

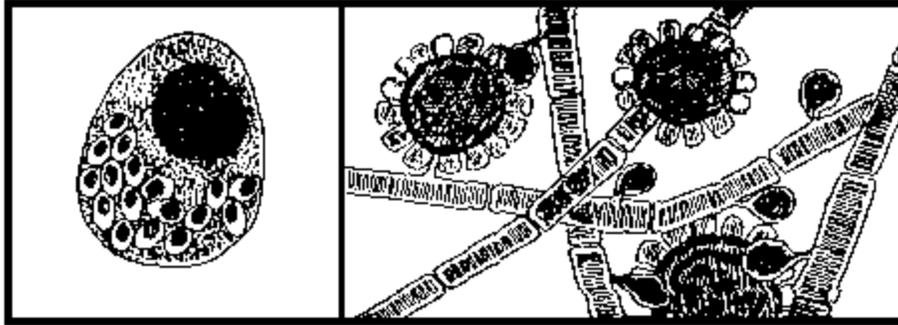
Histoplasmosis Control

Decontamination of Bird Roosts, Chicken Houses and Other Point Sources

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE PUBLIC HEALTH SERVICE
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PREFACE

The role of contaminated bird roosts, chicken houses, and other point sources in the epidemiology of endemic and epidemic histoplasmosis has been illuminated in recent years. This pamphlet has been prepared to assist State and local health agency personnel in reducing the hazard of areas contaminated with *Histoplasma capsulatum*. The procedures for sampling and decontamination of positive point sources presented in this pamphlet have proven effective in situations where they have been applied.



Histoplasmosis

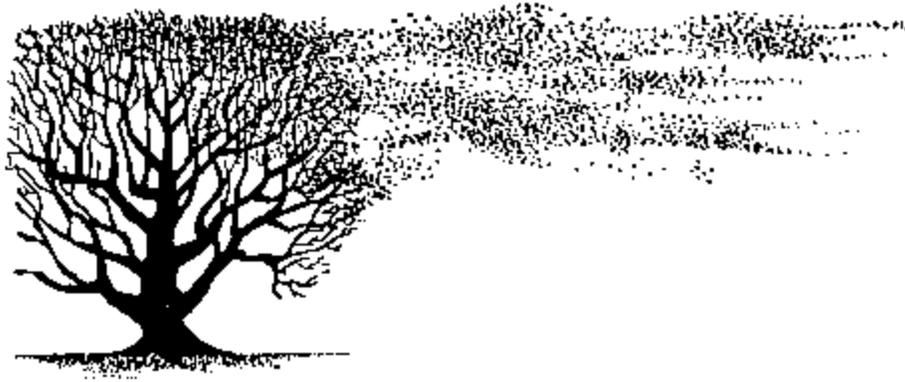
Histoplasmosis is an airborne disease caused by a fungus, or mold, called *Histoplasma capsulatum*. The fungus enters the lungs, where it begins an infection. Many of these infections are easily overlooked because they do not produce symptoms or cause minor respiratory distress. Histoplasmosis can be severe, however, producing an illness similar to influenza or, with more serious symptoms, similar to tuberculosis. The disease may become chronic, and occasionally the fungus may be spread by the bloodstream throughout the body to infect other organs. Should the disease progress, the outlook for recovery is poor unless the patient gets proper treatment.

There are both skin and blood tests for histoplasmosis that can reveal the presence of an infection and disease. However, a positive skin test does not necessarily mean that an individual has active disease; rather, it may only be evidence of a previous infection.

Histoplasma capsulatum is often found in soil containing chicken, bat, or bird droppings. The fungus needs certain conditions to flourish. These conditions are found most often where accumulated droppings from bats, blackbirds, chickens, or pigeons have existed for 3 years or more. The spores become airborne when the soil containing the fungus is disturbed. Therefore, infection has often resulted from disturbing contaminated barns, belfries, blackbird roosts, caves, chicken houses; and pigeon lofts.

