

HATCHERY & HATCHING-EGG SANITATION



Effective disease control in hatcheries depends on good design for cleaning and disinfection. The incubation system must be an intimate part of this design. Consult the manufacturer of the incubation system you intend to use before you make any detailed plans for constructing a new hatchery or remodeling present facilities.

Minor changes in facilities and procedures can greatly improve sanitation in many existing hatcheries. No disease-control system will be successful unless **all employees and management** are convinced that the system will work and strive to make it work. Achieving a sanitary hatchery requires constant effort by management to motivate and educate employees.

A system of monitoring microbial levels in a hatchery and in the chicks or poults produced is a valuable aid to management in keeping informed. The manager can also use the data to inform and motivate employees by posting the results on the wall in the employee lounge and keeping the data current.

The four main sources of contamination in a hatchery are *people, equipment, air, and eggs*. People are the primary disease carriers (vectors), but equipment, eggs, chicks or poults, and air are also significant disease spreaders in some situations. All these vectors must be successfully controlled if high-quality chicks or poults are to be hatched.

Eggs improperly handled at the farm can be particularly important sources of contamination. The egg at 99° to 100° F is an excellent growth medium for many disease-producing bacteria and viruses, and embryos infected in the egg usually die before hatching. If these eggs remain unbroken and are

disposed of by a sanitary procedure, they will not infect chicks in the hatcher. When infected eggs break, disease organisms can be carried throughout the hatchery.

DON'T GUESS—PLAN

Planning is essential to successful disease control in a hatchery. First, analyze your situation, including personnel, facilities, volume and timing of hatches, and proximity to potential contamination (i.e., poultry flocks). It would be advisable to call in a consultant to help with this evaluation. University of California poultry farm advisors or specialists can assist you with situation analysis and planning.

For specific information, contact your nearest Cooperative Extension office. Often an outside observer can see your operation from a different viewpoint and perhaps help you locate flaws you otherwise might miss.

When you analyze your present situation, you will undoubtedly find some weaknesses in your disease prevention procedures. Now the challenge is to design a plan for hatchery operation that will correct these faults. In some cases, improvement of facilities will be the only solution, but often only minor changes are required.

This is one of a series of publications on Planned Disease Prevention, which includes all aspects of management to help prevent exposure of poultry to disease and to minimize the effects of disease. The publications have been prepared by University of California Cooperative Extension and Experiment Station personnel as part of a statewide poultry disease prevention project.

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HYGIENE

All employees should have special clothing (including shoes or boots) to wear inside the hatchery. They should also wear washable hats (that are laundered daily) or disposable hats. Require employees to wash all exposed areas of skin when they enter the hatchery. Visitors, owners, managers, and others should be required to follow the same procedures. Provide clean garments for all people who visit.

Employees must have appropriate facilities so that they can wash or shower and change clothes. Also provide hand-washing facilities in the egg- and chick-handling areas and require each employee to wash with a disinfectant solution, in full view of co-workers, before starting work.

Sexing, debeaking, and vaccinating crews should follow the same sanitary procedures as other employees. The equipment that these crews use should be thoroughly cleaned and disinfected daily. Honey pots used by sexers are of particular concern, because these containers harbor pathogenic organisms for a long time.

PERSONNEL MOVEMENT

Controlling the movement of people in the hatchery is one of the most difficult and important steps in a sanitation program. Carefully explain the restrictions on movement to all employees, and rigidly enforce them. The manager (and his supervisors, if any) must **always** observe the restrictions also, if the program is to succeed.

The following restrictions on personnel movement are suggested as a goal for hatcheries.

- All persons entering the hatchery should be required to pass through one entrance, where dressing rooms and clean protective clothing are located. Keep other doors locked. Have the main entrance guarded whenever it is unlocked. The office may be the most convenient location for this entrance.
- When eggs are delivered, outside employees should unload them directly into a cham-

ber or room where the eggs will be fumigated or washed before inside employees remove them. Eggs delivered in cases should be removed from the cases, preferably by outside employees, before fumigation.

- Any employee who enters the hatching room(s), chick holding or sorting areas, equipment washroom, or other contaminated areas should not return to egg-handling or incubator rooms without washing all exposed skin and changing into clean protective clothing. The only exception would be during transfer of eggs from the incubators to the hatchers.
- Visitors or inspectors should always start at the egg room and proceed to the incubators, hatchers, chick room, and equipment washroom, in that order.
- The hatchery should have an intercom and telephone extensions in all areas where employees work regularly. Employees or managers moving around to find people or answer telephones cause cross-contamination in a hatchery.

