

# Alternative hatching systems



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# Traditional hatching procedures

When we think about incubation, we often focus on the **setter period, from 0 to 18 days of incubation**. And there is a good reason for it, as **in that period the embryo develops, and with that development the baseline for future performance is made**.



In the setter period we can influence that development by changing the temperature of the egg, and subtle changes can have a significant impact on the development and quality of the day old chick.

**A limiting factor for the embryo is the availability of oxygen.**

- ▶ Oxygen is needed to utilize energy from the yolk. **When the temperature of the egg drives the development/growth of the embryo to a too high level, energy cannot be mobilized fast enough from the yolk** and the embryo will need to find alternative pathways to survive, compromising the optimum development.

Once the embryo **gets past 14 days of incubation**, we can notice that the increase of energy mobilization starts to slow down, due to the limitation of the oxygen supply.

Once the embryo is **17-18 days in incubation**, **the energy mobilization cannot increase any further and the maximum heat production of the embryo is reached**. This is called the **plateau phase**, the period where oxygen limitation forces the embryo to a plateau in heat production.



So, **in the hatchers we cannot increase the developmental rate of the embryo any further**, as the oxygen supply to the embryo is limited.



When **we do increase the temperature the embryo will try to respond with a higher metabolism, but as the oxygen is limited the utilization of energy out of fat cannot be increased.**



**As a result the embryo will burn protein from its body to get energy, which has a negative influence on its development.**

It is known that **an increase of 1°C in egg shell temperature over a longer period of time can bring down the size of the heart muscle with 20-25% at hatch.** Not only the heart muscle is smaller, but also intestinal tract, leg formation, foot pad formation and immune system are known to be negatively influenced, at hatch and later in life.

This is well studied during the **setter period**, which is recognized as the **most important period for the development of the embryo.**

But also **the conditions during the hatching phase have an influence on both hatchability and chick quality**, and then especially on navel closure and the energy supply of the chick. If we look at mother nature we can observe that **mother hen doesn't leave her nest during the hatching process.**

*This is of course to protect her eggs and newly hatched chicks from predators, but also to supply enough heat to the hatching chicks.*

**During internal pipping, the embryo opens the air cell and starts lung ventilation.** Due to this extra oxygen and the movement of the embryo in the egg the temperature in the egg increases with approximately 1°C.

**During external pipping the embryo/chick opens the shell, gets even more oxygen and hatches.** Also this activity generates a lot of heat and results in an increase in egg temperature.

- ▶ **If the egg temperature remains too low we see more eggs that didn't complete the hatching process, more chicks that hatch relatively slow and late (dragging hatch) and more navel closure problems (string navels and black buttons).**
- ▶ Also the chicks that have hatched will be more lethargic as they have lost a lot of energy in the hatching process.



**This increase in temperature after internal and external pipping is important for the embryo/chick to close its navel and complete the hatching process quickly.**





**To get a good hatch and chick quality it is important to keep also the last eggs that hatch at the right temperature.**

This is not only a matter of not dropping the temperature too quick, but especially of controlling the ventilation. In most machines, incoming air gets in direct contact with the eggs in the hatching baskets. That incoming air can cool the last eggs hatching, with a dragging hatch and more navel problems as a result.

**For the chicks that have already hatched an increase in ventilation and decrease in temperature would be beneficial, but this can create a problem for the last eggs in the hatching process.**

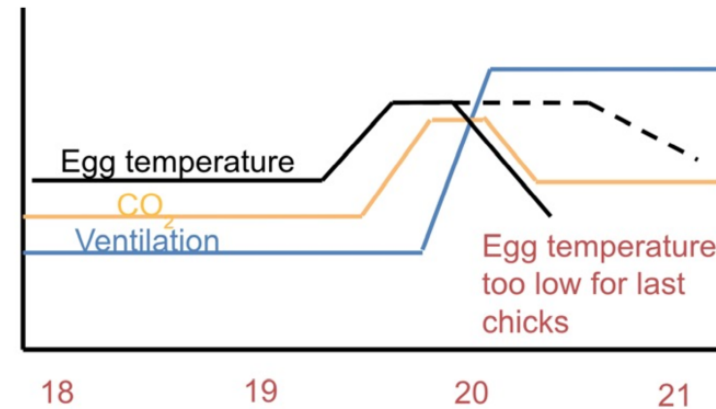
- ▶ When the sprayer is used together with a high ventilation, this can even get worse as the evaporation will contribute to local cold spots.





The precise control will depend on the type of machine, but **most hatchers give better results when the ventilation is kept at a low level until the last chick has hatched.** With that limited ventilation, the carbon dioxide (CO<sub>2</sub>) and relative humidity (RH) will go up.

- ▶ This has resulted in a wide spread assumption that for a good hatch high CO<sub>2</sub> and high RH are necessary, where in reality they are more a result of how to avoid too low temperature for the last eggs hatching.



