

Novel disinfectant for *Aspergillus* control

by J. P. Temperley and L. Limper of Health and Hygiene (Pty) Ltd, PO Box 347, Sunninghill 2157, South Africa, in conjunction with Drs R. F. Horner, M. Odendall and D. J. Verwoerd.

A number of factors have a direct or indirect influence on chick quality including microbes. A high microbial challenge, especially *Aspergillus* spp has a direct influence on hatchability, chick quality and chick health.

Microbes enter the hatchery via various routes of which contaminated eggs from the breeder farms is a most important one.

Infection results in embryo mortalities, yolk sac infections ('Mushy chick disease'), navel infections, fungal pneumonia ('brooder house pneumonia'), high percentage of 'reject' or second grade chicks and the like.

The goal should be to eliminate microbes from entering the hatchery in, as well as on, contaminated eggs. This is not possible even with the best control measures in place.

The incubation conundrum

In the hatchery conditions are manipulated to be ideal for the incubation of eggs. These are also creating a perfect environment for high levels of microbial multiplication during a very short period.

It is very difficult to control these microbes, especially spore

forming microbes like *A. fumigatus*.

Spores are very resistant and special measures need to be taken to destroy fungal spores in a hatchery.

Good hygiene practices in and around the hatchery will prevent microbes from multiplying out of control in the hatchery. Cleaning and disinfecting takes place every day in the operational areas but not necessarily in the setters and hatchers. Setters and hatchers are often cleaned and disinfected only when they are empty.

Setter and hatcher control

Microbes need to be controlled in both setters and the hatchers. Dirty or infected eggs placed in the setters, even under ideal conditions, can contaminate clean eggs.

Others explode (so called 'pop-pers' or 'bangers') during the incubation period as a result of accumulated gases from bacterial multiplication inside the egg, and in this process contaminate the entire contents of such a setter/hatcher.

This situation adds impetus to the microbial challenge to all eggs/embryos inside the

setter/hatcher and can easily lead to disastrous consequences to the entire newly hatched batch of chicks.

In conjunction with visual (and olfactory) inspection, infected (leaking) eggs should be regularly removed during the incubation period.

adverse affect on embryo development and the respiratory system of hatched chicks.

Therefore, in most instances the control of fungal spores with these biocides has been problematic.

The disinfectant of choice should have a total spectrum of

Colony forming units (CFUs) = $\frac{\text{Number of colonies} \times \text{dilution factor}}{\text{Inoculum}}$

Example: $CFU = \frac{20 \times 100}{0.5}$
 $= 4,000$
 $= 4 \times 10^3 \text{ CFU/ml}$

Table 1. Calculation of colony forming units.

However, apart from these actions, the only effective way to control these microbes is by continuous disinfection during the whole of the incubation period.

This means that the disinfectant should be bactericidal, fungicidal, virucidal and sporicidal.

It should also be non-toxic, non-corrosive and non-irritating.

Traditionally, formaldehyde or glutaraldehyde based products have been used on a periodic basis to disinfect and fumigate setters and hatchers but never on a continuous basis because of their inherent toxicity and

activity, it should be safe to use on the eggs and in the presence of chicks, it should be safe to apply (non-toxic and non-irritating) and it should not have a detrimental affect to the incubator and equipment within them (non-corrosive).

F10 Super Concentrate (F10SC) disinfectant manufactured by Health and Hygiene (Pty) Ltd has these attributes and this article will describe its evaluation in a large, commercial hatchery.

Case study notes of the trial

The trial was designed after detailed discussion and consultation with experienced poultry veterinarians who shared the goal of eliminating aldehyde based disinfectants from the incubation process.

The product (F10SC) was introduced to control *Aspergillus* spp into a large hatchery comprising 40 setters and 40 hatchers, producing a million chicks per week, situated in the Gauteng Province of South Africa.

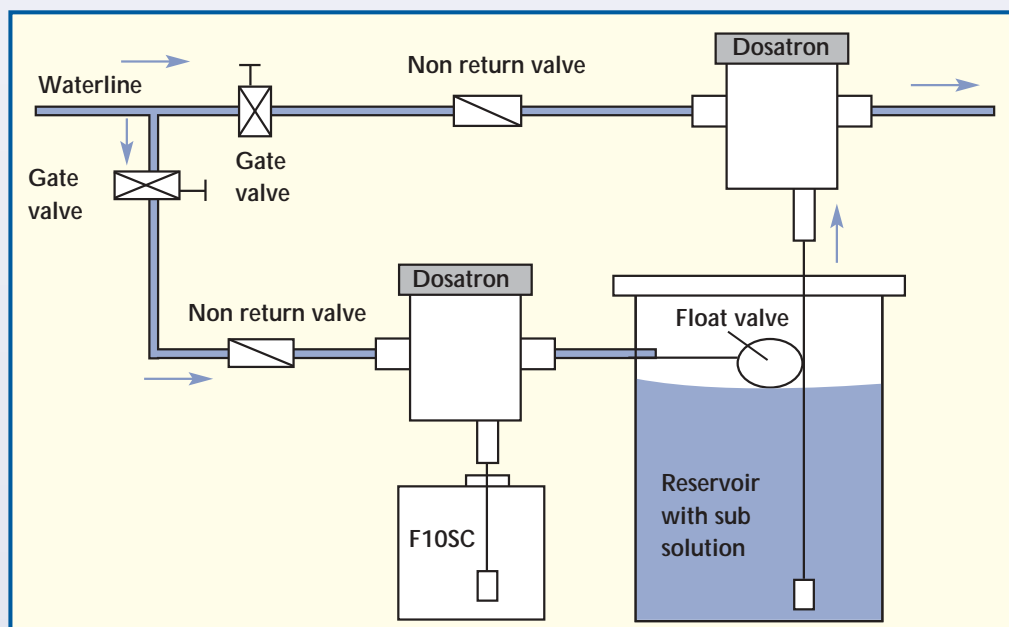
F10 was used for a total of 38 weeks from week 18, 2001, up to week 3, 2002. The specific areas of concern were the setters and the hatchers.