Histoplasmosis may also occur in persons who clean out silos, church towers, basements or attics; demolish chicken houses, explore caves; or clear out underbrush in areas where bats or birds have habitually roosted. The birds, it is believed, do not carry the disease, but their droppings enrich the soil in a way that supports growth of the fungus.

Most young children and those adults who move into areas where histoplasmosis is common are especially susceptible to infection. A large percentage of the permanent adult residents of endemic areas experience mild infections early in their lives, and once recovered they tend to possess a resistance to serious histoplasmosis illness. Although animals may become infected, the disease is not considered contagious because man-to-man or animal-to-animal transmission is known to be extremely unlikely.



Reducing the Hazard of *Histoplasma capsulatum*

Prevention of histoplasmosis may be accomplished by avoiding areas, which harbor *Histoplasma capsulatum*. This may not be possible at times especially for susceptible persons living near an active or previously inhabited bird roost, which is slated for clearing. The same is true for construction workers and for persons living in rural areas. However, those places which contain the fungus and which must be disturbed may be chemically decontaminated. Of course, decontamination will not provide long-term safety in an inhabited bird roost.

If a bird roosting site is suspected to be an existing or potential health hazard, the level of contamination must first be determined. Proper collection and recording of soil specimens help to delineate the positive areas and are useful in calculating the quantity of chemicals required to treat the site. Once it has been determined that a site is to be sampled, the local or state health department laboratory should be contacted for guidance in sending the specimens for fungal isolations.

Protecting Workers

There is potential risk of illness to those who are disturbing the soil of a roost positive for histoplasmosis prior to decontamination. This includes workers who sample the roosts, monitor bird populations, or put in ground pipes. Workers should be healthy persons with positive histoplasmin skin tests and clear chest X-rays. Only persons with positive histoplasmin skin tests should work in the bird roosts.

Persons working in areas contaminated with *Histoplasma capsulatum* should be protected to the best extent possible, including the wearing of masks capable of filtering out particles as small as two microns in diameter or use of a self-contained breathing apparatus. Protective clothing that can be removed at the site and placed in a plastic bag should be worn. The contents can be drenched with formaldehyde and sealed until the clothes can be washed in hot water with detergent. Boots should be laced off before leaving the site to prevent spore dissemination in cars, restaurants, or at home. All samples should be sealed in a large plastic bag in order to avoid contamination of cars and trucks used to transport the samples. It is also advisable to schedule work at a time when the ground is relatively wet to minimize dust.

Sampling

In order to establish the level of contamination and to determine the boundaries of the contaminated site, a number of specimens must be taken from the area. The number of

specimens collected from each site depends upon the number of Square feet in the site. Each site should be divided into as many equal areas as the number of specimens to be collected.

The following table should be used to determine the number of sample areas needed.

Table 1

Area in Square Feet	Less Than 100	100–399	400–899	900–7199	7200-14400	14401-28800	28801-57600	57601 or greater
Number of Sample Areas (Specimens)	2	4	6	12	15	21	30	42

When sampling areas smaller than 7,200 square feet, small amounts of soil taken at many places in each sample area are combined for the specimen.

When the sample area is larger than 7,200 square feet, each specimen should consist of small amounts of soil taken from an area approximately 2 feet in diameter.

The litter and debris should be raked aside and only the First 1-2 inches of soil or soil and guano mixture collected. Each specimen should consist of approximately one-half pint or material. The specimen should be collected in a plastic bag with a sterile spoon, tongue blade, or other object. A different sterile spoon and plastic bag should be used for each specimen to prevent mixing of the specimens. After collecting each specimen, the sample area number and date of collection should be written on the outside of each bag using a permanent marking pen. It is desirable that a person experienced in specimen collection supervise the technique of novices to avoid the improper collection of specimens.

A diagram or the roost should be prepared showing the location and number of each sample area. At the time of sampling, information similar to that on the suggested "Bird Roost Sampling" form at the back of this pamphlet should be gathered.

