CONTRIBUTED AND SELECTED

AERIAL OR GASEOUS DISINFECTION.*

BY SEWARD W. WILLIAMS, PH.C., F.C.S.†

CONDITIONS IN ARIZONA AND MINNESOTA COMPARED.

As to "proper conditions," probably nowhere are conditions for natural disinfection as nearly ideal as in Arizona and New Mexico.

The following comparison of relative humidity and percentage of sunshine, as found respectively in St. Paul and Phœnix, was supplied by the United States Weather Bureau:

RELATIVE HUMIDITY, PERCENT.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
St. Paul, Minn.:													
7 A.M.	83	84	80	74	74	78	79	83	83	80	80	83	80
7 P.M.	75	74	66	54	52	56	54	56	60	62	69	75	63
Phœnix, Ariz.:													
6 A.M.	68	65	59	48	39	33	51	59	52	53	62	66	54
6 P.M.	39	34	29	20	15	13	23	27	25	28	37	38	28

PERCENTAGE OF POSSIBLE SUNSHINE.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
St. Paul, Minn.:	50	62	62	63	59	66	75	70	62	58	48	44	60
Phœnix, Ariz.:	73	78	78	87	91	93	83	82	88	88	83	80	84

It is interesting to note that, while Arizona has far more sunshine and much less humidity than Minnesota, the State Health Officer of Arizona says in answer to number 7: "It is not safe to rely entirely on fresh air and sunlight." And the State Health Officer of New Mexico says: "Very unwise [to rely on natural conditions]; use all precautions, but at the same time fumigate the best we know how."

Surely if conditions are not "proper" in these two states we cannot expect them to be so anywhere.

The following letter from Assistant Surgeon General J. W. Trask, under date of July 20th, will be of interest in this connection:

Your letter of the 10th instant, addressed to the Weather Bureau, has been referred to this office because of the contained inquiry regarding the "natural aids and hindrances, in combating pathogenic bacteria," in Arizona and Minnesota.

In Arizona the amount of sunshine is very great and the air is exceedingly dry, so that the outdoor conditions in Arizona will quickly destroy most pathogenic organisms, if these organisms are exposed to the sunlight and air. However, these conditions will not

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† Director, Scientific Department, Bauer & Black, Chicago.

directly affect pathogenic bacteria located within the body of a person. The extent to which they will combat such bacteria inside a house depends upon the conditions within the house, the windows, and whether they are kept open or closed.

In Minnesota the air within a steam heated house or hot-air heated house will be as dry in the winter time when the furnace is in operation as the air in Arizona unless unusual precautions are taken to add moisture to the air. While the dry air in such heated houses, and this applies to most all furnace heated houses in northern climates, is destructive to pathogenic bacteria exposed to the air, it is not destructive to such organisms within the bodies of the inmates of the houses and, moreover, it is detrimental to the health of the inmates themselves.

By direction of the Surgeon General.

Respectfully,

J. W. TRASK,
Assistant Surgeon General.

THE LOGIC OF GASEOUS DISINFECTION.

Dr. M. J. Rosenau, in his standard work on "Disinfection and Disinfectants" (1902), says:

A gas is the ideal weapon for destroying such an invisible foe as the infection of the communicable diseases, but the ideal gas for this purpose is still to be discovered. By reaching all portions of a room or confined space it lessens the risk of overlooking any surface upon which the infective agent may be lodged. Germicidal solutions are difficult to apply to all the surfaces of an ordinary living room, and it is furthermore difficult to hold the solution in contact with the ceiling, walls and other surfaces a sufficient length of time in order to obtain the certain action of the substance.

There is practically only one gas suitable for general application—viz., formaldehyde. This substance comes nearer being an ideal disinfectant than any of the gases so far exploited. It is not poisonous, does not injure fabrics, colors, metals, or objects of art and value.

He goes on to explain that formaldehyde has distinct limitations, and makes it clear that, while superior as a germicide in warm, moist air, it is not an insectide.

Dry sulphur dioxide is the right gas to use for killing insects and vermin.

In his work on "Preventive Medicine" (1913), the same authority says:

We now know that fomites play a comparatively minor rôle in the transmission of disease. The disinfection of rooms and objects does not now, therefore, hold the importance in the minds of sanitarians that it once did. However, if terminal disinfection prevents the occurrence of only a small number of cases it would still seem to be worth while. Moreover, what health officer would willingly allow his child to occupy the bed or handle the objects in a room soon after a case of typhoid, scarlet fever, tuberculosis, or diphtheria, without first applying some effective method of purification? So long as we possess such a reasonably efficient and satisfactory substance as formaldehyde, terminal disinfection should be practised after all diseases in which the environment may become infected, even though the danger be slight.

