amount of gas production is very great, and the number of bacteria as represented by several counts is 80,000 to the gramme, at a conservative estimate and under favorable conditions. There has not been time enough to make a qualitative analysis of these bacteria, so that it is not possible to say whether any pathogenic forms are present in these particular specimens. Two inoculation experiments showed only local necrosis. The subject of the possibility of the transmission of pathogenic bacteria by dust has, however, been elaborately studied by E. Germano.² He first took up typhoid, and showed that the typhoid bacillus is not able to resist complete drying, and is not transmitted by dry dust to man. In this respect the typhoid bacillus behaves as does the cholera spirillum — and certainly most of the epidemics are not to be ascribed to transmission by dust. The infection of the air for many hundred metres about, as suggested by Froidboise, is entirely improbable.

The next bacterium studied was that of diphtheria, and the conclusions are: (1) That this bacillus can resist drying for a very long time, as well in the membrane as in the tissues and in dust; (2) an acceleration of the drying process does not influence the resistance of the bacillus either in tissue or in dust; (3) this bacillus retains its vitality longer the greater the amount of the surrounding dust (it may thus be better protected against oxidation); (4) in a condition of complete dryness the diphtheria bacillus can retain its full virulence until its death; (5) air can carry this bacillus in the living condition.

Taking up the possibility of the transmission of erysipelas, pneumonia and other streptococcus diseases, Germano demonstrated the following facts: (1) The resistance of the streptococcus to drying varies with the variety as well as the material in which the drying is carried on; (2) the resistance is always high and may last for some months; (3) the rapidity of drying does not affect the length of vitality in any way; (4) the resistance of the streptococcus increases with the mass of the imbedding material, as this prevents the direct access of the air.

The diplococcus of pneumonia belongs among the bacteria that can resist drying for a long time. (1) This property varies between wide limits, and a special variety may be of little resisting power. Kruse and Pansini were right in explaining the discrepancies of various authors upon this ground; (2) the form lying between the streptococcus and the diplococcus may be extremely resistant; (3) in Germano's experiments, the diplococcus kept its properties better in the dry than in the moist condition; (4) in low temperatures, the behavior is the same as in moisture; cold hinders drying; (5) the rapidity of drying in medium temperatures has no influence upon the retention of vitality of the diplococcus; (6) since the diplococcus may, under some conditions, resist drying for some time, even if it cannot do this to the same extent as the streptococcus, the possibility of its transportation in the air, and of infection of man through the air must be granted.

Germano then took up the study of cholera, plague and cerebrospinal meningitis, and came to the general conclusion that there is little danger of the transmission of these diseases through dust in the air.

He summarizes his final results by saying that there

must be a revision of opinion as to the transportation of important disease producers. In general it may be considered as settled that they must be dry to render their transportation by means of dust at all probable, and the experiments upon drying are only of value when conducted with fine dust. As the result of such experiments the conclusion is that the finer the dust the quicker the bacteria die.

In relation to resistance to drying, the bacteria he studied divided themselves into several groups: The first included typhoid, cholera and plague. Experiments with these showed that they often sank in number of resulting colonies from 100,000 to 0 in twenty-four hours. Therefore the chances of transportation by the air must be considered as very slight. His experiments were controlled by the use of several races of each, so that the fallacy of working with one especially susceptible to drying might be excluded. Similar results were obtained with influenza and gonorrhea.

A second group was formed by the streptococci, the pneumococci, and the diphtheria bacillus, which in various races showed great variation in resistance to drying, some dying almost at once, some living days, weeks, or even a month; most of them died quickly, only a very small number resisted for any length of time. The so-called sporadic cases of erysipelas, diphtheria, etc., may be explained by the occurrence of these resisting types.

In a third group may be placed, as still more resistant, the diplococcus intracellularis, and with it the staphylococci of suppuration, and the bacillus of tuberculosis.

The fourth and last group includes the spore-producers, — which in this way may resist drying for an indefinite period, — anthrax, malignant edema, tetanus, etc.

Our knowledge of the acute exanthemata is not great enough to enable us to know in what group to place them; they certainly do not belong in the first, but it may be doubtful whether they belong in the second or third.

It would seem to me, then, that the conclusion to be drawn is that the danger from such a dust nuisance as we have had is greater from the direct irritant quality of the dust itself than from the chance of the transportation of any infectious disease; the winter has been so exceptional, however, that the Board of Health has an opportunity to furnish some valuable statistics upon the comparative occurrence of infectious diseases in the affected area this year as compared with last, when the same conditions did not exist.

EFFECTS OF DUST UPON THE LUNGS.¹

BY VINCENT Y. BOWDITCH, M.D., BOSTON.

WHEN asked to make a few remarks upon the "dust nuisance," with special reference to its effect upon the respiratory organs, I gladly assented, delighted that the medical profession had again taken this matter in hand. The lethargy which seems to have let the people of Boston endure this state of things is as extraordinary as it is exasperating to those of us who know that the effect upon the health of the community is baneful, and who also know that the remedy is

¹ Read at a meeting of the Boston Society for Medical Improvement, February 19, 1900.

² Zeit. f. Hyg. u. Infektionskrankheiten, Bd. xxiv, S. 403; Bd. xxv, S. 439; Bd. xxvi, S. 66, u. s. v.

not difficult to find, if our citizens will only insist that a better state of things shall prevail. Will you allow me at first to recall a little of the work done by medical men upon the question of street watering?

