

# Hatchery Talks Q&A – 3 tips to minimize the impact of prolonged hatching egg storage

Webinar hosted by Gerd de Lange, Senior Poultry Specialist, on 08 July 2020.

Q&A Answers by Gerd de Lange and Eline Holtslag.

## Heat treatment of eggs in general

**Q:** For how long would you pre-heat the eggs to 25 °C in the heat treatment?

**A:** Long enough for the air temperature to be at least 1 hour at set point, but better 2 hours. Generally 4 hours would be enough for that, but this depends on the storage temperature of eggs and the heating capacity of the machine used for heat treatment

**Q:** Is there breed-based data for meat chicken or layers concerning heat treatment? Are there differences?

**A:** It looks like heat treatment is more common in layer hatcheries, compared to broiler hatcheries. This is probably related to less advanced embryos at moment of laying the egg in the case of layer breeders. My hypothesis is that the egg spends less time inside the body of a highly productive layer breeder than it does in a lower productive broiler breeder, but I have no proof of this hypothesis.

**Q:** Does SPIDES have the same effect on old flocks and young flocks, in relation to embryonic development? Should flock age be considered during SPIDES?

**A:** I do not have any data, but probably young flocks will benefit more from the first heat treatment, as I assume that embryos in the eggs of younger flocks are less advanced. Note that I have no proof of this assumption!

**Q:** Is there a difference in the heat treatment profile for male and female line for Broiler GP?

**A:** There is no known difference in heat treatment profile for male and female line. There are huge improvements in both lines, but I have never really compared different profiles for the different lines.



**Q:** Is there any difference between doing SPIDES in the middle of storage and the beginning of storage?

**A:** There is a difference in first heat treatment (aim: to bring embryos to storage resistant stage XII – XIII) and subsequent treatments (aim: to replace cells that have died & to revitalise cells which have started to degenerate).

**Q:** If I have a batch of eggs from 1-4 day egg age, when do I apply the first treatment? 1/4 of my eggs being 1 day old, 1/4 2 days old, etc.

**A:** Age for first treatment 3: 4 days is fine. There is no harm if some eggs are just 1-day old at that time. But if storing the 1-day old eggs only for another maximum of 3–4 days before setting, it is questionable whether there will be a positive effect of heat treatment. It might suffice to only treat the eggs which were already stored for 3–4 days and which are going to be set 3–4 days later.

**Q:** In the application of pre-store incubation only once when eggs are placed in store, can you maintain hatch, or do you need to repeat each 5 days like SPIDES? Also, for storage of more than 10 days, what should the SPIDES gap/plan be?

**A:** For storage of up to 10 days, 1 treatment is enough. A 2nd treatment at 10–12 days will benefit if you store for 2–3 days longer after the 2nd treatment (so, for example, 14 days of egg storage in total).

**Q:** Let's say we have eggs of 30 days. How many SPIDES treatments do we do in order to avoid embryonic developments? Can we delay the treatment from 15 days onwards? Also, we have to store the male line eggs of GP at least 30 days, as the egg production is low – therefore, what would the SPIDES program be, and how many times is it necessary to apply heat treatment when the egg stored up to 30 days?

**A:** The answer consists of several points:

- First of all, delaying first treatment until 15 days does not make any sense, as there are already embryos lost during that time;
- In the case of 30-days egg storage, 4 heat treatments are suggested; the 1st time at day 3–5 followed by a repeat every 5–6 days;
- Make sure in each treatment that the time of egg shell temperature >90°F does not exceed 3 hours. It is also important to ensure that eggs are cooled back after heat



treatment properly and rapidly, to avoid negative effects from these frequent treatments;

- It is suggested that you keep some control eggs, without any heat treatments, and incubate these separately after same duration of egg storage. This will help you to evaluate the effect of heat treatment.

**Q:** How much time should elapse between the last heat treatment and actual set?

**A:** It does not make sense to do a heat treatment and set eggs the same or next day. I would say that after the last heat treatment, eggs should be stored at least for another 2–3 days.

**Q:** Could SPIDES be done on all setters, or we should have special machines to do it?

**A:** Multistage setters are less useful, as these are lacking both heating capacity and cooling capacity. Single-stage machines are generally OK to use for heat treatment. Most suppliers now also have purpose-built heat treatment machines.

