CONTRIBUTED AND SELECTED

AERIAL OR GASEOUS DISINFECTION.*

BY SEWARD W. WILLIAMS, PH.C., F.C.S.†

3. *Do You Think the Conclusions Reached by Mr. Adams in the Ladies' Home Journal for March (See Quotation in Enclosed Paper) Justified?*

[This was the quotation:

I am assuming in what follows, only two points: That you are an adult, and a non-consumptive at present. On that hypothesis:

1. You have had tuberculosis.
2. You have cured yourself of it.
3. In the process of curing yourself you have so fortified your body against it that you are safe against "catching" the disease from any other person.
4. If you now become a consumptive it will be through a relapse and *by your own fault.*]

ARIZONA.—[This question not answered.]

ARKANSAS.—Dr. C. W. Garrison: No.

DISTRICT OF COLUMBIA.—Dr. W. C. Woodward: Mr. Adams is in a position to speak dogmatically with respect to this matter. I am not.

FLORIDA.—Dr. J. Y. Porter: I cannot wholly agree with Mr. Adams's conclusions that tuberculosis is never contracted by adults through contact with persons suffering with the disease. I believe that such infection does occur through the moist sputum, in which the bacillus is kept in a moist and active state. I very much doubt the possibility of transmission by dried sputum.

IDAHO.—Dr. W. R. Hamilton: I do not know. My experience in fumigation has been rather limited, but, until I receive more definite information, much prefer to continue using formaldehyde.

ILLINOIS CENTRAL R. R.—Dr. A. E. Campbell: No, I do not.

INDIANA.—Dr. J. N. Hurty: I think the conclusion reached by Mr. Adams, Dr. Chapin, Dr. Goldwater and other close observers will likely be found correct.

KANSAS.—Dr. O. D. Walker: Formaldehyde as it is generally used as a disinfectant is of little real value. Under proper treatment it is quite effectual.

MAINE.—Dr. A. G. Young: No, I do not.

MARYLAND.—Dr. J. S. Fulton: I do not regard Mr. Adams's statement as a "conclusion." It is simply a rather vivid statement; and for a certain large fraction of the adult population, it is 75 percent true.

MISSOURI.—Dr. G. B. Schultz: Yes.

NEBRASKA.—Dr. E. A. Carr: No. (We should not cast ourselves overboard in mid-ocean until we see another boat in sight.)

NEVADA.—Dr. M. F. Boyd: I consider that Mr. Adams's statements, *under the conditions he names,* and in the light of our present knowledge, to be justifiable and conservative.

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NEW YORK.—Dr. F. M. Meader: Yes.

Dr. E. H. Porter: The conclusion is not yet justifiable and should not be put forth to the public.

Dr. J. J. O'Connell: I have not read the article by Mr. Samuel Hopkins Adams to which you refer. I do not see that his four conclusions logically follow his two assumptions. In other words, it does not seem to me to be a necessary sequence of the fact that you are an adult non-consumptive at present, that you formerly had tuberculosis and have cured yourself of it, and in curing yourself have so fortified your body as to make it safe against reinfection. Of course if you had tuberculosis and have cured yourself, that settles it. You are cured and must be reinfected in order to have the disease a second time. I think it highly probable, however, that a retardation of the growth of the causative factor by a removal of the patient from conditions favorable to such growth into conditions unfavorable to such growth has frequently been mistaken for a complete cure, and that in such cases the organisms are dormant, but not dead, and await only a restoration to conditions favorable to them to renew their malignant activity.

Dr. M. C. Schroeder: No, they are not justified; while reasonable care and personal hygiene may protect a consumptive individual from reinfection, he is still subject to sources of infection which may be beyond his control.

NEW MEXICO.—Dr. L. G. Rice: No.

NORTH CAROLINA.—Dr. J. H. Way: Hardly; while the degree of tuberculophobia induced has been excessive, and doing positive harm in some places, yet, I would not wholly have people feel that they may associate intimately with careless spitting consumptives without taking precautions.

OHIO.—Dr. E. F. McCampbell: The quotation from Mr. Adams's article in the Ladies' Home Journal is to the effect that adults who are non-consumptive have had the disease and have been cured of it. Any further infection must come from the person's own body and not from some other person. In other words, will be a relapse. This I believe is generally true.

OREGON.—Dr. C. S. White: No. I question the authenticity as to whether or not we have all had tuberculosis.

PENNSYLVANIA.—J. P. Remington, Ph.M., F.C.S., Chairman Committee of Revision U. S. Pharmacopœia; Dean of American Pharmacy:

[On the way to the San Francisco meeting, while chatting with Professor Remington, I asked his opinion on this question, and the experience he related showed so positively that an adult *may* contract tuberculosis from one ill with that disease that I asked to be favored with a written account. This he has very kindly supplied, as follows:]

Charles Frederick Zeller, Ph.G., died April 7, 1886, from tuberculosis. The history of this case attracted my attention to the communicability of the tuberculosis germ by oral infection. Professor Zeller was my assistant in pharmacy for ten years and during this time was the picture of health. He was a young man of strict integrity, vigorous in health, and a physique which enabled him to rise early in the morning and work in a drug store until eleven o'clock at night. He was strictly temperate, using neither alcohol nor tobacco, very fond of his parents, and devoted to his sister. This sister in 1880 nursed an intimate girl friend through a fatal illness, which was termed "galloping consumption."