The germicidal power of formaldehyde is credited very largely to its property of combining directly with the albuminoids constituting the protoplasm of bacteria.

While it may be true that disinfecting gas does not penetrate far into heavy fabrics, cushions, etc., it is also true that most of the infection in a room is on the surface of things. Evidence has been advanced that, with the minimum amount ever authorized, formaldehyde gas at least penetrates a paper envelope, killing the test organisms within four hours.

Dr. Rosenau says (p. 91, "Disinfection and Disinfectants"): "Bacteria exposed directly to the action of a concentrated volume of the [formaldehyde]

gas are destroyed almost instantly. Under similar conditions spores are sometimes killed within one hour. But in practical work it is necessary to prolong the time of exposure because the gas is evolved slowly from most forms of apparatus, and it takes considerable time for it to penetrate to all the corners and dead spaces of a room."

It may be noted here that the specific gravity of formaldehyde gas is so near that of air that diffusion through the room is readily facilitated if there is anything to start a circulation, as for example the hot air and gas rising from a fumigator in which heat is being used to drive off the gas; and the longer the lamp burns after the gas is driven off the longer will the effect on the circulation of air in the room continue.

THE IMPORTANCE OF DISINFECTION.

Francis Ramaley, Ph.D., and Clay E. Giffin, B.A., M.D. (Boulder, Colo.), in their work on "Prevention and Control of Disease" (1913), say:

> The germs of many diseases remain for a long time unaffected by exposure to the air. A room infected with diphtheria may be dangerous for many weeks after the recovery of the patient, unless disinfection has been carried out. Scarlet fever, smallpox, tuberculosis, and pneumonia may be taken by those exposed to infected air, even though the person having the disease be not in the room at the time. . . . Just as people may carry infectious material of disease in their clothing, so may it be carried in clothing which is shipped from the manufacturer to the dealer. . . . It is difficult to prove the extent of such distribution of disease, but it is highly probable that this means of starting an epidemic is more frequent than is usually supposed.

That Dr. Ramaley's ideas regarding the viability of pathogenic bacteria and the danger of fomites have recently undergone some change is evident from the following replies which he kindly made to the seven queries of the preceding pages:

1. I have come to believe that fumigation is of little importance in any case where the patient recovers and perhaps really unnecessary even when the patient dies or is removed during height of disease. In latter case *tuberculosis.*
2. Formaldehyde, it seems to me, is the best.
3. I believe that people (generally children) "catch" tuberculosis from others; that they do not get the disease from infected rooms.
4. I think there would be little necessity for such fumigation if the room were well aired and sunned.
5. I know of no case in which disease alleged to be due to fomites could be proved to have originated in such manner. Generally there was much more likelihood that a "carrier" or a light unrecognized case was the cause of infection.
6. Cannot answer for others. For myself, I recommend that school books be laid aside for a time; aired if possible. However, I doubt if even this is at all necessary.
7. I believe that the micro-organisms of disease, except those few that produce spores, lose all virulence soon after leaving the body of a patient. Hence, fumigation would seem to be unnecessary.

(Signed) FRANCIS RAMALEY.

B. L. Arms, M.D., Professor of Preventive Medicine, the University of Texas, Galveston, says in a recent letter:

> . . . . I am a firm believer in disinfection, but do not consider fumigation and disinfection synonymous terms. In 1910–11–12 we made in Boston a series of tests of the efficiency of fumigation and reached the conclusion that fumigation was not disinfection,

and is so often misleading to the public. A short paper on this was presented at the American Public Health Association at Washington in 1912. This was published in the American Journal of Public Health late in 1912. The fumigation of rooms tends to make the public believe that an inanimate object is at fault, overlooking what I consider to be a great factor, the personal carrier of diseases. The Journal of the Outdoor Life for October, which came this morning, has an interesting article on page 334 which bears out our contention. The conclusions of the New York Health Department are drawn only after very careful consideration and as a result of numerous practical tests.

