given: Sputum from 3 such patients contained only few bacilli and these were not found until after several examinations, none being found at the time when the specimen slides were collected. Another showed no bacilli in his sputum, yet autopsy revealed cavity formation. Three were extremely weak and did not talk while wearing the mask. The remaining 5 presented marked sprays containing many bacteria; yet careful examination failed to reveal the presence of tubercle bacilli.

The detection of the bacilli in these fine droplets of the spray was greatly facilitated by the use of a low power lens for the purpose of locating such droplets; after which a 1/12 oil-immersion lens was used. Droplets not perceptible to the naked eye were often found in this manner, and such minute particles not infrequently contained tubercle bacilli; at times they were present in great numbers. By the employment of these methods, it can be stated with safety that the finding of tubercle bacilli in the spray emitted by consumptives during the act of coughing, sneezing, laughing, and talking, is not attended with greater difficulties than is the finding of the bacilli in the sputum of patients early during the course of the disease.

VALUES IN DIAGNOSIS.

These are doubtless limited. However, from the extreme difficulty one always meets in eliciting satisfactory physical signs from the chest examinations of the insane, and since we are seldom able to collect the sputum from such patients, it would appear that if they be carefully guarded by the attendants, this method of collecting their sputum for clinical study should have at least a limited field of usefulness. In nearly all instances a slide could be placed in a forceps and then held by an attendant before the patient's mouth during one or more vigorous coughs. In one instance, that of a colored female, aged 19, few bacilli were found after wearing the mask for one and a half hours, during which time she did not cough, while the spray from a single cough during a paroxysm showed many bacilli. Where the mask was worn for ten minutes during such periods great numbers of bacilli were found.

Children, likewise, seldom expectorate and a mask could readily be adjusted to the face of any child, and by carefully instructing the nurse, specimens could be collected during the acts of coughing or crying. This, as well as its value in the clinical study of the insane, must be further tried, and estimated only from the results obtained.

HYGIENE.

Now that it is shown that the secretions of the mouth and respiratory tract are atomized and given off in the form of a fine spray, in both health and disease, and that this spray contains bacteria and other cellular elements known to be common to such secretions, it is reasonably fair to suppose that many other diseases are conveyed by this medium, and that the work accomplished through the study of consumptives is but a step in a direction which bids fair to modify, in a measure at least, the hygiene of infection. Conditions affecting these organs and consequently their secretions must of necessity be spread in this way; especially is this true of diphtheria, tonsillitis, and possibly other conditions, the etiology of which is not definitely known, such as smallpox, measles, scarlet fever, whooping cough, mumps, etc. It further furnishes additional cause for the rigid disinfection, now universally carried

out, in connection with all cases known to be infectious in character.

Droplets alighting on clothing must serve as a favorable means to convey disease from house to house; and that man may become infected by the spray thrown off by horses, cows, and other domestic animals suffering from glanders, tuberculosis, influenza and similar affections, appears highly probable.

SURGICAL VALUE.

To repeat, "experiments show that during ordinary talking for two minutes, ninety droplets may fall in a four-inch circle at a distance of eight inches, each of these droplets containing from dozens to thousands of bacteria." (Goldie). At first this would tend to convey the impression that the danger of infecting open wounds during an operation by the sprays produced by the talking of the surgeon or any of his assistants is extremely great, and this would doubtless be true where any person assisting in the operation is suffering from either an acute or chronic infection of the mouth, throat, or respiratory tract. A fact ever to be borne in mind is, that in health this spray may contain great numbers of bacteria; yet few, if any, such organisms possess the properties necessary to infect man, even when introduced into an open wound. The advisability of all persons being provided with a mask of gauze on entering the operating room, to prevent all possibility of their contaminating the air of the room, would appear from a bacteriologic standpoint to be a rational procedure; yet before this precaution can be urged, it, too, must be tried by the surgeon, and shown to lessen the number of cases of infection for which at present no ascribable cause is given.

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TREATMENT OF CERTAIN FORMS OF CANCER BY THE X-RAYS.