Fluff samples were taken weekly to analyse for the presence of bacteria and fungus.

High levels of *A. fumigatus* were an issue of great concern for the hatchery. It was decided that

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Fig. 1. F10SC hatchery trial – micro dosing unit.



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F10SC would be introduced into the system and that the process would be monitored on a continuous basis.

The equipment used included two DI16 Dosatron units and an R L Flomaster Atomiser Fogger model 1037BR.

Procedure

F10SC was fed continuously to the humidification nozzles in the setters and hatchers via a two stage dilution process using two Dosatron units (Fig. 1).

The required dilution was 200ppm (1:5000) and to obtain this, the first Dosatron was set on 1.33% and the second on 1.5%.

The settings on the Dosatrons, transfer tubes and the level of the F10SC were checked daily.

The setters were fogged daily from weeks 18 to 34 with an atomiser sprayer owned by the hatchery but from week 40 using a 1037BR fogger.

The droplet size of the hatchery fogger was unknown but the 1037BR was set to 12µm. A concentration of 1:250 (28ml per seven litres of water) F10SC was used for daily fogging in the setters.

The fogger was left in the setter for five minutes – the setter volume was 65m³. Setters with ‘floor or dirty eggs’ were fogged twice daily for five minutes at a time with a concentration of 1:250 (28ml per seven litres of water) F10SC.

The time and droplet size were considered very important in order to prevent the humidity going above 88%, but ensuring a total coverage in the setter.

The hatchers and bay areas were fogged for 20 minutes with a 1037BR fogger after terminal

cleaning to prevent any potential recontamination of eggs coming into the hatchers. A concentration of 1:250 (28ml per seven litres of water) F10SC was fogged for 20 minutes into the hatchers and bay area.

When it came to sampling, the hatchery staff collected fluff samples every day. These samples were taken from each hatch when chicks were removed from the hatcher.

The samples were collected in sterile sample bottles supplied by the in-house laboratory. Sixty grams (60g) of sample was collected per hatch and the samples were sent once a week to the laboratory for analysis.

In the laboratory 0.1g of fluff was taken aseptically from the 60g sample and mixed with 10ml of buffered peptone water.

Then 0.5ml of this solution was transferred and spread evenly over a rose bengal agar plate (a special fungal agar).

Plates were then incubated for five days at 25°C. After incubation the number of colony forming units were calculated (see Table 1).

The results are shown in Fig. 2.

It is clear from results that F10SC was effective in controlling *Aspergillus* spp in the setters and hatchers.

Fig. 2 indicates the following:

- The situation from week 1 up to week 18 represents the period in the hatchery before F10SC was introduced. During that period the number of positive samples was unacceptably high.

- During the first three week period surface swabs were taken every seven days from differing age eggs in five setters to monitor microbiological surface contamination levels.

The laboratory results indicated that over the 18 day incubation

period microbiological surface contamination was substantially eliminated which confirmed that using the fogging method was an effective way of applying F10SC.

- F10SC dosing and fogging started at week 18. From week 24 up to week 34 no *Aspergillus* spp was isolated, only for a small peak at week 32.

From week 35 to week 41 there was an increase of *Aspergillus* spp. Initially during this period the hatchery atomiser sprayer was unserviceable and no fogging was carried out in the setters.

Fogging recommenced in week 40 with another fogger with a droplet size of 12µm. The time of fogging to cover the setter without wetting the eggs was determined to be five minutes for a 65m³ setter.

The number of positive *Aspergillus* spp started to fall in week 42 and remained at virtually zero up to week 3 in 2002.

There was an isolated peak of 40% positive in week 48 when it was found that the filter in the spray's feed reservoir was blocked and the reservoir itself containing the F10SC solution was cracked and leaking resulting in a lower than required concentration of the product entering the setters and hatchers.

A wide range of factors will influence chick quality like flock age, flock health, age of egg bank, egg grading, egg collection and storage conditions and others.

It made it thus very difficult to determine what effect F10SC had on chick quality, however no abnormalities were observed over the period and day old chicks were healthy and ‘more’ lively.

The presence of F10SC in the hatchers lowered the risk of navel infections in day old chicks and the absence of *Aspergillus* low-

ered the risk of infection from the hatchery; manifesting as ‘brooder house pneumonia’ related mortalities/culls during the first week after placement.

This resulted in a lower seven day mortality rate which dropped from around 1 to 0.7% and below.

Conclusion

The results conform that F10SC as applied will give a comprehensive fungal kill when eggs have been exposed during a complete incubation cycle.

This was further confirmed when the number of *Aspergillus* colonies increased as soon as fogging stopped, and came down when fogging re-started again.

F10SC needs to be fogged over the full 18 day period in the setters and three days in the hatchers to ensure that a substantially complete kill level is consistently maintained.

Although not scientifically proven there is the possible added benefit that chicks hatched into an aldehyde free F10SC environment in the hatchery could be ‘healthier’ chicks, as hatchery personnel commented that the chicks were certainly ‘livelier’ than had been the norm.

In an ongoing operational system, particularly in a large hatchery, consideration should be given to installing a permanent fogging system with a nozzle in each setter and hatcher.

These fogging nozzles, which can be operated via a simple programme will minimise labour input and allow the hatchers to be effectively disinfected to the completion of the hatch thus creating a means of overcoming chick contamination from other internally infected eggs. ■

Fig. 2. Weekly percent of fluff samples positive for *Aspergillus* spp.

