They are ovoid in shape and possess a thin brown shell.

The occurrence of cercomonas in the expectoration derived from a freshly opened tonsillar abscess, as well as its frequent appearance in the sputum in pulmonary gangrene has already been referred to. Wagner saw similar objects occasionally in hysterical sputum.

Appendix.

Pulmonary calculi (lung stones) are rarely observed in the sputum. They are expectorated in lentil to bean size and have a stoney, hard consistence: they are sometimes smooth, at other times covered with small and large, blunt or spiculate processes, or are somewhat branched. They form in retained bronchial secretion, probably in small diverticula or depressions in the bronchial tube; rarer in the inspissated stagnating contents of a cavity whose bronchus has become occluded. Calcification of the infiltrated tissues, which so frequently accompanies tuberculous cicatricial formation, may also lead to the formation of stoney, hard, coarse concrements which may gradually become loosened by disintegration of the surrounding tissues and be expelled by violent fits of coughing. Finally, exfoliation of calcified bronchial glands and their appearance in the sputum has been observed.

If small fragments of such stones are scraped off and the reaction produced by addition of hydrochloric acid examined under the microscope, there will invariably be observed distinct CO_2 formation, a proof that they are composed of calcium carbonate.

Many of the foreign bodies which enter the bronchi may be dislodged and expelled by fits of coughing. The sputum of such patient, provided the condition is acute, is usually bright, bloody, foamy, but often assumes a distinctly fetid character. Aside from a great variety of foreign bodies, fruit kernels and seeds, peas, rye beards, blades of grass, etc., are especially worthy of mention. In a case observed by the author, a piece of kalmus which the patient to gain relief had stuck in the cavity of an aching tooth, entered the air passage during the night and quickly excited violent symptoms of asphyxia with profuse, bright bloody, muco-foamy expectoration. In another case a grain beard, which had entered the bronchi, gave rise to intermittent fetid bronchitis for a period of ten years. Rye beards frequently excite pulmonary abscess. Israel saw pulmonary actinomycosis develop from aspiration of a fragment of a tooth. Out of a gangrenous pulmonary cavity operated upon by the author, several foul smelling tooth fragments were expelled through the fistulous tract.—*The Post Graduate.*

THE PREVENTION OF CONCEPTION—A CRITICISM OF SOME METHODS.*

BY G. KOLISCHER, M.D., CHICAGO, ILL.

The prevention of conception is not only a sociologic problem of importance, but it is of interest in a medical sense. I shall not refer to operative measures for sterilizing women, but only discuss the mechanical devices for preventing conception.

These can be divided into two groups—one used by men, the other by women. The latter are of greater medical interest because of their increasing popularity and their influence on the general health. These devices are constructed after the manner of a pessary, and are intended to grasp the portio-vaginalis in such a way as to occlude the external os and prevent the entrance of the spermatozoa into the uterus.

* Read before the Chicago Medical Society, May 16th, 1902.

In preventing conception these devices are unreliable, as a skilled hand is required to place them in proper position. Their supposed efficacy is enhanced by the fact that they are used by individuals whose intercourse is sterile, from occluded tubes, endometritis, epididymitis, or prostatitis. But these considerations are of only individual interest. The fact that these devices may be dangerous to both parties gives the subject a general medical interest.

The occlusive pessaries used in preventing conception consist of a rubber ring with a central diaphragm, the latter modified in various ways, or the whole pessary is formed of soft rubber, in the form of a cap with a thickened rim, the latter firmly grasping the cervix. As a rule such pessaries are inserted after the menstrual period and left in position until the next menstrual flow. This practice is a menace to the health of both sexes. Gynecologists know that certain vaginas do not tolerate soft rubber; it causes an intense congestion with profuse secretion.

Pathogenic germs are always present in the vagina, but their virulence and viability are greatly reduced. A change in the environment alters their virulence; in a few generations they may become so virulent as to excite an inflammation which varies in character with the germ. A copious catarrhal secretion may undergo decomposition when retained and awake the potential virulence of these germs. Such an altered secretion may infect the male urethra, or cause an ascending inflammation of the female pelvic organs. Such cases have been observed in which gonorrheal infection could be certainly excluded. I append a few cases which support these views.

The wife of a physician married for eight years had borne three healthy children, when one of the above-mentioned contrivances was used. The husband, perfectly familiar with the modern professional views concerning gonorrhea, and aware of the importance of truth in this matter, emphatically denied ever having had any infection. He willingly submitted to all kinds of examinations, which proved the truth of his statements. I had occasion to examine the wife repeatedly and carefully, as I conducted all the confinements. Never up to the time of the above-mentioned incident was there any infection. The soft-rubber cap was introduced after menstruation and kept there until the next period, and daily irrigations were used. In the second month of the use of the pessary the wife noticed a rather offensive discharge, while pain in her right side set in. Shortly afterward the husband appeared in my office very

much concerned, having noticed a purulent discharge from the urethra; this discharge appeared the day following the last intercourse. The pain during urination was slight. That the urethritis was not gonorrheal was proven by microscopic and culture tests. The short incubation and the disappearance of the discharge inside of a few days without treatment confirmed the diagnosis of a non-specific process. The examination of his wife showed a typical vaginitis with a copious cream-like secretion. In removing the cap, quite an accumulation of pus in its cavity was found. Cervicitis was present, the right parametric tissue infiltrated and sensitive, the right ovary enlarged and painful. The removal of the pessary and antiseptic flushings and the four times repeated cleaning of the cervix with formalin caused the prompt disappearance of all symptoms.