The idea of the communicability of tuberculosis at that time was not held by physicians. Frederick's sister frequently kissed her friend, particularly when she left her in the evening to return to her home. Miss Zeller was in splendid

health and there was no history of tuberculosis in the father and mother or ancestors.

Shortly after the death of the friend of Miss Zeller, symptoms of tuberculosis appeared and Miss Zeller died in a few months. Frederick was of an affectionate disposition and he often kissed his sister. Although everything was done by the well-to-do parents to save their daughter by employing the best physicians and specialists, she died within a year. Shortly after the sister's death, Frederick manifested symptoms and the progress of the disease in his case was very rapid, and on April 7, 1886, after a violent hemorrhage from the lungs, this strong, healthy man passed away.

If my recollection serves me, the sister was about four years younger than Professor Zeller, who was twenty-eight years of age when he died.

He was a man who ridiculed the complaints of his friends about trifling ailments and accused them of having vivid imaginations and a desire to obtain sympathy. He was not subject to ordinary colds and believed that the way to get rid of these ailments was to pay no attention to them. He undoubtedly reasoned that when he himself had a cold the best way to proceed was to ignore it and his splendid vitality always prevailed and his rosy cheeks and cheerful disposition gave one the impression of health far beyond the average. Barely six months elapsed from the time of infection until the time of his death.

These events following each other so rapidly convinced the writer that tuberculosis, like so many diseases, was produced by the presence of a germ. Soon after Professor Zeller's death, at a meeting of the Philadelphia County Medical Society, the writer stated the case, giving facts and dates; but the impression on the majority of physicians present was very slight, and one noted physician of Philadelphia ridiculed the idea of communicability and dismissed the subject with the common story of it being simply a coincidence. Three years afterwards, this same physician informed the writer that he was convinced from other cases that tuberculosis was due to a germ. Since then, of course, the germ has been isolated and we are now in a fair way to stamp out the ravages of the "great white plague." (Signed) JOSEPH P. REMINGTON.

Dr. S. S. Cohen: It is partially true and partially false; as a rule recovery from tuberculosis does not establish immunity against infection. On the other hand, the life which prevents tuberculosis and brings about recovery from tuberculosis must be continued to prevent relapse. [Answering Question No. 3.]

SOUTH DAKOTA.—Dr. D. L. Rundlett: In a general way, yes, as few of us have not had a mild infection at some time but our natural immunity was such that the condition could not progress. In other words, we cured the disease ourselves, as Mr. Adams states. These facts are borne out in that we seldom see tuberculosis in those advanced in years. Of course, there is a possibility that people who did not understand this fully might be made careless of the danger.

TENNESSEE.—Dr. Ambrose McCoy: No. Not with our present knowledge.

UTAH.—Dr. T. B. Beatty: Have not seen article.

WISCONSIN.—Dr. C. A. Harper: I am not in accord with the statement of Mr. Adams in the Ladies' Home Journal for March. I do not believe that all young adults have had tuberculosis in mild or any other form; that there has been some infection in many of the apparently well young adults, I do not deny. Hence his first hypothesis in my judgment is absolutely incorrect. Of course, those adults who are now apparently well and have had tuberculosis in a mild form in some stages of their existence are self-cured. In the process of curing one's self that individual is not sufficiently fortified against catching the disease

from any other person. Catching tuberculosis is frequently a result of more or less repeated exposures to the infectious agent. This is abundantly exemplified in active observation that those intimately associated with a tubercular patient who is somewhat careless very frequently contract the disease, while those who are exposed to the same person only occasionally and at intervals under the same conditions never contract the disease. Everyone immunizing himself by having a mild type of tuberculosis is self-cured. Undoubtedly immunizing could be very thoroughly established by the inoculation of tuberculin over certain periods of time.

Furthermore, the hypothesis of Mr. Adams does not hold true in any of the other communicable diseases; pneumonia is prone to repeat itself; diphtheria likewise; scarlet fever may and occasionally smallpox; measles frequently and typhoid occasionally. There is nothing in the immunizing process of tuberculosis that is observed in other communicable diseases. One attack of these diseases does not immunize entirely.

Furthermore, there are homes where there are large families one member of which is afflicted with tuberculosis, all of the other members more or less exposed and undoubtedly infected for many weeks and months. Then a period of years will lapse and members of this family through marriage or change of residence would become exposed again to a tubercular person and as a result of exposure a second time would become thoroughly infected and seriously ill from the disease. It is conclusive in my mind that the danger of active tuberculosis is much greater at any time of life in those who are exposed to the infection from without than by a recurrence of latent infection. To me Mr. Adams's hypothesis is especially unsound and a dangerous principle to establish in the crusade against tuberculosis.

