Incubation and Fertility Research Group

(IFRG/WPSA Working Group 6)

2018 Meeting – Edinburgh, Scotland

October 4th – October 5th

Report

For the 2018 IFRG meeting was held at the 5th floor of the Holliday Inn hotel. The scenic view over Pink Hill Park and Edinburgh Zoo offered all 57 participants a sunny atmosphere during the two days of the meeting. We all experienced a friendly and informative meeting not least because we met several colleagues with similar interests, as became clear during coffee breaks, lunches and the conference dinner.

This 43rd IFRG meeting offered an interesting programme, including a workshop and presentations related to the biology of avian reproduction and the practice of incubation technology. The programme was the result of the combined efforts of Glenn Baggott (IFRG board, ed. British Poultry Science, London, UK), Marleen Boerjan (President IFRG, WPSA WG 6, Pas Reform) and Ann Collin (IFRG board member, URA, INRA, Nouzilly France). This year we were able organise the lectures offered by participants into sessions opened by 3 invited speakers.

Thanks to the talent for improvisation of the complete Aviagen incubation team, we were able to organize a workshop 'embryo-staging' led by invited speaker **Murray Bakst**, a recognized experienced consultant in fertility and early embryonic development of poultry. With the practical help of Ampai Nangsuay, and Serdar Őzlü embryos were collected from fresh eggs. Thereafter Murray Bakst and Guo Jun discussed the embryonic stage, according the Eyal-Gyladi staging system.

A second invited speaker **Professor Maureen Bain (**Glasgow University) presented an overview and new insights into the ultrastructure of the eggshell. In addition, she focused on the importance of the cuticle to protect the egg content from vertical contamination by *E.coli* or *Salmonella*. Finally, she advised us to include routinely the staining of cuticle in egg quality control practices.

Hatchery managers encounter more and more influences of incubation conditions on the quality and performance of day old chicken and poults. The positive as well as negative effects of high and low incubation temperatures are known and are discussed often. **Professor Warren Burggren** from the University of North Texas, USA , was invited to speak about the epigenetic implications of incubation on the embryonic and foetal development. In his intriguing presentation he showed how the developing embryo responds, in a critical phase, to environmental conditions by (1) complete phenotypic adaptations (developmental plasticity), (2) programming/training of the foetus and (3) epigenetic alterations of gene expression. In commercial incubation practice these different but related phenomena are often unknown or ignored. From the presentation we learned how the level of RH during certain critical phases of development influences the development of glomeruli in the primordial kidney.

In **Session 1: Embryo quality, egg handling and egg storage** four speakers showed how the genetic background, age of the parents and treatment of fresh eggs affects the stage of the embryo and,

consequently, early mortality during incubation. **Ewa Łukaszewicz** (University of Wroclaw, Poland) researching the stage of development in different goose breeds and flock ages reported the interesting observations that the stage of embryonic development at oviposition was dependent on laying season and breed. Also the need for a correct and routine staging of the embryos in fresh or stored eggs after short period of incubation (SPIDES, heat-treatments) was clear from the three presentations related to egg handling in the farm and hatchery.

Ampai Nangsuay (Aviagen, Asia Pacific) presented data on embryo stage in eggs collected under field conditions in a tropical climate. It was observed and concluded that the local environmental conditions (transport and temperature) influenced the rate of embryo development during storage. The eggs from prime flocks had to be transported over a long periods and distances at temperatures above 22 °C. As a consequence the embryos developed from and average stage 10.3 to stage 11.7 during prolonged transport at high temperatures. The eggs from an old flock were cooled below 22 °C within 5 ½ h and did not show any development after transport.

Okan Elibol from Ankara University, Turkey, concluded that the hatchability differences between eggs from young and old flocks induced by rapid cooling might depend on the differences in embryonic development at oviposition. He presented data on the effect of the profile of egg cooling after oviposition on stage of embryo and finally hatchability. The stage of embryonic development was advanced by controlled cooling compared to rapid cooling and in the eggs from the older flock. The rapid cooling resulted in a lower hatchability because early mortality and the number of second class chicks were increased especially for eggs derived from younger flocks (28 weeks).

Tolga Erkus (Aviagen, UK) presented results of 3 or 5.5 hours exposure above 32 °C at day 5 of a total storage period of 14 days of eggs from two grandparent flocks (34 wks and 54 wks). After the treatment the stage of the embryos (n=15) was evaluated and the longer period of treatment resulted in, as expected, an advanced stage of development and resulted in a better hatchability compared to the 3.5hr treatment.

Joanna Rosenberger, a PhD student from Wroclaw University is studying the behavioural aspects of Capercaillie *(Tetrao urogallus)* during incubation. In her first presentation she discussed whether improper turning might explain the high levels of early mortality during artificial incubation. In her second lecture she discussed how knowledge of female behaviour and egg storage in the nests might help to improve artificial incubation results.

