and increased transversely. The transverse diameter was always the greatest measurement. Mathematical calculation of the cubic content of an ellipsoidal viscus of dimensions of the bladder corresponded closely with the actual air capacity obtained by expression.

The average length of the urethra in seventeen cases was 3.3 cm., the shortest urethra measuring 2.7 and the longest 4.2 cm.

It is hoped by the writers that the measurements and observations here recorded, though limited to so small a number as twenty-five cases, may prove of interest and service, especially to the gynecologist, by affording a certain amount of carefully ascertained facts about the relative measurements and topography of the female bladder under air dilatation in the knee-breast posture.

DIPHTHERIA.*

BY EDWIN KLEBS, M.D.

CHICAGO.

I desire to express my appreciation of the honor conferred on me by your chairman, our highly esteemed Chicago hygienist, in inviting me to deliver before this Section an address on diphtheria. The occurrence of a prolonged illness of a member of my family, which terminated fatally, compels me to limit myself to a few outlines of personal observation, as a contribution to the discussion on the disease, the germ of which I have had the fortune to detect.

While acknowledging the success of serotherapy of diphtheria, the doubts expressed by Kassowitz and others only show that we must not neglect to exert all our intellectual powers and to improve our scientific methods with a view of achieving better results. We have still to progress in the development and execution of our prophylactic measures, particularly as regards the destruction of germs in the soil, air and food.

The first object of our attention will naturally be the diseased individual and his surroundings and members of the household, who, while apparently healthy, are really contaminated by germs, for the hair, nose, clothing, the surface of the body and even animals can serve as carriers of infection.

As far as human hair as a means of carrying germs is concerned, I made some interesting observations in Zurich during one epidemic outbreak of diphtheria in 1884.

In a school in that city, in which girls and boys sat in one classroom, separated by an aisle, principally the girls were attacked. The sex could not be regarded as a cause, but the long hair they were wearing. At my request the teachers made careful observations for statistic purposes and we found that children sitting behind others, in whose families diphtheria had broken out, became infected. The same was observed on boys who, because of lack of space, were seated among the girls. The children can infect each other while at play. In the same manner animals can become carriers of infection.

The second object demanding our attention is the patients' surroundings, particularly the garbage boxes and the dust of the street. During the epidemics at Zurich, in 1884 and 1885, open garbage boxes proved the means of spreading infection. I also had occasion to observe that adults who inhaled the dust of such open wagons whirled up by the wind, took sick within twenty-four hours. It is interesting to note, however,

that the wind does not carry the infectious material to great distances, but only to limited portions of the town, creating circumscribed areas, as it were. It is plain that the garbage ought not to be dumped near the city, which simply means removing the danger to another spot, but should be burned. Milk alone has not received any attention as a means of carrying diphtheria bacilli; water has been proven to be harmless in that respect. I would recommend that only such garbage boxes should be used as are fitted with good covers, and that the garbage be burned within the contaminated districts. The streets should be subject to thorough cleaning in such districts, using an appropriate disinfectant, as crude carbolic acid for sprinkling purposes. The dust should be collected and burned. We have nothing to fear from contamination of sewers.

TREATMENT.

Isolation should be carried out as much as possible. Every member of the family, or house, should be subject to prophylactic treatment. For the latter purpose I recommend chinisol and antinosin. Those already afflicted should receive antitoxin injection as early as possible. The danger of serum injections seems to be confined to the deleterious action of foreign serum, known as the globulicide qualities of such serum of not human derivation. These globulicide substances can be destroyed by subjection of the serum to a temperature of 60° C., which does not destroy the antitoxic quality, as is shown by Spronck in Utrecht. Further, I would suggest that the needle should only be pushed into the tissue, to make sure that no blood-vessel had been touched. Escape of blood warns us that such is the case and a new insertion must be made and the syringe attached. Only a small quantity of the serum should be injected at first, and the heart watched for a few minutes, when more can be injected. It is an error to recklessly inject 5 c.c. at once, fatal results having come to my knowledge not only in children but also in adults. Soft parts, remote from the heart, such as the hip or loins are the best places for injections. The serum should always contain a small quantity of antiseptics—kresol 0.2 per cent. or thymol in crystals.

Of greatest importance for a successful treatment is a correct clinical diagnosis. Even when membranes are not present, or are invisible because situated in the posterior parts of the nares, or when they are not characteristic enough, resembling follicular tonsillitis, true diphtheria may exist. In most cases the appearance and spreading of membranous exudation is certainly sufficient for a diagnosis, when associated with general symptoms. In other cases microscopic and bacteriologic examinations afford certain means for a correct diagnosis.

The portion for microscopic and bacteriologic examination should be taken from the edges of the membranes, and from the adjoining, seemingly healthy, portions of the mucous membrane, with a sterilized cotton ball. In the center of membranes it very frequently happens that no bacilli can be found, these having been thrown off. Cultures should be made nowhere except in properly equipped laboratories. For cultures, I may add, dog serum seems to be much preferable to the Loeffler serum, as was shown by Dr. Robert F. Zeit, in my laboratory. For staining microscopic preparations the method gives such characteristic features that we know them as yet only from the tubercle bacillus. The methods of Ernst, and later of Neisser, are by no means so sure and simple. Zeit used a strong staining of the dried cover-glass preparation in methylene-blue

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concentrated solution in 5 per cent. borax, and decolorizes with 1 per cent. Bismarck-brown for three minutes. All true diphtheria bacilli then show the chromatic bodies very darkly stained, whereas the other substance of the bacilli is stained yellow. No other bacillus gives this reaction, which in many cases assures the diagnosis by microscopic examination alone. This method will help the practitioner to make the diagnosis for himself.

