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ATROPHIC RHINITIS AND ITS TREATMENT BY VACCINES.*

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There are few diseases the etiology and treatment of which has been more discussed than ozena. I will not take up your time in consideration of previous theories further than is necessary to show that they cannot harmonize the parts and make a consistent whole.

Let us review, first, the anomalies in shape of the nasal cavities considered as a cause of ozena. Zaufal states that abnormal width of the nasal cavities, due to congenital conditions, causes atrophy of the mucous membrane resulting from stagnation of air and consequent crust formation, while Sauvage and Tillot claim that ozena occurs in narrow noses owing to stagnation due to interference with ventilation. If both authors' observation is correct, then we may draw the conclusion that atrophic rhinitis may occur in either broad or narrow nostrils. As almost every nose, in the opinion of most laryngologists, is open to criticism on one or other of these grounds, atrophic rhinitis would have to be an almost universal disease. Dismissing, then, the congenital anatomic origin as improbable, we have the origin from "catarrh." B. Fränkel explains that the secretion from catarrhal conditions dries and decomposes, causing ozena. But a catarrhal condition independent of such causes as adenoids and tonsils, foreign bodies, sinusitis, pediculi capitis, nasal discharge caused by diphtheria, or other definite local conditions, is, in these days, very uncommon. If, further, in young children a clear case of ozena can be established, the field of nasal catarrh will dwindle to even smaller proportions. Michael and Grünberg considered ozena as an end result of sinusitis, a view which the observations on postmortem cases by

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Zuckermandl negatived, and which has fallen into disuse. As to the diagnosis of atrophic rhinitis, we need not here discuss appearances so familiar to you all. Every laryngologist knows the picture given by the wide nostril with crusts and scabs in the middle turbinate region, sometimes with a large boggy middle turbinate, sometimes with a thin atrophied one. Often odor is present, while, again, in an equally marked case, it is absent. The posterior nares and pharyngeal wall are generally dry and scabby. The larynx, although often unaffected, is sometimes dry and has thickened false cords and interarytenoid folds. I allude to these well known appearances only in order to call your attention from this obvious condition to others in which the results are not so marked. Given a rather wide nostril with some mucus and no odor, is it an atrophic or is it a sinusitis? I can recall cases in the hospital in which a diagnosis of atrophic has been made, where, some weeks later, no width of the nostril could be seen and no crusts or discharge to justify the diagnosis. The only explanation of such errors is the flexibility of the turbinates as regards their size. Wide nostril per se, then, cannot be relied upon for diagnosis. Discharge may be from the sinuses, and only a long process of X-ray can clear up our difficulty, and that, as we know, unless done in the finest manner, is of little value. We are in need, then, of a better and surer method of diagnosis than we possess at present. In 1896, Rudolph Abel, a Privat-Dozent in Greifswald, identified in a most admirable article in the *Zeitschrift für Hygiene* a bacillus which he had found in ozena. He describes the bacillus as a thick rod 1.25 mm. wide, and of varying length. The ends are often rounded. Sometimes the bacilli lie together, forming a chain. These bacilli are separated from one another by a capsule. They stain readily with methylene blue and fuchsin solutions, and are decolorized by Gram's method. The number of these bacilli in the nasal secretion varies greatly. They are found in greatest number in the soft secretion underlying the crusts. Abel found many other cocci and fine bacilli associated with the bacillus just described. Probably, in the light of experiments of disinfection of the hairs of the nose, he would have found pure cultures in the same secretion. In over ninety cases we have found pure cultures of the above named bacilli. This bacillus is