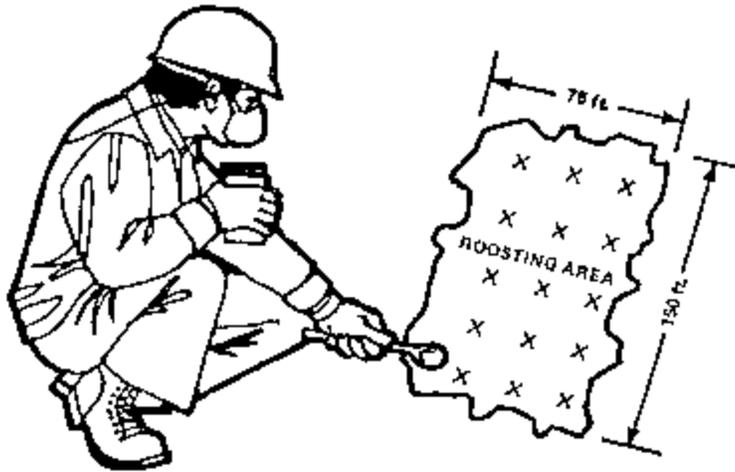
The location of soil specimens should be permanently marked for identification in roosts larger than 7,200 square feet. Specimens taken after treatment can then be collected from the same place in order to determine if decontamination has resulted.

Post treatment specimens should be collected at monthly intervals for 3 months, at 6 months after treatment, and 1 year after treatment. All specimens should be sent to a laboratory, which is experienced in performing fungal isolations.

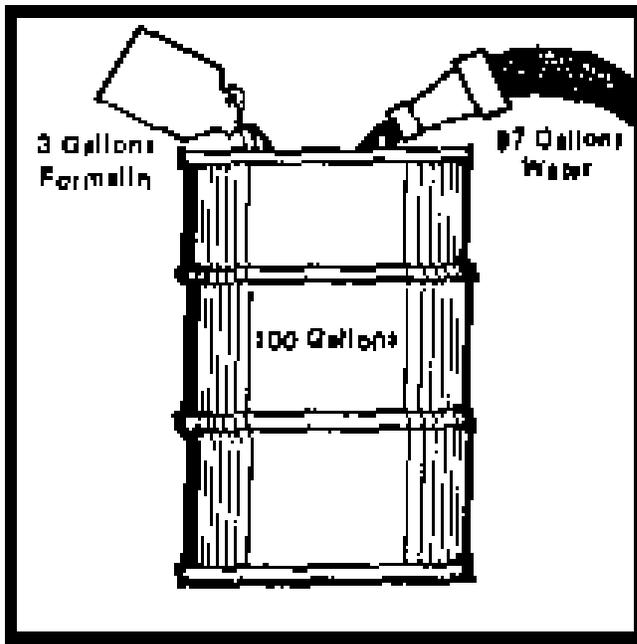
Example 1



The chicken house shown is 10 by 15 feet or a total of 150 square feet. The number of soil specimens needed is 4 as indicated in Table 1. Each specimen is a collection of small amounts of soil from throughout the individual sample area.



The bird roost in Example 2 occupies a portion of a wooded area and measures 150 by 75 feet or a total of 11,250 square feet. From Table 1, the number of soil specimens needed would be 15. The specimens should be in an area two feet in diameter around marked points throughout the roost as indicated by the 'x' s.



Chemical Decontamination

The chemical that has proven effective for this procedure is formaldehyde, which has fungicidal properties. A solution of about 37 percent, by weight, formaldehyde gas in water stabilized with 10-15 percent methanol is used as the base material for decontamination. This base solution is called formalin.