The treatment proper can be divided into general and local.

General Treatment.—Serum injections should be made in every case in which a diagnosis of diphtheria can be made even with probability, but should not be registered as diphtheria until the diagnosis is made sure by microscopic or bacteriologic examinations. To enable the proper execution of the latter it is very desirable that properly-equipped stations in charge of specially trained physicians or pharmacists be established by the state, subject to supervision and registration by a central board of health.

Other general, not specific, treatment should be instituted, if a given case suggests such a necessity. Mostly to be recommended are mild hydropathic measures, as practiced in other fever cases. As in other infectious diseases of a highly toxic character, the formation of polynuclear leucocytes in the bone marrow is impeded. Repeated blood examinations with dried and stained preparations should be made, as these will give better indications for treatment than the fever alone. As cold water applications promote peripheral circulation they afford the best means of promoting leucocytosis. Possibly also pilocarpin injections are indicated for that purpose.

Local Treatment.—This has been very much neglected since the introduction of serotherapy. In the use of local antiseptics such chemicals as are apt to endanger the life and action of tissue-cells are to be absolutely avoided. Mild, not irritating, antiseptics, such as chinisol—1 to 1000—or antiosin in 2 per cent. solution, applied to the entire surface of the tonsils, palatum molle, pharynx, etc., with cotton balls, have given good results. The nasal passages should be washed with these same solutions by means of a suitable syringe. Such local applications have healed many cases of true diphtheria in which toxic symptoms were absent. The local use of the antidiphtherin, a ten times *in-vacuo* concentrated filtrate of diphtheria cultures, recommended and proved by me as highly efficient against the local affection and the fever, should not be neglected. This substance could easily be prepared in every laboratory for antitoxic serum. Its manufacture is not prohibited by patents.

INFLUENCE OF ANTITOXIN STATISTICS.*

BY EDWIN ROSENTHAL, M.D.

PHILADELPHIA.

No feature is so conspicuous that proves the specific character of antitoxin as a remedy in diphtheria, as its influence on the mortality records of a city. The *Berliner Medicinische Wochenschrift* was the first to attempt a collective investigation in this direction, and the table so collected and published showed such remarkable results as to become the most potent factor in an argument.

Statistics, to become of value, must be truthful, not

only as regards figures, but they must take into consideration the difficult elements that control them. For instance, we should take into consideration under what auspices they were begun, and for what purpose; whether they be the result of certain conditions always the same, or unequal, as an epidemic, or not; again, whether they are the result of a collective body—as the American Pediatric Society—whose purposes are to obtain truths, or whether they be the result of the general reports of health boards, or of indifferent individuals. Of the greatest value and more specific would be the statistics obtained from hospitals devoted only to the treatment of such diseases.

Whatever has been the source, the result in the study of the statistics in the antitoxin treatment of diphtheria has been the same, and whether it be from hospital practice, private practice, or the collective investigation of different medical bodies, the surprising diminution in the death-rate has been so unanimous that this truth remains unquestioned.

No one is better versed in the art of compiling, calculating and presenting statistics than Professor Biggs, and in text and other books of reference, the story of antitoxin would be incomplete without his work being quoted. The honor remains with Dr. Biggs to place antitoxin on a certain well-defined footing, and his reports are almost always taken as a basis for comparison. In his various papers, he has gleaned the work of various health boards of different cities, both in this country and abroad, and has presented in an understanding and interesting form, the results thus obtained. As his work is public property, and at this moment is known to all, it would be a repetition of facts to give them here. However, I will briefly summarize, so that I can give his figures as an additional proof, and as a basis of anything new in this paper.

In "Bulletin Number 3" of the New York Health Department, Dr. Biggs presents the results of the four large cities, New York, Berlin, Paris and Chicago, and conclusively shows the fall in the death-rate. For example, in Paris alone, the monthly mortality before the "antitoxin period" was from 108 to 180; after the period it fell to 45 to 56. In Berlin, before the period, the death-rate was 114 to 117, which fell to 47 to 54. In New York, before the period, it was 236 to 317, after the period, 168 to 207. But the most surprising and convincing evidence comes from Chicago, and, as a demonstration, is here published a chart, which showed how a rapidly-rising death-rate was checked by the introduction of the serum, in October, 1895.

The lines for both years show relatively small number of deaths during the summer, but a rapid increase in the autumn months.

It will be noted that during every month of the second year up to and including October, there was an increase in the fatal cases over the previous year, and that in October the daily death-rate was 8.1 a day, as against 5.5 the previous year. The use of antitoxin was then begun and its influence is graphically shown in the chart. The dotted line B B indicates the mortality from April, 1894, to April, 1895; the line *a a* the mortality from April, 1895, to April, 1896. Antitoxin was introduced at the close of October. To summarize: Of 1468 cases treated by the inspectors, the mortality was but 6.4 per cent.; and of 1112 cases injected during the first three days, but 2.5 per cent.

Philadelphia alone has the unique distinction of presenting a very slight change in her mortality record. This change is so small that the advent of the antitoxin

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