Pekin duck egg incubation

Duck eggs have been artificially incubated for millennia, but in commercial incubation they have often been overlooked in terms of technical development.

Modern incubation systems have been developed for the very much larger chicken industry and have only secondarily been applied to ducks. This is not really problematical so long as the differences between the various types of egg are understood and acted upon.

Incubators have yet to be designed that will hatch only a single type of egg and it is only our understanding of the environmental requirements of the species concerned that allows us to achieve high rates of success.

We have long known that the waxy cuticle on the external surface of duck eggshells can prove a significant barrier to gas exchange during incubation particularly for those eggs that have a low porosity. This problem was resolved by Cherry Valley many years ago by removal of the cuticle by washing in a solution of hypochlorite prior to incubation, which removes this barrier and increases the porosity of the eggs.

This process means that incubation humidity has to be very much higher than conventionally used for poultry (75% compared with 55% respectively) and that commercial incubators should be able to supply and maintain these levels. In practical terms washed, cuticle free eggs will lose an average of 11.5% to transfer compared with 8.0% for plus-cuticle eggs incubated in the same incubator. The difference in hatchability amounts to around 15% of set, which makes the procedure commercially very important.

The cuticle causes a problem not with low rates of weight loss (which are easily corrected by changing the humidity during incubation) but rather with restrictions in the availability of oxygen within the egg.

Low porosity eggshells restrict diffusion of oxygen into the egg, which retards embryonic growth and eventually kills the embryos (and is not restricted to duck eggs).

The commonest diagnostic feature of the problem is a high incidence of 'drowned' embryos – fully formed but small embryos, surrounded by fluids but have yet to pip into the air space. Whilst it is impossible for these embryos to drown in the strictest sense of the word, they did die of suffocation caused by the eggshell.

In some wild duck nests it has been shown that the cuticle is eroded away by bacteria living on the eggshell and this increases the porosity of the shell as incubation progresses. Hence, at the start of incubation the cuticle repels water from the duck's feathers but as the embryo grows and requires more oxygen the cuticle is broken down and the porosity of the shell increases, thereby allowing more oxygen in.

Many hatchery operations around the world do not actively remove the cuticle from duck eggs yet claim high hatchability. The possibility exists that other incubation procedures, such as spraying the eggs with water during incubation, actually promotes degradation of the cuticle and coincidentally increases eggshell porosity as development proceeds.

Cherry Valley's increasing understanding of these processes is being applied in a research programme, which has the goal of retaining the cuticle but maintaining high hatchability. This will mean that washing in hypochlorite will become unnecessary, thereby reducing environmental hazards and minimising egg production costs.

Comparative research into the physiology of hatching is finally confirming what the industry has known for many years – not all commercial birds are the same. Waterfowl are developmentally more advanced at hatching than poultry, such as chickens and turkeys. This means that they are better able to thermoregulate than chickens and are more robust during the earliest days of rearing. This has to be reflected in their incubation requirements.

There is a lot of talk within the chicken industry of maintaining the egg temperature at a constant 100°F (37.8°C) throughout the incubation period because it maximises hatchability and quality of chicks. Whether this can be applied to duck eggs has yet to be fully investigated but the available evidence suggests that egg temperatures rise during the second half of incubation (which is also seen in turkeys and chickens) and this may be helping to pre-adapt the embryo to a higher body temperature that it requires after hatching.

Body temperature of ducks is 40.5°C yet optimal development is at 37.5°C and so a limited rise in egg temperature may be allowing the duckling's physiology to acclimatise to a higher temperature in the run up to hatching. Research into this exciting aspect of bird development is on going at Cherry Valley, but will eventually produce ducklings of the highest quality that have the best survival and rearing characteristics. ■