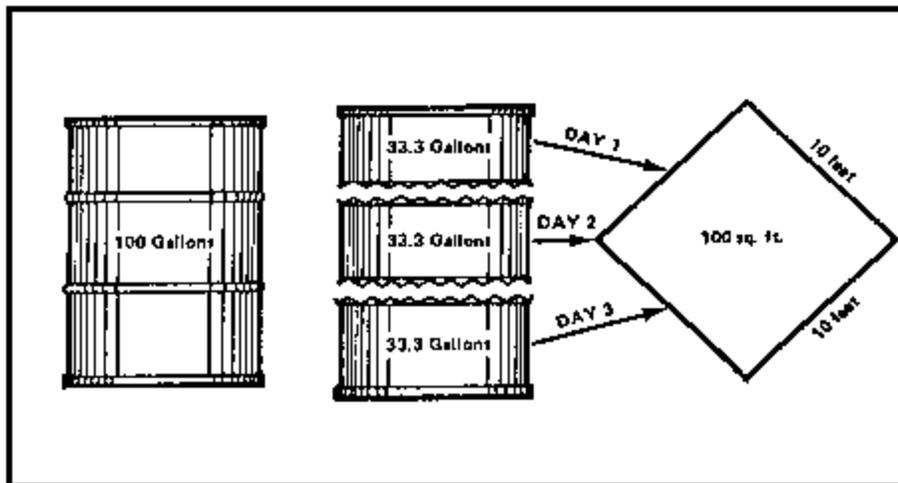
A solution that is 3 percent formalin or 1.1 percent formaldehyde by weight is used for the decontamination process. The fungicide is made as follows: To each 3 gallons of base solution, 97 gallons of water are added (0.3 gallons base solution to 9.7 gallons water)



In order for treatment of the site harboring the fungus to be effective, a total amount of 1 gallon of fungicide should be applied to each square foot of area. The prepared fungicide should be divided into 3 equal parts and applied on each of 3 consecutive days.

Decontamination should not be attempted when the outside and/or soil temperature is less than 60°F, or greater than 90°F. At temperatures a few degrees below or above this range, formaldehyde treatment may not effectively decontaminate a site.

Each application should be applied in a manner that will ensure even coverage of the area and allow for maximum penetration with a minimum of puddling and run-off. The size of the area to be treated and the equipment available will need to be taken into consideration. (Several alternative methods are described in Examples 3 and 4.)



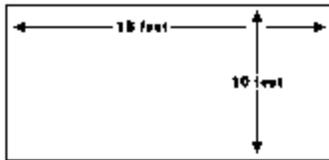
Precautions to Take When Decontaminating with Formaldehyde Solution

Formalin is a colorless liquid with a strong odor. Its vapors are intensely irritating to eyes nose, and throat. It has many uses, the most familiar of which is used as a preservative of biological specimens and cadavers. It may cause skin irritation and is harmful if swallowed. In decontamination operations, persons showing skin sensitization to formaldehyde or those individuals with a history or allergy should not take part in the operation. Caution should be taken to prevent the chemical from getting into the eyes as it can damage the cornea. Protective goggles should be worn when working with the concentrated solution. Rubber boots, at least mid-calf high, rubberized gloves, and a long sleeved shirt or jacket should be

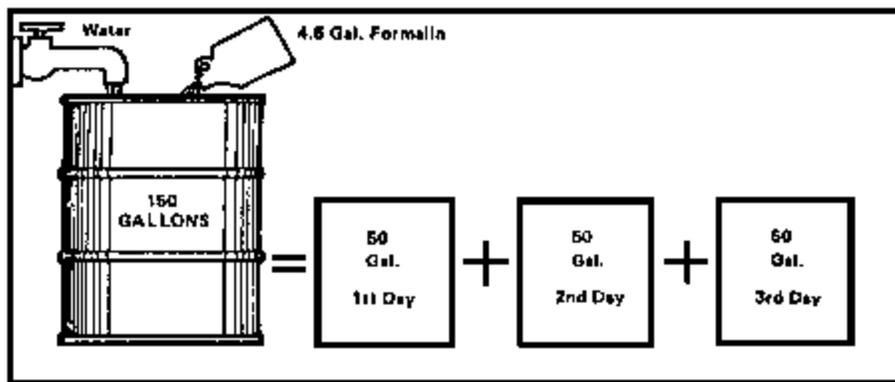
worn by all workers. Staying up-wind of the spraying activity will help reduce exposure. In addition to hazards related to formaldehyde exposure, the workers are disturbing an area contaminated with *Histoplasma capsulatum* and must take the precautions previously outlined.

To protect the environment the decontamination procedure must be done in accordance with state and local regulations, which should be investigated in the planning stages of decontamination activity. Extra precautions must be taken to ensure that the solution does not enter a water supply through storm sewers or water-courses of any type.

