The mystery of young breeders

By Ron Meijerhof

Birds are warm blooded animals, which means that they can actively influence their metabolism to keep their body temperature at a constant level. If they lose more heat than wanted and therefore get cold, they will first try to limit their heat loss, but if that is not possible or not sufficient they will start to produce more heat to stay warm. This is a very important mechanism for an animal, as their metabolism functions optimal at a specific temperature.
A cold-blooded animal like a snake or a fish reacts differently to temperature fluctuations. They do not have a specific optimal body temperature, but their metabolism can function at a range of temperatures. Their body temperature changes with the environmental temperature, and they don't change their metabolism to correct it. They do have a higher metabolism if their body temperature goes up, which is the reason why cold blooded animals are more active in higher temperatures.

Although birds are warm-blooded, chicken embryos react like a cold-blooded animal. They can't actively change their metabolism, but their rate of development depends on the temperature, and than especially on the temperature inside the shell (the so-called embryo temperature). Unlike a snake, they do have a specific optimum body temperature. If this optimum temperature is not achieved, the development and growth will be impaired, and more and more research shows that this impairs performance later in life as well.

The transition from a cold-blooded (poikilotherm) embryo to a warm-blooded (homeotherm) chicken does not happen immediately at hatch. It is a slow process that takes several days to be completed. The first signs of the change can be observed at the end of incubation, approximately at day 19. The transition process normally is completed approximately 4 - 5 days after hatch. From that moment on, the chick really reacts as a warm-blooded animal, before that moment it still partly reacts as an cold-blooded embryo, at least from a thermoregulatory point of view.
This means that during the first 4-5 days of life, the chick is very sensitive for temperature, and then especially too low temperatures. If they are getting too cold, they will not move around and find food and water but will sit lethargic on the litter. When this happens, they will start slow and non-uniform, which results in a poor growth and poor uniformity later on. Also the chance that they will die from navel-yolk sac and e-coli infection increases.
Birds, like all animals, produce heat as a by-product of their metabolism. So if they are eating, digesting feed and growing, they will produce heat and to a certain degree keep themselves warm. The problem is that when a chick is cold, it doesn't move and doesn't eat, and it doesn't start producing heat that results in a higher body temperature. Once the bird is eating, the problem of under cooling is much less, but first it has to start eating as quickly as possible.

The thermoregulatory system does not develop for each type of chickens in the same way. Some genetic strains react different from others, but there is especially a difference related with the age of the breeder flock.
We know that chicks from young breeder flocks (younger than 33-35 weeks) have more problems during the brooding period. Broilers originating from young breeders have an increased first week mortality and a reduced growth rate when compared to chicks from an older breeder flock. We often think that this is because the eggs are small, therefore the chicks are small at hatch and that creates the problem. This is definitely part of the problem, as a bird that is smaller takes longer to reach the same body weight, but it is not the only problem.
Eggs from breeders that are younger than 33-35 weeks of age produce chicks that take much longer (24-48 hours more) to develop their thermoregulatory system. This means that at hatch and during their first days of life they are less mature than chicks that are produced by older breeders. It is as if they are neonates, animals that are born too early, although their actual hatch time is normal.

It is not known what the origin is of this problem. Genetically chicks from young breeders are identical to those from older breeders, so the genetic capacity of the bird is not the problem. More likely it is related with the development of the embryo, which is influenced by the composition of the egg.
One of the problems could be that the young breeder bird is still growing itself, which creates a competition for nutrients between her own body and the egg. This would mean that the transition of nutrients from the breeder to the egg and from the egg to the embryo plays a role. Many attempts have been made to overcome the problem by feeding the young breeder a more balanced diet, but without much of success. Influencing the yolk composition by feeding a different diet to the breeder has not resulted in an improvement yet, as the embryo from these young breeders seems not able to take up this adjusted composition.
Perhaps the relative new science of Nutrigenomics can give more answers. Nutrigenomics studies the influence of nutrition on gene expression. Although all genes are present in every embryo of the same genetic make up, the expression of these genes depends on a lot of variables, including nutrition. As the embryo of a young breeder reacts so different from that of an older breeder, perhaps this science can give us directions on how we have to manage and feed our young breeders or embryos from young breeders to help them develop better.

But until science has given us more answers and solutions, we have to deal with a large number of chicks in commercial operations that react as a neonate at placement in the broiler house. As these chicks are very sensitive for sub-optimal conditions and than especially for temperature, maximum control of the environment for each individual chick is of utmost importance. Only in this way we can stimulate feed intake for these birds and let them develop further into a fully functional chick. It will take them 24 to 48 hours longer to get to that same stage of development and in that brooding period the birds are more sensitive, but once that period is passed the normal potential of the bird is there.