VENTILATION

Each major area within the hatchery should be ventilated separately. These areas include egg processing, egg storage, incubation, hatching room(s), chick processing and chick storage, equipment washroom (includes dirty storage), clean storage room, halls, employee area, and office. The hatchery can be ventilated with a positive or negative system designed to provide a uniform supply of clean, tempered air to all areas. Exhaust air from the hatchers should be moved directly outside and discharged at a location where it will not contaminate incoming air.

Ventilating halls so that they act as air locks between rooms helps prevent cross-contamination in the hatchery. To accomplish this, maintain slightly higher air pressure in the halls than in the rooms. A slight pressure differential in rooms adjacent to one another will reduce air flow back into the cleaner area,

e.g., from the hatching room(s) to the incubator room. Separate hatching rooms for each age of embryo to be hatched are also recommended. In some hatcheries, certain hallways can be designated as dirty and others as clean to minimize cross-contamination. The usefulness of this approach depends entirely on the hatchery layout.

Place air intakes so that a minimum of exhaust air will be recirculated. Where evaporative pad coolers are used, clean and disinfect the pads and pans twice weekly. Chlorinating the water supply to these units gives additional protection.

A hatchery roof collects dust and contaminants from exhaust air. To minimize recontamination of the hatchery, the roof should have rain gutters and downspouts that connect with the wastewater disposal system.

CLEANING

Sanitation is always 90 percent cleaning. Disinfectants are valuable in maintaining a sanitary hatchery, but they are inactivated by dirt and they will not compensate for a poor cleaning job. A good washing procedure is as follows.

1. Empty refuse.
2. Soak in detergent solution, if necessary, to loosen dirt.
3. Wash with hot water and detergent.
4. Rinse.
5. Disinfect.¹

A special washroom for movable equipment should be an integral part of the hatchery. Equip this room for effective washing. Mechanical tray washers, which are practical for larger hatcheries, can be most efficiently set up with the main part of the washer in the washroom and the clean-output end projecting through a wall into a clean-equipment room. Hand-washing does an equally good cleaning job if tanks are available for soaking, washing, rinsing, and disinfecting. Always store clean equipment in a clean room that is ventilated independently from the washroom.

¹Steps 4 and 5 may be combined; a final rinse may be required if you use a corrosive disinfectant on metal equipment.

Cleaning fixed equipment like hatchers and incubators is more difficult. In some hatcheries, the incubators are never empty, which makes it necessary to clean while the machines are operating. Incubators, hatchers, walls, floors, air ducts, etc. should be constructed of approved, water-impervious materials so that they can be effectively cleaned. The floors in all rooms and halls should be sloped for proper drainage. Because frequent cleaning is necessary in incubators and hatchers, which are set directly on the floor, good drainage is particularly important in those areas.

The large amount of fluff generated in the hatching process creates a special problem. It may be desirable to vacuum out the hatchers before attempting to wash them down. Regularly clean the exhaust ducts from the hatching and chick-processing rooms to remove chick down and other debris that collects there. To control the fluff on dirty hatching trays, wet them down before moving them to the washing area.