called by Abel the "*Bacillus mucosus ozenæ*." On culture media they form a thick, raised, confluent mass. They grow with great rapidity at body temperature. On lifting these colonies with a needle they seem stringy. In this peculiarity they resemble the mucous secretion under the crusts of the ozena nose. They do not liquefy gelatin. They grow luxuriantly on all the ordinary culture media. Abel warns us that the bacilli cannot be obtained always on the first examination, but after removal of the crusts and scabs for two or three consecutive days he has found them in large numbers, and in subsequent examinations they are always present. He, therefore, considers that they are sometimes concealed in the depths of the folds of mucous membrane. The bacillus is always nonmotile and never produces spores. They do not lie close together, since the capsule does not permit of close intimacy. In fresh cultures these capsules are very marked; after the first or second replant they disappear except in milk cultures. They are not absolutely dependent on oxygen, can grow in anaerobic cultures, but not so luxuriantly as in aerobic conditions. It is interesting to note that the *bacillus mucosus* cannot live in dry surroundings. Cultures which had been kept moist lived and could be reproduced at the end of the year, while dry cultures lived but a month or two. The capsule of the bacillus protects it, according to Abel, from antibactericidal solutions. Injections of cultures of these bacilli in white mice caused shortness of breath, conjunctivitis with plentiful secretion, and the animals died sometimes suddenly and sometimes slowly, without pain. Duration of life after injection was from three to four days. The autopsy on these animals showed a great infiltration at site of puncture, which consisted of enormous masses of bacilli with capsules, fibrin, and pus. The spleen was congested and greatly enlarged. The kidneys and liver were parenchymatously inflamed. The other organs showed no changes. From all the organs enormous masses of ozena bacilli could be obtained. These all corresponded to the same bacillus. It is interesting to note that these bacilli everywhere followed the blood stream, so that the disease could be called a typical septicemia in the bacteriologic sense. White mice are very susceptible to the *bacillus ozenæ*. Abel found that for various other kinds of mice, rats, guinea pigs, rabbits, doves, and swallows that the

bacillus was not infectious. The bacillus mucosus ozenæ belongs in the same group as the bacillus of Friedlander. The following are the distinctive differences: The growth of the bacillus mucosus appears more fluid and increases so rapidly that it fills the bottom of the tube in twenty-four hours. It does not form in gelatin a characteristic nail-like growth, but spreads over the whole surface. In the old cultures it never colors the media brown. It does not form gas on potato, and in agar and gelatin only in small amounts. Ozena is always fatal to mice, while Friedlander's bacillus is much less so. Finally, Friedlander's bacillus is very apt to make cocci-like forms. Usually the rhinoscleroma bacillus can only be distinguished from the ozena bacillus by Gram's method. In doubtful cases clinical appearances will leave no room for mistake. The presence in one hundred cases of well marked ozena of this peculiar kind of bacteria and its absence in all other forms of nasal disease, further strengthens Abel's theory. In the examination of secretion from atrophic noses Fränkel, Thost, Paulsen, Straca, Hajek, etc., have all found bacilli, but have not differentiated them from the pneumobacillus. Are these bacilli found in the mouth or in the healthy nose? Besser, in eighty-one noses (healthy), twice grew Friedlander's bacilli, Wright in ten cases, Delette in fourteen never found them, nor did Paulsen in thirty-seven normal and twenty-four acute catarrhs. Abel, in two hundred and fifty noses with acute and chronic catarrh, with syphilis and tuberculosis of the nose, with pus formation and accessory cavity disease, found none. Netter found Friedlander's bacillus three times in one hundred and sixty-five healthy persons, Rosenthal one in fourteen, Panzini three times in tubercular sputum, Kreuzer once in thirty-eight influenza patients, Kowalsky once in sixteen cases of influenza, Podbiolsky not at all in fifty secretions from the mouth. Biondi injected the sputum of fifty healthy and diseased persons in guinea pigs, rabbits, and mice. The greater majority lived, and in those that died no organ showed pneumobacillus. Abel, who had examined the secretion of the oral cavity in four hundred cases, found in only six cases the kind of bacillus which agrees with that of ozena. In three of these cases no examination was made of the nose, in the other three, one was plainly ozena, and both the other cases showed beginning