In a dairy herd in which I am interested over thirty animals have been tested repeatedly and found free from tuberculosis in every respect over a series of years. An additional animal was purchased with a certificate and tagged indicating freedom from tuberculosis and put with this herd. Facts were later discovered showing that this animal had been tested, given a free bill, when the test showed tuberculosis. Immediately the whole herd with which this infected animal had been placed was re-tested and seven animals reacted. This to me emphasizes the danger of an infected environment beyond all reasonable doubt.

WYOMING.—Dr. H. T. Harris: Not altogether.

[Summary for Number 3: Favorable to Mr. Adams's views, 5; partly favorable, 3; unfavorable, 12; doubtful, 5. Doctor Carr's parenthetical observation seems to the point.]

4. *Even if This New Theory of Tuberculosis Were Generally Accepted, Would It Not Point to the Necessity of Fumigation After Pulmonary Phthisis to Protect Children?*

ARIZONA.—Dr. R. N. Looney: We should always fumigate after pulmonary phthisis.

ARKANSAS.—Dr. C. W. Garrison: Yes.

DISTRICT OF COLUMBIA.—Dr. W. C. Woodward: The acceptance of Mr. Adams's dicta with respect to the communicability of tuberculosis does not lead necessarily to the abandoning of *disinfection.* Whether there shall or shall not be *fumigation* depends upon circumstances. (See answer to question 1.)

FLORIDA.—Dr. J. Y. Porter: Thorough fumigation would, I believe, be impracticable in nine-tenths of the cases, and would be practically, if not altogether, useless in all.

IDAHO.—Dr. W. R. Hamilton: I should feel so.

ILLINOIS CENTRAL R. R.—Dr. A. E. Campbell: I do most emphatically. Tuberculosis will never be reduced until the disinfection of all rentable houses occupied by this class be made compulsory by Municipal Health Boards.

INDIANA.—Dr. J. N. Hurty: If the "new theory" of tuberculosis were generally accepted, I would nevertheless favor extreme cleanliness, which means sanitary care of the sputum, etc., and would not object to disinfection if for no other reason than its psychological effect. Formaldehyde disinfection is not efficient against tuberculosis infection. The acidfast bacteria are not killed by gaseous formaldehyde.

KANSAS.—Dr. O. D. Walker: Fumigation will do no harm and may do much good; hence fumigate.

MAINE.—Dr. A. G. Young: Too many histories of tuberculosis in families, hitherto immune, after they have moved into tuberculosis houses.

MARYLAND.—Dr. J. S. Fulton: The view expressed by Mr. Adams is in no respect inconsistent with the practice of *disinfection* of tubercular sputum of contaminated premises of the tuberculous.

MINNESOTA.—Dr. H. M. Bracken: No.

MISSOURI.—Dr. G. B. Schultz: Yes.

NEBRASKA.—Dr. E. A. Carr: Yes, *to be sure.*

NEVADA.—Dr. M. F. Boyd: Terminal fumigation at the end of pulmonary tuberculosis for the protection of any person, and in the absence of more suitable and necessary prophylactic measures can have little justification.

NEW YORK.—Dr. F. M. Meader: No; because formaldehyde gas does not kill tubercle bacilli.

Dr. E. H. Porter: Possibly.

Dr. J. J. O'Connell: I am not very clear in my mind as to what the new theory of tuberculosis is, but it does not seem to me that the theories of Mr. Adams with regard to it have any real relationship to the question of fumigation.

Dr. M. C. Schroeder: Homes in which pulmonary tuberculosis occurs, especially where the lesions are breaking down, should be subject to routine weekly or monthly disinfection which should include the washing of walls, bedsteads, mattresses, blankets and the steam sterilization of bed and personal linen.

NEW MEXICO.—Dr. L. G. Rice: I believe in the theory, tuberculosis practically always contracted in infancy, all right, but this does not change my opinion on fumigation after tuberculosis.

NORTH CAROLINA.—Dr. J. H. Way: Fumigation after tuberculosis is, in my judgment, of little real value, though still advised. It does little good, and it may do harm in getting the attention of people away from real danger.

OHIO.—Dr. E. F. McCampbell: Yes, but it is most important to see that children are removed from an environment in which tuberculosis prevails.

ONTARIO (Canada).—Dr. J. W. S. McCullough: Fumigation advisable in tuberculosis quarters.

OREGON.—Dr. C. S. White: I believe renovation, scrubbing, boiling bedding, varnishing woodwork, etc., is better than fumigation.

PENNSYLVANIA.—[The writer has seen nothing to indicate that an exception is made, in the case of tuberculosis, to the general rule to fumigate with formaldehyde after communicable diseases.]