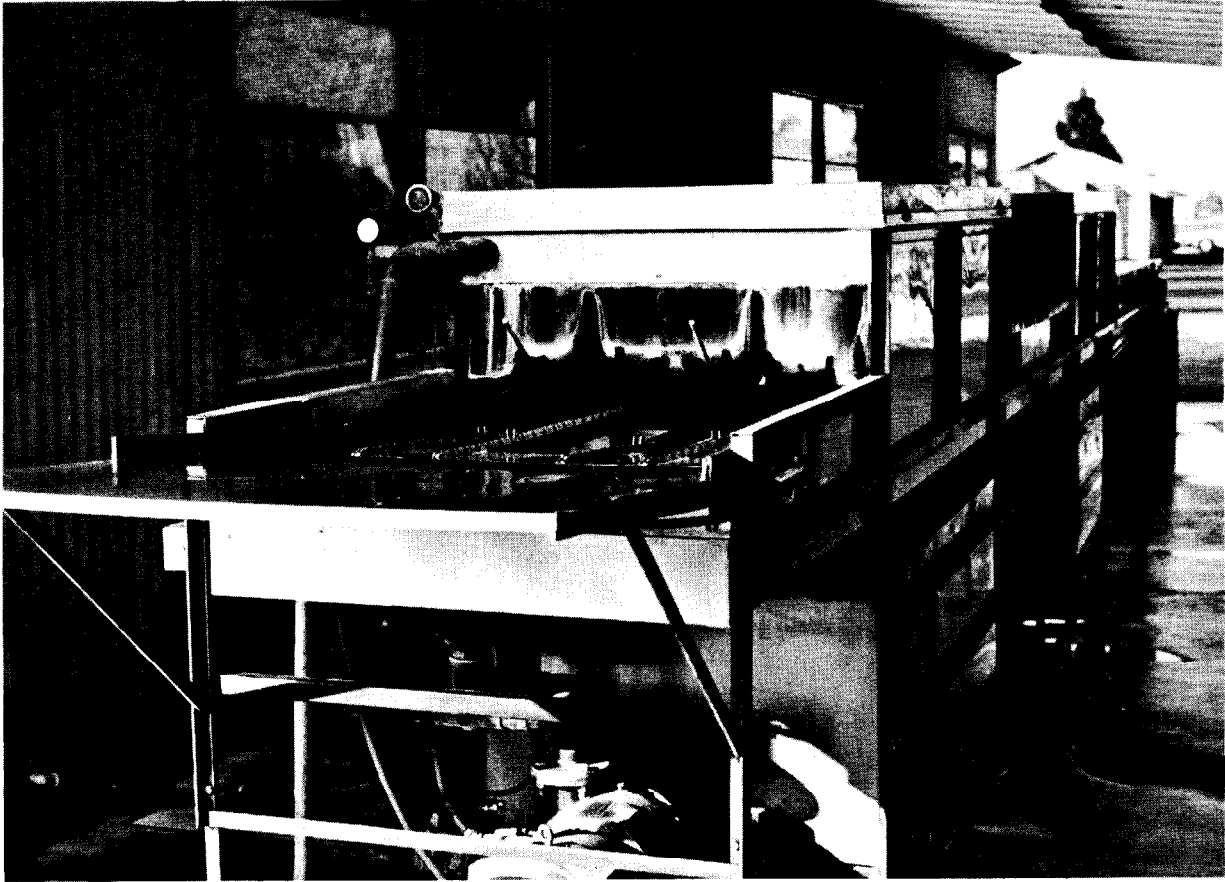
Disinfectants and Detergents for Equipment

In selecting a disinfectant, the first considerations are: (1) Will the disinfectant control the microbes that are a problem in this hatchery? and (2) Is it safe to use on the equipment or surfaces that need disinfecting? Choose detergents that are compatible with the water and that will be effective and economical. If water compatibility is also a problem in selecting a disinfectant for hatchery use, the water can be treated. This will probably prove less costly than trying to live with a problem organism in a hatchery.

Research at the University of California has demonstrated that a solution of 500 parts per million (ppm) quaternary ammonium and 20 ppm EDTA,² with sodium carbonate (about 200 ppm) added to adjust the pH to about 8.0, is an effective cleaning and disinfecting solution for hatchery equipment.³ This solution is safe to use on plastic, galvanized metal,

²EDTA = ethylene diamine tetra acetic acid (disodium salt).

³See page 6 for instructions on preparing a quaternary ammonium solution.



Washer for hatchery trays. The trays move mechanically from the front of the machine pictured here through a washing step and then a disinfecting step.

or glass equipment, does not require a final rinse, and has a residual disinfectant value. For more information, consult AXT-406-2, *Cleaning and Disinfecting Poultry Equipment and Poultry Houses*, available at your local University of California Cooperative Extension office.

Cleaning Trucks

Trucks that move eggs and chicks should be cleaned and disinfected between deliveries. Provide a special washing area for this purpose. It may be economical to set up the vehicle cleaning area next to the hatchery equipment washroom.

HATCHING-EGG SANITATION

The most important step in egg sanitation is the production of nest-clean eggs. This requires a carefully planned management system. The following practices have proved useful in producing clean hatching eggs and in keeping the eggs clean until they are set in incubators.

- Maintain birds on wire, plastic, or wooden slatted floors whenever possible. However, some commercial strains of chickens and turkeys do not produce well in this environment.