atrophy and crusts, and in all three the nasal secretion showed masses of these bacilli. What rôle does *ozena bacillus* play in *ozena*? Many authors believe that the *bacillus mucosus* is simply present in *ozena* without causing it, but since Abel has found it in all *ozena* cases and in no others, this hypothesis is not tenable. That it is not the cause of the odor is obvious from the fact that it is found both in fetid and nonfetid cases. The appearance of the mucus found on the under surface of the crusts is almost exactly similar to that seen on agar cultures of the bacillus. It is a harder matter to explain the further progress of the disease. Part of the atrophy Abel believes is pressure atrophy caused by the crusts. The change of epithelium from columnar ciliated to squamous conduces to this condition. Further than this inflammation in the mucous membrane, shown by small round cell infiltration, followed by granulation tissue and then by scar tissue, increases the atrophy. Voltolini believes that atrophy of the bone is caused by the shrinking of the mucous membrane and its consequent contraction of the blood vessels which nourish the turbinates. Observers have not found the *ozena bacillus* in the tissues, but Abel believes that the poisons generated by the bacteria are taken up by the mucous membrane and are the source of irritation, and he draws a parallel between tubercular tissue with its small number of bacilli in the tissues, and the condition found in *ozena*. Whether the growth of the *ozena bacillus* needs for its development an altered nasal discharge or a weakened condition of the blood is not yet determined. Abel experimented on a patient with a culture of *ozena*. This patient had advanced tuberculosis of the lungs, but his nose showed no signs of disease. In this man's right nostril a small amount of *ozena* culture which had been carried through several generations was rubbed in without injury to the mucous membrane, while in the left nostril at the same time fresh *ozena* secretion was also rubbed in. During the four weeks the patient lived, no changes were visible in that nostril, although bacilli were found. In the right nostril, after eight days, typical crusts with mucopus were found under the middle turbinate, and fourteen days afterwards there were numerous small lesions of the same character on the lower turbinate, which did not disappear until the death of the patient. The lesions gave the same picture as is seen in beginning

ozena cases, and from them pure culture of ozena bacillus was obtained. In this individual there were also found, in the right nostril, crusts exactly similar to those found in fresh ozena cases. The mucous membrane showed nothing pathogenic, as was to be expected in this short space of time. In animals inoculations were unsuccessful, as animals do not get ozena. Whether ozena is transferable as an infectious disease, it is difficult to say, on account of the chronic course it takes. Rosenfeld's example, however, is rather striking. He found a family of twenty-one members. Fifteen had ozena, with or without odor. Many authors have observed the same occurrence in families. Abel also examined cases where apparent healing of the ozena process had occurred, and those no longer showed the bacillus. Abel believes that the odor of ozena is caused by bacteria other than the mucosus, and cites the well known fact that when the crusts are removed the smell ceases, although the ozena bacillus at the same time increases. What germ, however, among the numerous ones found in the crusts, causes the odor, Abel cannot say.

In the Transactions of the Congress of American Physicians and Surgeons, Washington, 1910, we have reported a series of cases treated by vaccine made from a bacillus not then identified as Abel's.

In the present series, cultures were taken from ninety cases of atrophic rhinitis, the vestibule being previously sterilized. All showed a pure culture of the atrophic bacillus. Every one of these patients had had previous local treatment without benefit.

Forty patients received vaccine, from four injections up to fifty-six injections. Only twenty came for treatment at the required intervals. No bad effects from the vaccine were noticed. One patient, while objectively better, could herself see no signs of improvement. In all cases, if the patient was using a wash, no change was made during the inoculations, and no local treatment was given. No history of the duration of the disease could be obtained, but in most of the cases it had lasted as long as the patient could remember.

Of the six cases injected two years ago, only two could be found.

A. V., age 24 years, female; fifty-six injections; previous to vaccine large casts in the nose; very bad odor; sensations

of pressure over the bridge of the nose; has used washes for months. Now the nose is practically normal, no odor, no crusts; never washes the nose; has no symptoms.

B. L. R., age 15 years, female; thirty-two injections; large crusts in nose and bad odor; impossible to keep clean. Now the nose is practically normal; no dryness, no odor, no crusts, scabs, or mucus; never uses any wash for nose.

Eight cases where injections had ceased from six months to a year ago.