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It is well recognized that cancer is on the increase, and reliable statistics made in various countries and extending over periods of years prove that the rapidity of this increase is surprisingly great. Any method of successful treatment, even though it may be limited in its application to certain forms of this disease, will prove to be a great boon to humanity. Further, as is natural with the advance in the application of science to medicine, the opportunities for the irregular practitioner will be curtailed.

Although I shall refer to but few of the cases I have treated, I hope to present enough to have the reader share my opinion, namely, that in the x-rays we have an agent which causes superficial external forms of cancer to heal; and this may be done without pain to the patient.

From the standpoint of treatment by the x-rays, cancers may be divided according to their position into external and internal forms. Of the internal cancers

I will not speak at the present time, as it seems better to wait until I have had more experience with them, but will take up the external forms, which thus far appear most suited for treatment by this new

Rodent Ulcer. Before treatment.

This case shows how harmless the X-rays may be, when carefully used, even near the eye.

Rodent Ulcer, duration fifteen years. After treatment by X-rays. The ulcer, which was a deep one, healed by first filling up from the bottom and then closing over. The healing went on without pain or inconvenience to the patient.

By further treatment by the X-rays this has improved more than is shown in these photographs.

method. I think the subject can be best presented by a brief report illustrated by photographs of some of the cases that have been or still are under my care.

The diagnosis in all the cases which I have treated, except one, which was undoubtedly a rodent ulcer, has been made by means of the microscope. They include epidermoid cancers, typical epitheliomas, and rodent ulcers, and also cases which had the clinical appearance of beginning cancers, but which under the microscope were found to be plasmoma, or simply cases of ulceration and necrosis, or chronic inflammatory tissue.

As the first cases of cancer yielded to treatment by the x-rays, I became sanguine enough to state to new patients that this method would cause the growth to disappear if it were cancerous in nature; if, however, the microscope showed that it was not of a serious form, I felt obliged to give a doubtful prognosis. But further experience teaches me that those growths which clinically resemble beginning epitheliomas also yield to treatment by the x-rays, and the indication is that we

painless and harmless form of treatment, and also one which yields excellent cosmetic results. Whether these new growths will return within two or three years, can only be determined by time; but if there should be a recurrence, treatment can again be instituted.

This form of treatment also has the advantage of causing a diminution, or cessation of the pain resulting from the new growth, and the disappearance of foul odors from discharging ulcers. Further, it should encourage patients who have suspicious growths to consult a practitioner in regard to them at the very earliest moment, and not delay, as many are inclined now to do, through dread of the knife, until the growth has attained greater size and caused more inconvenience.

Great care is necessary to carry out the treatment properly. First, the surrounding parts should be protected from the action of the rays, and second, the treatment should not be pursued so vigorously as to

Epidermoid Cancer of Lip.

Epidermoid Cancer of Lip. After treatment by the X-rays.

have in this new agent a useful therapeutic measure for most—possibly for all—forms of external new growths, except perhaps those due to syphilis.

From the fact that the x-rays are useful in treating a variety of abnormal conditions of the skin, or parts near by, it would seem that their local action must stimulate healing or that these abnormal conditions are due to organisms to whose life or life conditions the x-rays are inimical.

Thus far, all the forms of superficial growths mentioned above have yielded to treatment by the x-rays. That is to say, in every case, with the exception of one of rodent ulcer where the treatment was pursued for a short time only—and of course should not be included—the new growth has disappeared, or is improving under treatment. It would therefore seem that we have undoubtedly for external growths, a new,

cause an x-ray burn. While in making the ordinary x-ray examinations—as, for example, examining the heart and lungs—there is no risk whatsoever to the patient, of an x-ray burn, in treating cases of cancer, it is necessary to have the tube so near the patient that, in unskilful or inexperienced hands, a burn may result. This might be a serious matter, as such burns yield only slowly, and might cause disfigurement. I do not mean to suggest that an x-ray burn is a necessary result of the treatment in external cancers; quite the contrary, for all of my cases have been treated without the occurrence of this accident, but I desire to emphasize the necessity for care.

The details of treatment and the various precautions to be taken I have considered fully in my book on "The Roentgen Rays in Medicine and Surgery," and there-

fore will not present them here, as it would occupy too much of your time.*

In the following cases from which these photographs were taken, the microscopic examinations were kindly made by Dr. F. B. Mallory, assistant pathologist of the Boston City Hospital.