- Collect eggs frequently (at least four times a day).
- Keep nests filled with clean nesting material.
- To keep floor eggs to a minimum, provide one nest for every four hens. Be sure nests are in place before egg production starts.
- Exclude hens from nests at night.
- Use semi-trap gates on turkey nests.
- Maintain dry litter under the hens' feet at all times.
- Collect eggs on clean, sanitized, plastic flats.
- Separate cracked, stained, and heavy dirty eggs as you collect them, and **don't set them**.
- Wash or fumigate clean eggs as soon as possible after collection. This kills microbes on the outside of the shell. It does not kill microbes that have penetrated the shell.
- Cool eggs overnight in flats before placing them in cases. If eggs are to be stored, place them in a clean room held at 60° to 70° F and 75 percent relative humidity.

Duration of Egg Storage (days)	Recommended Storage Temperature
1	70° F
1 to 4	65° F
5 to 10	60° F

- Fumigate or sanitize eggs as they enter the hatchery.
- Always wash hands thoroughly with a disinfectant solution before handling eggs.
- Never allow eggs to sweat; they may sweat when moved from storage into a warmer trayng room. You can prevent this by trayng eggs in a temperature-controlled room. (See table 1.)

TABLE 1. Combinations of Temperature and Relative Humidity in Egg-Handling Rooms Causing Eggs to Sweat When Stored at 60° or 65° F

Conditions in Room		
Temperature	Relative Humidity	
	60° F Egg Storage Temperature	65° F Egg Storage Temperature
60° F	—	—
65° F	85%	—
70° F	71	83%
75° F	60	71
80° F	51	60
85° F	44	51
90° F	37	43
100° F	28	32

WASTE DISPOSAL

Dispose of liquid waste in a sanitary manner as required by state and federal water discharge regulations. This is also necessary to prevent unsanitary conditions in the area surrounding the hatchery. A good solution is to connect directly to a municipal sewer system, if possible. Rural hatcheries need to provide their own disposal systems. A large septic tank and drainage field is adequate for small hatcheries. Liquid waste is a more difficult problem for large hatcheries in rural areas. In most parts of California, a holding pond is an effective means of handling liquid waste, where sufficient acreage is available.

Solid waste can be safely disposed of by incineration, rendering, or sanitary landfill. In any case, store solid waste in closed containers or trucks until it is moved away from the hatchery. The solid-waste area should be adjacent to the washroom and away from employee or visitor entrances and parking areas. Also, place the waste storage area as far as possible from the egg-receiving and chick-shipping docks.

FUMIGATION

Effective formaldehyde gas fumigation requires a room temperature of at least 70° F

and a relative humidity above 70 percent. Formaldehyde gas can be generated by mixing 60 grams of potassium permanganate with 120 cubic centimeters of a commercial 37 percent formaldehyde solution for each 100 cubic feet of space to be fumigated.⁴ Pour the formaldehyde over the potassium permanganate in an earthenware or enamelware container. Circulate the gas for 20 minutes with a fan and then expel the gas from the fumigation room or cabinet. For effective fumigation, be sure the formaldehyde gas reaches all of the eggs; place the eggs on flats held in special racks that allow adequate gas circulation.

EGG WASHING

Some hatchery managers prefer egg washing to fumigation because they feel it is easier, faster, and more likely to be rigorously performed by hired labor. A residual disinfectant material remains on the eggs, which protects against recontamination. Washing has been most widely used on turkey eggs that are to be dipped in a cold antibiotic solution before setting.

Egg washing effectively sanitizes hatching eggs if proper equipment is available to do the job correctly. **However, washing can cause contamination of eggs if the water temperature drops below recommended levels or if contamination exceeds the capacity of the disinfectant in an immersion washer.** Wash-water must always be hotter than the eggs (recommended range, 110° to 120° F). The washing solution must contain a detergent-sanitizer. A washer that does not recirculate water is recommended. If an immersion or reservoir-type washer is used, the water must be changed frequently; do not wash more than 200 eggs per gallon of solution capacity. Immersion time should not exceed 3 minutes, and eggs should be thoroughly dry before they are put in cases.

⁴Formaldehyde solution (formalin) is highly irritating. Follow the precautions on the container label. Wear goggles, respirator, long-sleeved shirt, and liquid-proof gloves when handling the fumigant. If the fumigating chamber is within another room, be sure the outside room is well ventilated. If the chemical solution spills on you, wash it off immediately.