Dr. S. S. Cohen: Yes and no. The germ of tuberculosis does not remain long suspended in the air. Proper cleansing of walls and floor are necessary; also

sunlight is necessary. Fumigation is of much less importance in this connection than after the exanthemata and diphtheria.

SOUTH DAKOTA.—Dr. D. L. Rundlett: Certainly yes. It's a well known fact that a tubercular patient is a safe one only as long as he protects his mouth by a cloth on coughing or sneezing, and expectorates into a receptacle which contains an antiseptic. The sputum [in street or on floor] is dangerous only as it dries out and becomes ground up in the dust on the floor of rooms or on streets, and is breathed in, or taken in on food.

TENNESSEE.—Dr. Ambrose McCoy: Yes.

UTAH.—Dr. T. B. Beatty: Believe in fumigation after pulmonary tuberculosis.

WISCONSIN.—Dr. C. A. Harper: Whatever the theory, the fumigation and cleaning of the home where there was a case of pulmonary tuberculosis should be invariably practised.

WYOMING.—Dr. H. T. Harris: Yes, by all means.

[As nearly as replies to number four can be classified, 17 may be called affirmative, 5 negative and 8 doubtful.]

5. *Have You, in Your Experience, Thoroughly Satisfied Yourself as to Whether or Not Communicable Diseases are Commonly Conveyed by Objects Handled by the Patient? In Other Words, What Rôle Do Fomites Play in Carrying Infection?*

ARIZONA.—Dr. R. N. Looney: Fomites play an important rôle in the spread of disease.

ARKANSAS.—Dr. C. W. Garrison: I believe fomites do not play as important a rôle in the transmission of disease as formerly supposed, except in drinking and eating utensils by direct contact.

DISTRICT OF COLUMBIA.—Dr. Wm. C. Woodward: Exact channels of infection have not been satisfactorily worked out. Fomites, using the word as ordinarily understood, to mean woollen garments, etc., probably play a small part, if any, in the transmission of communicable diseases. If the word fomites can be used to cover such articles as cups, spoons, etc., then the part played by fomites is probably considerably greater.

FLORIDA.—Dr. J. Y. Porter: In my opinion, fomites play very little, if any, part in the transmission of contagious or infectious diseases. I believe direct contact with the patient or his excretions to be the only factor worthy of serious consideration in any epidemic or contagious disease.

IDAHO.—Dr. W. R. Hamilton: My belief is, that communicable diseases are contracted in this manner.

ILLINOIS.—Dr. C. St. Clair Drake: In my opinion, contact with patient or objects handled by patient—sick or well carrier—is the only way disease is spread.

ILLINOIS CENTRAL R. R.—Dr. A. E. Campbell: Yes, there are times when it looks that way, but we must state how often this is found and how often disease is traced to such a source. I would not favor a sweeping deduction.

INDIANA.—Dr. J. N. Hurty: I am inclined to believe fomites play very little part in carrying infection.

KANSAS.—Dr. O. D. Walker: A very common way of spreading contagious diseases.

MAINE.—Dr. A. G. Young: A secondary rôle, but one not to be neglected.

MARYLAND.—Dr. J. S. Fulton: Inanimate materials are frequently instrumental in the conveyance of infectious diseases. With respect to some diseases, inanimate

conveyors are more potent, and with respect to other diseases less potent, than animate carriers.

MINNESOTA.—Dr. H. M. Bracken: Not air borne.

MISSOURI.—Dr. G. B. Schultz: They frequently convey the infectious agent.

NEBRASKA.—Dr. E. A. Carr: School books, pencils, drinking cups, etc., are known to be carriers of disease; so I say fomites are dangerous.

NEVADA.—Dr. M. F. Boyd: Fomites, as the term is usually used, play a very insignificant rôle, if indeed any, in the transmission of the commoner infectious diseases. Objects directly passing from mouth to mouth, etc., are of considerable importance in disease transmission, but are not included in the generally accepted meaning of the term fomites.

NEW YORK.—Dr. F. M. Meader: A very minor part.

Dr. E. H. Porter: It would seem to be an important one.

Dr. J. J. O'Connell: Certain of the communicable diseases are undoubtedly conveyed on objects which have been handled by a patient. Our knowledge of the etiological factors is not adequate to warrant us in defining the rôle played by fomites. In pneumonia plague there is no doubt that the air sustains for a period minute globules which contain *B. pestis*. In clothing soiled with fecal matter certain organisms will survive for varying periods of time. In our laboratory we have recently conducted several experiments as to the viability of cholera germs in sea water and we find that in the greatly contaminated water of our harbor the vibrios will live for several weeks. As we have not identified as yet the pathogenic organisms of scarlet fever and measles and some of the other infections, it is not scientific to contend that these organisms will not live in clothing and in material other than animal tissue. There have been cases in my own experience as well as in the experience of most physicians with whom I have discussed this subject, where direct contact was most improbable if not impossible, and the infection was explicable only in the light of the fomite theory. I have not read in the published works of those who condemn this theory any explanation of infection in such cases which did not seem to me to be based upon the merest speculation. I believe there is great danger in the acceptance as authoritative of theories with regard to fumigation and isolation of cases of infectious diseases based upon conjectures which fly in the face of common experience.