In regard to the questionnaire I would answer the questions as follows:

(1) None. Disinfect instead. (2) All gases affect the surface only. They will not penetrate. I feel that the thorough airing out of the room after formaldehyde is one of the best results from its use. (3) ——— (4) Disinfection and renovation are better than fumigation. (5) I think that inanimate objects, other than those recently infected, play little part in the spread of disease. (6) In my opinion books play little part in the spread of infection. The patient affected with an acute infectious disease rarely handles books, and the drying action of the paper tends to kill any infection. It is also practically impossible to fumigate books, *i.e.*, to kill organisms in books. (7) Much more good will be accomplished by disinfection and renovation than by fumigation.

(Signed) B. L. ARMS.

Dr. M. J. Rosenau, Harvard University Medical School, under date of July 2, 1915, writes:

It would not be possible for me to answer your questions concerning disinfection in the confines of a brief questionnaire. The necessity for disinfection, as well as the germicidal agents to be used, and the method of using the same, varies with the circumstances, and also with the disease. I am glad you are making a distinction between fumigation and disinfection. Those who claim that disinfection is not necessary after measles and certain other infections really mean that fumigation may be dispensed with.

(Signed) M. J. ROSENAU.

The Saturday Evening Post for June 26, 1915, in an article unfavorable to fumigation, says:

The questions now are as to whether there is need for any disinfecting measures after most diseases, or whether more effective measures than the old fumigating operation should be taken. Undoubtedly there is sound reason for undertaking more vigorous disinfection. Paint, new wallpaper, fire, air, soap and boiling water are best able to take the enthusiasm out of any lurking germs.

In the report of the Michigan State Board of Health for August, 1915, p. 414, the following is credited to Prof. Edward D. Rich, State Sanitary Engineer: "Tuberculosis germs in shady places will retain life for days. Often germs are taken into the homes on the feet of pedestrians and in the homes the germs have been known to retain life for ten years."

In Section 159, p. 59, Sanitary Code of Louisiana (1911—latest obtainable from the Board, September, 1915), it is stated that "if, in spite of thorough disinfection and renovation, new cases should arise in a house that has been occupied by a consumptive, the premises may be condemned and destroyed by the State Board of Health whenever it seems advisable so to do."

Making allowances for varying dates, we still have a remarkable illustration of what Dr. Fulton on another page refers to as oscillation "extreme"—from the idea that disease germs do not live long enough outside the body to make it worth while bothering with them, to the conclusion that the only safe thing to do is to scrub, repaint, repaper, recalcimine or even burn the house down.

It's safe to say that the truth lies somewhere between these violent extremes,

and that to be on the safe side we should still fumigate and in such manner, of course, as to disinfect.

Charles V. Chapin, M.D., Sc.D., Superintendent of Health, Providence, R. I., abandoned fumigation some years ago chiefly because he " did not believe that the house and its contents were a factor of any moment in the spread of disease." But coincident with abandoning fumigation he did a great work in effecting a better control of " carriers "—apparently healthy people who harbor pathogenic organisms, and, unknown to themselves or others, spread contagion in crowded places.

To what extent inefficient fumigation has been compared with no fumigation at all may be open to question. Certainly his vital statistics were greatly improved by his eliminating in a large measure the " carriers " as a menace to public health. If, as a large majority of the sanitarians who contributed to the foregoing symposium think, gaseous formaldehyde disinfection is justified, we certainly should not abandon it because we now know that a considerable share of infection results from " carriers."

Infection should be fought both by making old methods of fumigation efficient means of disinfection, and by looking after carriers.

The replies of Dr. Harper (Health Officer of Wisconsin) and Dr. O'Connell (Health Officer, Port of New York), on preceding pages, for example, seem none too conservative in the matter of retaining the safeguard of efficient gaseous disinfection.

WILL FORMALDEHYDE GAS KILL THE BACILLUS OF TUBERCULOSIS? IT'S MAINLY A QUESTION OF HUMIDITY AND TEMPERATURE.

With one death from consumption every 2½ minutes in the United States*—23 every hour, 548 every day, 200,000 every year—the question raised by Dr. Hurty, of Indiana, in his reply to question number 4 assumes great importance. He says: " Formaldehyde disinfection is not efficient against tuberculosis infection." Just one other of our authorities says the same thing—Dr. Meader, of Albany.

I asked Dr. Meader on what he based his conclusion and he replied that his attention was first called to the matter by Dr. Hurty, and that he determined to experiment for himself. He says: " I took tuberculous sputum, spread it out thinly on a glass slide and exposed it for twenty-four hours to the concentrated fumes of formaldehyde gas, after which I inoculated several guinea-pigs, and, much to my surprise, they all died in four weeks with characteristic lesions of tuberculosis in the inguinal lymph-nodes and spleen."