**Q:** SPIDES compensates for cells amount that have been affected by storage. What is the eggs cell amount that renders an embryo to become viable from to give a chick at 21 days?

**A:** Sorry, I cannot answer this question. A freshly laid egg which cooled down in 5–6 hours to below  $<25\text{ }^{\circ}\text{C}/77\text{ }^{\circ}\text{F}$  will contain approximately. 60.000–80.000 viable cells. If you could maintain that number with heat treatment, I guess you are doing a great job – but how to count in practice?

**Q:** Is it possible to build a new setter for SPIDES treatment inside the storage room?

**A:** Yes, certainly, but care must be taken that this setter in the egg storage room does not cause the temperature in the egg storage room to fluctuate. So, for example, the warm air being exhausted from this machine during cooling phase (if air cooling is used in addition to water cooling) should not be exhausted into the storage room.

**Q:** For long storage over 10 days, should the humidity set point adjust to achieve egg weight-loss target?

**A:** If eggs already lost weight during egg storage, the weight loss during incubation is allowed to be less. Optimal egg weight-loss is supposed to be calculated from fresh egg weight and not from egg weight after storage. So humidity set point during incubation of long-stored eggs could be a bit higher. But even if humidity set point is not adjusted, I hardly can imagine that total egg weight-loss will be too high, such that it has a negative effect.



**Q:** SPIDES tends to increase weight loss since we heat for 3 to 4 treatments. Going up to 65% HR helps, but is there another way to reduce that weight loss?

**A:** In addition, create optimal storage conditions including high relative humidity (80–85%).

**Q:** What is the effect of egg >10 days to DOC Quality and brooding period?

**A:** Long-stored eggs have a negative effect on chick quality – resulting especially in more black navels. A reduced 7-day weight might also be expected.

**Q:** What you would expect the negative impact for hatchability to be for egg storage of more than 21 days after SPIDES?

**A:** See the graph in the pdf of the presentation you received after the webinar. Of course, hatchability will be lower compared to incubating fresh eggs – but by applying heat treatment you can reduce the negative impact of long egg storage on hatchability.

**Q:** If incubating 15 days eggs in the setter ( With SPIDES ), which eggs do I need to consider for ML – youngest or oldest egg age?

**A:** Sorry, this question is not clear. Please clarify if you still require an answer.

### **Incubating eggs of multiple storage days**

**Q:** How is it best to set eggs into a setter with differing age storage? Also, if I have long interval storage for setting (For example 4-18 days), what can we do?

**A:** If you know some part of your setter is slightly warmer than other parts during first days of incubation, this is where you could place the long-stored eggs. The higher temperature will speed up embryo development a bit. Note: Do not increase the temperature set point for that reason, and if you do, only by just a little! (see next question). It's more important to transfer the long-stored eggs to the same hatcher and the shorter-stored eggs to another. At pulling date you start with the hatcher of the shorter-stored eggs, thus giving the longer-stored eggs some extra incubation time.



**Q:** What temperature is required when we have egg different collection points? ( there are 2 days, 3 days... up to 8 days

**A:** I would not really work with different temperature set points. It is better to place the 8-day stored eggs just at the warmest place during this period in your setter. If you want to increase the set point, I would suggest being very careful, and no more than just 0.1–0.2°F.

### Pre-heating or pre-warming of eggs

See also <https://www.pasreform.com/en/knowledge/61/pre-heating-an-effective-tool-for-chick-uniformity>

**Q:** Does warming the eggs just before setting have any effect on hatchability?

**A:** The biggest impact of pre-warming or pre-heating the eggs prior to incubation is a more uniform start of embryo development, and thus a shorter hatch window. If done correctly (77–81°F/25–27C and not excessively long) there will certainly not be a negative effect

**Q:** How long must be the pre-heating when I have 15 days storage – because I normally take 10 hours to 80°F? Also, when considering the preheating time for egg storage for 16 days stored at 16C in cold store, what is the required air velocity during preheating?

