

AN EPIDEMIC OF SORE THROAT DUE TO A
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During the past three months there has been, and still continues, in Chicago an epidemic of sore throat that is unusually severe and characterized by complications strikingly different from those of other years. That it is generally prevalent throughout the city is attested by numerous physicians.

A streptococcus presenting certain peculiar characteristics is found in practically all cases. A number of cases have terminated fatally. In view of these facts, it is thought wise to make a brief preliminary statement at this time concerning certain clinical and bacteriologic features of the disease.

The attack usually begins suddenly with or without a chill. The fever, the muscular pains, the prostration and the constitutional symptoms are out of all proportion to what one would expect from the amount of local involvement. The pulse is relatively slow. The leukocytes are only moderately increased. The throat presents a diffuse redness; there is much secretion of mucus. The tonsils are always infected and the crypts filled with an exudate; and a grayish membrane may spread over a large part of the tonsil, (closely resembling diphtheria); only occasionally does ulceration take place. The acute symptoms often subside in a few days. At the end of a week or ten days, however, the patient, instead of recovering completely, may suddenly become worse. The cervical glands may become very large, but usually do not suppurate, or the neck may become tender and the act of swallowing very painful; and the clinical picture suggests septicemia. Blood cultures are most always negative where glandular involvement is pronounced, while at the outset in the latter group of cases they yield streptococci. The visceral complications occur most often in the group of cases which have little or no glandular involvement, but marked constitutional disturbances. Otitis media occurs quite frequently, but suppurative processes in the mastoid and other accessory sinuses are relatively uncommon.

Bacteriologic examinations have been made in many cases. Among the complications represented are, suppurating lymph-nodes, empyema, arthritis, erysipelas, pulmonary abscess, otitis media, brain abscess, meningitis, septicemia, peritonitis, puerperal sepsis, etc. From the throat and tonsils and from the secondary lesions just indicated, in practically all cases and usually in pure culture a streptococcus possessing the following features has been found: Morphologically in the smears from the throat and the exudates, it occurs in short chains and often in pairs. The cocci, which commonly occur in very large numbers, are spherical, but appear in twos in the chain. They are strongly Gram-positive and are surrounded by a definite capsule. The capsular substance is less abundant than that surrounding the pneumococci, does not indent between the pairs, as is the case in the latter, and is soon lost on artificial cultivation.

The colonies on blood-agar plates are larger and more moist than those of the common hemolytic streptococcus (*Streptococcus pyogenes*); at times there may be a faint greenish tint on transmitted light. The zone of hemolysis is relatively narrow and begins immediately around the colony, and its outer margin is often indistinct. The

growth on the surface of blood-agar slants is abundant, raised, and moist, but does not present the mucoid appearance of the *Streptococcus mucosus*. In broth, uniform turbidity is produced and milk is always acidified and sometimes coagulated. Inulin is not fermented. The cocci are slightly bile-soluble and autolyze slowly in sodium chlorid solution.

The organisms possess a high degree of virulence, readily killing guinea-pigs, mice and rabbits in from twelve to twenty-four hours from septicemia and serositis following intraperitoneal inoculation of small quantities. Animal passage increases strikingly the capsular substance, and the growth becomes more profuse and mucoid.

Autopsies have been made in four cases of this infection. In all there was acute serofibrinous peritonitis, in the exudate of which pure cultures of this streptococcus were obtained. In three, there was acute fibrinous pleurisy, in one acute pericarditis, and in three the cocci occurred pure in the heart's blood. Endocarditis was not found. The atrium of infection in three cases was clearly the tonsils or the throat. In the remaining case, it appeared to be a localized fibrino-purulent bronchitis following a sore throat.

To summarize, these infections are characterized by a sudden onset with severe prostration, by glandular enlargement, and frequently by serious complications. The organism, isolated, is an encapsulated hemolytic streptococcus of high virulence. It appears to occupy a position between the ordinary hemolytic streptococcus and the *Streptococcus mucosus*. It is not a pneumococcus. The increase of the capsular substance on animal passage and its loss on artificial media suggest that the capsule and high virulence are the result of frequent human passage and may serve to explain the unusual tendency to complications and the general severity of the disease.

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THE CLINICAL USE OF CARBON DIOXID
WITH OXYGEN

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As the result of an immense amount of investigation on the part of physiologists, both in America and in Europe, it has been shown that carbon dioxid is not merely a waste product of the body. On the contrary it is one of the most important of the body's hormones, exercising a regulative influence on the action of the heart, on the tonus of blood-vessels, and especially on the respiration. In fact, breathing in ordinary life is practically dependent on the stimulation afforded to the respiratory center by the carbon dioxid brought to it in the blood. In the demonstration of this exceedingly important fact the Italian school of physiologists has played an important rôle. In particular, the late Professor Mosso of Turin, in his important studies on mountain sickness, was led to conclude that this condition was essentially due to a decrease in the carbon dioxid of the body, a condition to which he first gave the name of "acapnia." Although, as regards mountain sickness, this view has been vigorously combated by other physiologists, Mosso's experiments, demonstrating that acapnia induces a lowering of arterial pressure and failure of respiration, have proved of the utmost impor-

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tance as the starting-point for the more recent work of others in this field. Especially deserving of mention are the investigations of Yandell Henderson on acapnia as a factor in shock. His observations are too well known to require detailed recital here.

After reading Henderson's papers I was led to consider the practicability of utilizing mixtures of carbon dioxid with oxygen for the purpose of stimulating the bulbar centers in those cases in surgical practice in which, owing to the effects of chloroform or ether or to operative trauma—or to a combination of these causes—the automatic activity of these centers is temporarily paralyzed. My experiments have shown that in carbon dioxid properly diluted we possess a therapeutic agent of extraordinary potency.