Dr. M. C. Schroeder: Yes.

NEW MEXICO.—Dr. L. G. Rice: They are very often carried by objects but not always.

NORTH CAROLINA.—Dr. J. Howell Way: I do not, and do not think many people nowadays believe much in fomital infection. *Persons,* not things, are the manifest sources of disease.

OHIO.—Dr. E. F. McCampbell: I believe that fomites do play a part in spreading communicable disease, but that the infection does not persist long as fomites and that direct contact is a much more important means of transmission.

ONTARIO (Canada).—Dr. J. W. S. McCullough: Immediate handling of toys, etc., especially if placed in the mouth as children do, will in my opinion transmit disease.

OREGON.—Dr. C. S. White: With the exception of smallpox, perhaps comparatively little.

PENNSYLVANIA.—[Dr. Dixon does not answer this question specifically, but from the thorough method of fumigation he advises, the danger of infection from articles in a room which have been handled by the patient is recognized.]

Dr. S. S. Cohen: Yes, fomites play a very large rôle. I have no statistical studies and can only judge by observation. That fomites do not carry yellow fever is evident; they do convey scarlet fever, typhoid fever, cholera, etc.

SOUTH DAKOTA.—Dr. D. L. Rundlett: Yes. I have seen it conveyed in two or three cases of diphtheria by the means of toys.

TENNESSEE.—Dr. Ambrose McCoy: Doubtful as to exact rôle that fomites play in the transmission of disease.

UTAH.—Dr. F. B. Beatty: No, but believe that the latter is secondary in importance.

WISCONSIN.—Dr. C. A. Harper: My observance leads me to believe that communicable diseases are very commonly conveyed by objects handled by patients, or, in other words, fomites. Many striking examples of this have come in my experience.

WYOMING.—Dr. H. T. Harris: Fomites play a very important part in the spread of communicable diseases.

[Summary, Number 5: 15 regard fomites as of considerable importance in conveying infection; 7 consider them of secondary importance but not to be neglected, and 8 regard them as of comparatively little or no consequence.]

6. *How Is It That Some Sanitarians, Who Advise Burning Books Handled by a Person Having a Contagious Disease, Regard the Fomite Theory, as Applied to Things Generally, so Lightly That They Do Not Fumigate the Room and Its Contents?*

ARIZONA.—Dr. R. N. Looney: Don't know.

ARKANSAS.—Dr. C. W. Garrison: Simply an inconsistency.

DISTRICT OF COLUMBIA.—Dr. Wm. C. Woodward: This is because of the radical difference between the relation of the patient to a book and the relation of a patient to a room.

FLORIDA.—Dr. J. Y. Porter: This is merely one of the very frequent glaring inconsistencies indulged in by some of our health authorities. This attitude is very often, I think, the result of a spirit of compromise on the part of the health officer with the laity, who persist in clinging to the ancient and time-worn superstitions and theories regarding disease transmission.

IDAHO.—Dr. W. R. Hamilton: I do not know.

ILLINOIS.—Dr. C. St. Clair Drake: Fumigation does not sterilize.

ILLINOIS CENTRAL R. R.—Dr. Campbell: Because the profession is divided on this subject.

INDIANA.—Dr. J. N. Hurty: I do not know how it is that some sanitarians would advise burning books handled by a person having contagious disease but do not fumigate the room and its contents. Such sanitarians must, of course, answer the question.

KANSAS.—Dr. O. D. Walker: I don't know.

MAINE.—Dr. A. G. Young: It is beyond me.

MARYLAND.—Dr. J. S. Fulton: I do not have to explain anybody's inconsistencies, not even my own. I am not even prepared to say that the inconsistency assumed in this question is a real inconsistency.

MINNESOTA.—Dr. H. M. Bracken: The idea of destroying books is on the basis that one who has had an infectious disease and has transferred the infectious material from the mouth or other parts of the body to the hands, has left the infectious material on the books.

MISSOURI.—Dr. G. B. Schultz: Ignorance.

NEBRASKA.—Dr. E. A. Carr: Do not understand how they apologize to themselves.

NEVADA.—Dr. M. F. Boyd: I am not familiar with such standing taken by any sanitarian.

NEW YORK.—Dr. F. M. Meader: I do not think it necessary to burn books. If exposed recently to infectious material they may be fumigated.

Dr. E. H. Porter: Consistency is a jewel.

Dr. J. J. O'Connell: I am sure that I cannot answer your question because there seems to be no consistency in burning books handled by infectious disease patients and failing to disinfect the rooms occupied by these patients and the contents of such rooms.

Dr. M. C. Schroeder: It is human to err.

NEW MEXICO.—Dr. L. G. Rice: They simply want to be a little different from others; but are not practical.

NORTH CAROLINA.—Dr. J. Howell Way: I don't know. Should you find a real, sensible, consistent reason, let me know why.