Solution: set high CO<sub>2</sub> levels (high RH levels)

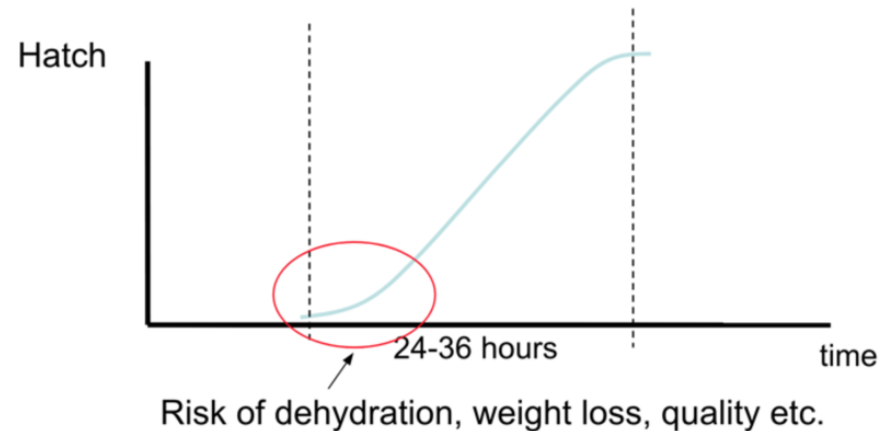
# Alternative hatching procedures

In recent years there has been especially in Europe a *welfare driven debate* about the maximum allowed time for chicks without feed and water.

Chicks have a hatch window of approximately 36 hours, and with time for processing and transfer, it takes often 48 hours before the first hatched chicks have access to feed and water. The residual yolk sacs in day old chicks is not considered to be sufficient, at least not by legislation and animal welfare groups.



This has contributed to the development of **alternative hatching systems, that allow the chicks to find feed and water already during the process of hatching.**





## HATCHING WITH FEED AND WATER IN THE HATCHER

As a result a number of alternative hatching systems/procedures have been developed. To be able to allow the chicks to eat within 36 hours after hatching, they can either hatch in a hatcher with access to feed and water, or hatch in a standard broiler house with feed and water available.

**Allowing feed and water in a hatcher requires a different hatcher or a different hatcher basket.**



Although both systems have their advantages and disadvantages, **both systems need a lower bird density per m<sup>3</sup> or hatching basket to provide enough space for the birds to be able to move to the feed and water.**



## HATCHING IN A BROILER HOUSE WITH FEED AND WATER

Eggs can also be transported at 18 days of incubation to a traditional broiler house at 18 days to hatch.

The eggs are placed on the litter or the incubator trays are placed on or above the litter. Providing the temperature is controlled well, the eggs will hatch normally and will have immediately access to feed and water.



**In both systems** (hatching in hatchers with feed and water or hatching in a broiler house) **the hatching results are good, comparable and sometimes better than in traditional hatchers.**



This shows that CO<sub>2</sub> levels and RH levels during hatch are of less importance, as these levels will be much less especially in a broiler house compared to a traditional hatcher, indicating that successful hatching is more about temperature control than about gaseous environment.

Although with feed and water available the chicks are expected to have an earlier start and therefore would be expected to have a higher end body weight, this is not always the case.

Both research and field experience show that **although the broiler results are good, they are not necessarily better than when the chicks hatch in a traditional hatcher.**



However, **there are indications that the chick quality and first week mortality are more “stable” when hatched in an alternative system.** This might be due to the presence of feed and water for the very young chick, but it can also be the result of lower level of stress and bacterial contamination.

When the chicks hatch in reduced density or on a litter floor the chicks will not “crawl” that much over another.



If alternative hatching systems will be profitable depends on the cost-benefit ratio.



Alternative hatching systems are more expensive than traditional hatching as they require more space, labor and investment or occupy a broiler house for a number of days.

- ▶ If the technical results do not show a significant benefit, **the difference should be made by a premium price for a better or more welfare friendly product.** Future will tell if and under what conditions this is realistic.





## FOR FURTHER INFORMATION

*de Jong I.C., J. van Riel, M.B.M. Bracke and H. van den Brand (2017). A 'meta-analysis' of effects of post-hatch food and water deprivation on development, performance and welfare of chickens. PLoS ONE 12 (12)*

*de Jong I.C., T. van Hattum, J.W. van Riel, K. De Baere, I. Kempen, S. Cardinaels and H. Gunnink (2020). Effects of on-farm and traditional hatching on welfare, health and performance of broiler chickens, Poultry Science 99 (10)*

*Giersberg, M.F., R. Molenaar, I.C. de Jong, C. Souza da Silva, H. van den Brand, B. Kemp, and T.B. Rodenburg (2021). Effects of hatching system on the welfare of broiler chickens in early and later life. Poultry Science 100 (3)*

# Thank you!

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