On page 151, " Practical Sanitation " (1914), by Doctors Gardner and Simonds, appears the following: " It was formerly thought impossible to kill the tubercle bacilli with formaldehyde, but if conditions are properly looked after, and the necessary amount of moisture is present, there is no trouble doing it. It is well to supplement the use of formaldehyde (which should last for at least six hours) with 2½ percent cresol solution, sprayed or mopped on."

The supplementary treatment is evidently to insure against failure due to conditions *not* being properly looked after.

It happens that Dr. Hurty wrote the introduction to this standard work. In it he says of the book: " Its teachings are true and to date, and it may be confidently stated that if its directions and lessons are heeded, the efficiency, wealth and happiness of the commonwealth will be greatly augmented."

Dr. Hurty is generally right, and all this does not prove that he is wrong in

* Average figures from Michigan Board of Health report, August, 1915, p. 380.

either of his apparently conflicting statements. As we shall see by the following evidence; his first statement is true if humidity and temperature are low, and the other true if humidity and temperature are relatively high.

On page 42 of Bulletin No. 42, Public Health and Marine-Hospital Service of the United States, Dr. Thomas B. McClintic says: "Upon the permanent vacation of the quarters occupied by a consumptive, whether through death, removal, or recovery, the room, and preferably the entire building, should be disinfected with formaldehyde gas, as described on page 9." (Formalin-permanganate method—10 ounces of formalin and five ounces permanganate, in a 10-quart pail, with air warm and humid, for 1000 cubic feet.)

The following letter from Assistant Surgeon General A. H. Glennan, under date of October 7, 1915, explains itself:

> The Bureau is in receipt of your letter of the 2nd instant inquiring as to the scientific basis of the statements in Public Health Bulletin No. 42 relating to the use of formaldehyde gas for the disinfection of premises vacated by consumptives.
>
> As suggested by you, the author did not take for granted his conclusions, but based these on the experiments described in Hygienic Laboratory Bulletin No. 27 entitled "The Limitations of Formaldehyde Gas as a Disinfectant." While these experiments tend to show the efficacy of formaldehyde gas as applied to tubercle bacillus, it is also recognized that conditions of temperature and humidity are very important.
>
> As of possible interest to you, there is enclosed a copy of Reprint No. 287 which will probably furnish the information desired by you in regard to terminal disinfection.
>
> (Signed) By direction of the Surgeon General.
>
> Respectfully,
>
> A. H. GLENNAN,
> Assistant Surgeon General.

In Bulletin 27 (1906)—now out of print—Dr. McClintic devotes over 100 pages to a report of exhaustive work in determining the limitation of formaldehyde gas as a disinfectant, with special reference to car sanitation.

For a sleeping car of 4500 cubic feet, 2000 Cc. of formalin and 1000 grammes permanganate were used, pieces of carpet bearing tuberculous sputum being exposed for two hours, the relative humidity ranging from 78 to 62 percent and the temperature from 83 degrees F. to 87 degrees. Sputum which had been exposed in the smoking-room was injected into a guinea-pig; pig chloroformed on 100th day; increased 255 grammes in weight, no lesions of tuberculosis. Sputum exposed on floor of main sleeping compartment and injected into guinea-pig; pig chloroformed 100th day; increased 235 grammes in weight; no lesion of tuberculosis. Control pig died of tuberculosis the 45th day. *Bacillus coli communis, B. diphtheria, B. typhosus* and *B. subtilis* were all killed in the same fumigation. Similar successful results attended numerous tests of the same kind, where temperature ranged from 74 degrees to 82 degrees F. and humidity from 65 to 58 percent. When air was cool and comparatively dry the results were not satisfactory. It should be taken into consideration that, owing to its many ventilators, a sleeping car could not be practically made as tight as an ordinary room, as shown by the small percentage of gas found in the cars when opened in two hours.

Four or five hours is usually allowed for formaldehyde disinfection in comparatively tight rooms; the longer, of course, the better.

Dr. McClintic's experiments proved conclusively that, with proper conditions of humidity and temperature, formaldehyde gas does kill the tubercle bacillus.

Variation of warmth and moisture in the atmosphere evidently supply all needed explanation of conflicting views regarding the value of formaldehyde fumigation after tuberculosis.