**A:** It is important that the setter achieves this set point and stays at this set point for a while. Remember, the aim is to warm all eggs INTERNALLY to the pre-heating temperature – in your case 80°F. The time to reach set point depends much on the initial temperature of the eggs (and thus to storage temperature) and heating capacity of the setter. The time needed after that to heat all the eggs thoroughly to an internal temperature of 80°F should be a minimum of approximately 4 hours (and longer if air velocity is low). Based on this, you can check if 10 hours is OK, or it may be a little longer than needed. I do not think 10 hours preheating is causing any problems though! Note: Preheating of eggs in the setter room (=low air velocity) takes much longer and should be at least 12 hours.

**Q:** Can you share profile set point temp for preheat in setter machine?

**A:** We advise 77–81°F for pre-heating temperature set point. For duration, please see the answer above.



**Q:** What is your advice for pre-warming or pre-heating of multi-stage incubators? Also, how best to apply preheat treatment for a multi-stage machine?

**A:** In case of multi-stage incubation, eggs cannot be preheated inside the setter prior to incubation. Eggs can be placed in the setter room where temperature is approximately 77°F/25C at least 12 hours before loading them in the setter. This long time is required as air flow in the setter room is limited – therefore it takes time for ALL eggs in the batch, and those in the centre of the trolley, to achieve a uniform internal temperature.

**Q:** Do you think that if we do not perform SPIDES and only do preheating, then the preheating will compensate in the hatchability?

**A:** No, preheating does not have the same effect as SPIDES.

### Storing the eggs sharp end up

**Q:** If eggs stored for more than 10 days, why must eggs must be put sharp end up? **Also,** what are the effects if we set eggs in the hatchery with sharp end up?

**A:** In case you want to store the eggs for longer than 10 days, you can consider storing the eggs sharp-end-up – or alternatively, turn them 2-4 times a day, as is done during incubation. As the yolk has a tendency to rise to the top of the egg (especially as the albumen gets thinner with longer storage) and the embryo lies on top of the yolk, storing the egg sharp-end up will prevent the embryo coming into contact with the air-cell, and this most-likely prevents dehydration. **NOTE:** Do not incubate the eggs sharp end up!

**Q:** Which day of storage do we have to turn eggs upside down if we know that long storage period is required just after collection of eggs?

**A:** Store the eggs sharp-end up as soon as they arrive in the hatchery if you know these eggs will have a long storage time.

**Q:** How many days should we keep eggs at narrow end up when we are going to store the eggs for 10 days?

**A:** Store the eggs sharp-end up from the moment they arrive in the hatchery until the day before setting.



## Cooling down of eggs after laying/physiological zero

**Q:** Eggs are stored at physiological zero to attain embryonic diapause, but will heat treatment beyond the point of no return temp up to 90°F and cooling back to storage temp will not cause early embryonic mortality?

**A:** Heat treatment is used to bring embryos up to the storage resistant stage XII – XIII, and to revitalise or replace cells that have died during storage. However, when the embryos are already in an advanced stage, heat treatment might cause the embryonic development to reach ‘the point of no return’. This should be prevented, as these embryo’s will not survive another storage period and the effect will be a high rate of early embryonic mortality!

**Q:** What is the ideal time to reach the physiological Zero temp after oviposition?

**A:** To maintain best hatching potential after egg storage, eggs should be cooled down uniformly and gradually from body temperature to between 18-25C in approximately 6 hours. Too-fast cooling down results in under-developed embryos and too-slow cooling down results in too greatly advanced embryos. In both cases, embryo survival of stored eggs is reduced

## Hatch window

**Q:** What is the minimum and maximum hatch window?

**A:** As every embryo is an individual, even two eggs receiving the same treatment will differ in hatch time. Therefore, a hatch window around 12 hours is considered optimum. Shorter hatch windows would be even better, but this might not be realistic. Preferably, the hatch window should not exceed 24 hours – and in single-stage incubation this is achievable with good management practices. However, in traditional multi-stage incubation a hatch window of 36 hours is not uncommon.



## Single questions

**Q:** What would the ideal storage parameters be for duck and goose eggs stored for longer than 10 days?

**A:** In the same way as explained for chickens. Lower the storage room temperature and try to turn the eggs frequently, or store them sharp-end-up. For more details, please see slide 16 from the hand-outs of this webinar.

