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Hatching Egg Sanitation [1]

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A common management tool in the handling of hatching eggs is treatment of the eggs with a fumigant or other type of disinfectant to reduce the number of microorganisms on the shell surface. In addition, sanitation of the hatchery building, hatchery equipment, egg transportation equipment, etc., is critical to good hatchability and high quality hatchlings.

Penetration of the hatching egg shell by microorganisms results in embryonic mortality, weak chicks, high chick mortality, and poor chick growth. The most effective sanitation system involves treating the eggs as soon as they are collected from the nest and before microorganisms penetrate the shell. Several recent research studies have examined the effectiveness, safety and ease of use of common disinfectants currently available for use in hatcheries and on eggs.

User- And Environmental-Friendliness

A Canadian study (1, References) examined 23 sanitizers/disinfectants for positive and negative characteristics in respect to their use in the hatchery. Each sanitizer was rated for user- and environmental-friendliness based on general characteristics, environmental impact and necessary safety precautions, health concerns, reactiveness, and potential fire hazard.

Ratings on environmental impact and safety were based on disposal methods, hazardous decomposition products, handling precautions, and ease of preparation for use. Ratings relative to health concerns were based on danger from direct contact (inhalation, eye, skin and ingestion), carcinogenicity, mutagenicity, and toxic effects on reproduction. Each product was also rated for reactivity (compatibility with other substances), stability over time, corrosiveness and fire hazard (flash point).

The types of products tested included ozone, quaternary ammonium, iodine complexes, phenols, halogens, aldehydes, salts, alcohols, acids, and various combinations. The following products [3] were tested: formaldehyde, Glutacide, Quat 800, Germex, Quam, Super Quam, Tryad, Egg Wash, Coverage 256, Basic G & H, Iocide-14, Iodophor, Lysovet, 1-Stroke, Tektrol, D.O.C., hypochlorite or bleach, Chlorwash, Bioguard, H Peroxide, Virkon, Sanimist, and ozone.

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2. Henry R. Wilson, professor, Dairy and Poultry Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611. The use of trade names in this publication is solely for the purpose of providing specific information. It is not a guarantee or warranty of the products named, and does not signify that they are approved to the exclusion of others of suitable composition.

The products that were rated user- and environment-friendly were Bioguard, Germex, Iocide-14, Lysovet, Super Quam, Chlorwash, Quam, Quat 800, 1-Stroke, and Coverage 256. Compounds such as bleach, peroxide and ozone were considered to be marginal in their user- and environmental-friendliness.

Most of the compounds tested should be used with protective clothing, and precautions should be taken against inhalation and eye and skin contact. Products which were deemed to have potential as severe hazards to eyes, skin, and respiratory system were bleach, formaldehyde, ozone and Tektrol.

Effectiveness Against Microorganisms

The 23 products listed above were also tested for their effectiveness against a variety of microorganisms on the egg shell (2, References).

Results:

- All of the sanitizers (except Basic G & H, Sanimist, and ozone) showed a general ability to reduce microorganism on egg shells to a negligible number.
- The active ingredient in Sanimist, chlorine dioxide, reacts with the protein of the egg shell cuticle which neutralizes it before it can effectively attack the microorganism.
- Although a freshly mixed solution of Virkon was effective, storing for 7 days caused it to be ineffective.
- Phenol-based sanitizers such as Tektrol, D.O.C. and 1-Stroke, were less effective than Lysovet, another phenol compound which also contains EDTA (surfactant and wetting agent).

Hatcheries should monitor the effectiveness of sanitizers/disinfectants by the use of air, swab, fluff or other microbiological sampling techniques.

Effect on the Embryo

Some of the 23 products tested caused embryo mortality and loss of hatchability (3, References). Virkon, Coverage 256, and Egg Wash, all of which contain EDTA, caused reductions in hatchability of 11 to 26%. They also caused below normal moisture loss during incubation ranging from 16 to 19% less than the formaldehyde-treated standard. Peroxide caused an increased loss of moisture from the eggs during incubation but did not affect hatchability.

Use of Ultraviolet Light And Air Filtering

A recent study (4, References) examined the potential of ultraviolet (UV) light as a user-friendly, safe method of sanitizing hatching eggs and as a means to "scrub" circulating air in the incubator. Pre-incubation treatment of eggs with UV light (254 nm) for 1, 3, or 5 minutes was much less effective in the control of bacteria on the shell than dipping eggs in 1% formalin for 1, 5, or 10 minutes. UV light-treated eggs had slightly less moisture loss during incubation, but hatchability was not affected.

Eggs treated with formalin before setting and then incubated in UV light with an air filtering system had lower bacterial counts and higher hatchability than those without the light (77.4 vs 71.4%). Late embryonic mortality was reduced nearly 30%. Pre-incubation egg treatment with sanitizers having a residual effect would also be helpful in preventing recontamination during incubation.

Timing of Egg Disinfection

In the case of hatching egg contamination, a good defense is truly the best offense. That is, a good sanitation program which prevents egg contamination is far superior to disinfection after the eggs are contaminated. At its best, disinfection is only partially successful.

The type of organisms involved and the immediacy of treatment will likely have a significant influence on the success of the disinfection. This has been demonstrated in studies by Cox and Bailey (5, 6, References) in which the shells of hatching eggs were inoculated with a strain of salmonella. The eggs were then treated with one of several disinfectants at 1 minute, 5 minutes, 4 hours or 24 hours after inoculation. On the average, there was a 77%

reduction of the incidence of contaminated eggs when treatment was within 1 minute, 64% reduction for treatment within 5 minutes, 45% reduction for treatment within 4 hours, and less than 10% reduction for treatment within 24 hours. Thus, the time lapsed from contamination to treatment with a disinfectant is crucial to the success of the disinfection.

Immersion of the egg in the disinfectant was more effective than a spray, which in turn was more effective than foam application. Glutaraldehyde, quaternary ammonium and a viricide were ineffective. Polyhexamethylenebiguanide hydrochloride (PHMB), hydrogen peroxide (1%), and phenol (.2%) were most effective resulting in 95, 94, and 80% reductions, respectively, in contaminated eggs with 1 minute post-inoculation treatment and 95, 44, and 69% reductions with the 5 minute treatment.

It is obvious that the results of disinfection are greatly influenced by the timing of treatment and the type of disinfectant. The type of organism involved also will likely have a major effect on the results. Furthermore, the beneficial effect of disinfection on hatchability may be disappointing. In a recent study with chicken eggs (7, References), the effects of disinfection of nest-clean or dirty eggs ranged from no effect on hatchability to an increase of 2 percentage points for sanitized dirty eggs.

Although egg disinfection is often helpful in reducing contamination on hatching eggs, it is not a panacea and every effort should be made to produce a clean egg which does not need to be disinfected.

References

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