At the outset of my investigations I experimented on animals. By means of the single or combined action of nitrites, chloroform, and morphin, failure of respiration was induced. The animals were then made to inhale a mixture of oxygen with various percentages of carbon dioxid—from 10 per cent. to 30 per cent. In every case there was an almost immediate return of the breathing and the effects of the inhalation were found to last for some time after it was discontinued. I then tried the administration of these gas mixtures to patients who, because of trauma or extensive and prolonged operation, had sunk into a partially or completely comatose state. The effects were at times brilliant, particularly in those cases in which the breathing had become shallow, irregular, or of the Cheyne-Stokes type. With mixtures of from 5 to 20 per cent. of carbon dioxid in oxygen the depth of breathing and the regularity of the rhythm was notably improved. The most satisfactory results were obtained with a mixture containing 15 per cent. of carbon dioxid. In cases which exhibited Cheyne-Stokes respiration, the periodical rhythm was immediately stopped and normal breathing was not only restored, but continued for some time after the inhalation was ended. In such cases not only was respiration improved, but there was a marked improvement in the condition of the circulation. The disappearance of cyanosis was one of the most striking features.

It is now nearly two years since the publication of my first article on this topic.¹ During this time my method has been continuously employed in the surgical clinic in Florence. Professor Burei, general director of the clinic, has in fact so strong a faith in its efficacy that he has made it a standing order that, prior to every operation, a gasometer containing a mixture of oxygen and carbon dioxid shall be prepared, and shall be at all times during the operation available for the immediate use by the assistant administering narcosis. It is our custom not to wait until the patient has reached a condition of profound shock or respiratory paralysis, but on the contrary, as soon as the slightest tendency to failure of respiratory or cardiac function appears, to administer immediately inhalations of the gas mixture. A rapid return of normal heart action and breathing is the almost invariable result. The best results, as might be expected, are obtained when the condition of shock has not progressed too far, although even in the latter condition, strikingly beneficial results are obtained. The number of cases thus treated during the past two years

at the surgical clinic of the Florentine university now amounts to several hundred. In no case have we observed any ill effects from the treatment. On the contrary, in several traumatic cases in which, under chloroform, breathing had entirely stopped, we have observed a prompt return of practically normal conditions. As evidence of the success of this procedure I would particularly refer to the paper published on this subject by Professor Marchetti,² head surgeon at the Hospital of Santa Maria Nuova in Florence, and that by Dr. Cresenzi,³ assistant at the Florentine University Surgical Clinic.

It will perhaps be of some interest to refer here to a case of a patient recently treated in the surgical clinic by Professor Stori and Dr. Abetti. It was a case of suicide by hanging. Prolonged artificial respiration, inhalations of oxygen and hypodermic stimulation had not given the slightest result. The case was practically given up as hopeless when it was suggested that the carbon dioxid oxygen mixture should be administered. After a few minutes' inhalation of this mixture spontaneous respiration returned.

This method has also proved of service in the treatment of medical cases, particularly in cases of profound asthenia due to toxemia. The administration of carbon dioxid oxygen-gas has proved an effective substitute for the peripheral stimulation ordinarily used. Particularly in those cases in which Baccelli's method of administering oxygen would ordinarily be used, we have found that the use of carbon dioxid with the oxygen by stimulating respiration increases the oxygen absorption.

Our observations in the Florentine surgical clinic with this method seemed to afford an explanation to some extent of the good effects obtained in surgical practice from the method of narcosis with artificially reduced circulation. It seems probable that the remarkable rapidity with which patients subjected to narcosis under this condition recover consciousness, as observed by many authors, is due to the sudden return to the general circulation of a large amount of blood rich in carbon dioxid when the lower limbs are unbandaged. Following up this suggestion we have found that the use of a gas mixture containing from 10 per cent. to 15 per cent. of carbon dioxid after the completion of an operation is very effective in causing a prompt awakening of the patient. It seems also to tend to decrease the postchloroform vomiting. This is doubtless referable to the rapid elimination of chloroform from the blood and tissues under the influence of the increased respiration induced by the carbon dioxid.

As our use of carbon dioxid and oxygen inhalations took its origin from the interesting experimental studies of Prof. Yandell Henderson on this subject, in America, it has seemed to me that it might be of interest to publish this brief résumé of our methods and observations in an American journal.

2. Marchetti: Ueber die Anwendung der Gemische von Sauerstoff und Kohlensäureanhydrid nach Dr. E. Levi in der Praxis der Chloroformnarkose, Wien. klin.-therap. Wehnschr., 1910, No. 40, p. 961.

3. Cresenzi: Die Anwendung der Gemische von Sauerstoff und Kohlensäureanhydrid in der chirurgischen Praxis, Wien. Klin.-therap. Wehnschr., 1910, No. 40, p. 960.

1. Levi, Ettore: Nota preventiva sulle applicazioni terapeutiche, nella pratica chirurgica e medica, di miscela di ossigeno e di anidride carbonica. Acad. med. fis., Firenze, March 16, 1910; Studi sull'azione fisiopatologica dell'anidride carbonica, e sulle applicazioni terapeutiche, nella pratica chirurgica e medica, di mescele di ossigeno ed'anidride carbonica, Rev. Crit. di Clin. Med., 1910, Nos. 30 and 31.

Small-Pox Quarantine in Practice and Its Failure.—When we read the thoughtless expressions of antivaccinationists we often feel as if the best thing to do with them would be to leave them to their folly, but consideration of the statistics shows how unfair that would be. There are the minors who pay a disproportionate toll in such cases.—G. Dock in *Journal of Missouri State Medical Association*.