Example 3: In Example 1 the area of the chicken house is 150 square feet. One gallon per square foot or 150 gallons of fungicide will be required. The amount of base solution needed to make 150 gallons of 3 percent formalin is $.03 \times 150$ or 4.5 gallons. One-third of the total amount or dilute solution of 50 gallons is applied to the site on each of 3 days.

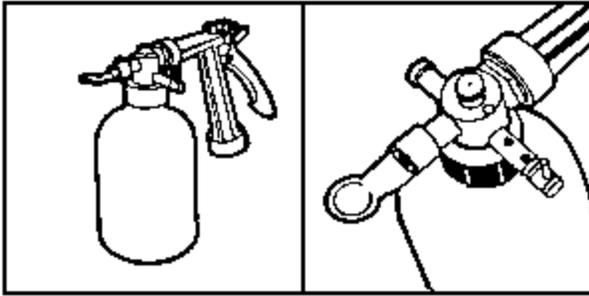


$10 \times 15 = 150$ Square Feet.
 150 Square Feet needs 150 Gallons of Fungicide.
 $150 \times .03 = 4.5$ Gallons of Base Solution
 * * * *
 145.5 Gallons Water
 + 4.5 Gallons Formalin
 150.0 Gallons Prepared Fungicide



Either of the following application methods and equipment would be appropriate for decontaminating this area.

- A. The solution may be mixed in a 50 gallon drum (1.5 gallons of base solution to 48.5 gallons of water) and dispensed by bucket or backpack sprayer. In this way, fresh fungicide could be mixed each day. Therefore, one 50-gallon drum of properly diluted fungicide would be applied to the entire chicken house each day for 3 days.
- B. Application of the chemical can also be accomplished by the use of a Gilmour Hosemaster Model 484 insecticide sprayer (manufactured by Gilmour Manufacturing Co., Somerset, Pennsylvania*) attached to a garden hose. This sprayer will siphon, dilute, mix, and dispense 8 tablespoons (4 ozs.) of formalin base solution for each gallon (128 ozs.) of water coming through the hose at 35 pounds water pressure. This will insure a 3.1 percent solution of formalin. This sprayer comes equipped with a 1-pint container. A full container of formalin base solution will provide 3.5 gallons of 3.1 percent solution. Therefore, for each 100 square feet of area to be treated, 10 fillings of the container would be required for each daily treatment.



* The use of trade names and commercial sources is for identification purposes only and does not constitute endorsement by the Public Health Service or by the U.S. Department of Health, Education, and Welfare.

Example 4: In Example 2 the area of the bird roost is 11,250 square feet. At 1 gallon per square foot, a total of 11,250 gallons of 3 percent formalin solution is required. The amount of base solution required is $.03 \times 11,250$ or 337.5 gallons. One-third of the total amount of dilute solution is applied to the bird roost on each day for 3 days.

The following procedure may be used to treat this large site.

A 1500-gallon street washing truck with a mounted auxiliary pump to which two 2-inch fire hoses can be attached can be used. Forty-five gallons of formalin base should be pumped into the truck tank first. Then the tank is filled to its 1500-gallon capacity from a fire hydrant. The water entering the truck tank will be of sufficient force to thoroughly mix the ingredients.

The solution should be sprayed as evenly as possible over a designated area with the 2-inch hoses. Each truckload will cover a daily application of approximately 4,500 square feet. Then the truck is refilled with fungicide for the following 2 treatments. The area to be treated can be measured and divided into plots in order to assist in calculating the areas each truckload will cover.



This pamphlet outlines an effective procedure to sample and decontaminate areas Infested with *Histoplasma capsulatum*. The following references may be consulted for more detailed background Information.

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Bird Roost Sampling
Diagram of Roost Site, Chicken Coop, etc., Including dimensions and sample area numbers

Results of Fungal Isolation						
Sample No.	Pre-Treatment Date	1 Month	2 Month	3 Month	6 Month	1 Year
1						
2						
3						
4						
5						
6						
-						
-						
-						