Several years ago a committee composed of Drs. F. I. Knight, J. C. Warren, Henry J. Barnes and myself represented to the gentlemen then in power at City Hall the views of the Suffolk District Medical Society upon the wretchedly inefficient methods of street watering and the intolerably filthy condition of the macadamized streets, not only through the winter, but during the summer months. We received the rebuffs that invariably meet attempts to change existing conditions, by the remark that there was not money enough, and were asked what we proposed to do about it.

To make a long story short, the matter was agitated sufficiently to induce the subsequent mayor to allude to it in his first address. He instituted a much more efficient service by taking it out of the hands of contractors, who mulcted private individuals to fill their own pockets, and the street-watering service for nine months in the year, partly by dint of constant and persistent efforts of the committee, collectively and individually, has slowly and steadily improved, so that during the nine months of the year when the temperature has been above the freezing point, the Back Bay in the last year or two, even though very far from satisfactory at times, has been made a more habitable section of the city, as far as dust is concerned, than it was several years ago. Last year even a new departure was made by Superintendent Wells, by occasionally sending out a sprinkler in the winter months on the day when the thermometer rose above 32°.

In order to improve still further upon existing conditions, petitions for asphalt pavements on Beacon Street beyond Massachusetts Avenue, the only artery for heavy teams from the Back Bay to the Allston and Brighton districts, were signed by the residents in that street with very few exceptions.

Mayor Quincy and Superintendent Wells both cordially endorsed the idea, but lack of proper appropriation has thus far failed to accomplish what large numbers of the residents have earnestly desired. In consequence of this lack of proper pavements the citizens of Boston, especially those of the Back Bay, the most exposed section of the city, have had to endure in this open winter a vile atmospheric condition, which is a standing disgrace to any civilized community.

As a striking example of a not uncommon occurrence, I have at home a twenty-pound butter firkin nearly full to the brim of filth collected from my own doorsteps, in four hours, after a high northwest wind had caused the usual dust storm, in spite of a heavy rain during the preceding night.

It would seem almost unnecessary to speak, gentlemen, of so self-evident a truth as the baneful effect of such a condition upon the health of the community, yet it is necessary to emphasize this point. Apart from any possibility of carrying disease germs from the powdered filth lying in our streets and blown into our faces and forced into our houses, the mere mechanical irritation upon the nasal and bronchial tracts of such an atmosphere as we have had to endure this winter is sufficient to be a fruitful cause of trouble to many people. I have patients under my care now, with delicate throats and lungs, unable to leave town for various reasons, who have to be housed absolutely

during these days when, were our streets in proper condition, they could enjoy out of doors the comparatively mild and bracing air of this moderate winter. Even in the houses with the windows shut tight, my patients have bitterly complained of the effect upon their throats of the dust which sifts through the windows and doors. What a mockery it seems with the constantly growing knowledge that fresh air and open windows are essential for health, more especially for the prevention and cure of our great scourge, consumption; what a mockery it seems that we should go on enduring such a condition of affairs in our city, of which we naturally feel so proud, the many advantages of which we are apt to boast.

Our city government is not wholly to blame for this state of things. Mayor Matthews, with far-seeing policy, advocated strongly the plan of paving the whole of Commonwealth Avenue with asphalt, and of gradually extending this process to the whole of the Back Bay. This scheme was defeated by a number of people, largely those who own horses, because of the occasional slippery nature of asphalt, and in consequence the Telford pavement was substituted. From personal questioning, I know that many of those who signed that petition to defeat the mayor's plan now deeply regret their action. In consequence of this mistake it has been impossible to drive or walk on this great avenue with any comfort for a large part of the winter on account of the sweeping clouds of dust.

That asphalt is an ideal pavement or without drawbacks, none of its strongest advocates would claim, but with proper care and regulation to prevent its being constantly torn up and replaced by inferior material, it has thus far proved in our American cities the one which possesses the greatest advantages and the fewest disadvantages of all pavements used here. This is the testimony of Colonel Waring in a personal conversation held not long before his death.

Huntington Avenue and the upper part of Columbus Avenue are constant proofs of the superiority of their pavements, if one will take the pains to walk through Massachusetts Avenue and witness there the clouds of dust in winter on a windy day, almost reaching to the house-tops, and then note the condition of the atmosphere in the former streets.

In mild, damp weather, moreover, the collected filth of Massachusetts Avenue in the spring and autumn causes often a nauseating odor, most marked in the evening, which has not infrequently compelled me to leave the street from sheer disgust.

That Boston now, in comparison with many other large cities in our own country, still more with those in Europe, is, to say the least, in a most provincial condition as far as pavements are concerned, I think no one can deny.

Gentlemen, for the comfort and health of our community, I trust that this meeting may be a strong factor in bringing about the improvements which we all so earnestly desire.

TUBERCULOSIS IN PARIS.—According to the *Journal of the American Medical Association*, nearly 26% of the deaths in Paris in 1899 were due to tuberculosis—12,314 out of a total mortality of 46,988. The percentage of tuberculosis mortality at various ages was as follows: One to twenty, 37.2; twenty to forty, 60.2; forty to sixty, 30.5, and over sixty, 3.3.