In Bulletin No. 287 (U. S. Public Health Reports, July 9, 1915), Past Assistant Surgeon H. E. Hasseltine says:

> For many years formaldehyde gas has been rated as the foremost gaseous disinfectant, and it still holds its place. Its germicidal effect, when applied under proper conditions, is not denied. While not as rapid as steam or hot water, it does disinfect within a short time. Disinfection by formaldehyde does not, however, mean merely the making of a disagreeable odor. It must be used in a temperature of 65 degrees F., or higher, and with a relative humidity of 65 percent at the beginning of the process. It is, useless to put formaldehyde gas in a room where the temperature is so low that polymerization can take place.

J. Scott MacNutt, A.B., S.B., in his "Manual for Health Officers" (1915), in chapter on cleansing and disinfection after tuberculosis, advises: "Formaldehyde fumigation, for disinfection of carpets, fabrics and surfaces not susceptible of treatment by scrubbing, vacuum cleaning and liquid disinfectants."

Regulation 6 of the Montana State Board of Health reads:

> When any dwelling is vacated after having been occupied by any persons known to have been suffering from tuberculosis, such dwelling shall be thoroughly disinfected in the manner prescribed by the State Board of Health for all other communicable diseases, except that the time the house shall remain closed for the action of formaldehyde gas shall be eight hours instead of four.

FORMALDEHYDE FOR DISEASE GERMS AND SULPHUR FOR INSECTS AND RODENTS.

It should be understood that, while formaldehyde is *by far the best gaseous germicide,* it has practically no value as an insecticide or rodenticide. If insects, other than mosquitoes, are killed by formaldehyde fumigation it is probably because they may have drunk water which, as in drops on a well-sprinkled floor, absorbed enough of the gas to kill through the digestive tract.

Sulphur dioxide is the most practical thing to use for killing insects and vermin. When used for *this* purpose, the dryer the air the better, because (1) the gas is practically as efficient, and (2) because it will not seriously tarnish metals or bleach and weaken fabrics, as would be the case if the atmosphere were damp.

The idea of using formaldehyde and sulphur at the same time is a mistake.* Instead of acting as synergists they seem to oppose each other.

For killing pathogenic bacteria use formaldehyde in a fairly tight room with the air as warm and humid as practicable. Then, if there are insects or vermin to be killed, use sulphur with the air as dry as practicable. One pound of sulphur per 1000 cubic feet should kill mosquitoes and flies in two hours, rodents should succumb to fumes from two pounds in four hours; and roaches, lice, bedbugs, etc., should be killed by five pounds in six hours.

Where no damage can be done by sulphur dioxide in a *humid* atmosphere (in which SO_2 combines with moisture to form H_2SO_3 which is to some extent

* Gardner and Simonds ("Practical Sanitation," 1914) say, on page 60, that "the products of sulphur combustion unite with the formaldehyde and consequently neither portion is of value." They call attention on the same page to the objection to candles with wicks running through the paraform, "as too large a portion of the gas is burned in the process of volatilization." In short, sulphur is always to be burned, while paraform must never be allowed to ignite. With sulphur, fire creates the gas which does the work, while, if paraform catches afire, the formaldehyde gas is destroyed and rendered valueless.

oxidized by air contact to H_2SO_4), five pounds per 1000 cubic feet may be used to kill everything—disease germs, insects and rodents.

Plants and pets should, of course, always be removed from a room before sulphur fumigation, and we have found that with full formaldehyde disinfection —2 ounces net, solid formaldehyde per 1000 cubic feet over night—nearly all of twenty different test plants showed some effect except the rubber plant. Formaldehyde has no effect on room furnishings and decorations other than plants.

Hydrocyanic acid is an efficient insecticide and rodenticide; but it is so exceedingly dangerous to handle that it should never be used where possibly escaping gas could reach either human beings or domestic animals.

A well-recognized authority says the addition of one-half ounce of camphor, to a solid formaldehyde disinfection for 1000 cubic feet, will kill insects. Experiments made by the writer with this method were disappointing, as were others along similar lines.

Para-dichlorobenzene has been proposed as an insect fumigant. But as one pound per *hundred* cubic feet is directed to be used at a temperature between 75 and 85 degrees F., with an exposure of 36 hours, it offers little as a practical insecticide. Details regarding it are given by A. B. Duckett in Bulletin of the U. S. Department of Agriculture, No. 167.

CHOICE OF FORMALDEHYDE METHODS.