**Q:** What can I do if the eggs arrived in the hatchery with a germinal disc diameter of 3.5 mm?

**A:** A fertile, well-developed embryo has a doughnut-like opaque ring, with a translucent centre, and a diameter of approximately 3.5-5mm. An under-developed embryo has a diameter <3.5mm with white dots in the centre of the opaque ring. If you see this, the egg was probably cooled down too fast and the eggs might benefit from heat treatment. An over-developed embryo has a diameter >5 mm. If you see this, the egg was probably cooled down too slow and these eggs might have a higher embryonic mortality, as they might have reached the embryonic 'point of no return'.

**Q:** Does geography/climate have an impact to hatchability and/or heat treatment?

**A:** It can have an effect, but it shouldn't have. If there is full control over the climate in the breeder house, transportation and hatchery, there should not be any difference. In reality, we see that temperature in the breeder farms is closely related to the outside temperature. And the effect on hatchability can be positive or negative. If eggs after laying cool down nice and slowly to below 77°F/25C it will result in a more storage-resistant embryo. This is what we often see in warmer climates: these eggs have less need for heat treatment. However, in warm climate there is risk that embryos develop too far if they cool down too slowly after laying, or if heat treated too long – both having a negative impact on hatchability.

**Q:** How can I estimate the hatchability loss per day?

**A:** In daily practice you can only do this when comparing hatchability of fresh eggs versus hatchability of stored eggs from the same donor flock: the hatchability of the fresh eggs would then be your benchmark. The longer the eggs are stored, the faster the hatchability declines. Research also showed that hatchability of young breeders is affected more by prolonged egg storage than that of old breeders (Yassin et al.,2008). See slide 8 from the





hand-outs of this webinar. Hatchability losses of 1-1.5% per day after 7 days are not uncommon in practice.

**Q:** Is there a machine that can be used to test fertile and infertile eggs after receiving from the farm?

**A:** Not yet! We advise to manually evaluate fertility of eggs when received at the hatchery by doing a fresh egg break-out, or to do a test candling after 10 days of incubation.

**Q:** What is the ideal storage requirements for ostrich eggs?

**A:** I cannot answer this question with certainty, as I have no experience with ostrich eggs. However, I do know of research stating that ostrich eggs should be stored after collection at <21C, with 40% relative humidity. Storing the eggs with the tip down, or horizontally, did not seem to have an effect on hatchability (Sahan et al., 2003).

**Q:** How should I reduce humidity in a storage room?

**A:** Are you sure humidity in the egg store is too high? I often find during hatchery visits that it is lower than we advise (75–max. 85%). Is your sensor reading correctly? However, if it really is too high, a bit of ventilation will help – proving that the inlet air is not too humid. In the latter case, you first need to dehumidify the inlet air by means of an Air Handling Unit.

**Q:** What is the main cause of egg mortality in the first 2 days after incubation in eggs stored for 5 days?

**A:** See <https://www.pasreform.com/en/knowledge/135/early-embryonic-mortality>

**Q:** What is the best set point temperature and humidity set point for a farm egg room?

**A:** The optimal climate settings in the egg storage room should be decided by – or at least coordinated with – the hatchery manager, in order to avoid sweating during truck loading and to match with intended storage duration at the hatchery and climate conditions in the hatchery's egg-storage room. Continued storage at the hatchery should at least be at equal temperatures – and definitely not higher! Generally, if the eggs are stored for up to 3-4 days at the breeder farm, maintain a temperature of 18–21C (and if possible 75-85% relative humidity). See slide 16 from the hand-outs of this webinar

**Q:** If there were bad egg storage conditions, how can I fix this problem in the incubators and hatchers to make the chicks as uniform as possible?

**A:** Generally spoken, the bad storage conditions will have already done harm and incubation cannot fix this anymore. Your main focus should be on improving the storage conditions. The



following might perhaps help: Check the development of embryos in a sample of eggs you took from the egg storage room; underdeveloped eggs might benefit from heat treatment, (too) far developed embryos do not. Ensure proper preheating prior to incubation. With the aim that all eggs start incubation from the same uniform internal egg temperature.

**Q:** How do you maintain good environment for multi-stage incubators if you have partial egg setting?

**A:** Optimal multistage incubation requires a constant and continuous setter loading pattern. With only partial, or irregular, loading you have to compromise. How best to do this depends a lot on the brand of incubator you use. Contact [info@pasreform.com](mailto:info@pasreform.com) if you need specific information.

**Ends**

