

All breeds are equal

But some are more equal than others...

By Ron Meijerhof

Genetic companies are constantly improving their products, and although the different breeds that we are using in our industry are very comparable, there are some differences as well. This has consequences for the performance in the field, but also for the way we have to incubate the different breeds.

What happens in incubation?

Embryos get energy by burning the content of the egg, first carbohydrates and later yolk. This yolk consists mainly of fat, which is a very effective energy source. Utilizing this fat for energy is a relatively slow process which requires a lot of oxygen. This means that the ability of the embryo to produce energy is influenced by the availability of oxygen.

The rate at which the embryo uses energy depends on the temperature in the egg. If this temperature goes up, the embryo will grow and metabolize faster, and therefore will use its energy faster. The production of energy and the use of energy must be in balance. If the embryo uses more energy than it can produce, it will run out of energy at the end of the process, and problems can be expected.

Differences among breeds

Not all breeds and all lines are equal. If we incubate for example Ross 308 and Cobb 500 eggs of the same weight in the same machine, we can observe some differences. We will find for instance that one breed will lose more weight than the other one. If we take egg shell temperatures at 18 days of incubation, we can also see that there are differences, one breed will probably show higher temperatures than the other one, and for instance will also hatch earlier. We do not completely understand why these differences between breeds exists, but it seems that different breeds produce different amounts of heat during incubation.

What are the consequences?

An egg with a higher embryo temperature will burn its resources faster. We can compare this with running. If we run faster, we burn more energy and we get warm. But at the same time, we start to breath faster as well, as we need more oxygen to burn that energy. This is the same for eggs, if they have a higher egg shell temperature, they need more oxygen to utilize the extra energy that they need. This means that if the oxygen availability is low because of a low conductance, a higher egg shell temperature will be more harmful for the embryo than when we have a higher oxygen availability.

As said, not all breeds lose the same amount of moisture during incubation. As moisture loss depends on conductance (porosity of the shell) we can expect that a lower moisture loss also means less oxygen available for the embryo, as oxygen also has to pass the pores. Changing the relative

humidity to increase the moisture loss will not change the pores, so it will not change the availability of oxygen, only the weight loss.

As the embryo needs energy to survive, a higher temperature especially in combination with a lower conductance will have a negative effect on the embryo. It doesn't have enough energy at hatch, and it will be more weak when it hatches. These birds will have a problem to move on the belt and tray in the hatchery, and also in the farm, resulting in a poor start. As the birds will burn protein to survive, their organ development and immune system will be affected as well.

How can we manage this situation?

What we have to realize is that there is a difference between breeds, especially in terms of shell conductance and heat production. Issues like differences in hatch time, more exhausted, poor starting birds with damaged hearts and immune systems are in most cases not genetic, but are the result of the fact that we forced the embryos to run too fast without enough oxygen uptake. So how do we force the embryos to slow down? Just by controlling its temperature to the right level of approximately 100-100.5°F (egg shell temperature). This means that the temperature of the machine needs to be adjusted to the breed which we are incubating, but also for instance to the egg sizes in the machine, as bigger eggs will give higher heat production and lower air velocity, resulting in higher embryo temperatures.

What happens if we do not adjust

If we are not able to control the temperature based on the demands of breed and strain, we will especially hurt the embryos that tend to produce more heat during incubation. As it seems that with increasing improvements in genetics the heat production over the years is slowly increasing, this will become more and more important in the future, and with it the need to control incubation conditions and then especially embryo temperature to the level desired by the developing embryo.