In the second case the husband married after a successful treatment and a cure of chronic gonorrhea. The wife became pregnant shortly after the wedding, and in due time was delivered of a healthy child. Labor and lying-in period were uneventful, and husband and wife enjoyed perfect health until half a year after the confinement, when the use of a preventive soft-rubber pessary was commenced. After this pessary was in the vagina for about three weeks, the husband was suddenly attacked by urethritis. The accused intercourse took place about twelve hours before the discharge was noticed. Examination of the woman revealed copious discharge from cervix and vagina, erosions on both lips, and a change of the cervical mucous strand to a yellowish mass. Search for gonococci gave a negative result. The discharge from the male urethra proved non-gonorrheic, but extension of the inflammation to the posterior urethra and prostate set in the week after the first symptoms appeared, and it took four months to cure the patient. All the time microscopical examinations and culture tests failed to show gonococci. The extension of the inflammation to the posterior urethra and appendages is somewhat similar to the well-known phenomenon, that every time a gonorrheal reinfection takes place the posterior urethra becomes involved. This incident proves at the same time how serious even a non-specific purulent infection of a urethra is, which has once been subject to gonorrhea. The symptoms in the woman were mild and subsided under antiseptic flushings and ichthyol.

In the third case both marital partners have had a chronic gonorrhea. The husband has shreds in the urine, mostly consisting of mucus and a few pus cells. Gonococci show up occasionally, especially after alcoholic excess. The symptoms in

his wife did not exceed the presence of chronic urethritis and cervicitis. In the secretions of both gonococci could be found. Repeated bimanual palpation failed to reveal changes at the uterine appendages. Both parties felt quite comfortable until the husband, in order to get rid of the frequent urinary calls, underwent an energetic treatment of his chronic gonorrhea. This treatment, consisting in dilatations, instillations, etc., cured, according to his physician's opinion, the chronic process. The husband, afraid on account of his improved condition that his wife might become pregnant, following the suggestion of his family physician, had his wife use a soft-rubber pessary. In about six weeks the wife was taken with a serious attack of inflammation of the uterine appendages and pelvic peritonitis. She said in her history that shortly after the pessary was inserted she noticed an increase of leucorrhea, which inside of two weeks turned into a yellowish flow. The conclusion seems not far-fetched that the irritation of a foreign body helped along the development of an ascending gonorrhea, or may be that a "mixed infection" took place on account of the decomposition of the retained secretion.

To sum up the prominent features of these cases, which are reported at some length, because they are the most typical and best observed of a series of similar cases, I may say this: The use of soft-rubber caps as preventive pessaries is always a dangerous measure. The practice of leaving it in the vagina during the interval between two menstruations is to be condemned. If they are used at all, they must be removed at short intervals and effective antiseptic douches should be regularly employed. These rubber caps may produce inflammatory catarrhs in pelvic organs that have never been attacked by a specific infection. The secretion of such inflammation may cause a non-specific urethritis in the male. These pessaries are especially dangerous in cases in which the tissues are weakened and made susceptible for new infection by a previous gonorrhea, and they are apt to increase the virulence of a latent gonorrhea.—*Medicine.*

SIGNS ON THE SKIN OF CERTAIN COMMON DISEASES.

Galloway (*British Medical Journal,* May 3rd, 1902), in a recent address, calls attention to the important subject of the relationship between the functions of internal organs and those of the skin, and briefly refers to certain eruptions which occur as sequelæ or complications of internal diseases. In nephritis, although skin manifestations are less frequent than one would expect, slight eruptions a e apt to occur as the result of the

internal administration of diaphoretics or external applications employed for the purpose of producing sweating. Erythematous conditions of the skin, miliaria, sudamina and even eczematous dermatitis may be thus produced unless care is exercised in drying the skin. The author finds that greasy applications are not well borne in such inflammations. A much graver class of skin manifestations in nephritis presents features resembling those of urticaria or erythema multiforme. These eruptions are usually of bad prognostic significance, indicating serious alteration in the blood and kidneys. As has long been known, diabetes specially predisposes the skin to invasion by pyogenic micro-organisms, so that boils, carbuncles and gangrene of the skin are very prone to occur in those the subjects of glycosuria. Seborrheic dermatitis is of frequent occurrence in the "gouty" form of glycosuria, and when neglected is apt to produce very troublesome forms of eczematous inflammation in the axilla, the groin or perineum. A very distressing form of dermatitis associated with intense pruritus is frequently seen about the genitalia of those suffering from diabetes, due in the first place to the contact of the saccharine urine with the skin and secondarily to fermentative changes. In the treatment of this distressing affection warm baths, simple or made alkaline, are especially recommended; and lotions containing from 20 per cent. to 50 per cent. of glycerin with 0.5 per cent. to 1 per cent. of carbolic acid are of great service. In all cases it is most important to regulate the diet. Another series of lesions of the skin is met in those who present, according to the author, "a fixed condition of depression of the vasomotor impulses, so that the whole of the capillary and venous area of the cutis is constantly flooded, without any recognizable lesion of the heart." In such persons, when the extremities are affected, there may be a superficial resemblance to Raynaud's disease. They suffer severely from chilblains and subsequent superficial ulceration. A reticulated hyperemia of the legs is frequently present resulting in reddish-brown pigmentation of the same areas. In such individuals slight injuries of the skin are frequently followed by chronic ulceration. Finally, attention is called to the resemblance between these lesions of circulatory origin and certain so-called "tuberculides." In the treatment of those suffering from the vascular condition above described the nutrition should be carefully regulated and watched. Great care should be taken of the skin. Frequent warm baths followed by careful drying, and warm and properly-fitting clothing are to be advised. In mild cases cardiac stimulants, such as digitalis, strophanthus, or strychnia, produce gratifying results.—*American Medicine.*