Chick vitality and uniformity

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The production of uniform chicks of high vitality requires incubation conditions which meet the needs of the growing embryo. Optimum incubation conditions vary between egg types and breeds.

To adapt the incubation conditions to the different types of eggs the hatchery manager needs to have more knowledge about the interaction between the incubator climate and chick quality. In addition, he must be provided with a single stage incubator which responds accurately and homogeneously to the set points defined by the hatchery manager.

In the commercial hatchery the manager adjusts the incubation set points by experience. Doing this she or he takes into account, breed, maternal age and storage time. When hatchability, chick vitality and uniformity are below the hatchery's reference there is a need to adjust the incubation programme by trial and error. With the increased application of single stage incubation the need for more objective methods to measure chick quality is growing. In addition, the design of the single stage incubator needs specific attention for optimum single stage incubation. This article summarises the development of an objective measurement of chick vitality and uniformity and then considers the specific requirements needed for a single stage incubator.

Pasgar score and vitality

In analogy with the Apgar score for newborn children, the Pasgar score has been developed as an objective measure for day-old chick quality. The Pasgar score is based on morphological criteria (Table 1).

The hatchery must be provided with a single stage incubator which responds accurately and homogeneously to the set points defined by the hatchery manager.

These criteria are mostly used by the hatchery manager when assessing chicks and are based on chicks' alertness (reflex) as a measure for activity, the appearance of the navel, legs, beak and the size of the yolk sac.

A top quality chick has a score of 10 and one point is subtracted for each abnormality recorded in one of the above mentioned five criteria.

To gain a representative score for chick quality of a flock of chicks, a sample of at least 30 saleable chicks must be assessed and the mean Pasgar score is calculated. For simplicity the degree of abnormality is ignored in the examples.

A list of the criteria causing downgrading of birds in the Pasgar scores categories is shown in Table 1.

When the degree and the frequency of abnormalities scored are analysed separately for the distinct criteria, the Pasgar score can also be used as a diagnostic tool. Here we present the first results of the application of the Pasgar score in commercial hatcheries.

The Pasgar score can be applied to improve incubation programmes in single stage incubation on the one hand, and to create a database for incubation programmes on the other hand.

Table 1. Criteria used to downgrade chicks for the analysis of the Pasgar score.

Category	Criteria for downgrading
Reflex	Chicks need more than two seconds to turn from lying on its back to a normal position.
Navel	Navel closed with small white knob; small black knob; large black knob; remnants of yolk; open navel; down is smeared with albumen, knob.
Legs	Red hooks, swollen hooks, malformations.
Beak	Red dot, nostrils contaminated with albumen; malformed beak.
Yolk	No yolk left, yolk sac too large.

The influence of storage

Storage conditions (length and temperature) of incubation eggs influence hatchability and chick quality. In the following experiment the Pasgar score was applied on eggs from the same flock but stored for either three or 11 days before incubation.

Of both lots 4,800 eggs (one trolley) were incubated in the same setter and hatcher. The Pasgar score was determined on a sample of chicks of both groups. The mean Pasgar score for the eggs stored for three days was 9.4 (27 chicks) compared with a mean value of 8.9 (29 chicks) for eggs stored for 11 days.

This result was in accordance with the anticipated chick quality after prolonged storage. From these results it was concluded that the Pasgar score can be used to express chick quality after storage.

Single stage incubation

Flock age affects hatchability and chick quality. In a second experiment the influence of maternal age was evaluated on the Pasgar score. In addition, the possibilities of using the Pasgar score to adjust the incubation programme for eggs from an older flock and to improve hatchability and chick quality was examined.

The Pasgar score of chicks derived from one flock of Cobb eggs was determined in three different successive single stage incubation cycles. Unfortunately, it was not possible to compare two different incubation programmes in one and the same incubation cycle.

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It appeared that the chick quality expressed as the average Pasgar score relates to the age of the mother.

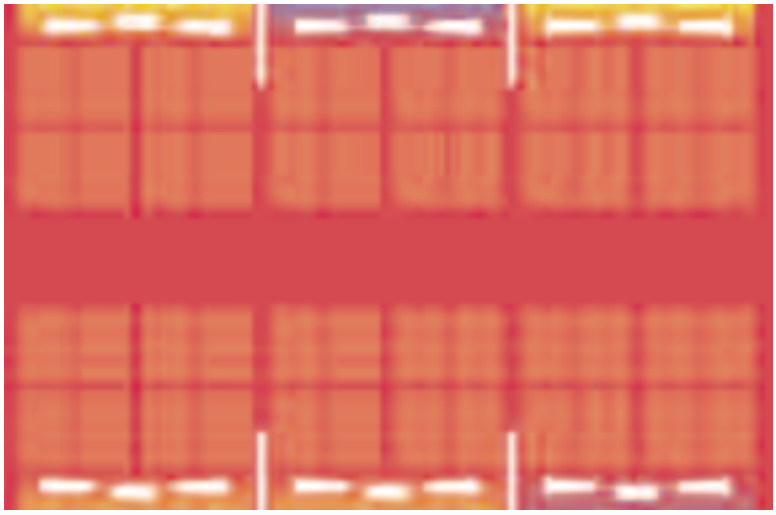
In another experiment chicks from 35 week old mothers had an average Pasgar score of 9.1; chicks from the same flock but 10 weeks later (maternal age 45 weeks) had a score of 8.6.

Thus, chick quality expressed as Pasgar score decreases as maternal age increases. This observation is in agreement with earlier published results.

The low Pasgar score was mainly the result of a high number of chicks with navel and beaks contaminated with residual albumen.

It was concluded that incubator temperature might be too low for eggs from older hens and, therefore, for the next assessment of quality the incubator temperature was increased on average by 0.2°F at day 10-12 and by 1.0°F at day 18 compared to the set points previously used.

The increased temperature resulted in a Pasgar score of 9.1, which is higher compared to the Pasgar score of the chicks from eggs from hens at 45 weeks. It was concluded that, in this specific experiment, the eggs from older mother hens benefit from the higher incubator temperature.



The ideal incubator is divided into small compartments, each with its independently controlled temperature, so that different set points can be defined.

Modern design

From the above description of experiments and results we must conclude that if the hatchery manager needs to optimise the incubation programme for highest hatchability, chick vitality and uniformity he must be provided with a single stage incubator that accurately responds to small adjustments (0.2°F) made by the hatchery manager.

Therefore, the design of the single stage incubator needs to meet the following specific requirements:

- The incubator is divided into small compartments, each with its independently controlled temperature, so that different set points can be defined.
- The cooling capacity in the incubator is sufficient so that air cooling can be avoided.
- A pre-heat function is included to improve day old chick uniformity and a narrow hatch window so that the hatching time is predictable for the different egg types.
- Each of the different climate parameters (temperature, humidity and ventilation) can be controlled independently through a proportional integral derivative (PID) control unit. ■