Preference has been shown by many boards of health for the formalin-permanganate process. While some of the formaldehyde is actually consumed in the violent reaction, the sudden evolution of gas with moisture has advantages in the hands of experts. When permanganate gave out on account of war conditions, other oxidizing agents were resorted to, such as potassium dichromate (Pennsylvania) and chlorinated lime (Chicago).

It is noticeable that some sort of caution or warning goes with all such methods.

Regarding the permanganate method, Gardner and Simonds (" Practical Sanitation," page 59) say: " In this process the formaldehyde is poured over potassium permanganate crystals, in the proportion of one quart of the former to one pound of the latter.

"CAUTION! If the permanganate is thrown into the formalin it may explode." Capitals and italics theirs.

This amount is used in some states per 1000 cubic feet; but the United States Public Health Service directs only 10 ounces of formalin (40 percent solution of formaldehyde) and 5 ounces of permanganate if temperature is above 60 degrees F. and air is not too dry.

This government authority says (Bulletin 42, page 10):

" On account of the vigorous ebullition during the reaction, a ten-quart pail should be used for mixing therein 10 ounces of formalin and 5 ounces of permanganate. Even then a few drops of the mixture may be thrown over, so that it is well to place the pail in a large tin pan or upon something to protect the carpet or floor. To prevent this sputtering over there is some advantage in using a pail with a flared top. As the process is attended with slight danger of fire, the reaction, which is quickly over, should be watched through a window or the pails placed on a non-inflammable surface."

With the chlorinated lime method, as used in Chicago, goes a WARNING regarding the danger of injury to " woodwork, fabrics, etc.," should any of the disinfecting material come in direct contact with them.

In Pennsylvania, where the dichromate method is used, it is directed to pull

" the tin container out of the room by an attached cord one-half hour after the reaction has been started. The residue should be removed from the can immediately and the vessel should be scrubbed with soap and water."

These dangers and inconveniences are avoided by volatilizing solidified formaldehyde (paraform) by means of applying heat under a metal receptacle containing it—two ounces net formaldehyde being used per 1000 cubic feet (according to Bulletin 42, Public Health and Marine Hospital Service of the United States)

DIFFERENT AGENCIES OF INFECTION SHOUD RECEIVE THEIR PROPER SHARE OF ATTENTION.

Prior to the recognition of carriers, the dangers from fomites and infected apartments were, it is true, over-rated. Now the pendulum, so to speak, shows a tendency, in certain quarters, to swing to the other extreme. It is easy to see how the presence of unrecognized carriers, in the home or in crowded places, can upset calculations regarding the efficiency of terminal disinfection. The fact, however, that the great majority of State health officers contributing to the symposium favor the continuance of gaseous disinfection indicates that a fairly stable equilibrium will soon be established, each agency for conveying infection receiving its fair degree of consideration.

Aerial disinfection has also suffered because (1) too little formaldehyde was used and (2) owing to lack of proper conditions of temperature and humidity.

When one considers the cost of the alternative offered—repapering, repainting, etc.—the slight expense of making the air warm and moist and using plenty of formaldehyde is a very small matter. It is quite practical and advantageous to supply some moisture with the disinfectant in commercial fumigators; but, as it is desirable to volatilize the formaldehyde as quickly as possible, the addition of much water to the formaldehyde has the objection of considerably prolonging the time needed to drive off the gas. The bulk of the moisture may best be obtained by introducing steam into the air independently, as by causing water to boil in the room in any convenient manner, or, in fairly damp weather, by simply sprinkling the floor liberally.

With the air thus properly conditioned the volatilization of two ounces solidified formaldehyde per 1000 cubic feet should insure efficient disinfection of the room and its general contents. Bedding and material which has been in close contact with the patient may well be sent to a disinfecting station, or at least be given a thorough sunning and airing, in addition. It should be remembered that the alternative of repainting, repapering, etc., leaves bedding, etc., to be cared for *entirely* in some other way.

CONCLUSION.

A large majority of the state health officers, joining in the symposium, favor a continuance of formaldehyde gas disinfection.

We should not neglect one cause of spreading communicable diseases (room infection) because we have found another (carriers), whatever the relative importance of the two agencies may be.

To destroy bacteria volatilize formaldehyde, without ignition, in warm, moist air.

To kill insects and vermin, burn sulphur in dry air.

While, as pharmacists, we should supply trustworthy means for combating communicable diseases, as citizens we should look for their underlying causes and assist in correcting them.