OHIO.—Dr. E. F. McCampbell: I cannot explain the mental processes of the sanitarians mentioned.

ONTARIO (Canada).—Dr. J. W. S. McCullough: Fomites will not carry disease after any lengthened period.

OREGON.—Dr. C. S. White: I do not know.

PENNSYLVANIA.—[Dr. Dixon's explanation of the process used in Pennsylvania for fumigating the room and everything in it, appears on another page.]

Dr. S. S. Cohen: This is a question for psychiatrists.

SOUTH DAKOTA.—Dr. D. L. Rundlett: That is beyond the working of my brain to explain.

TENNESSEE.—Dr. Ambrose McCoy: That I cannot answer.

UTAH.—Dr. T. B. Beatty: Consider such practice inconsistent.

WISCONSIN.—Dr. C. A. Harper: In answer to your next question, beg to state that I am unable to reconcile myself to the proposition advanced that books should be burned after they have been exposed to contagious disease while other fomites are left unfumigated or not destroyed. The element of light is an important factor in the destruction of infective agencies and of course it is difficult to have the light invade the interior of a book to any considerable extent, while fomites in general are more exposed to light; but there is not sufficient difference in the two propositions to warrant the destruction of one and neglect of the other.

WYOMING.—Dr. H. T. Harris: Such an attitude as above outlined seems to me inconsistent.

[Nearly all seem to agree that the position referred to is inconsistent. Dr. Harper's very clearly stated views will doubtless be generally accepted.]

7. *Is Not the Viability of Pathogenic Bacteria So Influenced by Deficiency of Light and Fresh Air, and So Affected by Atmospheric Conditions in General, as to Make it Unwise to Rely Upon Disease Germs Shortly Succumbing to Conditions Practically Unattainable Without Fumigation?*

ARIZONA.—Dr. R. N. Looney: It is not safe to rely entirely on fresh air and sunlight.

ARKANSAS.—Dr. C. W. Garrison: Yes. We should be on the safe side and fumigate. In addition to fumigating, however, I hold that the free and intelligent

use of soap and water is more important and efficacious in most instances, especially in those diseases classified as infectious.

DISTRICT OF COLUMBIA.—Dr. Wm. C. Woodward: If the destruction of disease germs is practically unattainable without fumigation, then by all means fumigate; but the impracticability of destroying disease germs without fumigation must not be taken for granted. Fresh air, sunlight, mechanical cleaning, and the use of germicides in solution can commonly be relied upon.

FLORIDA.—Dr. Porter: I do not so consider it. All of our knowledge of pathogenic bacteria shows clearly that they can live only a short time outside the body, except upon suitable media and under *most favorable* conditions; which conditions certainly do not exist, as a general rule, outside the bacteriological laboratory.

IDAHO.—Dr. W. R. Hamilton: Yes.

ILLINOIS.—Dr. C. St. Clair Drake: Yes.

ILLINOIS CENTRAL R. R.—Dr. A. E. Campbell: This also is unsettled ground. We will fumigate all our cars as a precautionary measure for some time.

INDIANA.—Dr. J. N. Hurty: I cannot answer this question satisfactorily to myself.

KANSAS.—Dr. O. D. Walker: Yes.

MARYLAND.—Dr. J. S. Fulton: Practical disinfection must take all of these considerations into account, and as far as possible must be governed by them. The general assumption that the processes of nature would be greatly expedited by liberating quantities of formaldehyde gas may have some pleasant spiritual effect, but I am convinced that four-fifths of the time and material expended in my State on the liberation of formaldehyde gas is of no demonstrable value.

MINNESOTA.—Dr. H. M. Bracken: Yes, and under ordinary methods of disinfection, they will not be killed. They can be disposed of by a thorough housecleaning and a room into which it is not possible to admit the sunlight and air should not be considered as a place for future habitation under any conditions whatever. In fact, the existence of such rooms is a disgrace to any community.

MISSOURI.—Dr. G. B. Schultz: Yes.

NEBRASKA.—Dr. E. A. Carr: Yes.

NEVADA.—Dr. M. F. Boyd: Your last question is too broad to permit of a brief concise reply. The organisms causing the commoner infectious diseases are all strict parasites, needing the conditions of warmth, moisture and darkness offered them by the body cavities for their life and multiplication, so that they readily succumb outside the body. The inability to survive in an extra-corporeal existence, due to factors of chilling, light and desiccation, achieves the same results, as contemplated by fumigation, and I believe probably as effectively.

NEW YORK.—Dr. F. M. Meader: Experience teaches that terminal fumigation does not limit the spread of communicable diseases as enumerated by our sanitary code.

Dr. E. H. Porter: It might be; but the value of fumigation unless supervised by an expert is often doubtful.

Dr. J. J. O'Connell: I do not think it wise to rely for safety solely upon the influence of light and fresh air on the viability of pathogenic bacteria.

Dr. M. S. Schroeder: Yes.