The first is an epidermoid cancer of the lip, and the photographs show the results obtained. The diminished amount of hair seen above the lip is not due to the *x*-rays, but to the fact that the patient shaved off his mustache after the first two photographs were taken, but let it grow again shortly before the last two were made.

The second case is an epithelioma of the eyelid, which was treated without causing the slightest trouble in the eye and without interfering with the work of the patient. Treatment was suspended for a time in this case, owing to my absence, but the improvement, already begun, continued during this interval.

The third case is that of a rodent ulcer on the side of the nose and cheek. The photographs, taken before and after treatment respectively, need no comment. They speak for themselves, like those already shown.

The last case that I shall take up is an epithelioma of the right hand; and is improving, but still under

Typical Epithelioma of Hand, before treatment by *X*-rays. This was 4 cm. wide and 7 cm. long.

treatment. The growth was cauliflower-like in form, four centimeters wide by seven long, with raised, indurated edges. The photograph shows the condition before treatment was begun. In inoperable cases, such as those of the orbit, the tongue or the larynx, the *x*-rays should be tried in the most thorough manner.

The external growths that I have treated with good results have varied in the length of time they have existed from a few months to twenty years. This fact shows that even when the growth is of long standing the *x*-rays are of assistance.

It has been known for many years that these growths yield to treatment by various forms of caustics, so that if the *x*-rays simply act as a new form of caustic, some of the older forms might rather be employed; but my experience shows that we have in the *x*-rays a therapeutic agent that is novel in its mode of action, and that these growths disappear without a burn being produced.

The advantages of this new method may be summed up as follows: The treatment causes no pain; healing is produced without creating a burn; some cases improve after a certain number of sittings without further

renewal of the treatment; the treatment can be carried out without interfering with the work of the patient.

The disadvantages are that the necessary apparatus is expensive and difficult to use; that great care must be exercised when the *x*-rays are employed as a therapeutic agent, and that the treatment must often be continued for some weeks.

THE RELATION OF UNBALANCED PHYSICAL DEVELOPMENT TO PUBERTAL MORBIDITY AS SHOWN BY PHYSICAL MEASUREMENTS.*

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The measurements upon which this paper is based were made by the Child Study Department of the Chicago Public Schools, under my direction as Chairman of the Department. The gentlemen composing this department are Mr. F. W. Smedley, Director, and Messrs. C. C. Krauskopf, Daniel P. McMillan, and C. Victor Campbell, assistants. These gentlemen are all thoroughly equipped for the work, and large experience in making measurements has made them exceptionally accurate, and this skill on the part of the observers gives great weight to the observations. I wish to acknowledge particularly my indebtedness to Mr. Smedley, who jointly with me has discussed every phase of the work done by the Department, and every detail of its official publications.

The tables are based upon the measurements of 6259 children, 2788 boys and 3471 girls. Seven measurements were made of each child, except that no ergographic work was done with children under 5 years of age.

The children examined were all pupils in the Chicago Public Schools and were mainly the children of American parents in comfortable circumstances, the schools where the examinations were made being selected with reference to these points. In each school, however, all pupils were examined. These measurements include net stature, height sitting, weight with ordinary indoor clothing, endurance as measured by the ergograph, strength of grip of the right hand, strength of grip of the left hand, and the so-called "vital capacity" or volume of expired air. The methods of making these measurements, and the instruments employed were described in my paper "Measurements of Chicago School Children," read before this Society last year, and therefore need not be repeated here.

Table 1 gives the norms for each sex, in each of the several measurements, at each of the ages from 4 to 21 inclusive. These norms have been determined by averages, the actual computations being made with the aid of an adding machine. The table also gives the average ages and the number of children of each age examined. The norms given last year were medians, and a comparison of the two tables will show that they differ but slightly from each other, except at ages at which the number examined was considerably increased, and even in such cases the differences are really not great, the greatest difference in stature, for instance, which is found being only 13 mm. The close coincidence of these tables measures their approximation to the truth.

* The cuts shown herewith are inserted by permission of the MacMillan Company.

* Read before the American Pediatric Society, at Niagara Falls, May 29, 1901.