In **Session 2: Egg quality** more basic aspects of egg quality were discussed before the presentation of Professor Maureen Bain. Utilising new research on embryonic development during egg formation in the hen (South-Korean University) **Marleen Boerjan** (Pas Reform, the Netherlands) discussed pre-gastrulation embryonic development in the hen as it has been shown that gastrulation gene expression might be initiated in the oocyte during yolk development. In short, without the pre-gastrulation development in the uterus of the hen, the gastrulation-related cell movements cannot occur, with increased rates of early mortality as a consequence.

Roger Banwell (Petersime, Belgium) presented new hatchability data in experiments related to specific gravity of eggs, egg weight loss and RH levels and concluded that hatchability of eggs in the medium (1.070- 1.085 gm/cm^3) specific gravity class is highest compared to 'low' and 'high' specific gravity eggs. Specific gravity was found to be a better predictor for hatchability than percentage egg weight loss.

Session 3: Epigenetics, incubation and chick vitality was introduced by the lecture of Prof. Warren Burggren and followed by five presentations addressing several aspects of incubation technology and chick quality.

Incubation temperature

Juan Lopez (Hendrix Genetics, Canada) and **Roos Molenaar** presented new data on incubation temperatures measured and controlled as egg shell temperature (EST). Lopez showed that incubation of turkey at low (99.2- 99.6 °F) egg shell temperatures compared to high (99.8-101 °F) resulted in higher hatchability, higher body weights at hatch and higher yolk free body mass.
Roos Molenaar (Adaptation Physiology Group, Wageningen University, the Netherlands) studied the effects of a combination of high EST (38.9 °C) during second week and low EST (36.7 °C) in the third week on body weight and selected bone characteristics; hatch results were not addressed. In these experiments no effect on body weight and length of the tibia at slaughter age was found. The high temperature during the second week resulted in a slightly thicker bone and higher bone strength. A lower temperature in the third week resulted in a 5 hrs longer incubation duration and lower bone strength.

Early feeding

Keith Bramwell (Jamesway Incubators, Canada) presented the results of experiments related to feed and water in hatcher baskets. The hatch window was divided in four periods and chicks received water and feed immediately when all chicks of the specific period had hatched. From this research it is concluded that access to feed and water prior to chick placement at the farm had no influence on final body weight, feed conversion and mortality overall.

Serdar Őzlű (Ankara University, Turkey) studied the influence of hatching time and post-hatch holding time on yolk sac weight and live performance. The whole hatch window was divided in (1) early hatch (471-474 h), (2) middle hatch (483-486 h) and late hatch (493-496 h) and from all hatch periods half of the chick were held for 18 h and 30 h before they received feed. The chicks stored post hatch for 30 h consumed more feed the first 7 days and had a higher 7 days body weight but at day 35d all chicks had a similar body weight.

Development of the microbiome in day old chicks.

Jean de Oliveira summarized the research at R&D Cargill Belgium on the origin of the intestinal microbiome in day old broiler chicks held under commercial conditions. The results showed that in 5 out the 6 flocks studied there was a strong link, similarity, between microbiota of the parent breeder and offspring in an integrated poultry operation. As a result of vertical transmission from breeder to offspring *Salmonella* was found in one of 6 flocks.

Posters

Two posters from a research consortium of the **University of Pisa (Italy)** and **INRA- Nouzilly (France)** were presented on genetic selection meat traits of broilers and reproduction of parent breeders. From the research presented in both posters it can be concluded that genetic selection for more breast meat results in lower reproductive performance as shown by more poor quality hatching eggs and lower hatchability.

The **INRA research group** also presented a poster on multigenerational effects of heat manipulation on body temperature and growth in broiler chicks. The study addressed the effects of heat treatments during incubation on body temperature and growth in the two following generations. The thermal manipulation during embryonic development consisting of increasing incubation temperature of eggs up to 39.5 °C and relative humidity to 65% for 12 h/d between days 7 and 16 of

incubation. The results showed for the first time evidence of a multigenerational effect of heat stimulation during embryogenesis on growth and thermoregulation in fast-growing chickens. It seems that especially males respond to thermal manipulations.

Julia George and **David Clayton** (Queen Mary University, London, UK) presented a poster about the DNA methylation pattern in zebra finch embryos exposed briefly to vocal signals. It was confirmed that the zebra finch embryos react to environmental signals by epigenetic changes which can be detected by altered DNA-methylation pattern.

Ewa Łukaszewicz and colleagues (University of Wrocław, Poland) presented a poster addressing the enrichment of broiler sperm extender, diluent, for broiler sperm by organic additives. It was concluded that the implementation of organic additives had a positive effect on broiler sperm quality. However, the positive effects lasted for only 6 hours, thereafter the number of live sperm decreased.

Sylvian Briere and colleagues (Hendrix Genetics Turkeys and INRA Nouzilly) presented a poster related to the collection of data for genetic selection strategies. It is concluded that the application of CT-scans technology generates data not only on adipose tissue and bone composition but also about egg, yolk and albumen weights and composition.

MB 10/2018