Disinfectants and Detergents for Egg Washing

Several disinfectants are safe for hatching-egg disinfection. Chlorine-based disinfectants have been most widely used to wash table eggs and have proved safe for hatching-egg sanitation. University of California research has shown quaternary ammonium to be an excellent sanitizer for hatching eggs. The advantages of quaternary ammonium are that it:

- Is safe for hatching eggs at levels up to 10,000 ppm.
- Helps clean the eggs.
- Leaves residual protection on eggs.
- Is safe for equipment and personnel.
- Is reasonable in cost.
- Is compatible with antibiotic dipping since it is safe to use as a disinfectant in dipping solutions.

For egg washing, a solution containing 250 ppm quaternary ammonium and 10 ppm EDTA is recommended. Make the solution alkaline with sodium carbonate (a cleaning agent) to reach a pH of approximately 8.0. Several other disinfectants have been tested and found safe for hatching-egg sanitation:

- Iodine (200 ppm).
- Chlorine dioxide (100 ppm).
- Synthetic phenol (800 ppm).
- Chlorohexidine (200 ppm).
- Mixture of phenol (250 ppm), quaternary ammonium (200 ppm), and formaldehyde (2,500 ppm).

For additional information concerning the properties of some of these materials consult AXT-406-2, *Cleaning and Disinfecting Poultry Equipment and Poultry Houses*.

DIRECTIONS FOR PREPARING QUATERNARY AMMONIUM SOLUTIONS

Prepare the following stock solution:

1. 10 percent quaternary ammonium disinfectant (alkyldimethyl benzyl ammonium chloride);

2. 0.4 percent EDTA (disodium salt) (15 grams/gallon); plus
3. 4.2 percent sodium carbonate (Na_2CO_3) (160 grams/gallon).

Dilute as follows:

- For egg washing, use 1 ounce stock solution in 3 gallons water.
- For equipment, use 2 ounces stock solution in 3 gallons water.

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COOPERATIVE EXTENSION

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ERRATA TO Leaflet 2629

Use of unregistered sanitizers on eggs is a violation of state and federal law.

Two compounds, CHLORINE DIOXIDE and CHLOROHEXIDINE, recommended in this publication are no longer registered by the California Department of Food and Agriculture for use in egg sanitation.

Do not use either of these compounds in your egg sanitation program.



LIVESTOCK PESTICIDE USE WARNING — READ THE LABEL



Pesticides and drugs are poisonous and must be used with caution. READ the label CAREFULLY BEFORE opening a container. Precautions and directions MUST be followed exactly. Special protective equipment (as indicated) must be used.

STORAGE: Keep all pesticides and drugs in original containers only. Store separately in a locked shed or area. Keep all pesticides and drugs out of the reach of children, unauthorized personnel, pets, and livestock. DO NOT STORE with foods, feeds or fertilizers. Post warning signs on storage areas for all chemicals, pesticides, and drugs.

USE: The suggestions given in this publication are based upon best current information. Follow directions. Measure accurately, to avoid residues exceeding established tolerances. Use exact amounts as indicated on the label, or lesser amounts as specified in this publication. Use a pesticide or drug only on animals listed on the label.

CONTAINER DISPOSAL: Consult your Agricultural Commissioner for correct procedures for rinsing and disposing of empty containers. Do not transport pesticides or drugs in vehicles with foods, feeds, clothing, or other materials, and never in a closed cab with the vehicle driver.

RESPONSIBILITY: The livestock owner is legally responsible for proper use of pesticides, including drift to other crops or properties, and for excessive residues. Pesticides should not be applied over streams, rivers, ponds, lakes, run-off irrigation or other aquatic areas, except where specific use for that purpose is intended.

PERMIT REQUIREMENTS: Many pesticides require a permit from the County Agricultural Commissioner before possession or use. When such compounds are recommended in this publication, they are marked with an asterisk (*).

ANIMAL INJURY: Certain pesticides or drugs may cause injury, or give less than optimum parasite control if used: (1) at the wrong animal age; (2) at the wrong time of year; (3) on animals under extreme stress or sick; (4) with the wrong formulation; (5) at excessive rates; or (6) in simultaneous use with incompatible materials. Read the label to be sure you are using the chemical properly.

PERSONAL SAFETY: Follow label directions exactly. Avoid splashing, spilling, leaks, spray drift or clothing contamination. Do NOT eat, smoke, drink, or chew while using pesticides. Provide for emergency medical care in advance.