1. L. G., age 21 years, male; sixteen injections; very large crusts in both nostrils. Deviation to right; bad odor; impossible to keep nose clean with washes; headaches. Now no odor present and no crusts; some mucopus; nose cleared easily. On left side has less mucopus than on right. Unable to continue treatment, as he lives in another city. Returned one year later. Patient said his nose never went back to original condition. Odor has not returned. Very small scabs in both nostrils; much smaller on the left. Turbinate, atrophied. Pharynx, somewhat glazed. As he wished to resume treatment, eight injections were given; when last seen, after discontinuing nasal washing for three days, no scabs or crusts were seen; nose and pharynx absolutely clean. Gain in weight.

2. J. R., age 35 years, male; forty-eight injections. Deviated septum to left; slight in amount. Large casts in nostrils. Pharynx dry and covered with crusts. Patient is hoarse; bad odor. Complains of pressure over the bridge of the nose. Uses about twelve handkerchiefs a day. This was a year ago; now the nose is clean on both sides; no crusts or scabs; inferior turbinate atrophied. Pharynx dry, but clean. Voice is very much clearer. No odor, no pressure over the bridge of the nose; often goes days at a time without using a handkerchief. Several times has had some discharge, but never amounting to a handkerchief a day, and always mucopurulent. Gained twenty pounds in weight during the treatment.

3. Julia R., age 18 years, female; twenty-four injections; complete casts in both nostrils; foul odor; headaches; pressure over the bridge of the nose. Had nose treated locally for four months. Pharynx shows no crusts. Patient seen one year after cessation of injections. Odor has not returned. Has

had no casts or crusts from the nose. Some mucopus on using nasal washes. On examination, left nostril perfectly clean. Right nostril had a small amount of mucopus on middle turbinate. No headaches or feeling of pressure over the bridge of the nose. Her mother has atrophic rhinitis.

4. H. C., age 35 years; female. Complete cast of left nostril; no headaches; no odor. Impossible to keep nose clean by ordinary methods. After eight injections, nose was very nearly clean for three weeks. Patient returned in two months; large crusts had appeared again in the last week. They disappeared after eight more injections. Five months ago she reported that nose was in good condition.

5. S. R., age 20 years; female; fifty injections; large crusts in both nostrils; headaches; foul odor. Examination of the nose one year after treatment ceased, shows it to be practically clean; patient had used a wash, however, thirteen hours before. Absolutely no odor. Patient feels that the treatment is only intermittently successful.

6, 7, and 8 are patients who failed to take their vaccine regularly. They had in all from sixteen to thirty-six injections. In two of these patients the odor disappeared and the crusts became moist. The other had intermittent odor with some improvement in condition of the nose.

Six recent cases:

1. J. S., age 25 years; male; five injections; nose easier to keep clean; no odor; crusts smaller and softer.

2 and 3. M^{gt} C. and M. C., sisters, ages, respectively, 28 and 18 years. In both cases four injections; less odor; can blow out the crusts easier. Crusts are smaller. The mother has atrophic rhinitis.

4. M. K., age 28 years; female; eight injections. Crusts on both middle turbinates; odor, dryness, and inferior turbinates atrophied. Patient feels that there is great improvement; husband no longer notices odor; slight crusting of left middle turbinate, but crusts are very small and moist; almost like mucopus. Easier to keep the nose free and clean.

5. R. J., age 18 years; male; fourteen injections. Large crusts in both nostrils. Inferior turbinate atrophied. Bad odor. After fourteen injections, subjectively improved; no odor, nose has become more moist. Instead of crusts, only a little pus seen on right middle turbinate. Left side clean.

6. C. R., age 22 years; male; crusts moderate; odor present; atrophy of lower turbinate. After fourteen injections, no odor; crusts smaller; nose feels moist, less handkerchiefs used.

SUMMARY.

Vaccine injections, if carried out regularly, seem to produce permanent improvements. Irregular or small number of injections cannot be counted on with the same certainty, but marked improvement seems to have followed, even in these cases. As to strength of vaccine, each cubic centimeter contains one hundred million bacteria, and the dose varied from one-tenth of a cubic centimeter to one and a half cubic centimeters.