NEW MEXICO.—Dr. L. G. Rice: Very unwise; use all precautions, but at the same time fumigate the best we know how.

NORTH CAROLINA.—Dr. J. Howell Way: Possibly so.

OHIO.—Dr. E. F. McCampbell: Pathogenic bacteria differ in their resistance

to such agents as light and drying, so it is impossible to make a general statement in answer to this question. As I have said, in answer to Question No. 1, the Ohio State Department of Health recommends terminal disinfection after certain diseases.

ONTARIO (Canada).—Dr. J. W. S. McCullough: I think it wise in light of present knowledge to fumigate.

OREGON.—Dr. C. S. White: Yes. This is especially true of the pus infections and smallpox.

PENNSYLVANIA.—Dr. S. G. Dixon: [As stated before, Dr. Dixon favors fumigation by the sodium dichromate, formalin and sulphuric acid method, suggested by Dr. George D. Rosengarten and developed by the Pennsylvania Board of Health.]

Dr. S. S. Cohen: Certainly.

SOUTH DAKOTA.—Dr. D. L. Rundlett: Yes. I feel very strongly that the process of fumigation should be carried out in a thorough manner, because while sunlight and fresh air will kill certain disease germs in a few moments, we have no way of knowing positively that these means have been able to penetrate certain nooks and corners, where a gas will penetrate.

TENNESSEE.—Dr. Ambrose McCoy: Cannot say.

UTAH.—Dr. T. B. Beatty: Yes.

WISCONSIN.—Dr. C. A. Harper: The viability of pathogenic bacteria differs very much. The degree of light and moisture also are important factors in the greater lessening of the viability of pathogenic bacteria. The degree of light and moisture differs very materially and cannot be relied upon as a sufficiently destructive factor to eliminate the necessity of fumigation. Such a procedure in my judgment is not verified in actual experience; on the other hand, the opposite condition is frequently observed.

I believe aerial disinfection an important factor. This also is important on the exposed surface with which the air comes in contact, and should the process be abolished the pocket-books of the medical profession would be greatly fattened.

WYOMING.—Dr. H. T. Harris: Most certainly.

[Twenty favor fumigation in addition to fresh air and sunshine; three emphasize value of germicidal solutions; three regard fumigation as of practically no value, and four are doubtful.]

FRESH AIR AND SUNSHINE.

Doctor Bracken's (Minnesota) reference to "proper conditions" and "sunlight," in his replies to questions 1 and 7, in some way reminded me of an article by Professor Lewis Jerome Johnson of Harvard University (page 498 of the American Public Health Journal, June, 1914) on the relation of methods, of taxation to the public health, and I wrote to General Gorgas and Dr. S. S. Cohen for expressions of their views on this phase of our subject. Here is letter from General Gorgas:

WAR DEPARTMENT,
Office of the Surgeon General.

WASHINGTON, July 3, 1915.

Mr. Seward W. Williams,
5415 Hyde Park Boulevard,
Chicago, Illinois.

Dear Mr. Williams:

Yours of June the twenty-eighth is acknowledged. I was very thoroughly impressed in my sanitary work with the evil effects upon the general health of the community which our

present system of taxation causes. In both Cuba and Panama American occupation was at once followed by a large increase of wages. This was at once followed by very much better living conditions among the poorer classes, and, therefore, very much improved sanitary conditions. In considering these instances, I was impressed by the fact that low wages were due to there not being enough jobs to go around and that, therefore, the wage-earners were forced to bid against each other for these jobs. I can see that a tax on land values would tend to everywhere bring the large body of unused lands into use. This would furnish abundant jobs to the jobless and would prevent them from bidding against each other for employment, and, therefore, have a great tendency to raise wages. I feel confident that the most important sanitary measure that any community could adopt would be a taxation on land values.

Very truly yours,

(Signed) W. C. GORGAS,
Surgeon General U. S. Army.

Dr. S. Solis Cohen, Philadelphia, Pa., under date of July 19, 1915, replies as follows:

I have been very much interested in your letter and its enclosure.

With the comment which you quote from an executive officer of the Board of Health as follows:

> Pathogenic germs will not be killed under ordinary methods of disinfection. They can be disposed of by a thorough house-cleaning; and a room into which it is not possible to admit sunlight and fresh air should not be considered as a place for future habitation under any conditions whatever. In fact, the existence of such rooms is a disgrace to any community—

I must express considerable sympathy. While I advocate fumigation, I am not at all sure that it succeeds in killing all pathogenic germs. It is, however, much better than nothing. It does, judging from practical results, diminish considerably the danger of infection, probably by killing a certain proportion of the pathogenic bacteria and diminishing the virulence or viability of others. Thus, it is a precaution that we cannot afford to neglect, however imperfect it may be.

Nevertheless, we should not allow ourselves to be misled into an unwise dependence upon an acknowledgedly imperfect measure. Fresh air and sunlight are necessities of life; and just in the proportion that they are beneficial to man they are harmful to his microscopic enemies. I have long been in the habit of quoting Graves of Dublin, who said, three-quarters of a century ago: "It is important to know how to make a man phthisical, as by pursuing an opposite line of conduct we will be able to prevent it." Graves had studied phthisis as it appeared in the Irish peasants and town laborers. He had found that it was the result of dirt and dampness and darkness and starvation; that those who were well fed and well housed, to whom water and air and sunlight were easily accessible, did not succumb.

This has been the invariable experience of all those who have studied the problem of tuberculosis. The tubercle bacillus is harmless against normal human beings under normal conditions. The organism contains within itself powers of defense and resistance more than sufficient to overcome infection, and it is only when these powers have become enfeebled through privation, depression or excess, that tuberculosis can find lodgement within the body. Hence, it is, also, that while Ireland was the great field for tuberculosis in the time of Graves, on account of the poverty and the wretched housing conditions there prevailing, New York City has become in our day pre-eminently the field of tuberculosis, on account of the poverty and the wretched housing conditions there prevailing.

More than thirty years ago I pointed out that tuberculosis was no longer a medical problem, but pre-eminently one for the sociologist, and especially one for the statesman. Originating in the hovel, it may, under certain conditions, spread to the palace, visiting, as I then said, "the miseries of Lazarus upon the children of Dives." Though it prevails chiefly among the poor, the rich are not immune, and while the resistance of the poor breaks down because of their lack of food, their lack of rest, their lack of fresh air and of sunshine, of

opportunities for personal cleanliness and for innocent enjoyment, it may break down among the very rich from the opposite causes—the exhaustion by the victims themselves or by their parents, of their natural protection—through lives of extravagance and idleness, or physical and spiritual dissipation.

Hence, considering both extremes, the problem is one of economics—on the one hand to prevent the accumulation of unearned fortunes as now permitted by unwise laws, and on the other hand to secure a proper distribution of the wealth produced by conjoined labor and capital among the masses of producers so that they shall be enabled to provide for their wants without excessive hours of labor, and shall be enabled both to work and to live under sanitary conditions both as regards the body and as regards the mind. The fear of poverty —the constant anxiety lest one "get out of work" with all that this implies—is a fertile cause of mental and physical depression reducing the resistance.

It is easier, however, to understand concrete examples than abstractions, and one concrete example may stand as a type of the whole series of conditions mentioned. The absence of air and sunlight from dwellings is owing to the necessity for crowding a large number of habitations into a small area; and this is purely an artificial, man-made, indeed, law-made, need. In other words, it is unnatural. In Great Britain and Ireland we have the miserable cottage of the laborer flanking the enormous estates, lawns, forests, grand preserves, and deer parks of the gentry. In New York City we have the tenements or the congested districts within a short distance of open country affording ample space for modest dwellings with healthful surroundings. Nay, on Manhattan Island itself there is space, if properly utilized. Both in the old country and in the new, our land laws are at fault. The remedy is obvious. It applies alike to village and town, to commercial, industrial, mining and agricultural settlements. It would alter factory conditions, mining conditions, housing conditions, for the rich and the poor alike.

It is simply this: At present we set a premium upon keeping land vacant, and fine those who improve and make use of their land. The vacant lot in the heart of the growing city is taxed lightly; when it is built upon, not only are the taxes upon the land itself increased, but we add to them the tax upon the building that has been erected, and whose erection has afforded employment to architect and to many classes of artisans. Enormous profits are pocketed with the unearned increment accruing to land held idle, while the farmer and the builder receive but a modest recompense for their labor and risk. The owner of idle land along a railroad demands a large sum from those who propose erecting a factory upon it which will employ many workers, increase the business of the railroad and help to build up the community wherein it is established. The factory owners, after expending large sums for the land, must also invest other large sums in buildings and machinery, and then pay taxes on the increased assessment of the land and upon the value of their plant. Since they risk their whole capital in the business, they are entitled to a fair profit, and when this has been deducted from what is left after the payment of interest upon the cost of ground and plant, added to taxes, the amount left for distribution among the workers is relatively small.

Change this, tax vacant land equally with adjoining land put to wise use, and remove taxes from the improvements made by the farmer, builder, manufacturer, miner, etc., and you will revolutionize not only industry, but health. Rents will fall, the profits of the farmer, the manufacturer and the merchant, the wages of the workman, will alike increase. In other words, labor, whether mental or physical, will receive its due reward; and legal ground-blackmail—which is what the holding of land out of use amounts to—will cease.

In particular, to come back to our text, over-crowding in unsanitary dwellings, will disappear; and the increased bodily resistance which will result from working under proper conditions and with wages that will afford to everyone good food and decent living, with his share of rest and recreation, will so simplify the problem of contagious diseases that perhaps fumigation may be dispensed with, and dependence placed upon the cleanliness and due provision of air and sunlight which will then be possible.

(Signed) SOLOMON SOLIS COHEN.

(To be continued.)